

THE OPILIONIDA (ARACHNIDA) OF THE NETHERLANDS

by

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INTRODUCTION

Until now very little has been published on the harvestmen of The Netherlands. The earliest paper known to me is by Goedaert (1669), who mentions *Phalangium opilio* from The Netherlands and gives the following "biological" information: "The animals originate from mush-rooms; they eat salpêtre; catch flies with their many-jointed tarsi; at night they play, because there is nothing to prey on". For a long time this was the only "knowledge" concerning Dutch Opilionida, except that according to Houttuyn (1769), Bennet and Van Olivier (1825), Van der Hoeven (1828, 1859), Snellen van Vollenhoven (1859), and Rombouts (1875), the above-mentioned species occurs throughout The Netherlands. An outstanding anatomical study of the sexual organs of a number of species, by De Graaf, appeared in 1882. In "Les Arachnides de Belgique" the Belgian naturalist Becker (1896) records the presence of *Nemastoma lugubre* ²⁾, *Phalangium opilio*, and *Platybunus triangularis* from localities throughout The Netherlands, and *Mitopus morio* and *Odiellus spinosus* from Maastricht. The first important publication on distribution and biology of Dutch harvestmen, is by Loman (1900). He mentions the following species: *Phalangium opilio*, *Opilio parietinus*, *Leiobunum rotundum*, *Mitopus morio* (common from North to South); *Oligolophus tridens*, *Odiellus spinosus*, *Platybunus triangularis* (on sandy soil, in woods, and in heaths); *Nemastoma lugubre*, *Nemastoma quadripunctatum* (in South Limburg). Oudemans (1916) and Arnoud (1955) briefly recorded the presence of *Trogulus tricarinatus* in Limburg. Van der Drift (1950) listed a number of species collected during his investigation of a beech forest, whilst Van der Hammen (1947, 1950) mentions *Mitostoma chrysomelas chrysomelas*, *Nemastoma quadripunctatum*, *Leiobunum rotundum*, and *Opilio*

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2) For the sake of clearness these names are adopted here in the present-day nomenclature.

parietinus from caves in Limburg. A preliminary paper by the present author (Spoek, 1957) deals with the distribution of Limburg specimens.

These references provide only an incomplete picture of the occurrence of the harvestmen in The Netherlands, whilst a key to the species of our country has not yet been published. It appeared, moreover, that the correct identification of a number of species with the help of current foreign keys is nearly impossible; unreliable characters are sometimes used, whilst important characters are often inaccurately described, as will be demonstrated in the Systematic Review.

In the present paper a key to the Opilionida of The Netherlands is therefore given, followed by descriptions and figures of the species, and notes on biology and distribution. Three species that possibly will prove to occur in our country, are included in this study. Up to now the following 20 species and subspecies (all belonging to the suborder Palpatores) are known to occur in The Netherlands: *Anelasmacephalus cambridgei*, *Trogulus tricarinatus*, *Nemastoma quadripunctatum*, *Nemastoma lugubre*, *Mitostoma chrysomelas chrysomelas*, *Mitostoma chrysomelas confusum*, *Homalenotus quadridentatus*, *Oligolophus tridens*, *Oligolophus hansenii*, *Paroligolophus agrestis*, *Lacinius ephippiatus*, *Mitopus morio*, *Odiellus palpinalis*, *Odiellus spinosus*, *Phalangium opilio*, *Opilio saxatilis*, *Opilio parietinus*, *Platybunus triangularis*, *Leiobunum rotundum*, and *Leiobunum blackwalli*. Three species, *Trogulus tricarinatus*, *Anelasmacephalus cambridgei*, and *Homalenotus quadridentatus*, are apparently restricted to Limburg, inhabiting mainly the southern part of this province, whilst *Nemastoma quadripunctatum* is characterized by a discontinuous distribution, being known from South Limburg and from one locality in the province of Gelderland.

The following nine species have been found to occur also in artificial caves: *Mitostoma chrysomelas chrysomelas*, *Nemastoma quadripunctatum* (troglaphiles); *Leiobunum rotundum*, *Leiobunum blackwalli* (troglonexes); *Trogulus tricarinatus*, *Nemastoma lugubre*, *Homalenotus quadridentatus*, *Odiellus palpinalis*, *Opilio saxatilis* (occasional visitors).

Many of the data on the ecology of the species are the result of an ecological investigation in Meijendel, the dune area of the "Gemeentelijke Duinwaterleiding van 's-Gravenhage".

The present study is based on the collection of the Rijksmuseum van Natuurlijke Historie, Leiden, the collection of the Zoologisch Museum, Amsterdam, and the collection of the author. My thanks are due to the curators of these museums. I express also my sincere gratitude to Dr. L. van der Hammen, who suggested the subject of the present study, and offered much help and encouragement during the preparation of the paper.

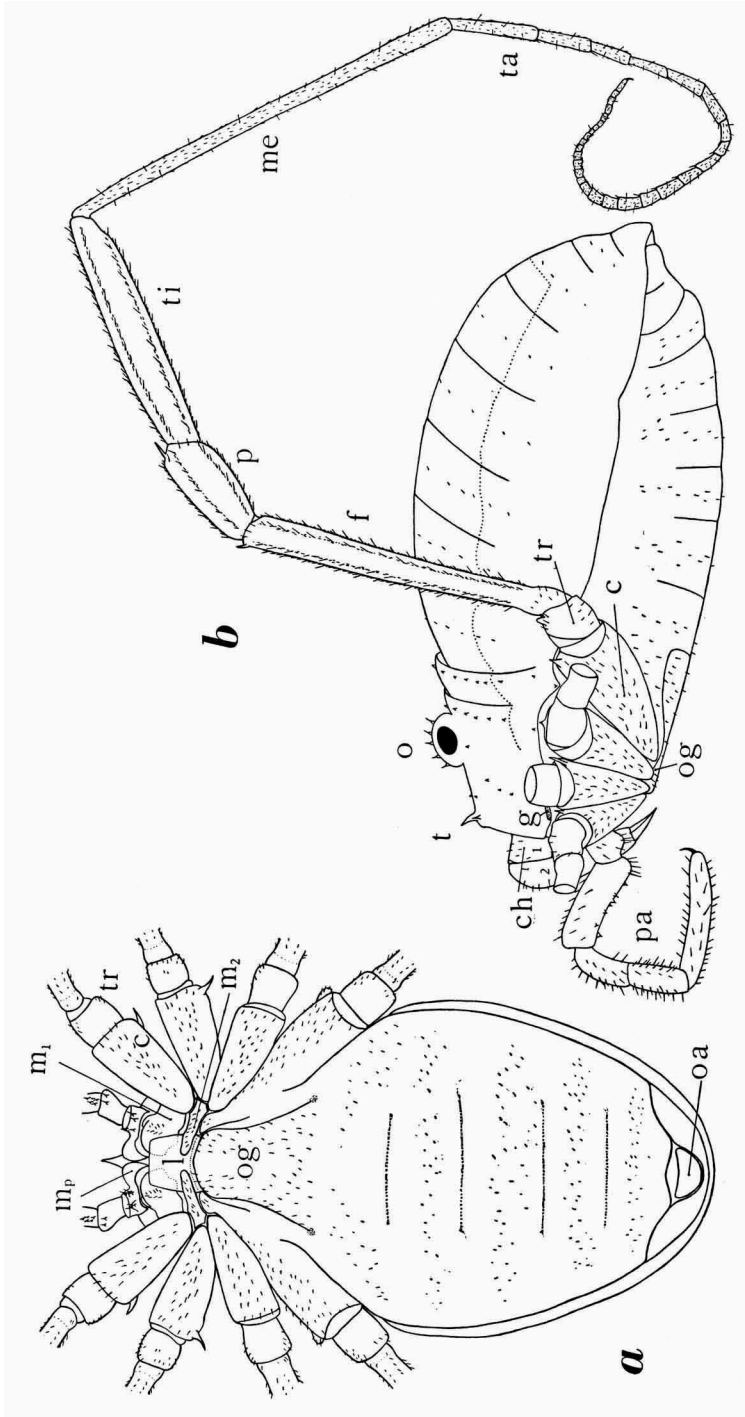


Fig. 1. *Oligolophus tridens* (C. L. Koch), ♀ : a, ventral view; b, lateral view; c, coxa; ch, chelicera; f, femur; g, supra-coxal gland; l, labium; m_1 , lobus maxillaris of coxa I; m_2 , lobus maxillaris of coxa II; m_p , lobus maxillaris of the palp; me, metatarsus; o, ocularium; oa, operculum anale; og, operculum genitale; p, patella; pa, palp; t, trident; ta, tarsus; ti, tibia; tr, trochanter.

KEY TO THE FAMILIES AND SUBFAMILIES OF DUTCH OPILIONIDA

1. Tarsus of the palp shorter than the palpal tibia (fig. 3f); palpal claw rudimentary or absent (Dyspnoi) 2
- Tarsus of the palp longer than the palpal tibia (fig. 1b); palpal claw well developed (figs. 6a-f, 13b) (Eupnoi, Phalangiidae) 3
2. Cephalothorax with a bifurcate hood, covering the palps and chelicerae. Eyes at the base of the hood and almost on a level with the surface of the cephalothorax (fig. 2a, b) **Trogulidae** (p. 6)
- Cephalothorax without bifurcate hood; palps and chelicerae visible in dorsal view. Eyes raised on an ocularium (figs. 3a, e, g, 4b) **Nemastomatidae** (p. 11)
3. Palpal claw without pectination (fig. 6a-f) **Phalangiinae**¹⁾ (p. 22)
- Palpal claw with pectination (fig. 13b) 4
4. Anterior border of the cephalothorax with a large median spine. Posterior border of the abdomen with 4 tubercles (fig. 5a) **Sclerosomatinae** (p. 60)
- Anterior border of the cephalothorax smooth, and abdomen without such tubercles (fig. 13a) **Leiobuninae** (p. 62)

SYSTEMATIC REVIEW

TROGULIDAE Simon, 1872

Body flat and covered with dirt; cephalothorax and tergites I-V fused into a scutum. Cephalothorax with bifurcate hood covering the mouthparts. No ocularium, but eyes at the base of the hood and almost on a level with the surface of the cephalothorax. Supra-cheliceral laminae absent. Supra-coxal gland not visible in dorsal view. Labium and lobus maxillaris II small. Palps much smaller than the body; tarsus of the palp smaller than the palpal tibia; without a claw. Coxae of the legs immovable, indistinctly separated, and without longitudinal rows of denticles; metatarsi with calcaneus; tarsi with at most 4 articulations. Legs without stigmata. Corpus penis and glans more or less in a straight line. Ovipositor rather short, not articulated (only with rings of hairs).

KEY TO THE GENERA

1. Branches of the bifurcate hood semicircular, the ends almost meeting in the median line. Legs without strong tubercles (except on femur I) (fig. 2b) . . . **Trogulus** (p. 6)
- Branches of the bifurcate hood short. Femur, patella, tibia, and metatarsus of the legs covered with strong tubercles (fig. 2a) **Anelasmoccephalus** (p. 9)

Trogulus Latreille, 1802

Bifurcate hood with semicircular branches that nearly meet each other in the median line. Body and legs granulate, without tubercles (except anterior row on femur I). Tarsi I and II with 2, tarsi III and IV with 3 articulations.

1) Roewer subdivided the Phalangiidae into 6 subfamilies. The distinguishing characters of his Phalangiinae and Oligolophinae appear to be erroneous, for which reason they are regarded here as one subfamily Phalangiinae.

The type of the genus is *Phalangium rostratum* Latreille, (now *Trogulus nepaeformis* (Scopoli)); one species (*T. tricarinatus*) is known from The Netherlands.

Trogulus tricarinatus (Linnaeus, 1758) (fig. 2b)

Phalangium tricarinatum Linné 1758, p. 1029.

Opilio tricarinatus, Herbst, 1799, p. 13.

Trogulus rostratus, Becker, 1896, p. 367.

Trogulus tricarinatus, C. L. Koch, 1839, p. 145; Simon, 1879, p. 304; Hansen, 1884, p. 515; Becker, 1896, p. 367; Kraepelin, 1896, p. 234; De Lessert, 1917, p. 68; Roewer, 1923, p. 640; Kästner, 1928, p. 13; Todd, 1948, p. 111; Savory, 1948, p. 4; Šilhavý, 1956, p. 112.

Localities in The Netherlands. Sint-Pietersberg, eastern slope, 12-IX-1950, 1 juv.; 14-X-1952, 2 juv. Meerssen, cave Oli (93), 21-IX-1950, 1 ♂. Geulhem, 22-IV-1947, 1 specimen; wood near cave Wolfsdries, 13-XI-1951, 1 ♀. Gronsveld, Sjeggelder Grub, 19-IV-1951, 1 juv. Rijckholt, Sjoene Grub, 25-IV-1950, 1 juv.; 14-IX-1950, 1 ♂. Eysden, Eysdenerbos, 14-IX-1950, 2 ♀♀. Kunrade, 29-V-1954, 1 ♂. Slenaken, Grote Bos, 9-VIII-1951, 1 ♀. Epen, 22-IV-1954, 1 specimen.

Description. Length of the body up to 8 mm.

Body flat, yellow-brown; whole surface granulate and usually covered with dirt (fig. 2b). Dorsal and ventral surfaces with an armour of chitin, but at both surfaces the segmentation is still present; dorsal surface with a median ridge, ventral surface with a median groove. Anterior border of the cephalothorax with a bifurcate hood of which the branches are semicircular and meet each other in the median line; inner and outer borders of the branches with tubercles. No ocularium; eyes at the base of the hood and almost on a level with the surface of the cephalothorax.

Chelicerae brown; first joint without ventral spur.

Palps brown, with a few hairs.

Legs granulate, light to dark brown. Femur I with an anterior row of tubercles. Femora, patellae, and tibiae with some small hairs, whilst metatarsi and tarsi bear stronger hairs or spines. Tarsus I and II with 2, tarsus III and IV with 3 articulations. Length of the legs (without coxa and trochanter) 5.0-7.5-5.0-6.5 mm.

The penis is straight; corpus penis light brown, with a very small glans and curved stylus.

Remarks. Simon (1879, p. 304) pointed out that the original description of *Phalangium tricarinatum* Linnaeus indeed relates to the present species. In France *Trogulus tricarinatus* appears to be more rare than *T. nepaeformis* (*T. rostratus*, Simon, 1879); the last mentioned species is not found in our country.

Occurrence. *Trogulus tricarinatus* is known from the southern part of Limburg only; it is found in the litter of woods and under stones in the cretaceous area. Only one specimen is recorded from a cave; the small number of records from caves in other countries (Belgium and Italy) sug-

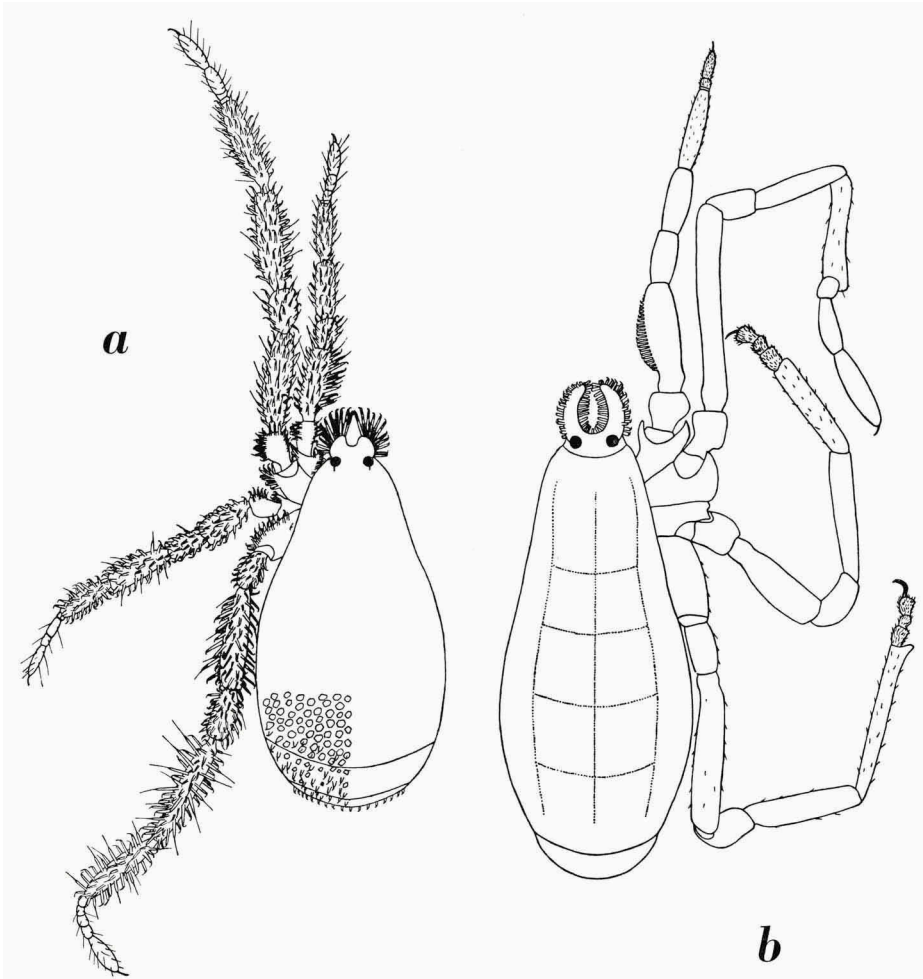


Fig. 2. a, *Anelasmacephalus cambridgei* (Westwood), dorsal view, $\times 17$. b, *Trogulus tricarinatus* (Linnaeus), dorsal view, $\times 8$.

gests that the species is troglaxene.

Juveniles and adults can be found throughout the year.

Distribution: Sweden, Germany, The Netherlands, Belgium, England, France, Spain, Switzerland, Austria, Italy, Hungary, Czechoslovakia and Yugoslavia.

Anelasmacephalus Simon, 1879

Bifurcate hood with short, blunt branches. Surfaces of the body and of femora, patellae, tibiae, and metatarsi of the legs with strong tubercles. Tarsi I and II with 3, tarsi III and IV with 4 articulations (the first 2 articulations are indistinctly separated).

The name *Anelasmacephalus* was created by Simon (1879) in order to replace *Anelasma* Soerensen (1873) (non *Anelasma* Darwin, 1854). The type remains *Anelasma lycosinum* Soerensen, a species from Italy. One species, *A. cambridgei*, is known from The Netherlands.

Anelasmacephalus cambridgei (Westwood, 1874) (fig. 2a)

Trogulus cambridgei Westwood, 1874, p. 202.

Anelasmacephalus cambridgei, Simon, 1879, p. 299; Becker, 1896, p. 365; Kraepelin, 1896, p. 233; De Lessert, 1917, p. 65; Roewer, 1923, p. 646; Kästner, 1928, p. 12; Todd, 1948, p. 111; Savory, 1948, p. 4; Šilhavý, 1956, p. 118.

Localities in The Netherlands. Sint-Pietersberg, near Slavante, 9-I-1951, 1 ♀. Geulhem, wood near Barakkengrot, 13-XI-1951, 1 ♂. Rijckholt, Sjoene Grub, 21-V-1950, 1 ♂. Eysden, Eysdenerbos, 14-IX-1950, 1 juv. Heerlen, XI-1957, 4 specimens.

Description. Length of the body 3.0-3.2 mm.

Body flat, light to black-brown; whole surface with tubercles, and usually covered with dirt (fig. 2a). Dorsal and ventral surface with armour of chitin; only at the ventral surface, the transverse segmentation and a median groove are clearly present. Anterior border of the cephalothorax with a bifurcate hood, of which the branches are provided with long tubercles. No ocellarium; eyes at the base of the hood and almost on a level with the surface of the cephalothorax.

Chelicerae dark brown; first joint without ventral spur.

Palps pale to light brown, and provided with a few hairs.

Coxae, femora, patellae, tibiae and metatarsi of the legs covered with strong tubercles; apical part of metatarsi (the calcaneus) and tarsi with hairs but without tubercles. Tarsi I and II with 3, tarsi III and IV with 4 articulations (the first 2 articulations are indistinctly separated). Length of the legs (without coxa and trochanter) 2.7-3.8-2.8-3.6 mm.

The penis is straight; corpus penis dark brown, with a small glans and curved stylus.

Occurrence. *Anelasmacephalus cambridgei* is only known from the southern part of Limburg and inhabits the litter of woods in the cretaceous area. In The Netherlands the species is more rare than *Trogulus tricarinatus* (in contradistinction to its wide-spread occurrence in France and the southern part of England).

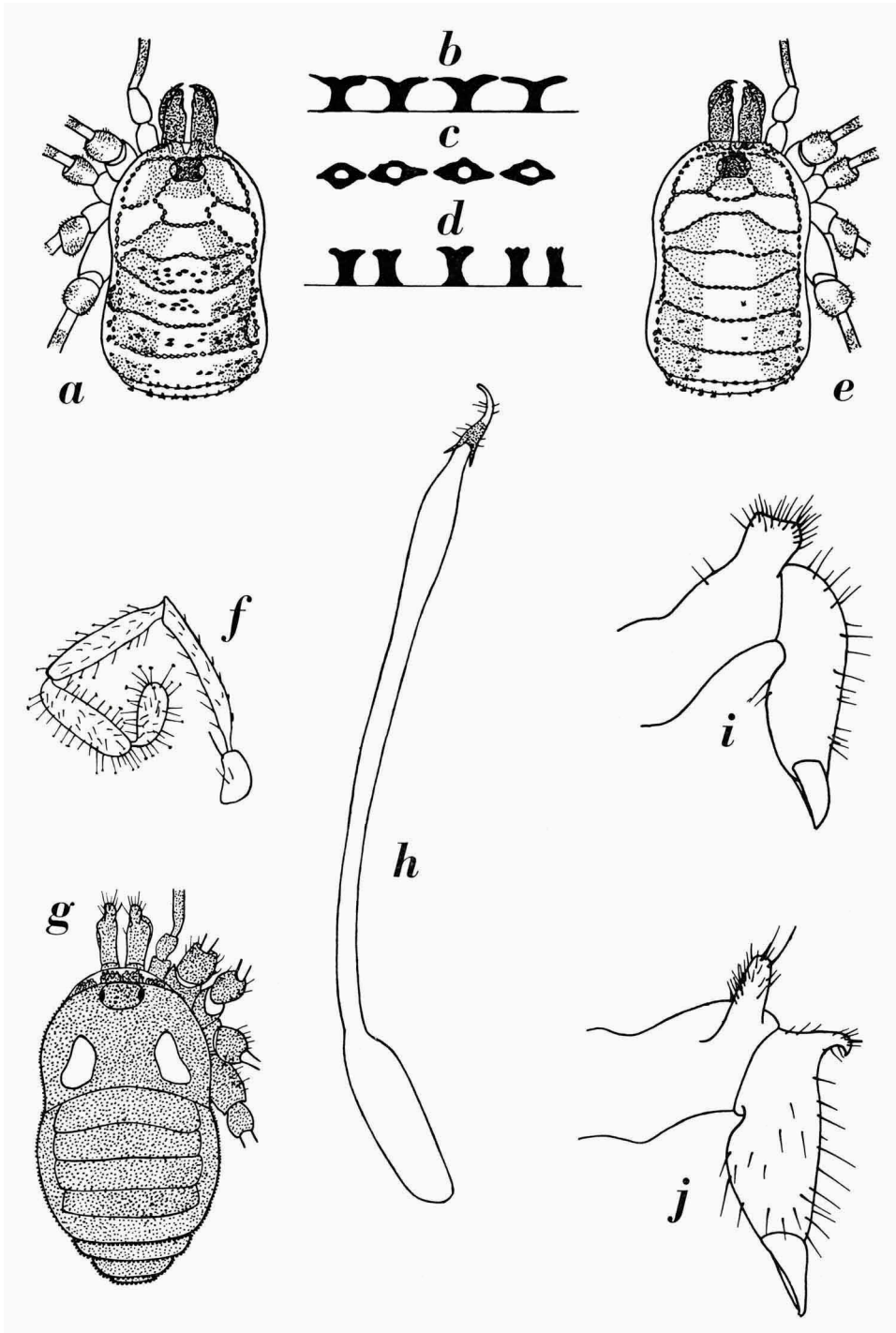


Fig. 3. a, j, *Mitostoma chrysomelas chrysomelas* (Hermann), ♂ : a, dorsal view, $\times 18$; j, chelicera of the male, $\times 100$. b, c, *Mitostoma*, denticles of the anterior rows of the abdomen; b, lateral view; c, dorsal view. d, *Mitostoma*, denticles of the posterior row of the abdomen, lateral view. e, *Mitostoma chrysomelas confusum* n. subsp., ♂, dorsal view, $\times 16$. f-i, *Nemastoma lugubre* (Müller), ♂ : f, palp, $\times 33$; g, dorsal view, $\times 21$; h, lateral view of the penis, $\times 100$; i, chelicera, $\times 100$.

Juveniles and adults can be found throughout the year.

Distribution. Germany, The Netherlands, Belgium, England, France, Spain, Switzerland, Austria, Italy, Hungary, and Yugoslavia.

NEMASTOMATIDAE Simon, 1872¹⁾

Cephalothorax and tergites I-V fused into a scutum. Eyes raised on a distinct ocularium. The anterior border of the cephalothorax bears four indented lamellae on the supra-cheliceral laminae. Supra-coxal gland not visible in dorsal view. Labium small and lobus maxillaris II not present. Palps as long as or longer than the body; tarsus of the palp smaller than the palpal tibia and without a distinct claw. Coxae of the legs immovable, distinctly separated, and each with two longitudinal rows of blunt denticles; metatarsi without calcaneus; tarsus with more than four articulations. Legs without stigmata. Corpus penis and glans more or less in a straight line; corpus penis swollen at the base. Ovipositor rather short, not articulate (only with rings of hairs).

KEY TO THE GENERA

1. Dorsal surface of the body black; transverse rows of denticles absent (figs. 3g, 4b). The length of the palp equals the length of the body. The first joint of the male chelicerae bears a dorsal apical apophysis (figs. 3i, 4e) . . . *Nemastoma* (p. 11)
- Dorsal surface of the body brown to yellow-brown, with transverse continuous rows of denticles (fig. 3a, b, c, d, e). Palps much longer than the length of the body. First and second joint of the male chelicerae each with an apophysis (fig. 3j) . . . *Mitostoma* (p. 16)

Nemastoma C. L. Koch, 1836

Dorsal cuticle of the body solid; transverse rows of denticles are absent. First joint of the chelicerae of the male with a dorsal apical apophysis.

The type of the genus is *Phalangium quadripunctatum* Perty 1833; two species are known from The Netherlands.

KEY TO THE SPECIES

1. Dorsal surface with more than one pair of silver-white spots (fig. 4b). Abdomen with 3 pairs of denticles. Length of the body 3.8-5.2 mm. Chelicera of the male see figure 4e. Penis see figure 4d . . . *Nemastoma quadripunctatum* (Perty) (p. 12)
- Dorsal surface with one pair of silver-white spots (fig. 3g). Abdomen without denticles (only granulate). Length of the body 2.5-3.1 mm. Chelicera of the male see figure 3i. Penis see figure 3h . . . *Nemastoma lugubre* (Müller) (p. 14)

1) Kratochvíl distinguishes the subfamilies Nemastomatinae and Mitostomatinae; moreover, the genus *Nemastoma* is subdivided into two subgenera *Lugubrostoma* and *Nemastoma*. Because the paper was not available to me, I have not followed this classification.

Nemastoma quadripunctatum (Perty, 1833) (fig. 4b, c, d, e)

Phalangium quadripunctatum Perty, 1833, p. 204.

Nemastoma aurosum, L. Koch, 1869, p. 165; Simon, 1884, p. 353.

Nemastoma quadripunctatum var. *aurosa*, De Lessert, 1917, p. 59.

Nemastoma quadripunctatum-aurosum, Roewer, 1917, p. 59; Roewer, 1923, p. 661;

Roewer, 1951, p. 105; Kästner, 1928, p. 20.

Nemastoma quadripunctatum aurosum, Kratochvíl, 1934, p. 12.

Localities in The Netherlands. Bekendelle near Winterswijk, litter of pine-wood, 21-VI-1952, 2 ♀♀. Houthem, Ravensbos, 8-VIII-1946, 1 ♀; shelter, 11-XI-1951, 46 ♂♂, 35 ♀♀; cave Ravensbos III, 4 ♂♂, 1 ♀. Geulhem, cave of Schenk, 6-VIII-1946, 1 ♂; Barakkengrot, 13-XI-1951, 3 ♂♂, 2 ♀♀; cave Heide, 13-XI-1951, 4 ♂♂, 3 ♀♀. Valkenburg, 2 ♀♀. Terblijt, cave Kleine Heide, 12-XI-1951, 1 ♂, 6 ♀♀. Between Oud-Valkenburg and Sibbe, Sibberbosgrot (Vallenberg), 18-IX-1950, 1 ♂; cave Gewand II, 18-IV-1951, 2 ♀♀; Biebos, 18-IV-1951, 1 ♂, 1 ♀; cave Canadasberg, 12-XI-1951, 7 ♂♂, 2 ♀♀; cave Lemmekenskoel, 11-XII-1952, 1 ♂. Scheulder, caves I, II and III, 19-IV-1951, 4 ♂♂, 4 ♀♀. Gronsveld, cave Dolenkamer, 11-I-1951, 2 ♂♂, 6 ♀♀; cave Savelsberg, 27-IX-1951, 6 ♂♂, 10 ♀♀. Eysden, Eysdenerbos, 14-IX-1950, 1 ♂. Near Heerlen, 1955, 1 ♂. Kerkrade, 31-VIII-1954, 1 specimen; Anselbeek, 16-VII-1954, 1 ♀. Epen, 31-V-1943, 1 ♀. Elzeter and Vijlenerbos, 31-VII-1948, 1 ♂.

Description. Length of male and female 3.8-5.2 mm.

Body black (fig. 4b). Cephalothorax with 2 pairs of small silvery spots near the anterior border, and one pair of large 8-shaped silvery spots near the abdomen; in about 30 % of the specimens, the 8-shaped spots are connected with the spots at the anterior border by a thin silvery line (this is also mentioned by De Lessert, 1917, p. 59); a figure is given by Van der Hammen (1947, p. 479, fig. 2). As to the abdomen, the posterior part of the scutum is provided with 3 pairs of small silvery spots, and the 3 free tergites each with one pair of these spots. Cephalothorax and tergites I-V fused into a scutum; whole surface granulate; segments II, III, and IV of the abdomen each provided with a pair of median denticles. Supra-cheliceral laminae with 4 indented lamellae. Supra-coxal glands not visible in dorsal view. Ocularium low and broader than long, covered with small black denticles or granules; the colour is black with a small silvery triangle at the base of the posterior surface.

Chelicerae brown, both joints with dorsal hairs; first joint with dorsal granules. In the male the first joint of the chelicerae bears a dorsal apical apophysis (fig. 4e).

Palps pale, length about 4.2 mm; all joints covered with erect, clavate hairs.

Coxae black to brown, each with two longitudinal rows of blunt denticles; dorsally the joints of the coxae are white. Trochanteres brown-black; femora, patellae, and tibiae light brown to brownish black, and generally with small denticles; metatarsi and tarsi light brown, and provided with very small hairs. Femur I without constrictions; femur II with 1-5, femur III with

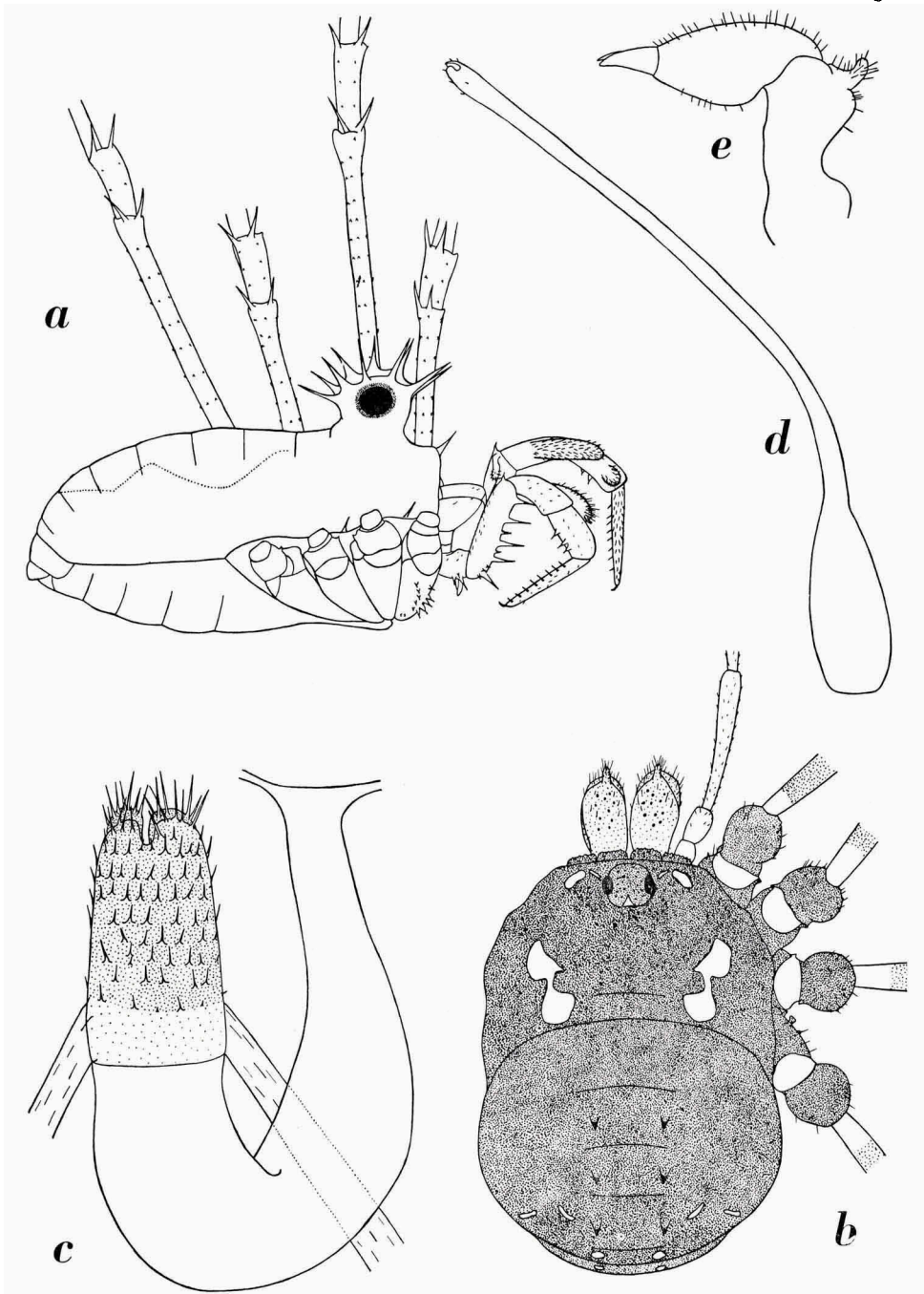


Fig. 4. a, *Megabunus diadema* (Fabricius), ♀, lateral view, × 13. b-e, *Nemastoma quadripunctatum* (Perty): b, dorsal view of the male, × 14; c, ovipositor, × 40; d, lateral view of the penis, × 47; e, chelicera of the male, × 80.

2-4, and femur IV with 4-7 basal constrictions. Metatarsus I with 2-3, metatarsus II with 8-10, metatarsus III with 4-5, and metatarsus IV with 5-8 articulations. Length of the legs (without coxa and trochanter): I, 8-9 mm; II, 9-14 mm; III, 8-9 mm; IV, 11-12 mm.

Penis swollen at the base (fig. 4d); the corpus penis and the glans are not separated by a constriction. Ovipositor rather short, with rings of hairs (fig. 4c).

Remarks. A rather large number of subspecies and varieties of *Nemastoma quadripunctatum* (Perty) have been described, some of which are ill-founded. The Dutch material is identical with Roewer's *Nemastoma quadripunctatum aurosum* (L. Koch) (cf. Roewer, 1923, p. 661); in our specimens the posterior spots on the scutum are, however, much smaller than in his description; in about 30 % of the specimens the 8-shaped spots are moreover connected with the spots at the anterior border by a thin silvery line.

In my opinion there is no evidence that the type of *Nemastoma aurosum* differs in essential characters from the type of *N. quadripunctatum*, for which reason the name is considered here a synonym.

I point moreover to the fact that Roewer provided the figure of his *Nemastoma quadripunctatum aurosum* (1923, fig. 819) with the subscript *N. quadripunctatum quadripunctatum*.

The lengths of the legs of the specimens from The Netherlands are more or less in accordance with those given by Šilhavý (1956), but differ much from those given by Roewer (1923).

Occurrence. In The Netherlands *Nemastoma quadripunctatum* is known from the southern part of Limburg; outside Limburg only 2 specimens were found in the province of Gelderland (Winterswijk). All these specimens have been collected in litter of woods or in caves situated in woods. The species can be characterised as troglophilous; in one small cave 81 specimens were found together on a wall.

Juveniles and adults occur throughout the year.

Distribution. Germany, Poland, The Netherlands, France, Spain, Switzerland, Austria, Czechoslovakia, Albania, and Greece.

***Nemastoma lugubre* (Müller, 1776) (fig. 3f, g, h, i)**

Phalangium lugubre Müller, 1776, p. 192.

Phalangium 2-maculatum, Fabricius, 1793, vol. II, p. 431.

Phalangium bimaculatum, Latreille, 1803-1804, vol. VII, p. 323; Hermann, 1804, p. 105.

Nemastoma lugubre, Simon, 1879, p. 281; Becker, 1896, p. 362; Kraepelin, 1896, p. 233;

Todd, 1948, p. 113; Savory, 1948, p. 5.

Nemastoma lugubre-bimaculatum, Roewer, 1923, p. 654; Kästner, 1928, p. 19; Heinäjoki, 1944, p. 11.

Nemastoma lugubre bimaculatum, Roewer, 1951, p. 126; Šilhavý, 1956, p. 125.

Localities in The Netherlands. Beetsterzwaag, 5-VII-1950, 1 ♀. Diever, 31-VIII-1932, 12 specimens. Wijster, 16-IX-1959, 1 ♀. Mantinge, Mantingerbos, 16-IX-1959, 1 ♂. Nijmegen, 3-13-IX-1945, 4 ♀♀. Emst, 23-VII-6-VIII-1946, 1 specimen. Hoge Veluwe, summer, 1945, 2 juv; 14-IX-1946, 13 ♂♂, 6 ♀♀. Amerongen, 23-V-1957, 1 ♀. Amersfoort, Den Treek, 26-VIII-1953, 1 specimen. Oud Amelis Weerd, 31-VIII-1953, 1 ♂. Naardermeer, 24-IV-1923, 1 ♀; 25-IX-1923, 1 specimen. Ankeveen, 23-X-1951, 2 specimens. Kortenhoef, 25-VI-1952, 9 specimens. Hilversum, 5-7-V-1957, 10 ♂♂, 3 ♀♀; 23-VI-1957, 18 ♂♂, 3 ♀♀. Duivendrecht, 22-VII-1913, 1 specimen. Wijk aan Zee, Geesterbosje, 3-IV-1949, 1 ♀. Driehuis-Westerveld, 28-VIII-1931, 1 ♂, 5 ♀♀. Heemstede, 19-X-1913, 1 specimen. Vogelenzang, Vinkenveld, 27-VI-1952, 8 juv. Nieuwkoopse Plassen, 11-IX-1946, 1 specimen. Valkenburg, 2 specimens. The Hague, dunes of Meijendel, 11-IX-1953 — 24-II-1954, 209 ♂♂, 159 ♀♀; Haagse Bos, 1-1943, 1 ♀. De Beer, drift-line of Nieuwe Waterweg, 10-VII-1956, 1 specimen. Lekkerkerk, 29-X-1949, 1 ♂. Peursem, 19-VIII-1914, 1 ♂. Breda, Liesbos, 8-V-1953, 1 ♀. Esbeek, 30-V-1944, 1 ♂. Herkenbosch, Hammerhof, 25-IX-1948, 2 ♂♂, 2 ♀♀. Vlodrop, Station, 30-IX-1948, 1 ♂, 4 ♀♀. Wijler, near Swalmen, 29-IX-1948, 1 ♂. Swalmen, 29-IX-1948, 1 ♂, 1 ♀. Sint-Pieterberg, Fort Sint-Pieter, 9-11-VII-1949, 2 ♂♂, 1 ♀; quarry near Franse Batterij, 19-IX-1949, 3 ♂♂; Enci-bos, 18-IX-1949, 3 ♀♀; 22-III-1950, 1 ♂, 1 ♀; western slope, 24-VIII-1949, 1 ♀; Slavante, 21-III-1950, 2 ♂♂; 25-IX-1951, 3 ♂♂, 4 ♀♀; between boundary-marks 53 and 58, 3 ♂♂; between boundary-marks 54 and 55, 8-V-1949, 1 ♂; between boundary-marks 51 and 53, 17-IX-1949, 1 ♀; eastern slope, 12-IX-1950, 3 ♀♀; wood of Caestert, VII-IX-1949, 2 ♀♀. Neercanne, 19-IX-1949, 1 ♀; Cannerbos, 18-VII-1950, 1 ♂. Elsloo, 20-IX-1950, 1 ♂, 1 ♀. Oostbroek, 20-IX-1950, 1 ♂, 6 ♀♀. Nuth, 16-IX-1950, 1 ♂. Schinnen, 28-IX-1948, 1 ♂. Geulhem, 7-8-VIII-1946, 1 ♂, 4 ♀♀; 9-XI-1951, 1 ♂, 1 ♀; wood near Barakkengrot, 13-XI-1951, 1 ♀. Houthem, Ravensbos, 9-VIII-1946, 3 ♂♂, 1 ♀; cave Ravensbos, 4-XI-1951, 1 ♀. Groot Haasdal, 9-VIII-1946, 1 ♂, 3 ♀♀. Bemelen, near Molenberg, 19-IX-1950, 2 ♀♀. Rooth, Bunderberg, 20-IV-1951, 4 ♂♂. Gronsveld, Savelsbos, 23-VIII-1950, 1 ♂; 27-IX-1951, 1 ♀. Rijckholdt, Sjoene Grub, 14-IX-1950, 1 ♀; 17-IV-1951, 2 ♂♂; 9-V-1951, 1 ♀. Eysden, Eysdenerbos, 14-IX-1959, 1 ♀; 17-IV-1951, 1 ♀. Kerkrade, 16-VIII-1952, 1 specimen; Anselbeek, 16-VII-1954, 1 ♂, 1 ♀; 22-IX-1954, 2 ♂♂. Epen, Bovenste Bos, 26-IX-1951, 1 ♂, 3 ♀♀.

Description. Length of the male 2.0-2.2 mm; length of the female 2.5-3.1 mm.

Body black (fig. 3g). Cephalothorax with one pair of silver-white spots. The cephalothorax and the tergites I-V are fused into a hard scutum; whole surface granulate. Supra-cheliceral laminae with 4 indented lamellae. Supracoxal gland not visible in dorsal view. The black ocularium is low, much broader than long, and covered with strong granules.

Chelicerae black; both joints with some dorsal hairs. In the male the first joint of the chelicerae bears a dorsal apical apophysis; ventro-laterally it has a row of 3 small denticles (fig. 3i).

Length of the palps about 2.3 mm. Trochanter of the palp black; femur dark brown, pale in the proximal part; patella dark brown; tibia and tarsus brown. All joints covered with erect, clavate hairs (fig. 3f).

Coxae of the legs black and with 2 longitudinal rows of blunt denticles. Trochanteres, femora, patellae, and tibiae black; metatarsi and tarsi brown.

All joints with small hairs. Femora I without constrictions; femora II and III with 1-2, and femora IV with 2-4 proximal constrictions. Metatarsi I with 2-3, metatarsi II with 4-6, metatarsi III with 3, and metatarsi IV with 5-6 articulations. Length of the legs (without coxa and trochanter): I, 4.0-4.3 mm; II, 6.0-7.1 mm; III, 4.2-4.5 mm; IV, 5.7-6.1 mm.

Penis swollen at the base (fig. 3f). Glans penis small, stylus curved.

Remarks. Up till now only the typical *Nemastoma lugubre* (Müller) is known from The Netherlands; *Nemastoma lugubre unicolor*, in which the white spots are lacking, has not yet been found in our country. In accordance with Sankey (1953) I regard *unicolor* as a variety of the typical species; Roewer (1923, 1951) distinguished two subspecies, of which "*Nemastoma lugubre-bimaculatum*", the typical species, bears a subspecific name which is not in accordance with the international rules of nomenclature.

Occurrence. *Nemastoma lugubre* is common in The Netherlands. It prefers humid places and is found in grass-lands, in the litter of shrubs and woods, and even in the drift-line on the beach. Only one specimen is known from a cave in Limburg.

Juveniles and adults can be found throughout the year; catch-box investigations in the dunes near The Hague suggest that the species is most active from September till in December.

Distribution. Europe; from the Arctic to the Mediterranean, from Great Britain and Ireland to Western Russia.

Mitostoma Roewer, 1951

Dorsal cuticle of the body rather soft with continuous transverse rows of denticles. First and second joint of the male chelicerae each with an apophysis.

Type: *Phalangium chrysomelas* Hermann (sensu Roewer).

Several species and subspecies related to *Mitostoma chrysomelas* have been described, although generally in an insufficient way, so that the relations in the *chrysomelas* group are complicated and lack clarity.

In 1804 Hermann (p. 108, pl. 8, figs. 3, H, I, K, L) described *Phalangium chrysomelas* from Strasburg, which species was afterwards recorded by Meade (1855), Simon (1879), Cambridge (1890), Becker (1896), Kraepelin (1896), and Roewer (1923). The last-mentioned author (1923, p. 669, fig. 833) gives, among others, the following characters of *Nemastoma chrysomelas*: Cephalothorax with 4 areas bordered by continuous rows of denticles; anterior border of the cephalothorax in front of the ocularium without a row of denticles; the areas I-V of the scutum are also bordered by continuous rows of denticles; abdomen with a median row of white spots.

I remark that the characters recorded by Roewer are not mentioned by Hermann and that Hermann's figure even shows that apart from a median row of spots on the abdomen there are also transverse, oblong white spots.

In 1928 Kästner includes in his monograph the description of *Nemastoma saxonica* Hnatewytch (also a *Mitostoma*); he mentions the following about this species in his introduction (l.c. p. 6): "Die Diagnose von *Nemastoma saxonica* Hnatewytch stellte mir der Autor lebenswürdigerweise aus seiner demnächst erscheinenden Dissertation zur Verfügung". Kästner's fig. 25 is prepared by Hnatewytch. In 1929 Hnatewytch's thesis appeared, in which the species now bears the name *Nemastoma spinosa*; the same drawing is given. It is, however, evident that *spinosa* is a synonym and that the correct name of the species is *saxonica* Hnatewytch in Kästner (1928) (see also Husson, 1941; Van der Hammen, 1947).

The diagnostic characters of *Nemastoma saxonica* are the following: Cephalothorax with 5 areas surrounded by continuous rows of denticles; in front of the ocularium the anterior row of denticles is not interrupted. On the scutum the areas I-IV only are surrounded by continuous rows of denticles (fig. 3b, c), whilst the eighth transverse row consists of separate denticles (fig. 3d). I remark that some of the distinguishing characters mentioned by Kästner (1928) (e.g. the breadth of the abdomen) are in my opinion not of diagnostic importance.

Kratochvíl (1934), Šilhavý (1939, 1956), and Roewer (1951) described a species under the invalid name *Mitostoma (Nemastoma) spinosum* (Hnatewytch); this form differs from *saxonica* by the absence of the row of denticles in front of the ocularium.

Roewer (1951, p. 143, fig. 74) described a new species from Serbia, *Mitostoma silhavyi*, which is said to be different from *M. spinosum* sensu Roewer by the transverse oblong white spots on the abdomen, by the presence of 2 pairs of circular rows of denticles at the lateral borders of the scutum areas, and by the fact that the eighth transverse row of denticles is not continuous. To my surprise the 48 specimens from The Netherlands, with the exception of one, correspond with *M. silhavyi*, although some characters are variable: the pattern of the white spots, the density of the denticles in the eighth row, and the presence of the circular or slightly differently shaped rows of denticles (inconstant in material from the same locality). Because it seemed improbable to me that our *Mitostoma* was not the common species known from this part of Europe, I also studied material from Luxemburg, France and Tirol (about 45 specimens). All these specimens also differ from Roewer's description of *M. chrysomelas* and appear to have the same characters as those from The Netherlands. As mentioned above the most important

differences from *M. chrysomelas* sensu Roewer are: cephalothorax with 5 areas surrounded by continuous rows of denticles, and abdomen with transverse oblong white spots. Since Hermann also mentioned the transverse spots on the abdomen, and because it is highly probable that he also described the common species from this part of Europe, I believe that Roewer's *Mitostoma šilhavyi* is identical with the *M. chrysomelas* of Hermann. In my opinion the variability of the specimens does not justify the separation of *šilhavyi* and "*spinosum*", for which reason I consider *M. spinosum* sensu Kratochvíl and *M. šilhavyi* Roewer synonyms of *M. chrysomelas* Hermann (not sensu Roewer). The species erroneously described by Roewer in 1923 as *Mitostoma (Nemastoma) chrysomelas* must be rather rare; it is absent in the material studied by me from Luxemburg, France and Tirol, whilst from The Netherlands only one specimen is known. As this form has been confounded with the original *chrysomelas* of Hermann, I give it the name *confusum* nov. subsp.

Because of the great variability of some species great caution should be exercised in creating new ones. Before doing so one should have a considerable number of specimens from a single locality all bearing the same new character.

The differences between the forms are of minor importance, so that I follow Šilhavý (1956) in regarding them as subspecies. In the *chrysomelas* group the following subspecies can therefore be listed: *Mitostoma chrysomelas chrysomelas* (Hermann, 1804); *Mitostoma chrysomelas confusum* n. subsp.; *Mitostoma chrysomelas saxonica* (Hnatewytš in Kästner, 1928); *Mitostoma chrysomelas alpinum* (Hadži, 1938).

The first two of the above-mentioned subspecies have been found in The Netherlands.

KEY TO THE SUBSPECIES

1. Dorsal surface of the cephalothorax with 5 areas surrounded by continuous rows of denticles (fig. 3a, b, c) . . . *Mitostoma chrysomelas chrysomelas* (Hermann) (p. 18)
- Dorsal surface of the cephalothorax with 4 areas surrounded by continuous rows of denticles (fig. 3e, b, c) *Mitostoma chrysomelas confusum* n. subsp. (p. 21)

Mitostoma chrysomelas chrysomelas (Hermann, 1804) (figs. 3a, b, c, d, 5d, e)

Phalangium chrysomelas Hermann, 1804, p. 108, fig. VIII-3.

Nemastoma chrysomelas, Meade, 1855, p. 413; Simon, 1879, p. 285; Becker, 1896, p. 362; Kraepelin, 1896, p. 233; Todd, 1948, p. 113; Savory 1948, p. 6.

Nemastoma aurosum, Canestrini, 1872, p. 10, fig. 113.

Nemastoma spinosum, Kratochvíl, 1934, p. 8, fig. 37; Šilhavý, 1939, p. 114, fig. 3.

Nemastoma saxonica, Van der Hammen, 1947, p. 477, fig. 1.

Mitostoma saxonica, Spoek, 1957, p. 44.

Mitostoma spinosum, Roewer, 1951, p. 146, fig. 70.

Mitostoma silhavyi, Roewer, 1951, p. 143, fig. 74.

Nemastoma chrysomelas šilhavýi, Šilhavý, 1956, p. 143, fig. 273.

Nemastoma chrysomelas spinosum, Šilhavý, 1956, p. 143, fig. 272.

Localities in The Netherlands. Mantinge, Mantingerbos, under holly, 29-VII-1959, 1 ♀; under oak and beech, 30-IX-1959, 1 ♀. Wijster, under oak and beech, 19-VIII-1959, 1 ♂, 2-IX-1959, 2 ♀♀, 9-IX-1959, 1 ♀, 30-IX-1959, 1 ♂. Dwingelo, staatsbossen, under spruce-fir and larch, 16-IX-1959, 2 ♂♂, 1 ♀, 23-IX-1959, 1 ♂, 4 ♀♀, 30-IX-1959, 1 ♂, 1 ♀, 7-X-1959, 1 ♂, 1 ♀, 14-X-1959, 1 ♂, 1 ♀. Lheebroek, Lheebroeker Zand, Empetrum-heath with shrubs of *Juniperus*, 27-I-1959, 1 ♂. Sint-Pietersberg, quarry near Franse Batterij, 19-IX-1949, 1 ♂, 1 ♀; Enci-bos, 2-IV-1951, 1 ♀; Slavante, 12-IX-1950, 1 ♂; eastern slope, 14-X-1952, 1 specimen; wood of Caestert, 1 ♀. Neercanne, Kasteelgrot, 21-IX-1950, 1 ♂, 1 ♀. Oostbroek, 20-IX-1950, 1 ♀. Houthem, Ravensbos, 9-VIII-1946, 1 juv. Gronsveld, cave Savelsberg, 2 ♂♂, 1 ♀. Groot Haasdal, 9-VIII-1946, 1 ♀. Geulhem, Leraarsgrot, 8-VIII-1946, 1 ♀. Epen, Bovenste Bos, 26-IX-1951, 1 ♂. Kolmont, 15-II-1958, 2 ♀♀. Heerlen, XI-1957, 4 ♀♀.

Description. Length of the male 1.7-1.9 mm; length of the female 2.2-2.9 mm.

The colour of the body is brown to yellowish brown with a slightly variable pattern of light spots. Often this pattern is as given in figure 3a: a median white band and transverse oblong white spots. The dorsal surface is provided with two types of denticles. The first type is T-shaped in lateral view and diamond-shaped in dorsal view; they form continuous rows of denticles (fig. 3b, c). The second type is only slightly furcate and is found in rows of separate denticles (fig. 3d). The dorsal surface of the cephalothorax is divided in 5 areas surrounded by rows of continuous denticles, and the areas I, II, III, and IV of the scutum are also bordered in this way. The posterior border of the scutum (posterior border of area V) and the free tergites, however, bear rows of separate denticles. Sometimes the lateral borders of area III and IV consist of circular rows of continuous denticles (fig. 3a). Especially in the female the cephalothorax and abdomen are, apart from the rows of denticles, covered with groups of brown denticles of normal shape. Ocularium black, with two longitudinal rows of denticles; in front of the ocularium the row of continuous denticles is interrupted and here the anterior border of the cephalothorax bears no denticles. Supra-cheliceral laminae with 4 irregularly sawed lamellae. Ventrally the abdomen is yellowish; generally the last 3 sternites bear rows of very small denticles.

Chelicerae black-brown, covered with a few long hairs. First and second joint each with an apophysis (fig. 3j).

Length of the palps 3.1-4.2 mm; all joints are brown, and covered with long clavate hairs.

Coxae of the legs with 2 longitudinal rows of denticles; usually the proximal

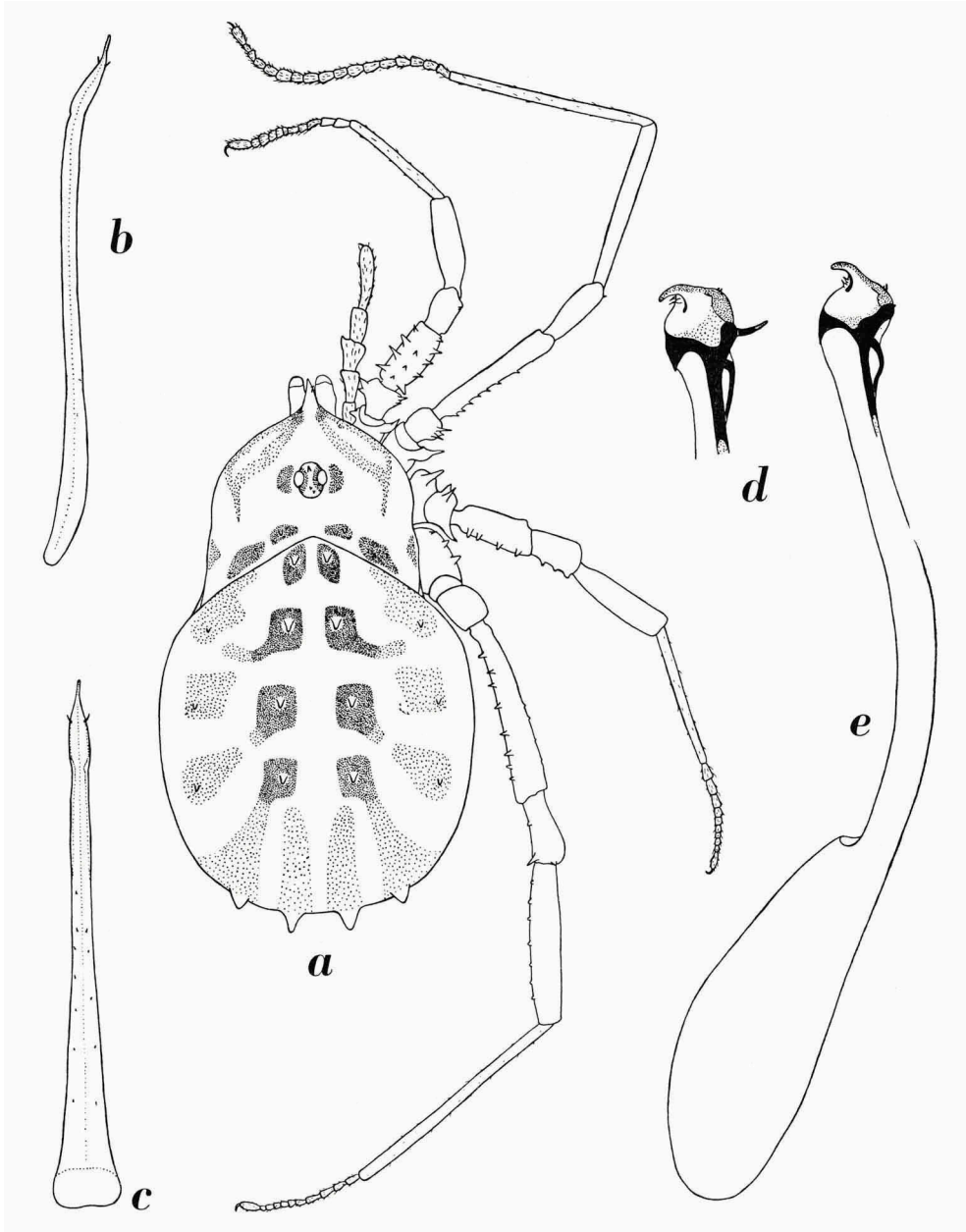


Fig. 5. a-c, *Homalenotus quadridentatus* (Cuvier), ♂: dorsal view, $\times 14$; b, lateral view of the penis, $\times 43$; c, ventral view of the penis, $\times 43$. d, e, *Mitostoma chrysomelas* (Hermann): d, lateral view of the penis showing the ventral protuberance, $\times 118$; e, lateral view of the penis with retracted protuberance, $\times 118$.

part is brown, and the distal part pale. Trochanteres dark brown with a light dorsal and ventral median part. The other joints of the legs are brown or pale brown; femora pale at both ends and with pale pseudo-articulations; femora, patellae and tibiae with small black denticles, metatarsi and tarsi with small hairs.

Number of pseudo-articulations of the femora: I, 3-6; II, 8-16; III, 4-7; IV, 6-8; of tibia II, 7-11.

Length of the legs (without coxa and trochanter): I, 7.5-11.5 mm; II, 12.5-19.5 mm; III, 9.2-11.7 mm; IV, 8.2-14 mm.

Penis swollen at the base; glans with a retractable protuberance (fig. 5d, e).

Occurrence. Till now the typical species has been found only in South Limburg and Drente. In South Limburg 9 specimens have been collected in caves and 13 specimens in the litter of various types of woods. In Drente the specimens originate from catch-boxes in woods of holly, of oak and beech, and of spruce-fir and larch.

Adults are known from January till November, and are possibly present throughout the year.

Distribution. Europe (except Spain).

Mitostoma chrysomelas confusum n. subsp. (fig. 3e)

Nemastoma chrysomelas, Roewer, 1923, p. 669, fig. 833.

Nemastoma chrysomelas chrysomelas, Kratochvíl, 1934, p. 5; Šilhavý, 1939, p. 112;

Šilhavý, 1956, p. 143, fig. 275.

Mitostoma chrysomelas chrysomelas, Roewer, 1951, p. 142, fig. 68.

Locality in The Netherlands. Noord Holland, Vogelenzang, Vinkenveld, dunes of the "Amsterdamsse Waterleiding", 27-VI-1952, 1 ♂.

Description. This subspecies closely resembles *Mitostoma chrysomelas chrysomelas*, but the only specimen known from The Netherlands (a male), shows the following differences.

Length of the male 2.0 mm.

Body with a median white band, and without transverse, oblong, white spots. The dorsal surface of the cephalothorax is divided into 4 areas by rows of continuous denticles. The dorsal surface of the abdomen bears, apart from the rows of denticles, only a few more denticles (fig. 3e). Ventrally the last two sternites each with a row of very small lateral denticles.

Occurrence. This specimen was found in an oak wood in the dune-area near Vogelenzang.

Probably the subspecies is present throughout the year.

Distribution. Because this subspecies has been confounded with *M. chrysomelas chrysomelas* (Hermann) (not sensu Roewer), the distribution of

M. chrysomelas confusum is uncertain. It seems likely that the subspecies is rather rare, but spread throughout Europe.

PHALANGIIDAE Simon, 1879

Eyes raised on an ocularium. Coxae of the legs movable; metatarsi without calcaneus. Labium large, lobus maxillaris II distinctly present. Tarsus of the palp longer than the palpal tibia, and with a distinct claw. Tibia of the legs with stigmata. Ovipositor long and articulated.

PHALANGIINAE Simon, 1879

Eyes raised on an ocularium. Anterior border of the cephalothorax smooth or with denticles. Lobus maxillaris II long. Supra-coxal gland visible in dorsal view. Supra-cheliceral laminae with or without denticles. Tarsus of the palp with a smooth claw. Coxae of the legs without longitudinal rows of denticles. Corona analis absent. Stylus and glans penis at an angle with the corpus penis.

Banks (1893), and Roewer (1923; in 1912 as Oligolophini) distinguished the subfamily Oligolophinae which should be characterised by a ventral spur on the first joint of the chelicerae. In *Odiellus palpinalis* (Herbst), *Oligolophus meadii* Cambridge, and *Paroligolophus agrestis* (Meade), however, this spur is absent, so that the distinction between the subfamilies is not justified. For this reason the two subfamilies sensu Roewer are regarded here as one subfamily *Phalangiinae*.

KEY TO THE GENERA

1. First joint of the chelicerae without ventral spur. 2
- First joint of the chelicerae with a ventral spur (fig. 11 b) 6
2. Cephalothorax without trident in front of the ocularium 3
- Cephalothorax with a trident (fig. 7 a, b, d, e) 6
3. Femur of the palp with ventral tubercles; patella of the palp with a median apophysis (figs. 6 f, 4 a) 4
- Femur of the palp without ventral tubercles; patella of the palp without apophysis 5
4. Ocularium with two longitudinal rows of 7-11 denticles (fig. 11 i). Chelicerae of the male with an apophysis pointing outwards (fig. 11 j). Cephalothorax usually with a few small denticles in front of the ocularium but without a strong median spine *Platybunus* (p. 23)
- Ocularium with two longitudinal rows of 5 very long spines (fig. 4 a). No sexual dimorphism in the chelicerae. Fore-edge of the cephalothorax with one strong spine. (Not yet found in The Netherlands) *Megabunus* (p. 26)
5. Supra-cheliceral laminae with 2 median teeth. Abdomen and coxae ventrally whitish (fig. 11 c-h). Operculum genitale of normal shape (as in fig. 1a) *Phalangium* (p. 27)
- No teeth on the supra-cheliceral laminae. Abdomen ventrally pale, coxae with brown spots (fig. 10 c-e). Operculum genitale with enlarged, rounded top (fig. 10 d) *Opilio* (p. 31)

6. Trident hardly recognizable; cephalothorax in front of the ocularium provided with a row of 3 small tubercles, and often with a few additional tubercles or denticles (fig. 11a, b) *Mitopus* (p. 38)
 — Trident distinct; sometimes small and with additional denticles (figs. 7a, b, d, e, 10a, b) 7
7. Dorsal surfaces of the femora of the legs with longitudinal rows of denticles (figs. 9a, 10a) *Lacinius* (p. 41)
 — Femora with longitudinal rows of hairs only (figs. 1b, 9b) 8
8. Trochanter and femur of the palp with large ventral tubercles some of which are longer than broad (fig. 6c-d) *Odiellus* (p. 47)
 — Trochanter and femur of the palp with ventral hairs and a few small tubercles (fig. 6a-b) 9
9. Operculum genitale with rounded top (fig. 1a). Ocularium with 2 longitudinal rows of small denticles or tubercles *Oligolophus* (p. 53)
 — Operculum genitale with a notch (fig. 9c-d). Ocularium with a few hairs only *Paroligolophus* (p. 58)

Platybunus C. L. Koch, 1839

Ocularium large, broader than long. In front of the ocularium the cephalothorax is unarmed or shows some small denticles. The supra-cheliceral laminae bear no denticles. In *P. triangularis* the second joint of the chelicerae of the male is provided with an apophysis. Patella and tibia of the palp with an apophysis. Penis of normal shape.

The type of the genus is *Platylophus pinetorum* C. L. Koch, 1839; one species is known from The Netherlands.

Platybunus triangularis (Herbst, 1799) (figs. 6f, 11i-j, 12c-d)

Opilio triangularis Herbst, 1799, p. 9.

Phalangium cornigerum, Hermann, 1804, p. 102.

Opilio denticornis, O. lucorum, C. L. Koch, 1836, pp. 30, 87.

Platybunus denticornis, C. L. Koch, 1848, vol. 15, p. 112.

Platybunus corniger, *P. triangularis*, Becker, 1896, pp. 353-354; Kraepelin, 1896, p. 226.

Platybunus corniger, Roewer, 1912, p. 250; Müller, 1919, p. 75; De Lessert, 1917, p. 50.

Platybunus triangularis, Roewer, 1923, p. 848; Pack-Beresford, 1926, p. 137; Kästner, 1928, p. 43; Kolosváry, 1929, p. 109; Heinäjoki, 1944, p. 21; Todd, 1948, p. 113.

Localities in The Netherlands. Westerbork, 3-VII-1944, 2 ♀♀. Dwingelo, 18-V-1939, 1 ♀. De Lutte, 21-IV-1949, 1 juv. Wilp, 1946-1954, 247 specimens. Barneveld, heath, 3-VI-1913, 1 ♀; De Schaffelaar, IV-V-1943, 19 ♀♀, 15 juv. Hoge Veluwe, 26-III-10-IV, 28-V-1947, 1 ♂, 10 juv. Nieuwersluis, 11-V-1951, 2 ♀♀. Zeist, 15-III-1950, 1 juv. Hilversum, V-1931, 1 juv.; heath, 30-VI-1913, 1 specimen. Amersfoort, 29-III-1914, 5 specimens; Den Treek, 9-IV-1953, 10 juv.; Japanse Bosjes, 7-IV-1953, 1 juv. Naarden, "Bos van Bredius", 21-V-1915, 1 specimen. Huizen, 9-18-VI-1916, 2 ♀♀. Amsterdam, 11-V-1913, 1 specimen; 29-V-1951, 1 ♀; 5-V-1953, 4 ♂♂, 3 ♀♀. Zandvoort, 2-IV-23-V-1953, 9 specimens. Aerdenhout, 30-IV-1953, 2 juv. Vogelenzang, 30-IV-1952, 1 juv.; 27-VI-1952, 1 ♀. Beverwijk, 17-V-1914, 1 specimen. Noordwijkerhout, 24-V-1953, 3 ♂♂, 2 ♀♀. Oegstgeest, Poelgeest, 3-24-V-1944, 5 ♂♂, 1 ♀, 1 juv. Wassenaar, 7-VI-1941, 1 ♀; 13-IV-1944, 3 juv.; 10-VI-1948, 1 ♀. The Hague, dunes of Meijndel, 8-III-1-VII-1953, 90 ♂♂, 172 ♀♀, 1036 juv. Voorschoten, 10-III-1951,

1 juv. Bodegraven, 9-III-1950, 1 juv. Nieuwkoopse Plassen, 18-V-1944, 1 ♂, 2 ♀♀. Ankeveen, 23-X-191, 1 juv. Koudekerk, 18-X-1948, 1 juv. Schiedam, Sterrebos, 3-7-V-1944, 4 juv. Maassluis, 30-IV-1944, 1 specimen. Rockanje, 16-V-1953, 5 ♂♂. Geldermalsen, 21-V-1950, 1 juv. Breda, Liesbos, 8-V-1953, 3 juv.; Mastbos, 3-V-1959, 1 ♂, 1 ♀. Rijen, 25-V-1916, 1 specimen. Baarle-Nassau, 26-28-IV-1949, 2 ♂♂, 2 ♀♀. Esbeek, 29-30-V-1944, 1 ♂, 3 ♀♀. Vlodrop, 30-IX-1948, 1 juv. Sint-Pietersberg, Enci-bos, 6-V-1949, 1 ♀; 22-III-1950, 1 juv.; 2-IV-1951, 3 juv.; Slavante, 24-V-1950, 1 ♂; 25-IX-1951, 3 juv.; 23-V-1950, 1 ♀; Caestert, 25-V-3-VI-1949, 2 ♀♀. Neercanne, near the castle, 20-III-1950, 1 juv.; Cannerbos, 11-V-1951, 1 ♀. Elsloo, 20-IX-1950, 1 juv. Oostbroek, 11-V-1951, 3 ♀♀. Maastricht, 1949, 1 juv. Bunde, 14-VI-1953, 2 ♂♂. Bemelen, Molenberg, 19-IX-1950, 1 juv. Groot Welsden, 20-IV-1951, 1 juv. Rijckholt, 11-VI-1953, 1 ♂; Sjoene Grub, 20-X-1950, 1 juv.; 5-IV-11-VI-1951, 4 ♀♀, 6 juv. Eysden, 8-V-1951, 2 juv. Strucht, Keutenberg, 27-V-1949, 2 ♀♀. Scheulder, 19-IV-1951, 1 juv. Heerlen, 1955, 2 ♀♀. Nijswiller, Plattebos, 18-IV-1951, 2 ♀♀. Bissen, 27-V-1949, 1 ♀. Epen, Bovenste Bos, 16-VI-1914, 3 ♀♀; 26-IX-1951, 1 juv. Vijlen, Vijlenerbos, 25-V-1949, 2 ♂♂; Kerperbos, 7-VII-1951, 1 ♂. Between Slenaken and Heyenrath, 9-V-1951, 1 juv.

Description. Length of the male 4 mm; length of the female 6 mm.

The colour and armature of this species is rather variable and may be slightly different from the following description; for this reason the colour pattern has been omitted from fig. 11i.

Cephalothorax whitish, with irregular yellowish brown spots; three of these spots are placed near the lateral border. In front of the ocularium a median olive-brown band including a white line is present; generally, the latter bears one small denticle. As mentioned above the armature is variable, but usually a more or less transverse row of small denticles is present in front of the ocularium (fig. 11i); laterally this row passes into another row of three small denticles which runs to the postero-lateral region. The lateral border of the cephalothorax is provided with 5-6 denticles, one denticle behind and in front of the pore of the supra-coxal gland included. Below the anterior border of the cephalothorax the supra-cheliceral laminae bear no teeth. Ocularium seen from above large, broader than long; grey-white, a little brownish in front. On each side of the broad, white median band the ocularium is provided with a row of 7-11 denticles. Abdomen whitish yellow with brown spots; especially in the female a distinct dark saddle is present. Dorsally the abdomen and the operculum genitale are grey-white and bear small black hairs.

Chelicerae pale yellowish brown with a white or brown pattern; on the dorsal surface both segments are provided with hairs. The second joint of the chelicerae of the male bears an apophysis that points outwards (fig. 11j).

Palps pale yellow or yellowish brown (fig. 6f). On the inner side the femur and tibia are provided with a small apophysis, the patella with a distinct hairy one. With the exception of some denticles on the dorsal surface of the femur (not always in the female), and 0-4 dorsal denticles on the

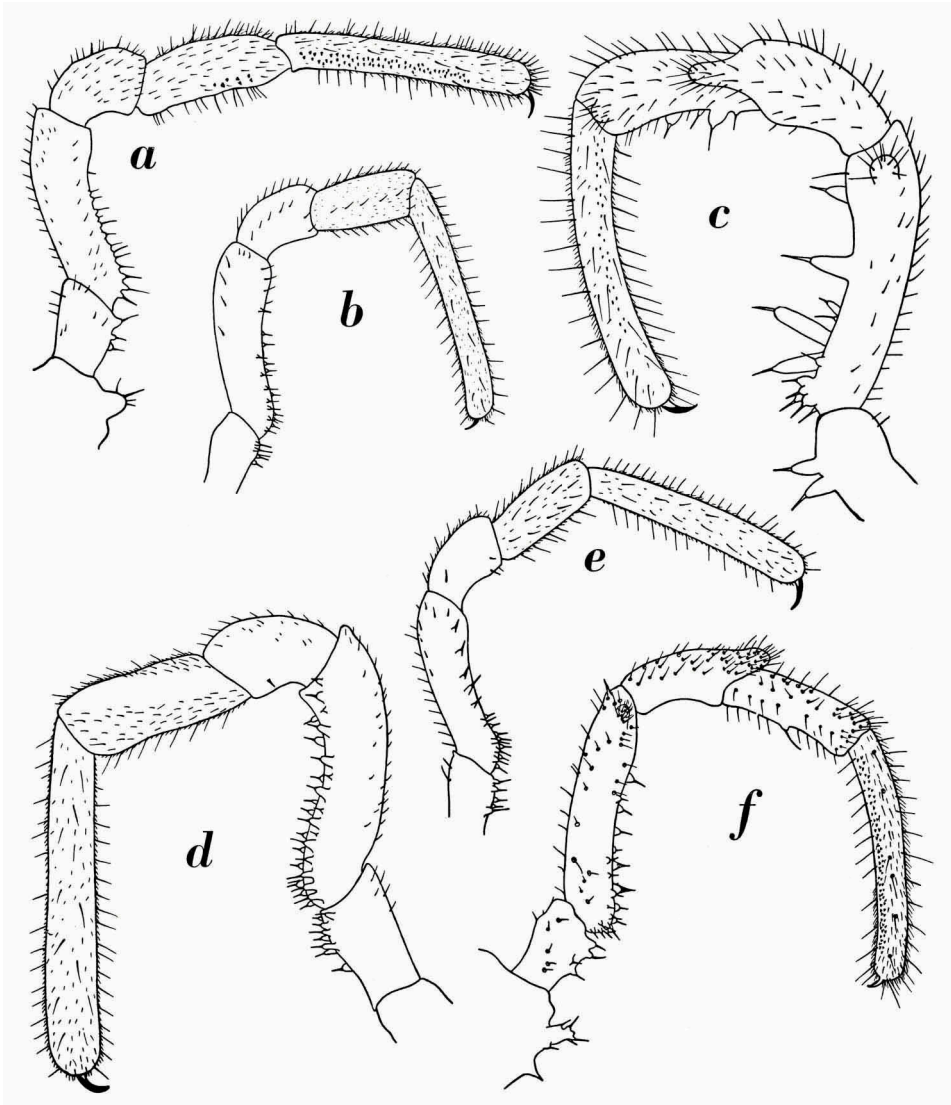


Fig. 6. a, *Paroligolophus agrestis* (Meade), medial view of the palp of the male, $\times 33$. b, *Oligolophus tridens* (C. L. Koch), lateral view of the palp of the male, $\times 23$. c, *Odiellus palpinalis* (Herbst), medial view of the palp of the male, $\times 40$. d, *Odiellus spinosus* (Bosc), lateral view of the palp, $\times 23$. e, *Lacinius ephippiatus* (C. L. Koch), lateral view of the palp, $\times 21$. f, *Platybunus triangularis* (Herbst), medial view of the palp of the male, $\times 23$.

patella, the joints of the palps are only provided with dorsal hairs; ventral surfaces of trochanter and femur of the palp with large and smaller tubercles; in the middle of the tibia one ventral tubercle is always present, sometimes

accompanied by other, generally smaller, tubercles; tarsus with darker top, and in the male with a longitudinal ventral row of small granules.

Coxae white with olive-brown spots. Femora of the legs with longitudinal rows of denticles; patellae with rows of hairs and generally with a few denticles; tibiae with longitudinal rows of hairs, each row consisting of a large number of small appressed hairs and one row of longer erect hairs; tibia IV usually with small denticles; metatarsus and tarsus unarmed. Length of the legs (without coxa and trochanter): 17-32-20-26 mm.

Length of the penis 2-3 mm (fig. 12 c-d). Corpus penis long and slender, thickened at the base. In comparison with the penis of *Phalangium opilio* L., the glans and stylus are slender.

Occurrence. *Platybunus triangularis* is found in lowlands as well as in mountains. De Lessert (1917) mentions that the species is found up to 1448 m. In The Netherlands this harvestman is very common and shows a preference for woods with a relatively high humidity but it is also found in open humid places with a dense herblayer, such as marshes etc. In the sand-dunes the species has a preference for birch-woods and thickets; in dry open places covered with grasses and small willows (*Salix repens* L.) the species is absent.

The juveniles live on the ground, in litter and mosses; as catch-box investigations have shown, they are already very mobile. The adults are found on the floor as well as on trunks of trees, branches, shrubs, etc. Todd (1949) proved that in the laboratory *Platybunus* shows a relatively low temperature preference (mean 8.8 C.); these observations are in agreement with the distribution throughout the year; *Platybunus triangularis* is a wintering species, the juveniles can be found from August till May and the adults from April till in July.

Distribution. *Platybunus triangularis* has been recorded from all parts of Europe; from the Faroe Islands and Scandinavia up to the Balkan and Western Russia.

MEGABUNUS Meade, 1855

Ocularium highly elevated, constricted at the base. Anterior border of the cephalothorax with one median spine. Supra-cheliceral laminae without median denticles. There are no secondary sexual characters in the shape of chelicerae and palps. Inner sides of femur, patella, and tibia of the palp with an apophysis. Penis of normal shape.

In 1855 Meade created the genus *Megabunus* in which he also included some representatives of the genus *Platybunus* (C. L. Koch, 1839). Thorell (1876) and Simon (1879) distinguished the two genera, and mentioned the constricted ocularium and the median spine on the anterior border of the cephalothorax as main characters of the genus *Megabunus*.

The type of the genus is *Phalangium diadema* Fabricius, 1779; no species is known from The Netherlands.

MEGABUNUS DIADEMA (Fabricius, 1779) (fig. 4a)

Phalangium diadema Fabricius, 1779, p. 339; Fabricius, 1802, p. 324.

Megabunus insignis, Meade, 1855, p. 406.

Megabunus diadema, Thorell, 1876, p. 464; Simon, 1879, p. 231; Roewer, 1912, p. 257; Roewer, 1923, p. 854; Pack-Beresford, 1926, p. 138; Savory, 1948, p. 15.

Description after material from: France, Huelgoat (Fin.), 5-VI-1953, 1 specimen; England, Hereford, V-1899, 1 specimen. The last mentioned specimen was kindly sent to me by the British Museum (Natural History).

Description. Length of the male 3 mm; length of the female 4.5 mm.

Cephalothorax white, with some dark brown spots. On the anterior border of the cephalothorax in front of the ocularium one median spine. Lateral margins with three denticles; for the rest the cephalothorax is provided with a few very small denticles. Ocularium highly elevated, constricted at the base; light brown with two longitudinal rows of five very large brown spines. Abdomen unarmed, whitish with dark brown spots and a median brown saddle; ventrally the abdomen is white with transverse rows of brown spots alternating with rows of very small hairs.

Chelicerae of normal shape, dorsally provided with a few hairs.

Palp pale yellow with some darker parts; inner sides of femur, patella, and tibia provided with a brown apophysis that is covered with hairs. Besides one denticle at the end of the femur, the dorsal surface of the palp is provided with hairs only. Ventral surface of trochanter and femur of the palp with long spines that are as long as the breadth of the femur; ventral surface of the tibia with three tubercles, each bearing a hair. Tarsus of the palp pale with dark apical part; it is provided with a row of strong ventral hairs.

Coxae white, with a few hairs; coxa I with two rows of tubercles. Legs yellow-brown; the apical parts of femora and patellae are provided with two long, dorsal spines. Femora with longitudinal rows of small denticles; generally the other joints bear only small hairs.

Occurrence. Probably *Megabunus diadema* will prove to occur in The Netherlands, because the species is found in Norway, Denmark, France, Great Britain and Ireland. In Great Britain and Ireland the species is common, in the other countries it appears to be rather rare. Up to now I did not find *Megabunus* among the Dutch material notwithstanding thorough collecting. According to the available data the continental records of the species are from coastal regions only, but in Great Britain and Ireland the species is found throughout the country (Savory, 1948; often on hills and mountains). In Norway, Fabricius (1779) found the type-specimen on rocks; Pack-Beresford remarked that in Ireland he found the species generally on stone posts. In her ecological study of the British harvestmen, Todd (1949) records that she never found *Megabunus* on the ground layer; she mentions tree-trunks as the habitat of this harvestman.

Pack-Beresford found his specimens in the "summer", while Todd recorded juveniles from November till May, and adults from May till July.

Phalangium Linnaeus, 1758

Ocularium of normal shape; dorsally with two longitudinal rows of denticles. Under the anterior border of the cephalothorax the supra-cheliceral laminae bear two median denticles. Palps without apophysis. Palps of the male long and slender; leg-shaped. The second joint of the male chelicerae is provided with a horn-like apophysis pointing upwards. Palps and chelicerae of the female normal. Penis of normal shape.

Linné (1758) created the genus *Phalangium*; subsequently Degeer (1778) and Hermann (1848) placed all harvestmen known to them in this genus whilst Simon (1879), Becker (1896), Kraepelin (1896), and others listed the species of our *Phalangium* and *Opilio* with *Phalangium*. The only genus distinguished by Herbst (1798) was the genus *Opilio*, whilst Koch (1839, and 1848) and Canestrini (1872) used the name *Cerastoma*. Roewer (1912) again distinguished the genera *Phalangium* and *Opilio* and established their differential characters.

The type of *Phalangium* is *Phalangium opilio* Linnaeus, 1758; it is the only representative of the genus in The Netherlands.

***Phalangium opilio* Linnaeus, 1758 (figs. 11c-h, 12a, b)**

Phalangium cornutum, Degeer, 1778, p. 173; Hermann, 1804, p. 102.

Cerastoma cornutum, Hahn und Koch, 1848, p. 8; Canestrini, 1872, p. 34.

Cerastoma brevicorne, Hahn und Koch, 1848, p. 10.

Phalangium opilio, *P. brevicorne*, Simon, 1879, p. 195; Kraepelin, 1896, pp. 224-225.

Phalangium opilio Linnaeus, 1758, p. 619; 1761, p. 485; 1767, p. 1027; Becker, 1896, p. 347; Loman, 1902, p. 191; Roewer, 1923, p. 751; Kästner, 1928, p. 41; Kolosváry, 1929, p. 105; Heinäjoki, 1944, p. 17; Todd, 1948, p. 113; Savory, 1948, p. 13; Bishop, 1949, p. 183; Šilhavý, 1956, p. 219.

Localities in The Netherlands. Vlieland, 17-22, 25-VII-1953, 1 ♂, 1 ♀, 3 juv. Terschelling, Oosterend, 7-VIII-1948, 1 ♀; Boschplaat, 11-IX-1952, 4 ♀♀. Opsterland, 31-VIII-1954, 1 ♀. Sloten, 7-IX-1913, 1 ♂. Urk, 11-13-VII-1929, 4 specimens; 26-28-IX-1929, 4 specimens. Westerbork, 3-VII-1944, 2 ♂♂, 4 ♀♀, 5 juv.; 26-VII-1944, 4 ♂♂, 3 ♀♀; VIII-1944, 4 ♂♂. Diever, 31-IX-1932, 3 specimens. Grolloërholt, Hondsrug, 24-VIII-1949, 1 ♂. Dwingeloo, 28-IX-1932, 1 specimen. Wilp, Kleine Noorddijk, 1946-1956, 148 specimens. Hoge Veluwe, Hoenderloo, 11-VIII-1944, 4 ♀♀; 4-X-1946, 2 ♂♂; 26-VII-1941, 1 ♂; Otterlose Zand, 10-14-VIII-1944, 12 ♂♂, 3 ♀♀, 3 juv.; De Harp, 22-VII-1952, 3 ♀♀. Busselo, 10-VII-1949, 1 ♂. Hulshorst, VII-1951, 5 ♂♂, 1 ♀. Barneveld, VI-VII-1943, 2 ♀♀. Epe, 11-13-IX-1946, 2 ♂♂, 1 ♀. Ede, 3-VIII-1943, 1 ♂. Nunspeet, 17-VII-1958, 1 ♂. Utrecht, VII-1932, 1 ♂, 2 ♀♀, 1 juv.; 11-VII-1949, 1 ♂. Woudenberg, Heuschotermeer, 6-VI-1953, 5 juv. Zeist, VIII-1932, 3 specimens. Bilthoven, 2-14-VIII-1954, 1 ♂, 4 ♀♀, 4 juv. Soest, 31-VIII-1931, 2 specimens. Amersfoort, Treckermeer, 11-X-1952, 4 ♀♀. Nieuw Loosdrecht, 13-VIII-1954, 1 ♂, 2 ♀♀. Oud Leusden, 10-IX-1952, 2 ♂♂, 1 ♀. Texel, 26-VIII-1947, 1 ♀. Laren, VIII-1937, 1 ♂. Huizen, 23-28-IX-1940, 1 ♂, 4 ♀♀. Bussum, 2-VIII-1954, 2 juv. Amsterdam, gardens, 20-27-VII-1913, 3 ♂♂, 2 ♀♀, 2 specimens; 12-VII-1914, 2 specimens; 3-4-IX-1913, 5 ♂♂, 5 ♀♀. Haarlem, gardens, 10-21-VIII-1950, 16 ♂♂, 28 ♀♀; 10-IX-1950, 5 ♂♂, 3 ♀♀, 1 juv. Petten, 4-VIII-1945, 2 ♀♀. Huisduinen, 8-VI-1950, 5 juv. Bloemendaal, VIII-1904, 1 ♂, 3 ♀♀; Thijssse's Hof, 23-IX-1943, 1 ♂. Heemstede, Naaldenveld, X-1943, 1 juv. Noordwijk aan Zee, 10-VI-1947, 1 ♀. Leiden, 25-XI-1930, 1 ♀; VII-VIII-1931, 2 specimens; 5-VIII-1932, 3 specimens; Leidse Hout, 16-IX-1933, 3 specimens; 3-IX-1940, 1 ♂; garden, 26-VII-1943, 1 juv.; 30-V-1949, 1 juv. The Hague, dunes of Meijndel, 17-V-17-XII-1953, 3430 ♂♂, ♀♀, juv. Duinrel, 19-IX-1948, 1 ♀. Wassenaar, 10-VI-1948, 1 ♂. Voorschoten, Beresteyn, X-1929, 1 specimen; 18-VII-1947, 1 ♀. Delft, 21-VI-1946, 1 juv. Schiedam, 23-VI-1944, 1 ♂. Rotterdam, 21-VII-1924, 1 ♀; 29-V-1944, 1 juv. Voorne, dunes near Brede Water, 30-VII-1952, 1 juv. Peursum, 19-VIII-1944, 4 ♀♀, 4 juv. Haamstede, 15-VI-1944, 1 ♂. Oosterwijk,

27-VII-1955, 1 ♀. Zundert, 2-VIII-1957, 1 ♀. Udenhout, 18-VIII-1952, 1 juv. Deurne, woods of Vliedingen, 6-IX-1958, 1 ♂. Wijler, near Swalmen, 29-IX-1948, 1 ♀. Linne, 25-IX-1948, 2 ♂♂. Grevenbicht, 25-VIII-1955, 2 ♀♀. Sint-Pietersberg, Ganzendries, 19-VIII-1950, 1 ♀; Franse Batterij, 17-IX-1949, 3 ♂♂, 3 ♀♀, 1 juv.; Franse Batterij, 14-VIII-1950, 2 ♀♀; Encibos, 21-IX-1949, 2 ♀♀; 15-VIII-1950, 1 ♂, 1 ♀; grass-land, 19-VIII-1950, 1 ♀; Wijngaard, 10-VII-1949, 1 ♂; 14-VIII-1950, 1 ♂; Slavante, 13-VII-1949, 1 ♀; 17-VII-1950, 1 ♀; Oude Luikerweg, 14-VIII-1950, 1 ♀; between boundary-marks 51 and 53, 17-IX-1949, 1 ♂; between boundary-marks 51 and 52, 18-X-1950, 1 ♂. Canne, 15-VI-1914, 1 ♂, 1 ♀. Neercanne, 26-V-1914, 1 ♂; near boundary-mark 71, 10-VII-1949, 1 ♂. Elsloo, 20-V-1950, 1 ♂, 1 ♀. Houthem, Kloosterbos, 7-VIII-1946, 1 ♂. Strucht, Gerendal, 13-VII-1944, 3 ♂♂. Schin op Geul, 13-22-VII-1944, 1 ♂, 1 ♀. Bemelen, Bemelerberg, 20-VII-1950, 1 ♀, 1 juv. Gronsveld, 27-VIII-1953, 1 ♂. Eysden, Eysdenerbos, 15-VII-1944, 1 ♂; 14-IX-1950, 1 ♀. Brunsummerheide, 13-VIII-1951, 1 ♂. Kerkrade, 8-14-VIII-1951, 1 ♂. Epen, Bovenste Bos, 24-V-1949, 2 juv.

Description. Length of the male 3.5-7.5 mm; length of the female 6.0-9.0 mm.

The colour pattern of this species is variable and for this reason it is omitted from figure 11f. The cephalothorax is whitish or yellowish brown, with irregular olive-brown spots; three of these spots are placed near the lateral border. Cephalothorax in front of the ocularium with a median olive-brown band that includes a distinct white line; the latter is provided with one or two small denticles. On both sides of the median band a group of 3-7 denticles is present; these groups pass into a row of three denticles directed to the postero-lateral region of the cephalothorax. On each side at the base of the ocularium one or two denticles are present. On the angles of the anterior and lateral borders of the cephalothorax of the male a group of 4-8 denticles is visible; in the female 1-3 denticles are present. Each of the supra-cheliceral laminae bears one median tooth under the anterior border of the cephalothorax. Ocularium seen from above more or less quadrangular; pale or yellowish brown; on each side of the median part it is provided with a row of 6-10 denticles. The dorsal surface of the abdomen is whitish grey or yellowish grey, generally with a distinct dark saddle; the armature consists of transverse rows of very small denticles. Ventral surface of the abdomen white or grey and, just as the operculum genitale, provided with small black hairs.

The colour and armature of the chelicerae and palps are also variable. Generally the chelicerae are pale or yellowish brown. In the male the dorsal surface of the first joint bears 7-15 small denticles which are more or less placed in a circle; in the female this circle generally consists of hairs. In the male the proximal part of the second joint has a vertical horn-like process (fig. 11g); often this horn is very small, not more than a boss (fig. 11c). In the female the second joint of the chelicerae is of normal shape (fig. 11h); just as in the male it bears hairs.

Palps of the male long (10-22 mm) and slender, about 2-3 times the length of hairs and small denticles; tibiae angular, provided with five longitudinal than the body. Colour of the palps pale yellow. With the exception of basal and proximal parts, the palpal femur of the male is generally dark brown and provided with a dorsal row of denticles (fig. 11f); the palpal femur of the female (fig. 11d) is darker in the middle part only, and the dorsal row of denticles occurs in the upper part of this joint only. In both sexes the ventro-lateral surfaces of the palpal femur are provided with extremely small tubercles with hairs. Generally the patella, tibia and tarsus of the palp bear no denticles but are provided with hairs only.

Coxae white with olive-brown spots. Legs pale or yellowish brown. Femora angular, with five longitudinal rows of denticles; patellae with five rows of hairs and small denticles; tibiae angular, provided with five longitudinal bands each consisting of 2-5 rows of hairs. Generally only the first tibiae bear some small denticles between the hairs. Length of the legs (without coxa and trochanter); male: 29-48-29-40 mm; female: 19-36-21-30 mm.

Length of the penis 2.8-3.5 mm (fig. 12a-b). Upper part of the corpus penis narrowed. Ovipositor besides the three divided top segments generally with 38 (32-44) undivided segments which can bear hairs up to the 32nd. Length of the ovipositor 3-5.2 mm.

Remarks. Roewer (1912) gave an extensive survey of the synonyms of this species; he mentioned no less than 20 different names. In this work Roewer proved (as Simon, 1879, suggested already) that the greater part of the "species" mentioned in literature are juveniles or varieties. For example this holds good for Koch's *Cerastoma curvicorne*, *C. cornutum*, *C. tirolense*, *C. praefectum*, *C. molluscum*, *C. capricorne*, *C. aduncum*, *C. longipes*. The studies by Kraepelin (1896, p. 225), Kulczynski (1904), and Roewer (1912) prove that *Phalangium (Cerastoma) brevicorne*, often recorded as a separate species, is a juvenile of *Phalangium opilio*.

Occurrence. *Phalangium opilio* is a very common species that is found in lowland as well as in mountains (according to De Lessert, 1917, up to 2045 m); localities from all provinces of The Netherlands are known. It has a preference for open places like grass-lands, dunes, and roadsides, but it is also found in open woods and gardens. In the sand-dunes near The Hague *Phalangium opilio* is especially found in open places covered with *Calamagrostis*; in the birch-woods of this area the species is only exceptionally present. At the "Hoge Veluwe", Van der Hammen (unpublished investigations) found *Phalangium opilio* to be especially common in isolated pine-trees in sand-drifts and heaths. Todd's (1949) laboratory observations prove that the species has a relatively high temperature preference (mean 15.5° C.), and

this is in accordance with the temperature of the open places in the field. Probably the juveniles are not very mobile; they live on the ground, under the herb-layer or stones, whilst the adults are often found on tree-trunks, shrubs etc.

Adults can be found from the beginning of June till the end of December; they are most abundant from the end of August till the end of November. In catch-boxes the juveniles are especially found from May till August but sporadically throughout the year till the end of December so that it is probable that the juveniles hibernate. A summer (July) and an autumn generation are possible (Kästner, 1928), but these two generations are not distinctly separated; from May till November adults as well as juveniles are present.

Distribution. *Phalangium opilio* has been recorded from all parts of Europe, North and Central Asia, Asia Minor, North Africa and North America.

Opilio Herbst, 1798

Ocularium low, height smaller than the length; dorsally with two longitudinal rows of denticles. Cephalothorax in front of the ocularium with denticles. Supra-cheliceral laminae without denticles. Chelicerae similar in both sexes; apophyses are absent. Palps not leg-shaped; patella and tibia without apophyses. Legs long and slender. Corpus penis with two concavities at the end of the dorsal surface.

The genus *Opilio* was created by Herbst in 1798 for a number of species of harvestmen; it contained all the forms of the group known to him. Among these, the first mentioned is *Opilio parietinus*, a species described in 1778 by Degeer as *Phalangium parietinum*. Although in 1839 Koch listed *O. parietinus* as the first species in his summary of the genus, he did not indicate it the type of the genus as Simon (1879) and Roewer (1912) erroneously supposed. Simon (1879) regarded moreover the name *Opilio* as a synonym of *Phalangium*. As far as I know Roewer (1912) was the first to designate *Phalangium parietinum* Degeer as type of the genus *Opilio*.

In 1839 C. L. Koch described *Opilio saxatilis*, a species that some later authors indeed recognized as distinctly different from *O. parietinus* (Canestrini (1872), Simon (1879), Becker (1879, 1896), Pickard-Cambridge (1890), and Falconer (1910)). In 1912 Roewer erroneously supposed, however, that *O. saxatilis* was the juvenile stage of *O. parietinus*; several authors e.g. De Lessert (1917) and Kästner (1928) adopted this opinion. In 1930 Hull suggested that *saxatilis* should represent a different species, while Savory (1945) also was not quite certain about the synonymy of *saxatilis* and *parietinus*. Šilhavý (1938) proved that the two species are really distinct;

he concluded from the study of the genital apparatus that *O. saxatilis* (C. L. Koch) and *O. parietinus šilhavýi* Krat., 1934 are synonymous. Afterwards, Todd (1948) and Sankey (1949) also demonstrated that the two species differ in external morphological characters, in the structure of the genital apparatus, and in their ecology. Recently the problem has become more complicated as a result of Hoffmann's investigations (1953). He demonstrated that in Germany several forms are found that belong to two groups; a *parietinus* group with four forms, differing in characters of penis, chelicerae and legs, and a *saxatilis* group with two forms differing in the chaetotaxy of the penis. He did not name these forms, although it is probable that they represent distinct species. There is no doubt about the identity of our *parietinus*, but it is not impossible that Koch's *saxatilis* will prove to have the penis type with 20-24 pairs of hairs; in this case the British and Dutch material with 9-12 pairs of hairs should represent a new species. Awaiting further investigations I keep, however, the name *saxatilis* for the Dutch material.

The type of the genus is *Phalangium parietinum* Degeer, 1778; two species are known from The Netherlands.

KEY TO THE SPECIES

1. Ocularium with two rows of 5-6 (exceptionally 4-8) denticles. Metatarsus I with false articulation. Abdomen dorsally with an indistinct white median line. Male 6.5-7.5 mm long. Concave plates of the corpus penis rounded; they are not provided with hairs. Tibia II of the male with longitudinal rows of denticles. Female 7-9 mm long. Ovipositor, besides the three divided segments, with about 37 segments. (fig. 10 d, e; fig. 12 e, f, g) *Opilio parietinus* (Degeer) (p. 32)
- Ocularium with two rows of 3-4 denticles. Metatarsus I without false articulation. First joint of the chelicerae with a dark brown spot on the lateral surface. Abdomen dorsally with a distinct white median line. Male 3-4.5 mm long. Concave plates of the corpus penis of elongate shape; ventrally they are provided with 7-10 hairs. Tibia II of the male without rows of denticles. Female 5-5.5 mm long. Ovipositor, besides the three divided segments, with about 28 segments. (fig. 10 c; fig. 12 h, i, j) *Opilio saxatilis* (C. L. Koch) (p. 35)

Opilio parietinus (Degeer, 1778) (figs. 10d-e, 12e-g)

Phalangium parietinum Degeer, 1778, p. 166; Hermann, 1804, p. 98; Meade, 1855, p. 403; Thorell, 1876, p. 486; Simon, 1879, p. 201; Becker, 1879, p. CV; Becker, 1896, p. 349. *Opilio parietinus*, Herbst, 1798, p. 12; C. L. Koch, 1848, p. 12; Roewer, 1912, p. 124; Roewer, 1923, p. 770; De Lessert, 1917, p. 45; Kästner, 1928, p. 42; Kolosváry, 1929, p. 105; Heinäjoki, 1944, p. 18; Todd, 1948, p. 113; Sankey, 1949, p. 297; Bishop, 1949, p. 185.

Localities in The Netherlands. Irnsum, 19-IX-1958, 4 ♂♂, 2 ♀♀. Abbega, 13-IX-1942, 1 ♂. Westerbork-Hooghalen, VIII-1944, 1 juv. Wilp, Kleine Noordijk, 1946-1954, about 200 specimens. Bilthoven, 10-VIII-1954, 14 juv. Lage Vuursche, 6-VIII-1954, 2 juv. Muiden, cellar of the castle, 5-VIII-1954, 1 juv. Laren, VIII-1937, 9 specimens.

Amsterdam, 1-IX-1913, 3 specimens; 18-IX-1949, 1 ♂. Haarlem, gardens, 12-21-VIII-1950, 2 specimens; 10-IX-1950, 1 ♂.

Description. Length of the male 6.5-7.5 mm; length of the female 7-9 mm.

Cephalothorax (fig. 10 e) in front of the ocularium with a median brown band that, especially in the male, includes a distinct median white line. The remaining part of the cephalothorax is covered with irregular brownish spots; 3-4 darker spots are placed near the lateral border. Anterior margin of the cephalothorax concave. On both sides of the median brown band in front of the ocularium two parallel rows of 2-4 denticles. Behind and in front of the pore of the supra-coxal gland one or two denticles are present. Between the ocularium and the pore of the supra-coxal gland an oblique row of three denticles is visible, which runs from the antero-median to the postero-lateral region. Anterior and lateral margins of the cephalothorax without denticles; posterior border with a transverse row of these teeth. On each side at the base of the ocularium one (often furcated) or two denticles occur. Ocularium, seen from above, broader than long and provided on both sides of the median white band with a row of 5-6 denticles (exceptionally 4-8).

The dorsal surface of the abdomen is brownish yellow with white spots and an indistinct median white band. Female dorsally with darker saddle. The first five segments generally bear some brown spots near the lateral border of the abdomen. Ventrally the abdomen is white, with transverse rows that generally consist of 4 brown spots. In both sexes the abdomen is dorsally provided with transverse rows of denticles.

Chelicerae red-brown; first and second joints with median white pattern, and dorsal black hairs. The chelicerae of the female are unarmed. In the male the upper surface of the first joint bears some irregular denticles and a transverse row of about 4-5 small teeth; the basal part of the second joint is also provided with some small dorsal teeth.

Palps yellowish brown, usually without spots. On the inner side the dorsal surface of the femur of the palp is provided with two long rows of denticles, close to each other; on the external side there is one row of denticles in the distal part of the femur only. Dorsal surface of the patella and dorsal and ventral surfaces of the tibia also with denticles. Tarsus of the male dorsally unarmed, ventrally granulated (secondary sexual character). Palps of the female unarmed, covered with hairs only.

Legs red or yellowish brown; femur, patella, and tibia show darker parts. Coxae pale with irregular light brown spots and two more or less elongated, brown, median spots; they bear hairs but no denticles. The legs of the male show the following characters: Femora I and II rounded, II and IV angular, all with solid denticles; femur I with an irregular broad row of smaller

denticles on the lateral surfaces; tibia I, II, and III dorsally with small, ventrally with larger denticles; tibia IV unarmed; metatarsus I, II, and III ventrally with small denticles, whilst metatarsus IV is unarmed; metatarsus I with false articulation. Femora of the female with rows of denticles; remaining joints generally without denticles. Length of the legs (without coxa and trochanter): Male, 32-58-32-41 mm; female, 24-45-24-35 mm.

Genital apparatus. Genital operculum with enlarged, rounded top (fig. 10d); length 1.8 mm. Length of the penis about 3.1 mm (figs. 12e, f, g). Corpus penis with two distal, rounded excavations without hairs on the dorsal surface. Glans relatively slender (cf. *O. saxatilis*). Length of the ovipositor 4.0-4.7 mm (fig. 7 c). Besides the three terminal segments the ovipositor generally consists of 37 (35-37) undivided segments which can bear hairs up to the 29th.

Remarks. In Degeer's original description of *Phalangium parietinum* several characters point to the genus *Opilio*. I refer especially to his pl. X fig. 3, and to his description of the colour. The measurements of the legs and the occurrence on walls enable a specific identification. An excellent description was given by Simon. In his key he separated *O. parietinus* from *saxatilis* by characters of the tibia. Simon as well as Roewer and Kolosváry mention two teeth at both sides at the base of the ocularium; in the greater part of my specimens the posterior tooth is lacking.

Occurrence. *Opilio parietinus* is found in lowlands as well as in mountains (according to De Lessert (1917) up to 1681 m). In The Netherlands the species is widespread just as in other countries, but I did not find it in the limestone area of South Limburg; it is certainly lacking in the sand-dunes along the coast. Kästner (1928) recorded the occurrence of *Opilio parietinus* on the small isles of Borkum and Spiekeroog, but these data probably refer to *O. saxatilis*.

The species is found above the herb layer; on trunks of trees, hedges, bushes, and rocks; it is very common on walls, fences, buildings, and is even found in the centre of towns. The species was called "faucheur des murailles" by Degeer (1778) and Hermann (1804); they state that the species frequents walls and that specimens are often found in groups, the body hidden in small holes, the legs pressed against the stones; this attitude is indeed very characteristic. Juveniles are found in the litter, under stones, etc. I agree with Todd (1948) and Sankey (1949) that the species has never been found together with *Opilio saxatilis*.

Adult specimens of *O. parietinus* are known from August till November. According to Kästner (1928) the eggs are laid in the autumn and the juveniles hatch after 4-5 month.

Distribution. *O. parietinus* has been recorded from all parts of Europe, from Iceland, Siberia, Turkestan, Asia Minor, Canary Islands and North America.

Opilio saxatilis C. L. Koch, 1839 (figs. 10c, 12h-j)

Phalangium saxatile, Simon, 1879, p. 205; Becker, 1896, p. 351.

Opilio saxatilis C. L. Koch, 1839, p. 32; C. L. Koch, 1848, p. 21; Canestrini, 1872, p. 40; Todd, 1948, p. 113; Sankey, 1949, p. 297.

Opilio parietinus silhavyi, Kratochvil, 1934, p. 24.

Localities in The Netherlands. Den Helder, on a sea-dike, 21-IX-1946, 1 ♂. Petten, outside of the dike, 4-VIII-1945, 1 ♂, 2 ♀♀, 3 juv. Zeeburg, 23-VII-1913, 3 ♂♂, 3 ♀♀. Haarlem, gardens, 12-21-VIII-1950, 1 ♀; 10-IX-1950, 2 ♂♂, 2 ♀♀, 1 juv. Leiden, 7-IX-1940, 1 ♀. The Hague, dunes of Meijendel, 19-VIII-1953 — 6-XI-1953, 21 ♂♂, 24 ♀♀. Wellerlooi, 20-VIII-1954, 1 juv. Swalmen, 29-IX-1948, 2 specimens. Maastricht, 22-VIII-1949, 1 ♀, 1 juv. Sint-Pietersberg, 19-IX-1949, 3 ♂♂, 1 juv.; quarry near Franse Batterij, 19-IX-1949, 3 ♂♂; western slope, 24-VIII-1949, 1 ♀, 1 juv.; between boundary-marks 53 and 58, 1 ♂; Slavante, 19-VII-1950, 1 ♂; artificial caves of Slavante, 22-IX-1949, 1 ♂; Caestert, VII-IX-1949, 1 ♂, 1 juv.

Description. Length of the male 3-4.5 mm; length of the female 5-5.5 mm.

Cephalothorax (fig. 10 c) in front of the ocularium with a median brown band that often includes an indistinct and very small median white line. Lateral border of the cephalothorax with three black spots. The cephalothorax is provided with irregular light brown spots on a white background. Concavity of the anterior border less developed than in *O. parietinus*. On both sides of the brown median band in front of the ocularium there is a group of 4-5 denticles. In front of and behind the pore of the supra-coxal gland there generally are one or two denticles. Between the ocularium and the pore of the supra-coxal gland an oblique row of three denticles is visible that runs from the antero-median to the postero-lateral region. Anterior and lateral margins of the cephalothorax without denticles; posterior border with a transverse row of them. Finally there is one denticle (sometimes two) on each side at the base of the ocularium. Ocularium seen from above more or less quadrangular; on both sides of the median white band it is provided with a row of 3-4 denticles.

Dorsal surface of the abdomen brownish-white. Each segment bears a white, triangular median spot; these spots together form a white median band. Laterally the first five segments bear some brown, round spots. All segments are provided with a transverse row of denticles. In the female these denticles are small, sometimes entirely absent. Ventrally the abdomen is white, with transverse rows of dark brown spots.

Chelicerae pale with an oblong brown spot on the external surface of the first joint. First and second joints with some dorsal hairs; dorsal surface of the first joint moreover with some very small denticles.

Palp pale yellow with some brown spots on femur and patella. On the dorsal surface the femur of the palp of the male is provided with three rows of denticles; the external row does not reach the base of the femur. Patella of the palp of the male on the upper and external surfaces with small denticles; tibia and tarsus without denticles; tarsus ventrally with granules. Palp of the female without denticles.

Legs of the male brownish yellow, those of the female whitish; in both they show brown spots on the distal parts of femur, patella, and tibia. Coxae pale olive with two, generally round, brown spots; they bear small hairs, but no denticles. The legs of the male show the following characters. Femora I and II round, III and IV angular with rows of denticles; patella and tibia I and III on the upper surfaces without teeth; with the exception of a median band, the ventral surfaces of these joints bear small denticles; patella and tibia II and IV unarmed; metatarsus I and III ventrally with rows of small denticles; metatarsus II and IV unarmed. Femora of the female generally with three dorsal rows of denticles; femora II and IV ventrally with hairs and small denticles; femora I and II ventrally with rows of hairs only. Length of the legs (without coxa and trochanter): Male, 13-22-13.5-18.5 mm; female, 11.5-20-12-17 mm.

Genital apparatus. Genital operculum with enlarged, rounded top; length 0.8 mm. Length of the penis about 2 mm (figs. 12 h, i, j). Corpus penis with two distal concave plates at the dorsal surface. Ventral surface of these plates with 7-10 hairs. Glans relatively short. Length of the ovipositor 2.1-2.5 mm; besides the three divided terminal segments it generally consists of 28 (25-29) undivided segments which can bear hairs up to the 18th segment.

Remarks. The original description of the species is very short; it contains information about the colour only. Koch's description of 1848 is more detailed; male and female are described and mention is made of their occurrence from August till October, so that it is certain that Koch studied adult specimens (as mentioned above Roewer suggested that the descriptions of *O. saxatilis* had been founded on juveniles); measurements and colour enable a specific identification. Simon gave excellent comparative descriptions of *O. saxatilis* and *parietinus*, whilst reinvestigations of these species were published by Šilhavý, Todd, and Sankey. As mentioned above Hoffmann recently distinguished two forms of *Opilio saxatilis*, which probably will appear to be separate species. It is unknown to which of the forms Koch's *saxatilis* does belong. The name *saxatilis* for the Dutch material therefore must be regarded as preliminary.

Occurrence. In France (Simon, 1879) and England (Sankey, 1949) the

species appears to be rather common. It lives near the ground in the field layer where it occurs at the base of grasses and herbs, and under stones; it is more often found in the open field than in forests and is recorded as especially abundant in maritime regions.

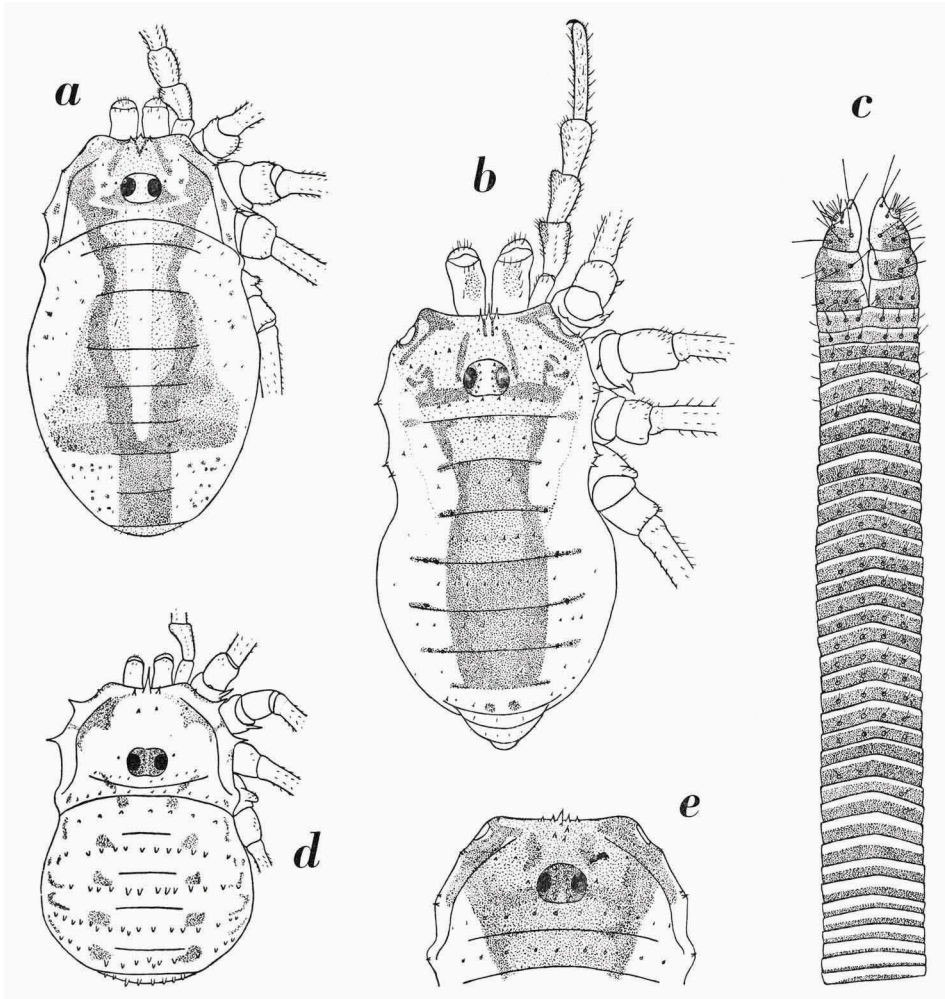


Fig. 7. a, *Paroligolophus agrestis* (Meade), ♂, dorsal view, $\times 13$. b, *Oligolophus tridens* (C. L. Koch), ♂, dorsal view, $\times 15$. c, *Opilio parietinus* (Degeer), ovipositor, $\times 22$. d, *Oligolophus meadii* Cambridge, ♂, dorsal view, $\times 12$. e, *Oligolophus hansenii* (Kraepelin), ♂, dorsal view of the cephalothorax, $\times 15$.

In The Netherlands the species is known from the provinces N. Holland, S. Holland, and Limburg only. Our data are in agreement with the general opinion that *O. saxatilis* has a preference for sand-dunes and limestone areas.

Two records from a sea-dike are interesting; once 6 specimens were collected at the outside of the dike. One specimen, probably an occasional visitor, is known from an artificial cave in South Limburg. In the sand-dunes near Meijendel the species appears to have a preference for grassy areas, and especially for areas of small shrubs (*Salix repens* L.).

Adult specimens were found from July till November.

Distribution. Because *O. saxatilis* has been confounded with *O. parietinus*, only a few certain records are available. The species is now known from: Sweden, Germany, Poland, The Netherlands, Belgium, England, Ireland, France, Italy, Slovakia, and The Canary Islands.

Mitopus Thorell, 1876

Ocularium of normal shape; dorsally provided with two rows of denticles. Anterior border of the cephalothorax without a median trident of spines. Supra-cheliceral laminae without denticles. Apophysis of the palp indistinct; femur ventrally without tubercles or denticles. First joint of the chelicerae with a ventral spur. Femora of the legs with longitudinal rows of denticles. Penis of normal shape, but in our species with retractable bladder.

In his key to the genera Thorell (1876, p. 465) distinguished the genus *Mitopus* by the following two characters: First joint of the chelicerae with ventral spur, and cephalothorax without trident.

The type of the genus is *Phalangium morio* Fabricius, 1779; one species is known from The Netherlands.

Mitopus morio (Fabricius, 1779) (figs. 8g-h, 12a-b)

Phalangium morio Fabricius, 1779, p. 341.

Phalangium urnigerum, Hammer, in: Hermann, 1804, p. 110.

Oligolophus alpinus, Canestrini, 1872, p. 38.

Oligolophus morio, *O. palliatus*, *O. alpinus*, *O. cinerascens*, Simon, 1879, pp. 243, 244, 246.

Oligolophus morio, Simon, 1879, p. 241; Becker, 1896, p. 355.

Mitopus morio, Kraepelin, 1896, p. 223; De Lessert, 1917, p. 29; Roewer, 1923, p. 718;

Kästner, 1928, p. 36; Kolosváry, 1929, p. 100; Heinäjoki, 1944, p. 12; Todd, 1948, p. 111; Savory, 1948, p. 10; Bishop, 1949, p. 178; Šilhavý, 1956, p. 188.

Localities in The Netherlands. Duurswoude, 13-VII-1954, 2 ♂♂, 4 ♀♀, 8 juv. Grolloërholt, Hondsrug, 24-VIII-1949, 1 ♂. Westerbork, summer 1944, 4 ♂♂, 2 ♀♀; 26-VII-1944, 1 ♂, 1 ♀; VIII-1944, 2 ♀♀. Diever, 31-VIII-1932, 1 specimen. Kampen, 1 ♂. Eese, 7-VII-1950, 1 ♀. Winterswijk, Wooldse Veen, 29-VII-1952, 1 ♀; quarry, 13-VI-1959, 10 juv. Wilp, Kleine Noordijk, 1946-1953, 404 specimens. Hoge Veluwe, VIII-1937, 3 juv.; 13-14-VIII-1944, 1 ♂, 4 ♀♀; IX-X-1944, 4 ♂♂, 21 ♀♀; 20-VII-1952, 2 ♀♀. Nunspeet, 17-VII-1958, 1 ♂. Vierhouten, 7-VI-1959, 1 ♀. Barneveld, De Schaffelaar, VI-VII-1943, 4 ♂♂; 1-11-IX-1943, 2 ♀♀. Amersfoort, Den Treek, 11-IX-1952, 1 specimen. Oud Leusden, De Hoge Klei, 25-VIII-1953, 1 ♂. Laren, 22-VII-1915, 1 specimen. Kortenhoeft, 25-VI-1952, 2 juv.; 5-VIII-1952, 1 ♂. Amsterdam, 12-IX-1953, 2 ♂♂, 1 ♀; 21-IX-1913, 1 ♂. Den Helder, Zoologisch Station, 8-VI-1950, 1 juv.

Haarlem, garden, 10-IX-1950, 2 ♂♂, 1 ♀. Bloemendaal, Thijsse's Hof, 24-IX-1943, 1 ♀. Heemstede, garden, 18-IX-1943, 1 ♀. Delft, 21-VI-1946, 3 juv. Vierlingsbeek, 17-VIII-1953, 1 ♂. Wellerlooi, 31-VIII-1954, 1 ♂. Heerlen, 1956, 1 ♂. Sint-Pietersberg, between boundary-marks 51 and 52, 18-X-1950, 1 ♂. Houthem, Kloosterbos, 7-VIII-1946, 1 ♀; Ravensbos, 8-9-VIII-1946, 2 ♀♀. Geulhem, 9-VIII-1946, 2 ♂♂, 2 ♀♀. Valkenburg, VIII-1952, 1 juv. Bemelen, Molenberg, 19-IX-1950, 2 ♀♀. Kerkrade, Anselbeek, 16-VII-1954, 1 ♂, 2 ♀♀. Elzeter and Vijlenerbos, 31-VII-1948, 1 ♀.

Description. Length of the male 4.5-6.5 mm; length of the female 6.5-8 mm.

The colour and pattern of the present species is extremely variable. Usually the dorsal surface of cephalothorax and abdomen of the male is almost entirely brownish black, with transverse rows of white tubercles (fig. 11a). The cephalothorax of the female has the same pattern as in the male but the colour is much lighter; generally, the abdomen of the female is pale or yellowish brown with a distinct black saddle, although the whole dorsal surface of the abdomen can be greyish brown without a saddle. Often a reddish brown or pink median line is present. Ventrally the abdomen is whitish and provided with hairs. Differences from the description given above often occur. In front of the ocularium the anterior border of the cephalothorax bears no distinct trident, but generally a more or less transverse row of 3 tubercles accompanied by other tubercles (or small denticles) is present. The number of tubercles on the cephalothorax is variable; in figure 11a one example is given. Ocularium broader than long; grey-white, sometimes with darker median part; provided with two longitudinal rows of 4-7 small tubercles (or denticles).

Chelicerae yellowish or reddish-brown; dorsally both joints show dark brown spots and hairs, whilst in the male black denticles are also present. First joint with ventral spur (fig. 11b).

Trochanter and tarsus of the palp pale; top of the tarsus a little darker. The colour of femur, patella and tibia of the palp is variable, sometimes pale, often with a blackish brown pattern (fig. 11a). Femur of the palp with a small blunt hairy apophysis in the median apical part. All joints with hairs, but without denticles. Tarsus of the male with a ventral row of granules.

Legs pale or yellowish brown; top of femora and tibiae blackish brown in the male, in the female brown. Coxae yellowish brown with a white pattern and provided with hairs; coxae I and II with one posterior apical spine. The legs show the following characters: Femora I and II almost rounded; femora III and IV, and all the tibiae angular; armature variable, but generally femora I and II dorsally with longitudinal rows of denticles, ventrally with rows of hairs, whilst femora III and IV are provided with dorsal and

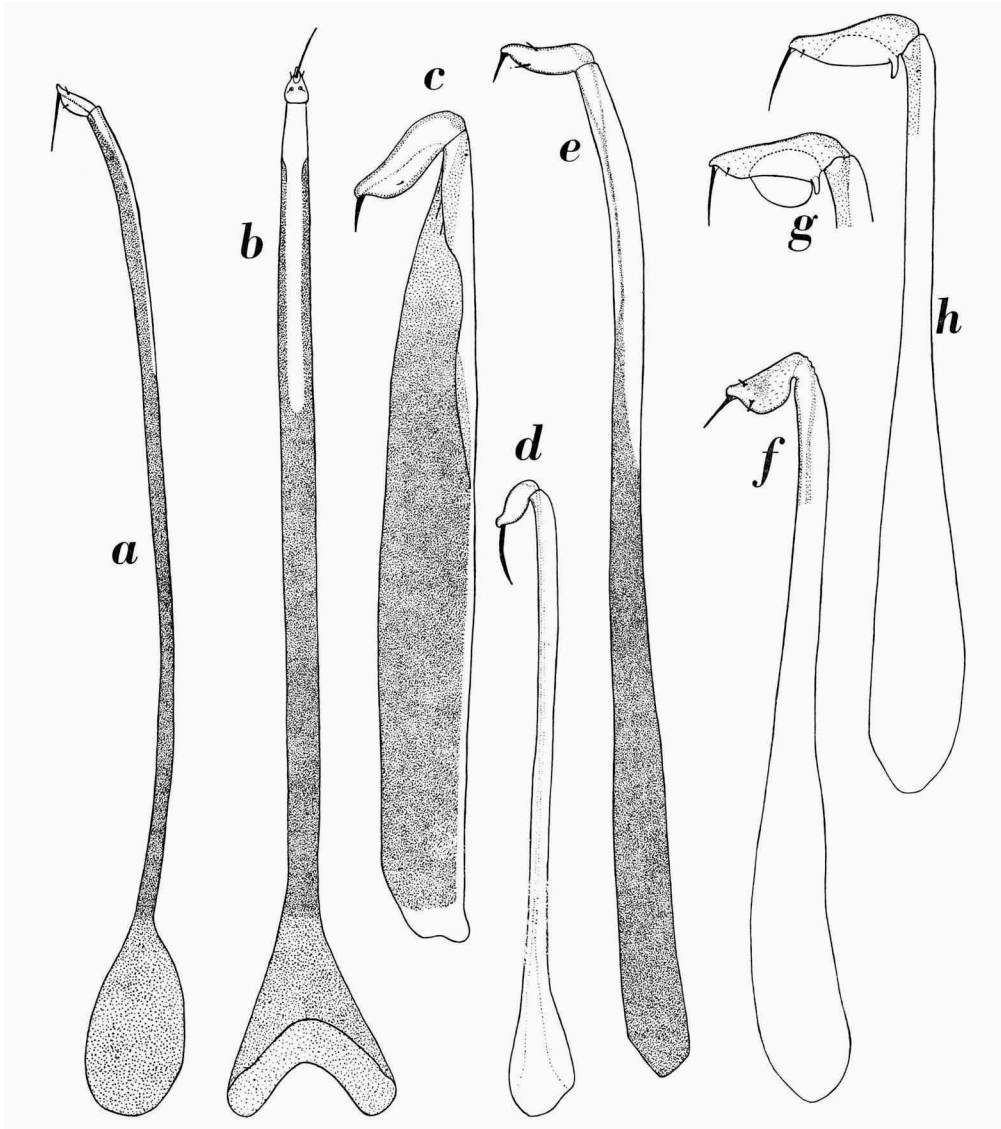


Fig. 8. Penes of Phalangiinae. a, b, *Paroligolophus agrestis* (Meade): a, lateral view; b, dorsal view. c, *Oligolophus hanseni* (Kraepelin), lateral view. d, *Oligolophus meadii* Cambridge, lateral view. e, *Oligolophus tridens* (C. L. Koch), lateral view. f, *Lacinius ephippiatus* (C. L. Koch), lateral view. g, h, *Mitopus morio* (Fabricius): g, lateral view with expanded bulb; h, lateral view. a-h, $\times 47$.

ventral rows of denticles; patellae and tibiae provided with longitudinal rows of hairs only; in the male tibia I, however, with ventral rows of denticles. Length of the legs (without coxa and trochanter): male 16.5-18.5; 32-32.5;

17-18; 29-30 mm: Female 14-15; 25-29; 14-17; 21.5-26 mm. (Some specimens collected at the "Hoge Veluwe" have longer legs: Male 17-40-20-30 mm; female 17-33-20-29 mm respectively.

Length of the penis 2.2-2.5 mm (fig. 8h). In this species the glans penis is characteristic; it shows a retractable bladder and at the base it has an apophysis. Figure 8g shows the bladder of the glans and the apophysis; figure 8h the glans with retracted bladder. As far as I know no other species show this type of penis.

Remarks. As said before this species is extremely variable, and differences from the description given above are possible. De Lessert (1917, p. 29) even considers the colour of the body and the armature of the legs of no use as diagnostic characters.

The occurrence of two varieties, *M. morio alpinus* (Herbst) and *M. morio cinerascens* (C. L. Koch) is questionable. Kraepelin (1896, p. 224) mentions intermediate forms, and Roewer (1923, p. 718) distinguished *Mitopus morio* only. Kästner (1928, p. 36) however mentions an upland form with short legs and Savory (1948, p. 10) recorded the occurrence of "two well-marked varieties" in England. The material from The Netherlands gives no indications of clearly separated varieties. The long-legged specimens from the Hoge Veluwe require further investigation.

Occurrence. *Mitopus morio* is found in lowlands and in mountains up to the snow-line (De Lessert, 1917). Bishop (1949) characterises *Mitopus morio* as a mountain form and mentions that in the state of New York this species only occurs above 4000 feet. In The Netherlands the species is widespread but I did not find it in the dune-area near The Hague. *Mitopus* has a preference for all kinds of woods, but it also inhabits moist open places. It can be found on the floor, on tree-trunks, shrubs etc.; near Huls-horst, specimens are found on beech and pine-trees up to 9 meters.

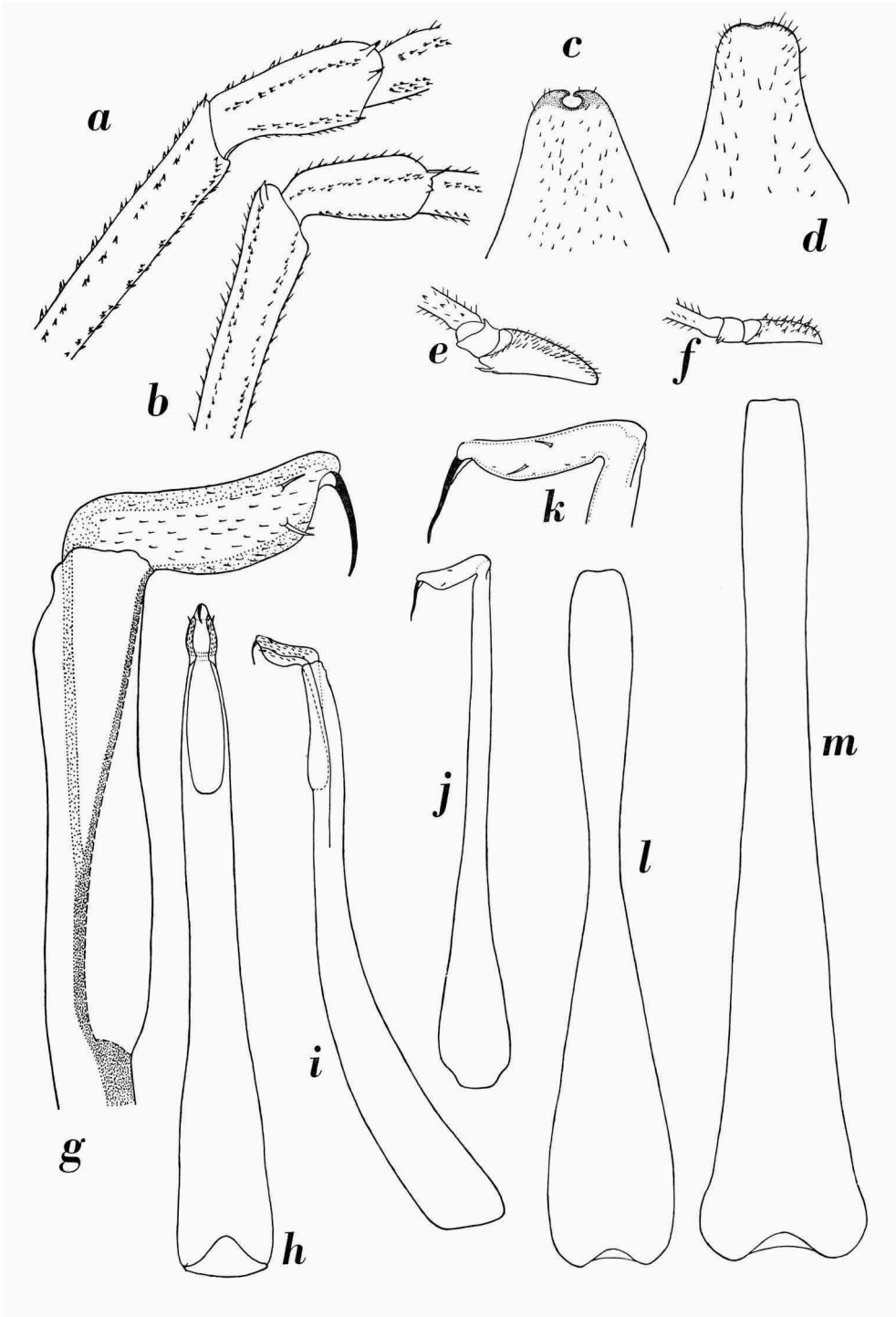
Juveniles are present from April till the end of August; adults from June till the end of October.

Distribution. Europe (Iceland and Spitsbergen included), North Africa, North America, Siberia, Persia, China and Japan.

Lacinius Thorell, 1876

Ocularium of normal shape; dorsally with two rows of denticles. Cephalothorax provided with a trident. Supra-cheliceral laminae without median denticles. Trochanter and femur of the palp with ventral tubercles. First joint of the chelicerae with a ventral spur. Femora of the legs with longitudinal rows of denticles. Penis of normal shape.

The type of the genus is *Phalangium horridum* Panzer, 1794. One species,



Lacinius ephippiatus (C. L. Koch), is known from The Netherlands; a second, *Lacinus horridus* (Panzer), will probably be found to occur in our country, for which reason a description of this species is also given here.

KEY TO THE SPECIES

1. Abdomen smooth, without transverse rows of denticles (fig. 10a). Coxae without distinct ventral tubercles (fig. 9e). Femur of the legs with longitudinal rows of denticles; tibia generally without these rows, but sometimes a few denticles are present. Corpus penis see fig. 9l. Length of the male 3.5-4 mm; length of the female 5-6 mm *Lacinius ephippiatus* (C. L. Koch) p. 43
- Abdomen with transverse rows of large denticles (fig. 10b). Coxae, especially coxae I and II with tubercles. Femur and tibia of the legs with longitudinal rows of denticles. Corpus penis see fig. 9m. Length of the male 5-7 mm; length of the female 7-9 mm (not yet found in The Netherlands) *Lacinius horridus* (Panzer) (p. 46)

Lacinius ephippiatus (C. L. Koch, 1835) (figs. 6e, 8f, 9a, e, l, 10a)

Opilio ephippiatus C. L. Koch, 1835, fasc. 128, no. 17.

Acantholophus ephippiatus, C. L. Koch, 1848, vol. 15, p. 121; Kraepelin, 1896, p. 230.

Oligolophus vittiger, Simon, 1879, p. 250.

Lacinius ephippiatus, De Lessert, 1917, p. 41; Roewer, 1923, p. 739; Kästner, 1928, p. 38; Heinäjoki, 1944, p. 15; Todd, 1948, pp. 111-112; Šilhavý, 1956, p. 209.

Localities in The Netherlands. Wilp, Kleine Noordijk, 1946-1953, about 50 specimens. Bilthoven, heath, 10-VIII-1954, 1 juv. Kortenhoef, 25-VI-1952, 1 ♂. Vogelenzang, Viukenveld, 27-VI-1952, 1 ♀. Lisse, 8-VII-1958, 2 ♂♂. Voorschoten, 28-VI-1953, 1 ♀; 12-VII-1952, 1 ♀. The Hague, dunes of Meijendel, 3-V-1953 till 2-IX-1953, 176 ♂♂, 171 ♀♀, 30 juv. Esbeek, 30-V-1944, 2 juv. Ulestraten, Vliek, 10-VIII-1946, 1 juv. Groot Haasdal, 9-VIII-1946, 1 ♀. Geulhem, 9-VIII-1946, 1 juv. Schin op Geul, 14-VIII-1944, 1 juv. Bemelen, Molenberg, 19-IX-1950, 4 ♀♀. Heerlen, 1955, 1 juv.

Description. Length of the male 3.5-5 mm; length of the female 5-6 mm.

Cephalothorax (fig. 10a) yellowish brown or dark brown with lighter lateral parts. The anterior border of the cephalothorax in front of the ocularium is provided with three teeth (a trident) of about equal length. Near the trident some small denticles are present. Generally the lateral border of the cephalothorax is provided with about 6 small denticles. Ocularium seen from above quadrangular; brown, on each side of the median white band provided with a row of 5-6 small denticles. Supra-cheliceral laminae without

Fig. 9. a, *Lacinius ephippiatus* (C. L. Koch), femur and patella IV. b, *Oligolophus tridens* (C. L. Koch), femur and patella IV. c, d, *Paroligolophus agrestis* (Meade): c, operculum genitale of the female; d, operculum genitale of the male. e, *Lacinius ephippiatus* (C. L. Koch), lateral and ventral view of coxa I. f, *Odiellus palpinalis* (Herbst), lateral and ventral view of coxa I. g, h, i, penis of *Odiellus spinosus* (Bosc): g, lateral view, × 87; h, dorsal view, × 23; i, lateral view, × 23. j, k, penis of *Odiellus palpinalis* (Herbst): j, lateral view, × 51; k, lateral view of the glans, × 127. l, *Lacinius ephippiatus* (C. L. Koch), dorsal view of the corpus penis, × 47. m, *Lacinius horridus* (Panzer), dorsal view of the corpus penis, × 47.

denticles. Dorsally the abdomen is pale with some small brown spots and especially in the male with a distinct dark brown, rectangular saddle; usually the abdomen of the female is yellowish grey and the saddle indistinct. Ventrally the abdomen and the operculum genitale are pale with white spots and hairs.

Chelicerae pale yellow; both joints with dorsal hairs, first joint with a ventral spur.

Palps pale yellow with a few dark spots (figs. 10a, 6e); apophyses are absent. Trochanter and femur of the palp with ventral tubercles; all joints provided with hairs only. Tarsus of the palp of the male with a longitudinal row of ventral granules.

Legs light yellow-brown with brown spots; often the apical part of the tibia is darker. Coxae pale yellow, provided with hairs (fig. 9e), but without distinct tubercles. Coxae I and II with a posterior apical tooth. Femora, patellae, and tibiae angular. Femora and patellae (fig. 9a) with longitudinal rows of denticles and hairs, but sometimes femur I bears a few denticles only. Generally the other joints of the legs with rows of hairs but sometimes the tibiae are provided with a few denticles. Length of the legs (without coxa and trochanter): male 9.5-11; 17.5-20; 10.5-13; 15-18.5 mm: Female 9-11; 15-18; 9-10.5; 14-17 mm.

Penis see figures 8f and 9l. Length of the corpus penis about 2.1 mm; in the middle the corpus penis is narrowed.

Remarks. Roewer (1923, p. 739) gives the following measurements of the legs; 7-12-8.2-9.5 mm respectively. As mentioned above the lengths of the legs of the specimens investigated by me are variable and longer than stated by Roewer.

In The Netherlands the tibiae of the legs of *L. ephippiatus* bear no longitudinal rows of denticles or sometimes a few denticles only. This causes some difficulties when one tries to identify the species consulting the works of De Lessert, Roewer and Savory. De Lessert (1917) mentions in his key on p. 25 "femurs, patellas et tibiae des pattes munis de séries de denticules..... *Lacinius*", and on p. 42 "tibiae garnis de séries longitudinales de denticules..... *L. ephippiatus*". Roewer (1923) mentions in his key to the genera on p. 712; "1-4 Femur-Tibia stark bezähnel..... *Lacinius*", but in his description of the species on p. 740 he states: "1-4 Tibiae an den Kanten fein behaart". Kästner (1928) distinctly records and figures that the tibiae of *L. ephippiatus* are only hairy. In 1948 Savory, in his key to the species, considers, however, "femora and tibiae of the legs strongly toothed..... *L. ephippiatus*".

From Roewer's key to the species of the genus *Lacinius* (p. 735) new difficulties arise. He mentions and figures (figs. 911 and 916) the following

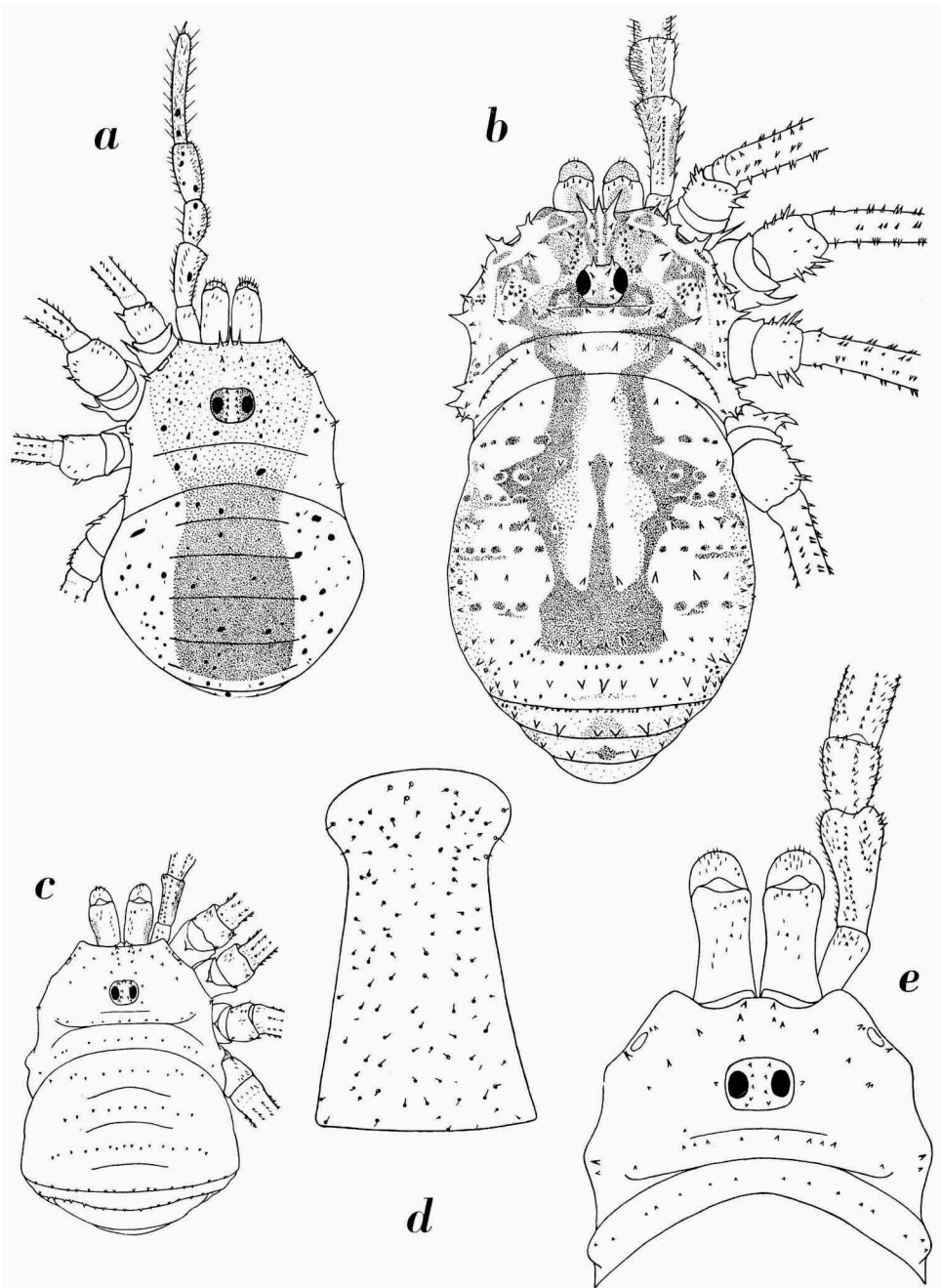


Fig. 10. a, *Lacinius ephippiatus* (C. L. Koch), ♂, dorsal view, × 12. b, *Lacinius horridus* (Panzer), ♂, dorsal view, × 14. c, *Opilio saxatilis* (C. L. Koch), ♂, dorsal view, × 13. d, e, *Opilio parictimus* (Degeer): d, operculum genitale, × 27; e, dorsal view of the cephalothorax of the male, × 13.

character of *L. ephippiatus* and *L. horridus*: "Coxa I apical-jederseits unbehrt". This character is certainly not present in the specimens studied by me; in *L. ephippiatus* as well as in *L. horridus* coxa I is provided with a distinct apical posterior tooth.

Whether the differences mentioned above are due to local variations or to incorrect descriptions remains to be investigated.

Occurrence. Probably *L. ephippiatus* is common throughout The Netherlands but only a few localities (14 from 6 provinces) are known to the author. According to De Lessert (1917) and Kästner (1928) *L. ephippiatus* inhabits the grass- and herb-layer of woods, whilst Todd (1949) mentions marshes also as habitat of the species. During the day Todd found the species in the ground-layer only, but at night it is hunting in the herb-layer. In the dunes near The Hague *L. ephippiatus* is especially abundant in small woods of *Populus tremula* L., and occurs furthermore in small woods of *Betula verrucosa* Ehrh., *Crataegus monogyna* Jacq. and *Salix repens* L.

In The Netherlands the juveniles are present from May till August, and the adults from June till the beginning of September. The species is most active in August.

Distribution. Sweden, Finland, Germany, Poland, The Netherlands, Belgium, Great Britain, Ireland, France, Portugal, Austria, Italy, Czechoslovakia and Yugoslavia.

LACINIUS HORRIDUS (Panzer, 1794) (figs. 9m, 10b)

Phalangium horridum Panzer, 1794, p. 21.

Opilio hispidus, Herbst, 1798, p. 20.

Acantholophus hispidus, Canestrini, 1872, p. 27; Thorell, 1876, p. 472.

Acantholophus horridus, *A. hispidus*, *A. kochi*, Simon, 1879, pp. 255, 256, 264.

Acantholophus horridus, *A. hispidus*, Kraepelin, 1896, p. 229.

Lacinius hispidus, De Lessert, 1917, p. 39.

Lacinius horridus, Roewer, 1923, p. 736; Kästner, 1928, p. 37; Kolosváry, 1929, p. 103; Heinäjoki, 1944, p. 15.

Description after material from: Sweden, Skåne, Åhus, 20-29-IX-1949, 1 ♂; Maglelem, 20-29-IX-1949, 1 ♀. The specimens were kindly sent to me by Dr. H. Lohmander of the Göteborg Museum of Natural History.

Description. Length of the male 5-7 mm; length of the female 7-9 mm.

Cephalothorax (fig. 10b) mainly spotted with brown; with lighter lateral parts. The anterior border of the cephalothorax in front of the ocularium provided with a trident; between the trident and the ocularium, two groups of small denticles are generally present. The lateral border of the cephalothorax is provided with 8-10 strong denticles and some small ones. Ocularium seen from above quadrangular; on both sides of the median white band it is provided with a row of 4-5 denticles. The dorsal surface of the abdomen is greyish white with numerous small dark spots; a dark brown saddle with a lighter median part is present. In figure 10b the general pattern is given, although differences occur. Generally the cephalothorax and the abdomen of the female are

slightly darker and the saddle indistinct. Dorsally the abdomen is provided with transverse rows of strong denticles.

First joint of the chelicerae with a dorsal brown spot, and a ventral spur; second joint darker than the first. Both joints dorsally with hairs.

Palp pale yellow; femur, patella, and tibia with oblong brown spots; tarsus apically and distally darker. No distinct apophyses are present. Trochanter and femur of the palp with ventral tubercles; generally femur and patella bear also some small dorsal tubercles or denticles. In the male the tarsus is provided with a row of ventral granules. In the female the palp is slightly darker, whilst the tibia is also provided with a few dorsal and ventral tubercles or denticles.

The legs are pale or yellowish brown; they bear dark brown spots. Coxae grey with olive-brown spots. Coxae I and II with a distinct posterior apical tooth; all coxae, especially coxae I and II provided with distinct tubercles. Femur, patella and tibia of the legs angular and provided with 5 longitudinal rows of stout denticles. On the femora these denticles are often placed in pairs (fig. 10b). Metatarsus with appressed and erect hairs and a few small denticles. Length of the legs (without coxa and trochanter) of the male 10-24-13-21 mm; female 11-20-11-18 mm.

Corpus penis (fig. 9m) about 2.6 mm long; in dorsal view hardly narrowed in the middle.

Remarks. Roewer (1923, p. 736) mentions the following lengths of the legs: male 8-16-9.5-12 mm; female 12-29-15-21 mm. These measurements are not in agreement with the data given above, so that probably the length of the legs is variable.

In contradistinction to Roewer's description, coxa I is provided with a distinct posterior apical tooth.

Occurrence. Probably *L. horridus* will prove to occur in The Netherlands because this species is recorded from Sweden, Finland, Germany and France. According to Simon (1879), De Lessert (1917), Roewer (1923) and Kästner (1928) the species is especially found in the litter of woods, but also at marshy places, margins of lakes, dikes etc.

There are adult specimens from August till the end of November.

Distribution. Sweden, Finland, Germany, Poland, France, Switzerland, Austria, Italy, Czechoslovakia, Hungary and Greece.

Odiellus Roewer, 1923

Ocularium of normal shape; dorsally provided with two rows of sharp or blunt denticles. Cephalothorax with a trident. Supra-cheliceral laminae without median denticles. Trochanter and femur of the palp ventrally provided with stout tubercles, some of which are much longer than broad. In at least one species the ventral spur of the first joint of the chelicerae is absent. Femora of the legs with longitudinal rows of hairs. Penis of normal shape.

The type of the genus is *Phalangium spinosum* Bosc, 1792; two species are known from The Netherlands.

KEY TO THE SPECIES

1. Femur, patella and tibia of the palp with an apophysis on the interior side. Trochanter and femur of the palp ventrally with very large tubercles; tibia of the palp with 2-5 ventral tubercles (fig. 6c). First joint of the chelicerae without ventral spur. Length of the penis about 1.5 mm; corpus penis straight (fig. 9j, k). Length of the male 3-3.5 mm; length of the female 4.5-5 mm . . . *Odiellus palpinalis* (Herbst) (p. 48)

- Palp without distinct apophysis. Trochanter and femur of the palp with tubercles ventrally; tibia of the palp without ventral tubercles (fig. 6d). First joint of the chelicerae with a ventral spur (fig. 11b). Length of the penis about 4 mm; corpus penis curved (lateral view) (fig. 9g, h, i). Length of the male 6-7 mm; length of the female 9-11 mm *Odiellus spinosus* (Bosc) (p. 52)

Odiellus palpinalis (Herbst, 1799) (figs. 6c, 9f, j, k)

- Opilio palpinalis* Herbst, 1799, p. 16.
Phalangium spinulosum, Hermann, 1804, p. 107.
Oligolophus palpinalis, Simon, 1879, p. 248.
Acantholophus palpinalis, Kraepelin, 1896, p. 231.
Odius palpinalis, De Lessert, 1917, p. 38.
Odiellus palpinalis, Roewer, 1923, p. 728; Kästner, 1928, p. 39; Kolosváry, 1929, p. 103; Todd, 1948, p. 112; Savory, 1948, p. 12.
Lophopilio palpinalis, Šilhavý, 1956, p. 214.

Localities in The Netherlands. Norgerhout, 24-VIII-1959, 4 ♂♂, 2 ♀♀. Dwingelo, 18-31-VIII-1932, 2 specimens. Byvanck, 11-IX-1953, 1 juv. Wilp, Kleine Noordijk, 1946-1953, 6 specimens. Haarlem, garden, 10-IX-1950, 1 ♀. Heemstede, 19-X-1913, 1 specimen. Lisse, 12-X-1913, 1 specimen. The Hague, dunes of Meijndel, 26-VIII-1953 up to 19-I-1954, 357 ♂♂, 404 ♀♀, 7 juv. Sint-Odiliënberg, 7-IX-1954, 1 ♀. Herkenbosch, 25-27-IX-1948, 1 ♀. Houthem, Ravensbos, 9-VIII-1946, 5 specimens. Geulhem, cave Heide (129), 13-XI-1951, 1 ♀. Rijckholt, Sjoene Grub, 14-IX-1950, 1 ♀, 2 juv. Epen, Bovenste Bos, 26-IX-1951, 1 ♂.

Description. Length of the male 3-3.5 mm; length of the female 4.5-5 mm.

The colour of the cephalothorax varies from pale to reddish brown; sometimes the front angles are darker (brown or black). In front of the ocularium a trident is present of which the central spine is longer than the laterals. Besides one denticle in front and one behind the pore of the supra-coxal gland, the lateral border of the cephalothorax is provided with 1 or 2 small denticles. Ocularium dark brown or black, sometimes with a lighter median part; on each side provided with a longitudinal row of 3-4 white denticles. Abdomen smooth; it bears a saddle that covers the greater part of the dorsal surface, but that is constricted near the ocularium; lateral borders of the abdomen pale to yellow-brown. Female specimens can be very dark (black with grey spots) or very light in colour; in these cases the saddle is indistinct. Ventrally the abdomen is pale yellow, often with a reddish shine.

Chelicerae yellowish brown; first joint lighter than the second. Dorsally both joints are covered with hairs; first joint without ventral spur.

Palp (fig. 6c) pale to yellowish brown, all joints covered with hairs. Femur, patella and often the tibia of the palp with a hairy median apophysis. Trochanter and femur of the palp provided with very long tubercles at the ventro-lateral surface (generally as long as the width of the palp-femur);

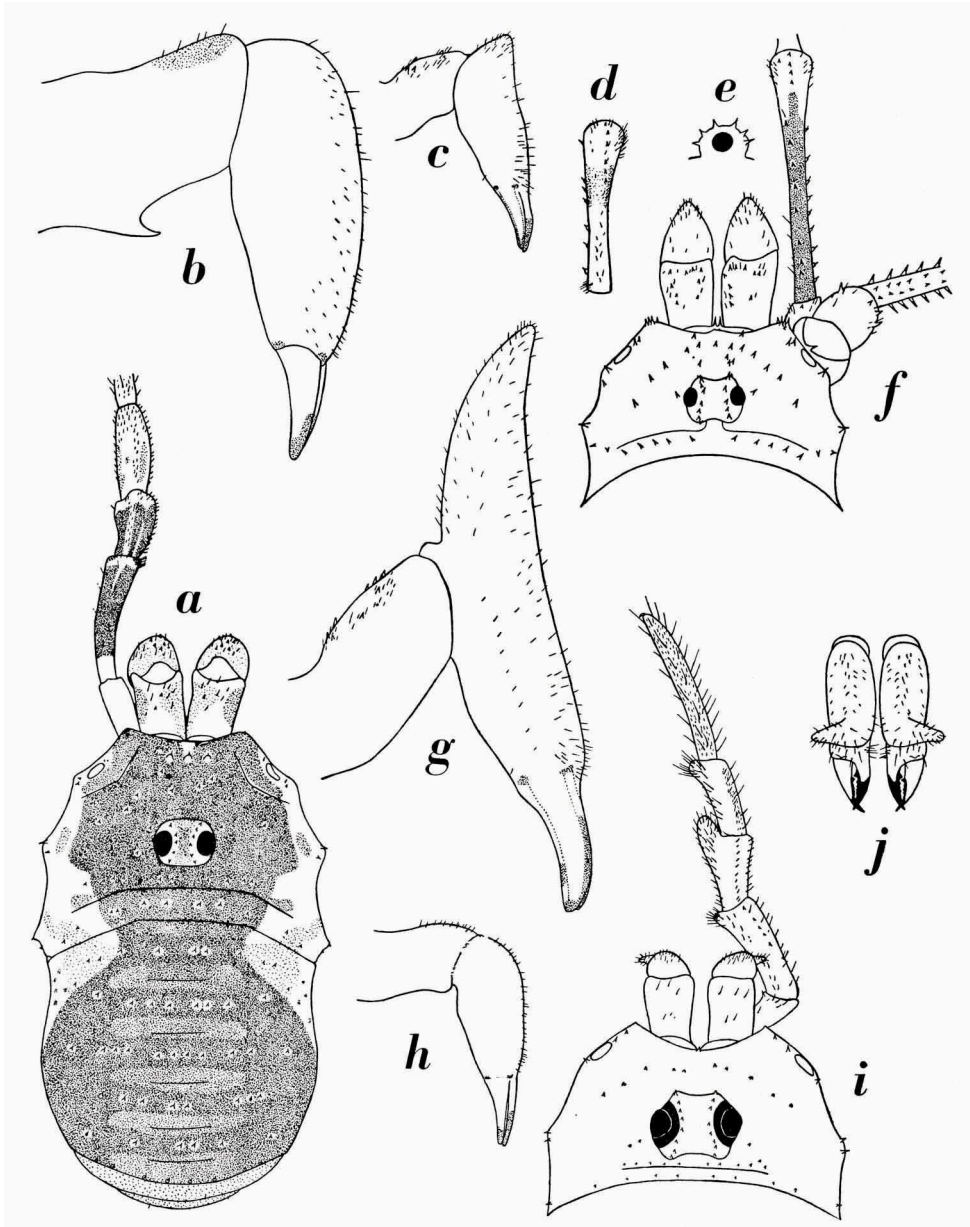


Fig. 11. a, b, *Mitopus morio* (Fabricius): a, dorsal view of the male, $\times 14$; b, chelicera showing ventral spur on the first joint, $\times 440$. c-h, *Phalangium opilio* Linnaeus: c, g, two types of the male chelicera with horn-like projection, $\times 15$; d, femur of the palp of the female; e, lateral view of the ocularium; f, δ , dorsal view of the cephalothorax $\times 15$; h, chelicera of the female. i, j, *Platybunus triangularis* (Herbst), δ : i, dorsal view of the cephalothorax, $\times 14$; j, frontal view of the chelicerae.

tibia with 2-5 small tubercles. Tarsus of the male with or without an indistinct row of granules.

Legs yellowish brown with small dark spots. Coxae pale and especially coxae I ventrally provided with tubercles (fig. 9f); coxae I without, and coxae II with a white posterior apical tooth. Femora rounded; patellae and tibiae angular. Femora and patellae dorsally with 2-3 apical denticles; femora, patellae and tibiae with longitudinal rows of hairs (without rows of denticles). Length of the legs (without coxa and trochanter): 5-6; 10-14; 6.5-7; 9-10 mm.

Length of the penis about 1.5 mm (fig. 9j, k). Corpus penis straight.

Remarks. Šilhavý (1958, p. 215) apparently mentions the following measurements of the legs: I, 5-7; II, 10-15; III, 5.5-7.5; IV, 8-11 mm, these agree with my own data. Roewer (1923, p. 728) and some other authors, however, give the following lengths: 17-35-17-25.5 mm.

Šilhavý (1956, p. 254) placed *Lophopilio tridentatus* Hadži in the synonymy of *Odiellus palpinalis* (Herbst), and mentioned at the same time the absence of the ventral spur of the chelicerae as a character of the species. For this reason Šilhavý classified *Odiellus palpinalis* with the genus *Lophopilio*. I prefer to keep the species in the genus *Odiellus*, and to regard the armature of trochanter and femur of the palp and the smooth femur and tibia of the legs as main characters of the genus *Odiellus*.

Occurrence. According to Simon (1879), De Lessert (1917), Roewer (1923), Kästner (1928) and Sankey (1949) *Odiellus palpinalis* is found in the groundlayer and in moss of moist woods from July till October. Todd (1948) records the species from different kinds of woods, but also from grasslands; she found juveniles from May till September and adults from September till November.

Only 13 localities in The Netherlands are known to me. The catch-box investigation in the dunes of Meijndel, yielded, however, so many specimens, that probably this species is more common. In the dunes of Meijndel near The Hague *O. palpinalis* inhabits especially woods, but it is also found in small numbers in dry open places covered with lichens, *Calamagrostis* and *Ammophila*. One female is known from an artificial cave near Geulhem.

Juveniles were found from August till the end of November, and adults from August till the end of January; the species is most active in November:

Distribution. Germany, Poland, The Netherlands, England, France, Switzerland, Austria, Czechoslovakia, Yugoslavia and Hungary.

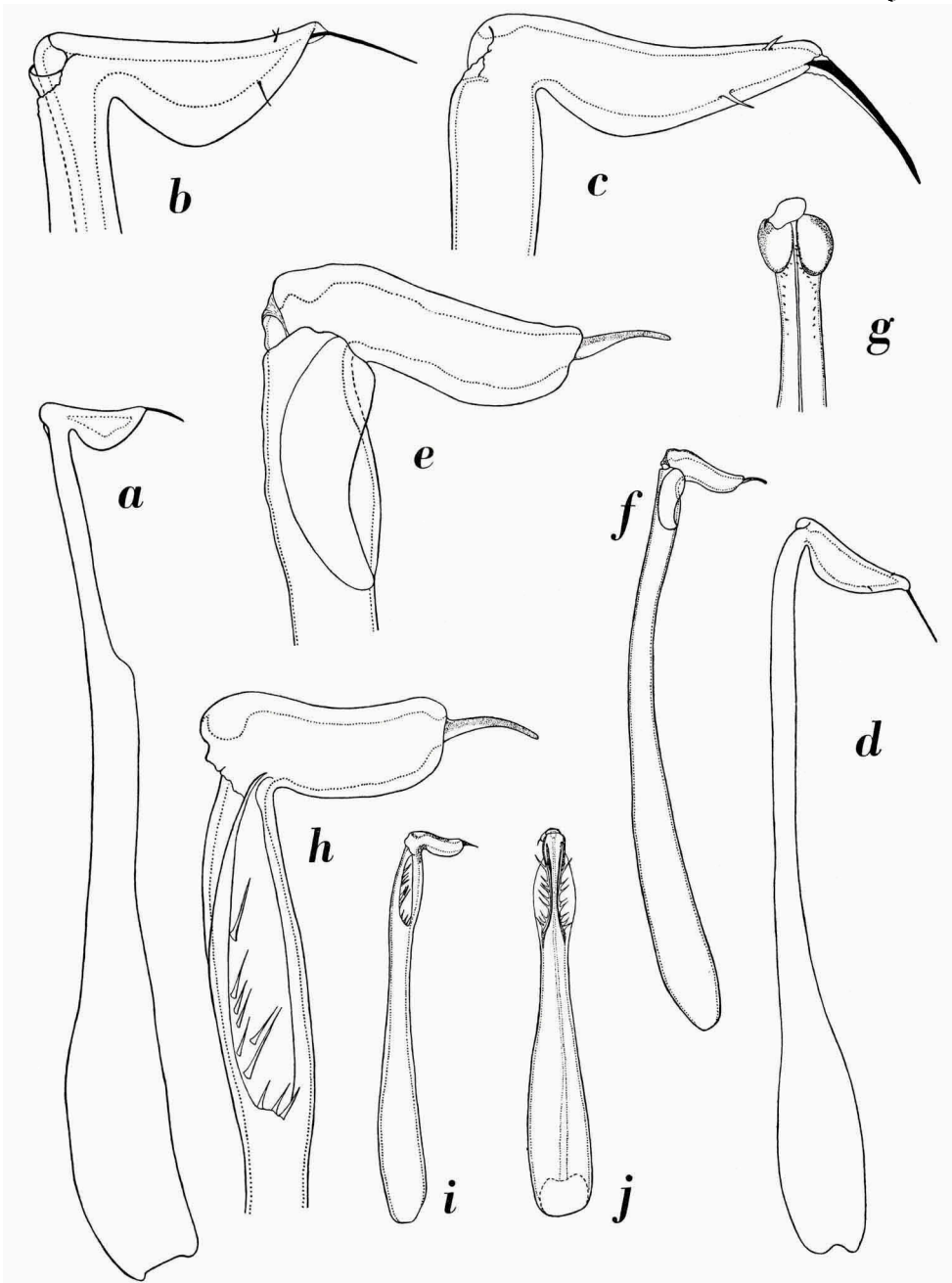


Fig. 12. Penes of Phalangiinae. a, b, *Phalangium opilio* Linnaeus: a, lateral view, $\times 29$; b, lateral view of the glans, $\times 77$. c, d, *Platybunus triangularis* (Herbst): c, lateral view of the glans, $\times 107$; lateral view, $\times 40$. e-g, *Opilio parietinus* (Degeer): e, lateral view of the upper part, $\times 107$; f, lateral view, $\times 26$; g, dorsal view of the upper part, $\times 26$. h-j, *Opilio saxatilis* (C. L. Koch): h, lateral view of the upper part, $\times 82$; i, lateral view, $\times 26$; j, ventral view, $\times 26$.

Odiellus spinosus (Bosc, 1792) (figs. 6c, 9g, h, i)

Phalangium spinosum Bosc, 1792, p. 18.

Acantholophus spinosus, Simon, 1879, p. 261; Kraepelin, 1896, p. 231; Becker, 1896, p. 359.

Odius spinosus, De Lessert, 1917, p. 37.

Odiellus spinosus, Roewer, 1923, p. 725; Todd, 1948, p. 112; Savory, 1948, p. 11; Kraus, 1959, p. 89.

Localities in The Netherlands. Nunspeet, 21-X-1950, 1 ♀. Putten, VIII-1914, 1 ♀. Hulshorst, VII-1951, 1 subadult. Bilthoven, 10-VIII-1954, 1 juv. Huizen, 25-29-VII-1915, 5 ♀♀. Hilversum, VIII-1953, 1 ♀. Schoorl, 4-XI-1951, 1 ♂. Zandvoort, Oosterveld, 6-IX-1953, 1 ♂. Katwijk, 6-VI-1949, 1 juv. Wassenaar, Duinrell, 12-IX-1948, 1 ♀. The Hague, dunes of Meijendel, 11-XI-1928, 1 ♂; 31-X-1940, 1 ♀; 2-VII-23-XII-1953, 46 ♂♂, 36 ♀♀, 5 juv.

Description. Length of the male 6-7 mm; length of the female 9-11 mm.

Cephalothorax greyish with white and brown spots. At the anterior border of the cephalothorax in front of the ocularium a trident is present that points forward; the spines of the trident are strong, broad at the base, and rather blunt; the central spine is slightly longer than the laterals. Behind the trident 1 or 2 pairs of small denticles may be present. Especially with a low magnification 3 longitudinal parallel light bands are visible; of these bands the median one runs from the trident to the ocularium. Besides 2 denticles near the pore of the supra-coxal gland, the lateral border of the cephalothorax is provided with 3-4 denticles. The last two segments of the cephalothorax each bear a transverse row of denticles. Ocularium blackish brown to black with a greyish white median part; 2 longitudinal rows of 4-5 indistinct, blunt denticles are present. Abdomen grey, with transverse rows of brown spots, and provided with an oblong, rectangular brown saddle with a lighter central part; among the females dark specimens with an indistinct and pale specimens with a distinct saddle may be present. Abdomen dorsally with transverse rows of small denticles; in the female these denticles may be very small.

Chelicerae pale or yellowish, dorsally with hairs. First joint dorsally with a brown spot; apically with a median row of 3-4 hairs, and with a ventral spur.

Palp (fig. 6d) pale or yellowish brown; upper part of femur, patella, and tibia with brown spots and stripes. Trochanter and femur of the palp with ventro-lateral tubercles; femur also with a dorsal apical denticle, and with a very small apophysis. All joints of the palp are covered with hairs. Tarsus of the male with distinct rows of black granules.

Legs pale yellow with brown spots. The colour of the coxae varies from light yellow to dark brown. In the male the ventral surface of the coxae is only covered with hairs; in the female coxa I and sometimes also coxa II often bear ventral tubercles. About half of the specimens investigated by me bear a posterior apical tooth at coxa I. Femora rounded, patellae and tibiae

angular. Femora and patellae with 2-3 dorsal apical denticles; femora, patellae and tibiae furthermore with longitudinal rows of hairs only (no rows of denticles). Length of the legs (without coxa and trochanter) of the male 15-26-16-23 mm; of the female 13-22-14-21 mm.

Length of the penis about 4 mm (fig. 9g, h, i). Corpus penis strongly curved; it shows a dorsal apical excavation. Glans penis covered with hairs (high magnifications).

Remarks. The lengths of the legs given above are in agreement with those given by Roewer. The posterior apical tooth of coxa I can be present or absent, and for this reason cannot be used in a key to the species (Roewer, 1923, p. 725).

Occurrence. According to Simon (1879) and De Lessert (1917) this species is found in grasses, under stones, and near stone-walls; in England *Odiellus spinosus* seems to inhabit gardens. Todd (1949) demonstrated a very low humidity preference (R.H. 50-60%), although the species withstands relative humidities up to 100% without drawback. The temperature preference is high (16.3° C.), as is the "heat death point" of 45° C. (other species 38.2-38.5° C.).

The few data from The Netherlands point to an occurrence on sandy grounds. In the sand-dunes near The Hague the species is especially abundant on open places with *Salix repens* L., but it is also found in small numbers in some birch-woods and some open, dry places with lichens, *Calamagrostis*, and *Ammophila*.

Juveniles are found from June till August, and adults from the beginning of July till the end of December; the species is most active in November.

Distribution. Germany (Frankfurt only), The Netherlands, Belgium, England, France, Switzerland, Spain, Italy, Corsica, Yugoslavia and North Africa.

Oligolophus C. L. Koch, 1871

Ocularium of normal shape; dorsally provided with two rows of denticles or tubercles. Anterior border of the cephalothorax with a median trident of spines. Supra-cheliceral laminae without denticles. Apophysis of the palp indistinct; trochanter and femur of the palp ventrally provided with small tubercles that are not longer than broad (hair on the tubercle not included). In some species the ventral spur on the first joint of the chelicerae is indistinct or absent. Femora and tibiae of the legs with longitudinal rows of hairs. Operculum genitale with rounded top. Penis of normal shape.

Roewer (1923, p. 720) mentions the absence of sexual dimorphism in the male palp, and the smooth ventral surface of the femur of the palp as char-

tibia of the palp ventrally provided with very small tubercles each with one long hair; tarsus covered with long hairs. Femur and patella with a small apophysis.

Legs pale; femur, patella, and tibia with a few indistinct brown spots. Coxae distally with a round brown spot; coxae I and II each with a posterior apical tooth. Femora more or less rounded, patellae and tibiae angular. Femora, patellae and tibiae with longitudinal rows of hairs; femora and patellae with 2-3 apical dorsal denticles.

Length of the legs of the male 5.8-5.6 mm; of the female 5.12-5.8 mm.

Penis pale; length 1.9-2 mm (fig. 8d). Stylus longer than the glans.

Remarks. Roewer (1923, p. 729) placed the species in the genus *Odiellus* but Todd (1948, p. 109) placed it again in *Oligolophus*; the small ventral tubercles on the femur of the palp justify the latter classification.

Occurrence. *Oligolophus meadü* is not yet found in The Netherlands. In England it occurs under stones and in moss of woods, in heaths (Sankey 1949) and in grass-lands (Todd, 1949).

Adults are present from July till December.

Distribution. England.

***Oligolophus hansenii* (Kraepelin, 1896) (figs. 7e, 8c)**

Acantholophus ephippiger, Hansen, 1884, p. 511.

Acantholophus hansenii Kraepelin, 1896, p. 232.

Oligolophus hansenii, Roewer, 1923, p. 722; Kästner, 1928, p. 35; Lohmander, 1945, p. 24;

Todd, 1948, p. 112; Savory, 1948, p. 11; Šilhavý, 1956, p. 196.

Localities in The Netherlands. Wilp, Kleine Noordijk, 1946-1956, 9 ♂♂, 10 ♀♀. Tiel, 26-X-1913, 2 specimens. Hoenderloo, 14-X-1946, 2 ♀♀. Hoge Veluwe, Pampelt, 21-IX-1946, 3 juv. Hulshorst, 9-VIII-1946, 3 juv.; 10-IX-1946, 1 juv. Treekermeer, 11-X-1952, 3 ♂♂, 4 ♀♀. Naarden, 16-X-1914, 3 specimens. Schoorl, 4-XI-1951, 3 ♂♂, 2 ♀♀. Amsterdam, IX-1943, 1 juv. Santpoort, 2-VIII-1940, 1 juv. Overveen, 27-VIII-1913, 2 specimens. Aerdenhout, 4-X-1951, 4 ♂♂, 8 ♀♀. The Hague, dunes of Meijndel, 6-XI-1927, 47 specimens; 24-IX-1953 till 19-I-1954, 18 ♂♂, 110 ♀♀, 1 juv.

Description. Length of the male 4 mm; length of the female 5-6 mm.

Generally the specimens are dark; cephalothorax and abdomen grey brown. Cephalothorax (fig. 7e) with dark brown spots and abdomen with a darker, sometimes indistinct saddle that is constricted near the ocularium. The last two segments of the cephalothorax and most of the segments of the abdomen are provided with transverse rows of small denticles or tubercles; especially in dark specimens these denticles form white spots. In front of the ocularium the anterior border of the cephalothorax is provided with a trident that is accompanied by two lateral denticles (fig. 7e); behind these 5 denticles which are placed often close to each other, a group of 3-6 irregularly placed denticles is present. Generally the ocularium is entirely brown or black, but sometimes it is a little lighter in the middle; two longitudinal rows of about 5 (often white) denticles or tubercles are present. Ventrally the colour of the abdomen, although variable, is generally yellowish brown with white spots and an indistinct dark median band.

Chelicerae yellowish brown or blackish brown; both joints provided with hairs. First joint with ventral spur.

Palp yellowish brown; femur, patella, and tibia darker. Femur and patella with an indistinct apophysis; trochanter and femur with small ventral tubercles each with one hair. All joints provided with hairs. Tarsus of the palp of the male with a long row of granules.

Legs brownish black; metatarsus and tarsus lighter. Femora more or less cylindrical, patellae and tibiae angular. Coxae I and II with a posterior apical tooth. Femora, patellae, and tibiae with longitudinal rows of hairs; femora and patellae apically with 2-3 dorsal denticles. Length of the legs of the male (without coxa and trochanter) 7.5-15-9-13 mm; of the female 9-18-10-14 mm respectively.

Length of the penis 2.3 mm (fig. 8c). Corpus penis in lateral view broad (compare *O. tridens*), and almost entirely dark. Stylus shorter than the glans.

Occurrence. Kraepelin (1896) found the species in gardens, whilst Todd (1949) mentions woods as habitat of the species. In The Netherlands *O. hansenii* can be found in all kinds of woods; it is widespread in our country, although it is possibly not present in the southern part of Limburg. The species never occurs in large numbers. In the dunes of Meijndel near The Hague the species prefers woods (especially of *Populus nigra* L.), but catch-boxes in open field covered with *Calamagrostis* also yielded a few specimens. On oaks and pine-trees specimens are found up to 9 meters.

According to Todd (1949) the juveniles are present from May till the end of August. In The Netherlands juveniles are known from August till December, whilst the adults are found from September till the end of January. The species is most active in November and December.

Distribution. Sweden, Denmark, Germany, Poland, The Netherlands, Belgium, England, Czechoslovakia.

Oligolophus tridens (C. L. Koch, 1836) (figs. 1a, b, 2b, 7b, 8e, 9b)

Opilio tridens C. L. Koch, 1836, p. 14.

Acantholophus tridens, Hansen, 1884, p. 511.

Oligolophus tridens, Simon, 1879, p. 251; Kraepelin, 1896, p. 231; Becker, 1896, p. 358; De Lessert, 1917, p. 32; Roewer, 1923, p. 721; Kästner, 1928, p. 35; Kolosváry, 1929, p. 101; Heinäjoki, 1944, p. 14; Lohmander, 1945, p. 21; Todd, 1948, p. 112; Savory, 1948, p. 11; Šilhavý, 1956, p. 192.

Localities in the Netherlands. Zeyer Strubben, 24-VIII-1959, 2 ♂♂, 4 ♀♀. Grolloërholt, Hondsrug, 24-VIII-1949, 1 ♀. Westerbork, summer 1944, 2 ♀♀. Wilp, Kleine Noordijk, 1946-1955, 152 specimens. Doetinchem, Slangenbergh, 28-IX-1952, 1 ♂, 2 ♀♀. Laarderhei 1-VIII-1913, 1 specimen. Stroe, 15-VII-1941, 3 juv. Hoge Veluwe, 14-VIII-1944, 1 juv.; summer 1945, 12 juv.; IX-X-1946, 21 ♂♂, 63 ♀♀. Zeist, 1888, 20 ♀♀. Naardermeer, 25-IX-1923, 1 ♂. Kortenhoeft, 5-VIII-1952, 4 specimens. Ankeveen, 23-X-1951, 1 ♂, 1 ♀. Duivendrecht, 22-VII-1913, 1 specimen. Overveen, 21-24-VIII-1913, 4 specimens. Haarlem-Zuid, garden, 10-IX-1950, 2 ♂♂, 2 ♀♀. Bentveld, 10-X-1951, 2 ♂♂, 1 ♀. Aerdenhout, 25-IX-1947, 1 ♀; 4-X-1947, 1 ♂. Naaldenveld, X-1943, 2 ♂♂, 3 ♀♀. The Hague, dunes of Meijndel, 19-VIII-1953 till 9-XII-1953,

586 ♂♂, 521 ♀♀, 4 juv. Peursum, 19-VIII-1944, 1 juv. 's Heer-Arendskerke, 31-VII, 1 juv. Vierlingsbeek, 17-VIII-1953, 1 ♀, 1 juv. Wellerlooi, 20-VIII-1954, 3 juv. Herkenbosch, Hammerhof, 25-IX-1948, 1 ♂, 6 ♀♀. Vlodrop, 30-IX-1948, 2 ♂♂, 2 ♀♀. Wijler near Swalmen, 29-IX-1948, 4 ♂♂, 3 ♀♀. Sint-Pietersberg, near Fort Sint-Pieter, 19-IX-1949, 5 ♀♀; Franse Batterij, 17-IX-1949, 1 ♂; Enci-bos, 18-IX-1949, 2 ♂♂; 19-VIII-1950, 1 ♀; between boundary-marks 51 and 58, 17-IX-1949, 3 ♂♂, 5 ♀♀; between boundary-marks 51 and 52, 18-X-1950, 1 ♂; Caestert, wood, 17-IX-1950, 2 ♀♀. Neercanne, 17-IX-1949, 2 ♂♂, 1 ♀; 17-X-1950, 1 ♂, 1 ♀; 12-IX-1951, 1 ♂. Elsloo, 20-IX-1950, 1 ♀. Nuth, 16-IX-1950, 1 ♂, 2 ♀♀. Spaubeek, 28-IX-1948, 1 specimen. Geulhem, 7-VIII-1946, 1 juv. Valkenburg, VIII-1952, 1 ♀. Bemelen, 5-X-1952, 1 ♀. Oud-Valkenburg, Biebos, 18-IX-1950, 2 ♂♂. Gronsveld, 27-VIII-1953, 2 ♂♂, 2 ♀♀; Savelsbos, 23-VIII-1950, 1 ♀, 1 juv.; 27-IX-1951, 1 ♂, 1 ♀. Rijckholt, Sjoene Grub, 26-VIII-1949, 1 ♂; 14-IX-1950, 1 ♂. Heerlen, Caumerdal, 8-IX-1954, 3 juv. Epen, Bovenste Bos, 26-IX-1951, 2 ♂♂, 1 ♀. Vijlen, Vijlenerbos, 17-IX-1954, 1 ♂.

Description. Length of the male 4-4.5 mm; length of the female 5-5.5 mm.

Body of the male (fig. 7b) somewhat elongate, distinctly constricted behind the cephalothorax; body of the female oval (fig. 1a, b). Cephalothorax with a pattern of light and dark brown spots, which continues on the abdomen as an oblong rectangular dark saddle. The postero-lateral parts of the cephalothorax and the lateral parts of the abdomen are silver-grey with some brown spots. The females are often lighter than the males; yellowish brown with lighter saddle. In front of the ocularium the anterior border of the cephalothorax is provided with a rather small trident; behind this trident 2-3 denticles are generally present. The two last segments of the cephalothorax and most of the segments of the abdomen are provided with transverse rows of very small denticles or tubercles. Ocularium mainly pale; eyes generally dark, surrounded by a black circle; two longitudinal rows of 4-7 small denticles are present.

Chelicerae pale, first joint dorsally with small brown spots. Both joints bear hairs; first joint with ventral spur.

Palp pale; femur, patella, the base of the tibia, and the apical part of the tarsus brownish. All joints covered with hairs; trochanter and femur ventrally provided with small tubercles each with one strong hair (figs. 1b, 6b). Tarsus of the male with a longitudinal row of granules.

Legs pale or yellowish brown, and the apical part of femora, patellae, and tibiae darker. Coxae pale or yellowish brown, covered with hairs (fig. 1a, b); coxae I and II with a posterior apical tooth. Femora, patellae, and tibiae angular, and provided only with longitudinal rows of hairs (figs. 1b, 9b); femora and patellae with 2-3 dorsal apical denticles. Length of the legs of the male (without coxa and trochanter) 10-19-11-16.5 mm; of the female 8-16-9-13 mm respectively.

Length of the penis 2.9-3.4 mm (fig. 8e). Corpus penis long and slender; dark for about 2/3 of its length. Stylus shorter than the glans.

Occurrence. *O. tridens* is a very common species that is found in lowlands as well as in mountains (according to De Lessert, 1917, up to 1500 m). In The Netherlands it is found in woods, marshes, and gardens, which is in accordance with the data mentioned in the literature. The species prefers woods; in open places it is present only in relatively small numbers.

Juveniles can be found from August till the beginning of September; adults from August till December. The species is most active in November.

Distribution. Iceland, Sweden, Finland, Denmark, Germany, Poland, The Netherlands, Belgium, Great Britain, Ireland, France, Switzerland, Austria, Czechoslovakia.

Paroligolophus Lohmander, 1945

Ocularium of normal shape; dorsally with a few hairs but without denticles. Anterior border of the cephalothorax with a median trident of spines. Supra-cheliceral laminae without denticles. Apophysis of the palp indistinct; trochanter and femur with small ventral tubercles that are not longer than broad. First joint of the chelicerae with a small or indistinct ventral spur. Femora and tibiae of the legs provided with longitudinal rows of hairs. Top of the operculum genitale with a notch. Corpus penis slender; swollen at the base; glans relatively small, at an obtuse angle with the corpus penis; stylus longer than the glans.

In 1945 Lohmander discussed the characters of *Oligolophus agrestis* (Meade) and subsequently created a subgenus *Paroligolophus*. In my opinion the smooth ocularium, and the shape of penis and operculum genitale, justify this view. The subgenus is raised here to generic rank.

The type of *Paroligolophus* is *Opilio agrestis* Meade, 1855; it is the only representative of the genus, and it is known from The Netherlands.

Paroligolophus agrestis (Meade, 1855) (figs. 6a, 7a, 8a, b, 9c, d)

Opilio agrestis Meade, 1855, p. 410.

Oligolophus ephippiger, Simon, 1879, p. 249.

Acantholophus agrestis, Kraepelin, 1896, p. 231.

Oligolophus agrestis, Becker, 1896, p. 357; De Lessert, 1917, p. 34; Roewer, 1923, p. 721;

Kästner, 1928, p. 36; Kolosváry, 1929, p. 101; Todd, 1948, p. 111; Savory, 1948, p. 10.

Oligolophus (*Paroligolophus*) *agrestis*, Lohmander, 1945, p. 26.

Lophopilio agrestis, Šilhavý, 1956, p. 217.

Localities in The Netherlands. Lippenhuizen, 1-IX-1954, 2 ♀. Terschelling, Boschplaat, 9-12-IX-1952, 8 specimens. Westerbork, summer 1944, 1 ♀. Emst, 23-VII — 6-VIII-1946, 1 ♂. Hoge Veluwe, Deelense Start, 11-VIII-1952, 1 juv.; 7-X-1946, 1 ♂; Pampelt, 21-IX-1946, 1 ♂; Hoenderloo, 16-VIII-1944, 3 juv. Hulshorst, on oak, beech, and birch up to 9 meters, 9-VIII-1946, 1 juv.; 7-10-IX-1946, 11 juv. Tiel, 26-X-1913, 2 specimens. Doetinchem, Kruisbergse Bossen, 29-IX-1952, 3 specimens; Slangenbergh, 28-IX-1952, 1 specimen. Zeddarn, 27-IX-1952, 1 ♀. Oud Leusden, Hazenwater, 10-IX-1952,

3 specimens. Amersfoort, Treekermeer, 10-II-IX-1952, 1 ♂, 1 ♀, 5 specimens. Bilt-hoven, Eykesteynsebossen, 2-VIII-1954, 12 juv. Lage Vuursche, 6-VIII-1954, 7 juv. Naarden, 16-X-1914, 1 specimen; Bredius Bos, 21-XI-1915, 1 specimen. Bussum, heath, 2-VIII-1954, 1 juv. Ankeveen, 23-X-1951, 4 ♀♀. Den Helder, 3-V-1949, 1 juv. Schoorl, 4-XI-1951, 1 ♀. Haarlem, 10-IX-1950, 4 ♂♂. Zandvoort, 2-XI-1913, 1 specimen. Bentveld, 10-X-1951, 1 ♂. Heemstede, 19-X-1913, 1 specimen. Aerdenhout, 4-X-1951, 19 ♂♂, 11 ♀♀. Between Katwijk and Noordwijk, sandbeach, 26-XI-1950, 2 ♂♂. Leiden, 12-X-1944, 1 ♂. Leiderdorp, 8-VII-1943, 1 ♂. Meijndel, dunes near The Hague, 17-IX-1953 till 19-I-1954, 195 ♂♂, 279 ♀♀, 1 juv. The Hague, XI-1949, 1 ♀. Schiedam, X-1943, 2 ♀♀. Nisse, 12-VIII-1952, 3 juv. Udenhout, 18-VIII-1952, 3 juv. Oisterwijk, Gemuldenhoeken, 10-IX-1916, 2 specimens. Between Maarheeze and Leende, 23-IX-1948, 2 ♂♂. Vierlingsbeek, 17-VIII-1953, 1 ♀. Venray, 16-VIII-1954, 1 juv. Wellerlooi, 20-VIII-1954, 2 juv.; 22-VIII-1954, 2 ♂♂, 3 ♀♀, 3 juv. Wijler near Swalmen, 29-IX-1948, 2 ♀♀. Swalmen, 29-IX-1948, 4 ♂♂, 3 ♀♀. Sint-Odiliënberg, 24-IX-1948, 9 ♂♂, 5 ♀♀. Herkenbos, Hammerhof, 25-IX-1948, 2 ♂♂. Vlodrop, 26-IX-1948, 1 ♂. Sint-Pietersberg, near Fort Sint-Pieter, 19-IX-1949, 2 ♂♂; Enci-bos, 18-IX-1949, 1 ♀; between boundary-marks 51 and 53, 1 ♀. Neercanne, Cannerbos, 18-VII-1950, 6 juv. Schinnen, 28-IX-1948, 1 ♂. Houthem, Ravensbos, 8-VIII-1946, 2 juv.; 11-XI-1951, 1 ♀. Heer, Heerderberg, 13-IX-1950, 1 ♀. Rijckholdt, 27-VIII-1949, 1 ♀. Epen, Onderste Bos, 26-IX-1951, 8 ♂♂, 14 ♀♀. Vijlen, Vijlenerbos, 17-IX-1954, 2 ♂♂, 1 ♀.

Description. Length of the male 3.5-4 mm; length of the female 6 mm.

Dorsally, the body is mainly silver-grey with small dark spots. The pattern of the cephalothorax is rather constant (fig. 7a) whilst the pattern of the abdomen is variable. Generally the abdomen of the male bears a saddle that includes a median white band (sometimes only the borders of the saddle are indicated). In the female the saddle is usually indistinct or absent, but the median white band is always present. In front of the ocularium the cephalothorax is provided with a small trident of spines; behind the trident up to 3 denticles may be present. With the exception of the black eyes, the ocularium is whitish. Usually the ocularium is smooth, and only provided with a few hairs; exceptionally a small tubercle may be present. Operculum genitale of the male with dented top (fig. 9d); the black corpus penis is visible through the cover. Operculum genitale of the female with a notch (fig. 9c).

Chelicerae yellowish brown, dorsally provided with hairs. The ventral spur on the first joint of the chelicerae is small or indistinct.

Palp pale yellowish brown; top of the tarsus darker (fig. 6a); apophysis indistinct. Trochanter and femur with very small ventral tubercles that are not longer than broad. The male tarsus is provided with a row of black granules.

Coxae pale with a silvery pattern; coxae I and II with a posterior apical tooth. Legs light yellowish brown; distal parts of femora, patellae, and tibiae with brown spots. Femora almost cylindrical, tibiae angular. Femora, patellae, and tibiae with longitudinal rows of hairs; femora and patellae with

2-3 denticles at the apical part. Length of the legs of the male (without coxa and trochanter) 6.5-8, 14.5-16.5, 7.5-10, 11-16 mm (according to Roewer 7-12, 14-20, 9-14, 12-18 mm).

Length of the penis about 3 mm (fig. 8a, b). Corpus penis black, long, and very slender, swollen at the base. Glans relatively small, at an obtuse angle with the corpus penis. Stylus longer than the glans.

Occurrence. *Paroligolophus agrestis* is a very common species that can be found in woods, park-lands, grass-lands, open sand-dunes, sand-beaches, and even outside sea-dikes. In the coastal region near The Hague it prefers open areas with scattered trees and shrubs (park-lands). The Hulshorst specimens have been found on oak, beech, and pine up to 9 meters.

In The Netherlands juveniles have been found from May till September, and adults from July till February; the species appeared to be most active in November and December.

Distribution. Sweden, Poland, The Netherlands, Belgium, Great Britain, Ireland, France, Spain, Switzerland, Austria, Czechoslovakia and Hungary.

SCLEROSOMATINAE Simon, 1879

Anterior border of the cephalothorax with a large median spine. Lobus maxillaris II short. Supra-coxal gland not visible in dorsal view. Supra-cheliceral laminae without denticles. Tarsus of the palp with pectinate claw. Coxae of the legs with 2 longitudinal rows of blunt denticles. Corona analis present. Corpus penis, glans and stylus more or less in a straight line.

Homalenotus C. L. Koch, 1839

Anterior border of the cephalothorax with one large median spine. Posterior border of the abdomen with 4 protuberances. Abdomen with at least 4 pairs of median denticles.

The type of the genus is *Homalenotus quadridentatus* C. L. Koch, 1839; one species is known from The Netherlands.

Homalenotus quadridentatus (Cuvier, 1795) (fig. 5a, b, c)

Phalangium 4 dentatum Cuvier, 1795, p. 206.

Sclerosoma quadridentatum, Simon, 1879, p. 160; Becker, 1896, p. 341; De Lessert, 1917, p. 20.

Sclerosoma romanum, Simon, 1879, p. 163.

Homalenotus quadridentatus, C. L. Koch, 1839, p. 23; Meade, 1855, p. 414; Roewer, 1923, p. 700; Todd, 1948, p. 111; Savory, 1948, p. 7.

Localities in The Netherlands. Sint-Pietersberg, near Fort Sint-Pieter, 9-II-VII-1949, 1 juv.; quarry near Franse Batterij, 19-IX-1949, 1 juv.; Enci-bos, 18-IX-1949, 1 ♂, 1 ♀; Wijngaard, 23-III-1950, 1 ♂; wood between boundary-marks 57 and 58, 23-III-1950, 1 ♂; near boundary-mark 58, 23-III-1950, 1 ♀, 1 juv.; near boundary-mark 54, 20-IX-

1949, 1 ♂; eastern slope, 12-IX-1950, 1 juv.; wood of Caestert, 23-III-1950, 1 specimen. Neercanne, Cannerbos, 12-I-1951, 1 juv. Groot Haasdal, 9-VIII-1946, 1 ♂. Between Oud-Valkenburg and Sibbe, cave Nullelökske (140), 11-XI-1951, 1 ♂. Bemelen, near Molenberg, 19-IX-1950, 1 ♂. St. Geertruid, 19-VI-1914, 1 specimen; Herkenrade, 28-IX-1951, 2 adults, 2 juv. Eysden, Eysdenerbos, 23-IV-1950, 1 juv. Ubachsberg, 8-VI-1951, 4 specimens. Colmond, 30-VIII-1954, 1 juv. Epen, 16-VI-1914, 1 specimen; 31-V-1943, 1 ♀. Camerig, 18-IX-1950, 1 ♂, 1 juv. Heerlen, XI-1957, 9 specimens.

Description. Length of the male and female 3.5-4.8 mm.

Body (fig. 5a) flattened, light brown, and plastered with sand. Anterior border of the cephalothorax in front of the ocularium with one strong median spine; behind the ocularium the cephalothorax is provided with 2 median denticles. Ocularium black, sometimes with a pale median band; provided with 2-5 small denticles. Abdomen with 4 median pairs of strong denticles and usually with 6 smaller lateral ones; the posterior border of the abdomen with 4 blunt protuberances.

Chelicerae small; the first joint is pale, the second brownish.

Palp pale brown. Palpal femur with a ventro-lateral and a median ventral row of denticles; patella and tibia of the palp dorsally with strong hairs or denticles, and tibia with a ventral row of denticles; tarsus covered with hairs, and provided with a pectinate claw.

Legs light brown. Coxae with 1 or 2 apical teeth; trochanteres with 2 rows of denticles. The denticulation of the femora is variable; sometimes the femora bear 4 or 5 rows of denticles, often in femora II, III, and IV only the posterior row of denticles is distinctly present. Length of the legs (without coxa and trochanter): 5.0-10.0-5.5-8.0 mm.

Penis straight; about 1.6 mm long (fig. 5c, b).

Remarks. Cuvier (1795) described his "Fauchaux a 4-dentelures" on pp. 206 and 207 and figured it between pp. 154 and 155. The rows of denticles on the femora justify the identification, although the small number of articulations of the tarsi (maximally 12) points to the juvenile stage.

Simon (1879) and Roewer (1912) mention that the femora of *Homalenotus quadridentatus* are denticulate, and those of *H. monoceros* C. L. Koch almost smooth. Afterwards, Roewer (1923) characterizes the femora of *H. monoceros*, however, as "bezähnel" (p. 700) and "stark bedornt" (p. 701). In 1928 Kästner figured *H. monoceros* as having smooth femora, whilst Grasshoff (1959, p. 284) mentions "femora mit feiner flacher, meist undeutlich verwaschener Körnelung, vereinzelt mit zerstreuten stumpfen Höckerchen". In my opinion the identity of *H. monoceros* is uncertain. The original description by C. L. Koch is insufficient, whilst the type-locality is unknown. The "redescriptions" by later authors are contradictory.

Occurrence. *Homalenotus quadridentatus* is, in The Netherlands, known

from the southern part of Limburg only. It can be found in the litter of woods, grass-lands, and soil in lime-stone areas. One specimen, probably an occasional visitor, is known from an artificial cave between Oud-Valkenburg and Sibbe.

Juveniles and adults are present throughout the year.

Distribution. The Netherlands, Belgium, England, France, Switzerland, Hungary, South Europe, and North Africa.

LEIOBUNINAE Banks, 1901

Anterior border of the cephalothorax smooth. Lobus maxillaris II long. Supra-coxal gland visible in dorsal view. Supra-cheliceral laminae without denticles. Tarsus of the palp with pectinate claw. Coxae of the legs with or without longitudinal rows of denticles. Corona analis small or absent. Corpus penis, glans, and stylus more or less in a straight line.

Leiobunum C. L. Koch, 1839

Ocularium of normal shape, smooth or (not in our species) with small denticles. Body without denticles, but covered with small granules. Supra-cheliceral laminae without denticles, sometimes with a point. Patella and tibia of the palp without apophysis. Legs very long and slender; at least coxa I and IV provided with a longitudinal row of small, blunt denticles.

In his "Nomenclatoris Zoologici", Agassiz (1846) corrected the name *Leiobunum* to *Liobunum*; he was followed by Simon (1879), Becker (1896), Kraepelin (1896), Roewer (1923), Kästner (1928), and Šilhavý (1956). This correction has, however, no validity, so that I follow Todd (1948), and Bishop (1949) in keeping the name *Leiobunum*.

The type of the genus is *Phalangium rotundum* Latreille, 1798; two species are known from The Netherlands.

KEY TO THE SPECIES

1. Eyes surrounded by a black circle and separated by a white or yellow-orange median band (fig. 13a, g). Minimum length of the legs 30-53-31-43 mm. Corpus penis without black spots (fig. 13c, d) *Leiobunum rotundum* (Latreille) (p. 62)
- Ocularium white with a black median band (fig. 13h). Maximum length of the legs 26-50-26-37 mm. The black spots of the corpus penis are visible through the operculum genitale (fig. 13e, f, i) *Leiobunum blackwalli* Meade (p. 65)

Leiobunum rotundum (Latreille, 1798) (fig. 13a, b, c, d, g)

Phalangium rotundum Latreille, 1798, p. 113.

Phalangium rufum, Hermann, 1804, p. 109.

Phalangium longipes, Hahn, 1834, vol. 2, p. 70, 162.

Leiobunum rotundum, C. L. Koch, 1839, vol. 2, p. 36.

Leiobunum rotundus, Meade, 1855, p. 411.

Liobunum rotundum, Simon, 1879, p. 175; Hansen, 1884, p. 497; Becker, 1896, p. 344; Kraepelin, 1896, p. 222; De Lessert, 1917, p. 11; Roewer, 1923, p. 886; Kästner, 1928, p. 47; Šilhavý, 1956, p. 168.

Leiobunum rotundum, Todd, 1948, p. 111; Savory, 1948, p. 8.

Localities in The Netherlands. Vlieland, Vliehors, 17-VII-1953, 1 juv.; 22-25-VII-1953, 1 ♀, 1 juv. Terschelling, Formerum, 2-VIII-1948, 7 ♂♂, 7 ♀♀, 1 juv.; Boschplaat, 9-IX-1954, 4 ♂♂, 3 ♀♀. Irnsum, 22-IX-1958, 4 ♂♂, 2 ♀♀. Drachten, 4-5-VII-1950, 1 juv. Westerbork, 26-VII-1944, 3 ♂♂. Dwingeler Stroom, 28-VIII-1932, 1 ♀. Winterswijk, Wooldse Veen, 29-VII-1952, 1 ♂. Doetinchem, Slangenbergh, 28-IX-1952, 2 ♂♂. Wilp, Kleine Noordijk, 1946-1953, about 420 specimens. Hoge Veluwe, Pampelt, 21-IX-1946, 1 ♂, 1 ♀; 8-X-1946, 1 ♂. Hulshorst, 21-VIII-1946, 2 ♂♂. Epe, 11-13-IX-1946, 1 ♂, 1 ♀. Baarn, botanical gardens, 11-VIII-1954, 1 ♂, 2 ♀♀. Nieuw Loosdrecht, Sypesteyn, 13-VIII-1954, 6 ♀♀. Amersfoort, 11-IX-1952, 1 ♂; Oud Leusden, 10-IX-1952, 1 ♀. Bithoven, 4-13-VIII-1954, 5 ♂♂, 6 ♀♀. Laren, VIII-1937, 3 ♂♂, 2 ♀♀. Naarden, 22-VIII-1915, 2 ♀♀. Weesp, 19-VII-1914. Amsterdam, 12-IX-1953, 1 ♀; Zeeburg, 6-VIII-1913, 1 ♀; 11-VII-1913, 1 ♂; 3-IX-1919, 1 ♂, 1 ♀; Sloterdijk, 31-VIII-1913, 1 ♀; Oostzaan, X-1947, 2 ♂♂, 1 ♀. Haarlem, 12-21-VIII-1950, 2 ♀♀. Bloemendaal, 23-IX-1943, 2 ♂♂; 10-IX-1950, 2 ♂♂. Leiden, VII-VIII-1931, 2 ♀♀; 28-VII-1940, 7 specimens; 23-IX-1940, 1 ♀; 15-VIII-1943, 1 ♀. Voorschoten, Beresteyn, X-1929, 1 ♀. The Hague, dunes of Meijendel, 30-VII-1953 till 25-XI-1953, 46 ♂♂, 42 ♀♀. Delft, 25-VII-1946, 1 specimen. Gorkum, 19-IX-1947, 1 ♀. Oost-Voorne, 30-VII-1952, 3 specimens. Boxtel, Veldersbos, 4-VIII-1945, 2 ♂♂, 1 ♀. Oisterwijk, 2-VIII-1916, 1 ♀. Wijler near Swalmen, 29-IX-1948, 1 ♀. Swalmen, near Hillenraat Castle, 24-IX-1951, 1 ♀. Sint-Odiliënberg, Muningsbos, 24-IX-1948, 1 ♂, 1 ♀. Montfort, 28-IX-1948, 1 ♂, 2 ♀♀. Sint-Pietersberg, near Fort Sint-Pieter, 9-11-VII-1949, 1 ♀; 19-IX-1949, 1 ♀; Franse Batterij, 17-IX-1949, 1 ♂, 1 ♀; Enci-bos, 19-VIII-1950, 5 ♀♀; 20-VIII-1950, 3 ♂♂, 2 ♀♀; western slope, 24-VIII-1949, 1 ♂, 1 ♀; near boundary-mark 64, 15-IX-1950, 1 ♀; Slavante, 13-VII-1949, 1 juv.; cave of Slavante, 21-IX-1949, 1 ♂; 22-IX-1949, 1 ♂; 20-IX-1949, 1 ♂; eastern slope, 17-VIII-1950, 1 ♀; between boundary-marks 51 and 53, 17-IX-1949, 2 ♂♂; near boundary-mark 52, 17-VIII-1950, 3 ♂♂, 2 ♀♀; wood of Caestert, 24-25-VIII-1950, 5 ♂♂, 8 ♀♀. Neercanne, Cannerbos, 20-VIII-1950, 6 ♂♂, 3 ♀♀. Oostbroek, 20-IX-1950, 4 ♂♂, 2 ♀♀. Schinnen, 28-IX-1948, 1 ♀. Tulle, 16-IX-1950, 1 ♀. Nuth, 16-IX-1950, 4 ♂♂, 1 ♀. Houthem, Ravensbos, 7-VIII-1946, 7 ♀♀. Geulhem, 7-9-VIII-1946, 2 ♂♂, 4 ♀♀; Geul, 21-IX-1950, 1 ♂; Leraarsgrot, 21-IX-1950, 1 ♀. Ulestraten, Vliet, 10-VIII-1946, 5 ♀♀. Groot Haasdal, 9-VIII-1946, 4 ♂♂, 6 ♀♀. Valkenburg, VIII-1952, 1 ♀. Bemelen, Bemelerberg, 20-VIII-1950, 1 ♂; Molenberg, 19-IX-1950, 1 ♂. Oud-Valkenburg, Biebos, 18-IX-1950, 2 ♂♂. Schin op Geul, IX-1924, 1 ♂, 1 ♀; 14-VIII-1944, 1 ♂, 1 ♀. Heer, Heerderberg, 13-IX-1950, 3 ♀♀. Cadier en Keer, 25-IX-1951, 2 ♂♂. Gronsveld, Savelsbos, 23-VIII-1950, 4 ♂♂, 4 ♀♀; Riesenbergh, 15-IX-1950, 4 ♂♂. Eysden, Eysdenerbos, 23-VIII-1950, 3 ♂♂, 3 ♀♀; 14-IX-1950, 1 ♂, 1 ♀. Brunsummerheide, 13-VIII-1951, 1 ♀. Heerlen, 8-IX-1954, 1 ♀. Kerkrade, 8-14-VIII-1951, 2 ♂♂, 3 ♀♀. Krapoel, Wagelerbos, 10-VIII-1949, 1 ♂. Landrade, Kruisbos, 10-VIII-1949, 2 ♂♂, 2 ♀♀. Bissen, Schweibergerbos, 10-VIII-1949, 1 ♂. Epen, Bovenste Bos, 9-VIII-1949, 1 ♂; 26-IX-1951, 1 ♂. Elzeter and Vijlenerbos, 31-VII-1948, 1 ♂.

Description. Length of the male 3.5-5.0 mm; length of the female 5.5-7.0 mm.

Cephalothorax without denticles but covered with very small granules. In the male the cephalothorax is yellowish orange with brown borders; in the

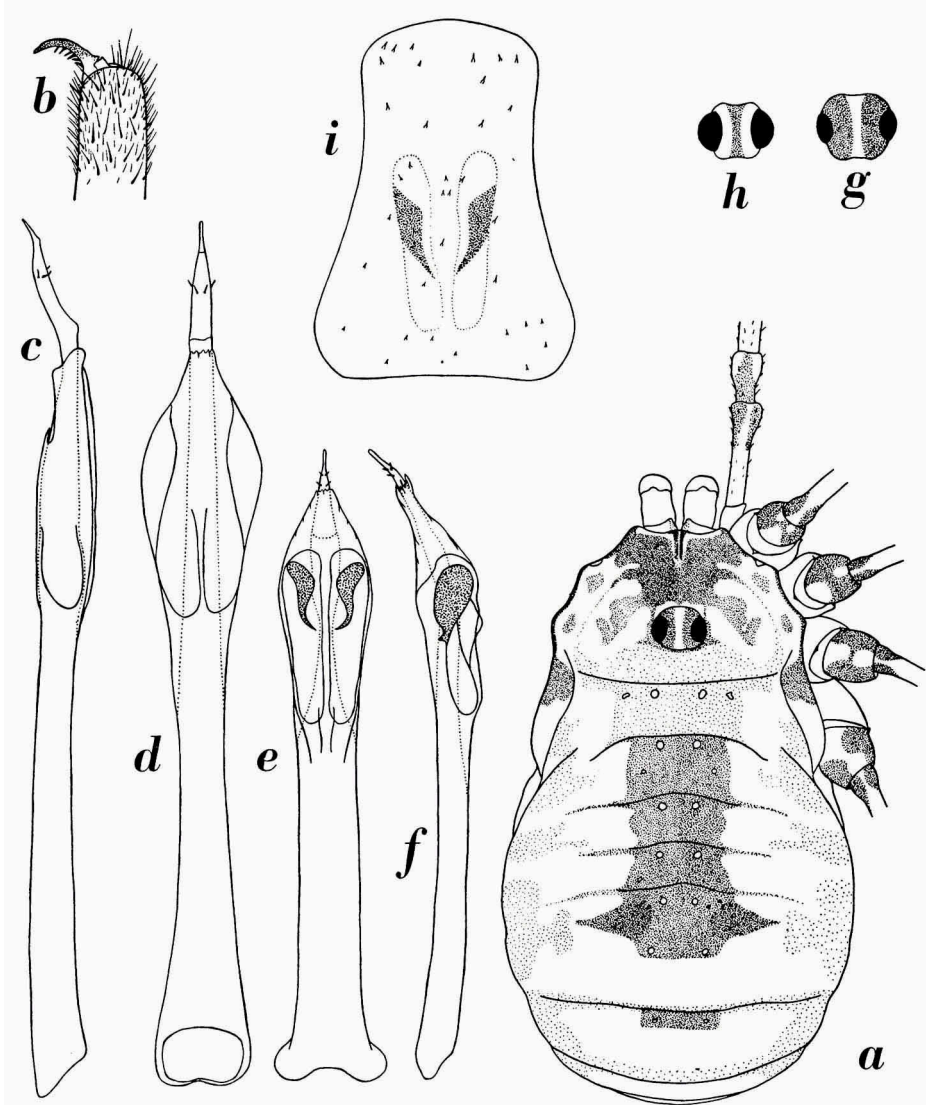


Fig. 13. a-d, *Leioibunum rotundum* (Latreille): a, dorsal view of the female; b, tarsus of the palp showing claw; c, lateral view of the penis; d, dorsal view of the penis; g, dorsal view of the ocularium. e, f, h, i, *Leioibunum blackwalli* (Meade): e, dorsal view of the penis; f, lateral view of the penis; h, dorsal view of the ocularium; i, operculum genitale with two dark parts of the penis visible from below. a, $\times 12$; c-f, $\times 50$; b, i, h, g, $\times 25$.

female a pattern of brown spots in front of the ocularium is also present (fig. 13a). Ocularium smooth; the eyes are surrounded by a black circle and separated by a white or yellowish orange median band (fig. 13g). Supra-

cheliceral laminae each with a point. Abdomen without denticles but covered with small granules. In the female a brown saddle and silvery spots are present (fig. 13a).

Chelicerae pale, second joint sometimes a little brownish. First joint with a ventral spur.

Palps without denticles and only with a few hairs. Tarsus and basal part of the palpal femur pale; trochanter, patella, tibia, and upper part of the palpal femur brownish. Tarsus of the palp with a pectinate claw (fig. 13b).

Coxae of the legs pale with white joints; coxae I, II, and III each with an anterior longitudinal row of small, blunt denticles; coxa IV with an anterior and posterior row of these denticles. Trochanteres of the legs dark brown, with light median spots; provided with a few anterior and posterior denticles. Femora, patellae, and tibiae black; metatarsus and tarsus light brown. Femora provided with rows of small denticles, other joints with small hairs only. Length of the legs (without coxa and trochanter) I, 30-34 mm; II, 53-59 mm; III, 31-33 mm; IV, 43-46 mm.

Length of the penis 2.2 mm (fig. 13c, d).

Occurrence. *Leiobunum rotundum* is very common; it is known from all provinces of The Netherlands. The species can be found in all kinds of woods, but it is rare in open grass-lands. In the dunes near The Hague the species is absent in the dry open sand-dunes. Four records are known from artificial caves in the southern part of Limburg; the troglaxene species is also recorded from caves in Belgium, France, Spain, and Italy.

The juveniles can be found from April till August; the adults from July till the end of November. *L. rotundum* is most active in August.

Distribution. Europe, North Africa, and The Canary Islands.

***Leiobunum blackwalli* Meade, 1861 (fig. 13e, f, i, h)**

Leiobunum blackwalli Meade, 1861, p. 355; Todd, 1948, p. 111; Savory, 1948, p. 8.

Liobunum blackwalli, Simon, 1879, p. 178; Hansen, 1884, p. 498; Becker, 1896, p. 345; Kraepelin, 1896, p. 222; De Lessert, 1917, p. 12; Roewer, 1923, p. 887; Kästner, 1928, p. 48; Šilhavý, 1956, p. 173.

Localities in The Netherlands. Westerbork-Hooghalen, VIII-1944, 1 ♂. Terhorster Zand, 16-IX-1959, 1 ♀. Wilp, Kleine Noordijk, 1946-1953, 1 ♂, 2 ♀ ♀, 1 juv. Doetinchem, Kruisbergse Bossen, 29-IX-1952, 2 ♂ ♂, 1 ♀. Hoge Veluwe, heath, 21-IX-1946, 1 ♀; IJzeren Man, 24-IX-1946, 1 ♀. Amersfoort, 11-IX-1952, 1 ♀; Den Treek, 11-IX-1952, 2 ♀ ♀. Baarn, green-house, 8-IV-1949, 1 ♂, 1 ♀. Naarden, wood of Bredius, 5-IX-1915, 1 ♂, 1 ♀. Ankeveen, 23-X-1951, 1 ♀. Kortenhoef, 25-VI-1952, 1 juv. Weesp, 19-VII-1914, 1 ♂. Haarlem, 12-21-VIII-1950, 1 ♀; 10-IX-1950, 2 ♂ ♂, 1 ♀, 1 juv. Overveen, 27-VIII-1913, 2 ♀ ♀. Aerdenhout, 4-X-1951, 4 ♂ ♂, 6 ♀ ♀. Bentveld, 10-X-1951, 1 ♂, 1 ♀. Leiden, 19-XI-1943, 1 ♂. Leiderdorp, 8-XII-1943, 1 ♀. Wassenaar, Voorlinden, 6-XI-1948, 1 ♂. The Hague, dunes of Meijendel, 30-VII-1953 till 8-I-1954, 90 ♂ ♂, 188 ♀ ♀, 17 juv.; Meer en Bos, VIII-1942, 1 ♀. Tholen, 26-IX-1949, 1 ♀. Swalmen, Hillenraat Castle, 24-IX-1951, 3 ♂ ♂, 1 ♀. Sint-Odiliënberg, Muningsbos,

24-IX-1948, 2 ♀♀. Herkenbos, 26-IX-1948, 7 specimens. Vlodrop, Station, 30-IX-1948, 2 ♂♂, 2 ♀♀. Sint-Pietersberg, near Fort Sint-Pieter, 19-IX-1949, 3 ♂♂, 1 ♀; quarry near Franse Batterij, 17-IX-1949, 1 ♀; Enci-bos, 18-IX-1949, 1 ♂, 3 ♀♀; 19-VIII-1950, 1 ♀; 18-X-1950, 1 ♀; wood near boundary-mark 58, 18-X-1950, 2 ♂♂, 1 ♀; between boundary-marks 53 and 58, 1 ♂; eastern slope, 12-IX-1950, 1 ♂; between boundary-marks 51 and 53, 17-IX-1949, 1 ♂, 2 ♀♀; wood of Caestert, 1 ♂, 1 ♀. Spaubeek, 28-IX-1948, 2 ♂♂, 2 ♀♀. Nuth, 16-IX-1950, 1 ♂. Houthem, Ravensbos, 9-VIII-1946, 1 ♂. Geulhem, 9-VIII-1946, 3 juv. Groot Haasdal, 9-VIII-1946, 1 juv. Ulestraten, Vlick, 10-VIII-1946, 2 juv. Between Oud-Valkenburg and Sibbe, Biebos, 18-IX-1950, 2 ♂♂, 2 ♀♀; cave Heiberg, 18-IX-1950, 1 ♂. Cadier en Keer, 25-IX-1951, 2 ♀♀. Gronsveld, Savelsbos, 23-VIII-1950, 6 ♀♀. Herkenrade, 28-IX-1951, 1 ♂. Eysden, Eysdenerbos, 28-IX-1951, 2 ♀♀. Heerlen, Caumerdal, 8-IX-1954, 1 ♂, 1 ♀. Kerkrade, 8-14-VIII-1951, 1 juv. Bissen, Schweibergerbos, 10-VIII-1949, 1 juv. Camerig, 18-IX-1950, 1 ♀. Vijlen, Vijlenerbos, 17-IX-1954, 1 ♂.

Description. Length of the male 3-4 mm; length of the female 5.0-5.5 mm.

The species closely resembles *L. rotundum* (Latreille) but it is distinguishable by the following characters.

Cephalothorax and abdomen of the male usually orange-brown; the pattern of the female is much darker than in *L. rotundum*, whilst the saddle is larger, covering almost the whole surface of the abdomen. The ocularium is white with a median dark band (fig. 13h).

The dorsal surface of the first joint of the chelicerae usually shows a white or silvery round spot.

Coxae I, II, and III each with an anterior, and coxa IV with a posterior row of denticles. Often these denticles are very small and hardly visible. Length of the legs (without coxa and trochanter) I, 25-26 mm; II, 38-43 mm; III, 25-26 mm; IV, 35-37 mm (Roewer, 1923, p. 887: 26-50-26-38 mm).

Length of the penis 1.9 mm (fig. 13e, f); corpus penis provided with 2 black parts that are visible through the operculum genitale (fig. 13i).

Occurrence. *Leiobunum blackwalli* is rather common and generally distributed in The Netherlands. Although this species prefers all kinds of woods, it is also found in open places with a herb-layer (grass-land, heath etc.), and even sporadically in dry open areas like sand-dunes. One specimen is known from an artificial cave in Limburg.

The juveniles are present from June till September; the adults from August till January. Two adult specimens were found in April in a green-house. The species is most active in September.

Distribution. Denmark, Germany, Poland, The Netherlands, Belgium, Great Britain, Ireland, France, Spain, Portugal, Switzerland, Austria, and Hungary.

REFERENCES *

- AGASSIZ, L., 1846. *Nomenclatoris Zoologici. Index Universalis.*
- ARNOUD, BR., 1955. "Trogulus tricarinatus". *Natuurhist. Maandbl.*, vol. 44, p. 3.
- BALAZUC, J., DRESCO, E., HENROT, H., NÈGRE, J., 1951. *Biologie des carrières souterraines de la region Parisienne. Vie et Milieu*, vol. 2, no. 3, pp. 301-334.
- BANKS, N., 1901. *Synopsis of North American invertebrates, XVI. The Phalangida.* *Amer. Nat.*, vol. 35, p. 673.
- BECKER, L., 1879. *Catalogue des Arachnides de Belgique.* *Ann. Soc. Ent. Belgique*, vol. 12, p. 105.
- , 1896. *Les Arachnides de Belgique.* *Ann. Mus. Roy. Hist. Nat. Belgique*, vol. 12, pp. 339-369.
- BENNET, J. A. en VAN OLIVIER, G., 1825. *Naamlijst der Nederlandsche Insecten.* *Natuurkundige Verh. Holl. Maatsch. Wet. Haarlem*, vol. 14, p. 468.
- BISHOP, S. C., 1949. *The Phalangida (Opiliones) of New York.* *Proc. Rochester Ac. Sc.*, vol. 9, no. 3, pp. 159-235.
- *BOSC, L. A. G., 1792. *Bull. Sci. Soc. Philom. Corresp.*, vol. 1, p. 18.
- CANESTRINI, G., 1872. *Gli Opilioni Italiani.* *Ann. Mus. Civ. Storia Nat.*, vol. 2, pp. 5-48.
- CUVIER, G., 1795. *Description de deux espèces nouvelles d'Insectes. Le Faucheur a 4-dentelures.* *Magazin Encyclopédique*, vol. 1, pp. 205-207.
- DEGEER, C., 1778. *Memoires pour servir a l'histoire des Insectes*, vol. 7.
- DRIFT, J. VAN DER, 1950. *Analysis of the animal Community in a Beech Forest Floor.* *Diss. Leiden.*
- FABRICIUS, J. C., 1775. *Systema Entomologiae.*
- , 1779. *Reise nach Norwegen.*
- , 1802. *Voyage en Norvège.*
- , 1793. *Entomologia Systematica*, vol. 2.
- FALCONER, W., 1910. *Keys to the families and genera of British spiders, and to the families, genera and species of the British harvestmen and pseudoscorpions.* *Naturalist, London.*
- GOEDAERT, J., 1669. *Metamorphosis Naturalis*, vol. 2.
- GOODNIGHT, C. J. and GOODNIGHT, M. L., 1953. *Taxonomic recognition of Variation in Opiliones.* *Systematic Zoology*, vol. 2, pp. 173-179.
- GRAAF, H. W. DE, 1882. *Sur la construction des Organes Génitaux des Phalangiens.* *Leide.*
- GRASSHOFF, M., 1959. *Über Homalenotus und Parasclerosoma (Arach., Opiliones-Palpatores).* *Senckenberg. biol.*, vol. 40, no. 5/6, pp. 283-288.
- HACKMAN, W., 1956. *Phalangida (Opiliones) from Newfoundland.* *Soc. Sci. Fennica*, vol. 15, no. 17, pp. 1-9.
- HADŽI, J., 1928. *Beitrag zur Kenntnis der Opilioniden-Fauna von Slowenien (Yugoslawnien).* *Zool. Anzeiger*, vol. 77, no. 1/2, pp. 5-19.
- , 1931. *Die Opilionen des Triglavmassivs.* *Prirodoslovne Razprave, Ljubljana*, vol. 1, pp. 107-154.
- HAHN, C. W., 1834. *Die Arachniden*, vol. 2.
- HAMMEN, L. VAN DER, 1947. *Opiliones en Araneae uit Zuidlimburgsche Grotten.* *Tijdschr. Ent.*, vol. 88, pp. 477-481.
- , 1950. *The Arachnida of the artificial caves in Southern Limburg (Netherlands).* *Natuurhist. Maandbl.*, vol. 39, pp. 108-113.
- HANSEN, H. J., 1884. *Arthrogastra Danica.* *Naturhist. Tids.*, ser. 3, vol. 14, pp. 18-84.
- HEINÄJOKI, M., 1944. *Die Opilionidenfauna Finnlands.* *Act. Zool. Fenn.*, vol. 42, pp. 1-26.
- HERBST, J. F. W., 1797. *Natursystem der Ungeflügelten Insekten*, vol. 1, Berlin.

* Papers marked with an asterisk are known to me by reference only.

- , 1798. *Natursystem der Ungeflügelten Insekten*, vol. 2, Berlin.
- , 1799. *Natursystem der Ungeflügelten Insekten*, vol. 3, Berlin.
- HERMANN, J. F., 1804. *Mémoire Apterologique*. Strasbourg.
- HNATEWYTSCH, B., 1929. Fauna der Erzgruben von Schneeberg im Erzgebirge. *Zool. Jahrb. (Syst.)*, vol. 56, no. 3/4, pp. 173-261.
- HOEVEN, J. VAN DER, 1828, 1859. *Handboek der Dierkunde*, vol. 1.
- HOFFMAN, E., 1953. Über die Verwendbarkeit der Penes für die Taxonomie des Phalangidae, insbesondere des Genus *Opilio*. *Mitt. Zool. Mus. Berlin*, vol. 29, no. 1.
- HOLM, A., 1947. On the development of *Opilio parietinus* Deg., *Zool. Bidr. Uppsala*, vol. 25, pp. 409-422.
- HOUTTUYN, F., 1769. *Natuurlijke Historie of uitvoerige beschrijving der dieren*, etc., vol. 1, no. 13, pp. 159-165.
- HULL, J. E., 1930. A note on North Country harvestmen. *The Vasculum*, vol. 16, no. 3.
- HUSSON, R., 1941. Sur la présence dans le domaine épigé de *Nem. saxonicum* Hnatewytsh. *Bull. Soc. Zool. France*, vol. 66, pp. 242-245.
- IMMEL, V., 1954. Zur Biologie und Physiologie von *Nemastoma Quadripunctatum* (Opiliones, Dyspnoi). *Zool. Jahrb. (Syst.)*, vol. 83, no. 1/2, pp. 129-184.
- KÄSTNER, A., 1928. Opiliones (Weberknechte, Kanker). *Die Tierwelt Deutschlands*, vol. 8, p. 1-51.
- KOCH, C. L., 1835. *Faunae Insectorum Germaniae initia*, vol. 128.
- , 1836. *Die Arachniden*, vol. 3.
- , 1839. Übersicht des Arachnidensystems, vol. 2.
- , 1848. *Die Arachniden*, vol. 15.
- *KOCH, L., 1869. Beitrag zur Kenntnis der Arachnidenfauna Tirols. *Zeits. Ferd. Tirol*, ser. 3, vol. 14, p. 165.
- KOLOSVÁRY, G. VON, 1929. *Die Weberknechte Ungarns*. Budapest.
- , 1943. Beiträge zur Opilionidenfauna Siebenbürgers. *Különlenyomat a múzeumi füzetek, évi 1, kötete 1-2*.
- , 1948. *Fragmenta Faunica Hungarica*, vol. 11, p. 64.
- KRAEPELIN, K., 1896. Phalangiden aus der Umgebung Hamburgs. *Mitt. Nat. Hist. Mus. Hamburg*, vol. 13, pp. 217-234.
- KRATOCHVÍL, J., 1934. Les Opilions de la Tchécoslovaquie. *Acta Soc. Sc. Naturalium Moraviae*, vol. 9, no. 5, pp. 1-59.
- , 1958. Höhlenweberknechte Bulgariens (Palpatores-Nemastomatidae). *Ibid.*, vol. 30, pp. 523-576.
- KRITSCHER, E., 1956. *Catalogus Faunae Austriae*, vol. 9c. Wien.
- KRAUS, O., 1959. Der grösste einheimische Weberknecht, ein südliches Faunen-element in der Umgebung Frankfurts. *Natur und Volk*, vol. 89, no. 4, pp. 125-128.
- , 1959. Eine bisher in Deutschland übersehene Odiellus-Art (Opiliones, Arach.). *Senckenb. biol.*, vol. 40, no. 1/2, pp. 89-92.
- , 1961. Die Weberknechte der Iberischen Halbinsel (Arach., Opiliones). *Senckenb. biol.*, vol. 42, no. 4, pp. 331-363.
- KULCZYNSKY, V., 1904. *Ann. Hist. Nat. Mus. Nat. Hungar.*, vol. 2, pp. 79-81.
- *LATREILLE, P. A., 1798. *Bull. Sci. Soc. Philom.*, vol. 1, p. 113.
- , 1802. *Histoire Naturelle Générale et Particulière des Crustacés et des Insectes*, vol. 3.
- , 1803-1804. *Histoire Naturelle Générale et Particulière des Crustacés et des Insectes*, vol. 7.
- LERMA, B. DE, 1952. Recherche zoologique sul Massiv del Pollino (Lucania-Calabria). IV, Opilionidi. *Ann. Inst. Mus. Zool. Univ. Napoli*, vol. 4, no. 5, pp. 1-13.
- , 1952. Allometria di sviluppo dei caratteri sessuali secondari in *Phalangium opilio* L. *Ann. Inst. Mus. Zool. Univ. Napoli*, vol. 4, no. 7.
- LESSERT, R. DE, 1917. *Catalogue des Invertébrés de la Suisse*. Fasc. 9. Opilions. *Mus. Hist. Nat. Genève*.

- LOHMANDER, H., 1945. Arachnologische Fragmente. Meddelanden från Göteborgs Musei Zoologiska Avdelning 111, ser. B, vol. 3, no. 9, pp. 15-30.
- LINNAEUS, C., 1758. Systema Naturae etc. Editio decima reformata.
- , 1761. Fauna Svecica. Editio altera.
- , 1767. Systema Naturae etc. Editio duodecima reformata.
- LOMAN, J. C. C., 1900. Ueber die geographische Verbreitung der Opilioniden. Zool. Jahrb., vol. 13, pp. 74-104.
- , 1902. Neue aussereuropäische Opilioniden. Zool. Jahrb., vol. 16, pp. 163-216.
- MEADE, R. H., 1855. Monograph on the British Species of Phalangiidae or Harvest-men. Ann. Mag. Nat. Hist., ser. 2, vol. 15, pp. 393-416.
- , 1861. Supplement to a Monograph on the British Species of Phalangiidae, or Harvest-men. Ann. Mag. Nat. Hist., ser. 3, vol. 7, no. 41.
- MELLO-LEITAO, C. DE, 1936. Les Opilions de Catalogne. Publications de la junta de ciències naturals de Catalunya, vol. 11, no. 9.
- MÜLLER, O. F., 1776. Zoologia Danica.
- MÜLLER, A., 1918. Ein Beitrag zur Kenntnis der Weibchen der Subfam. Phalangiini. Zool. Jahrb., vol. 41, pp. 535-580.
- , 1919. Abh. Senck. Ges., vol. 37, p. 75.
- OUDEMANS, A. C., 1916. "Trogulus tricarinatus L.". Ent. Ber., vol. 4, p. 277.
- PACK-BERESFORD, D. R., 1926. A list of the harvest-spiders of Ireland. Proc. Roy. Irish Acad., vol. 37B, no. 15, pp. 125-140.
- PANZER, G. W. F., 1794. Faunae Insectorum Germaniae initia, vol. 17, p. 21.
- PERTY, M., 1833. Delectus Animalium Articulorum quae in itinere per Braziliam ann. 1817 et 1820 colligerunt. Monachii, pp. 191-209.
- PFEIFER, H., 1956. Zur Ökologie und Larvalsystematik der Weberknechte. Mitt. Zool. Mus. Berlin, vol. 32, no. 1, pp. 59-104.
- PICKARD-CAMBRIDGE, O., 1890. On the British species of Phalangidea. Proc. Dorset Nat. Hist. Field Club, vol. 2.
- PLANET, L., 1905. Histoire Naturelle de la France. 14e partie. Araignées. Paris.
- RAFALSKI, J., 1960. Catalogus faunae Poloniae, vol. 32, Opiliones, pp. 1-29.
- RIMSKY-KORSAKOW, A. P., 1924. Der Kugelhaare von *Nemastoma lugubre* (Müller). Zool. Anz. Leipzig, vol. 60, pp. 1-6.
- ROEWER, C. FR., 1912. Revision der Opiliones Palpatores, II. Familie der Phalangiidae. Abh. Gebiete Naturwiss. Ver. Hamburg, vol. 20, no. 1, pp. 1-295.
- , 1917. Archiv Naturgeschichte, vol. 83, no. 2, p. 142 and p. 146.
- , 1923. Die Weberknechte der Erde. Jena.
- , 1928. Die Tierwelt Mitteleuropas, Spinnentiere. vol. 3. Leipzig.
- , 1950. Über Ischyropsalididae und Trogulidae. Weitere Weberknechte XV, Senckenbergiana, vol. 31, no. 1-2, pp. 11-56.
- , 1951. Über Nemastomatiden. Weitere Weberknechte XVI. Senckenbergiana, vol. 32, no. 1-4, pp. 95-153.
- ROMBOUTS, J. E., 1875. De dieren van Nederland.
- SANKEY, J. H. P., 1949. British Harvest-Spiders. Essex Naturalist, vol. 28, no. 4, pp. 181-191.
- , 1949. On the harvestman, *Opilio saxatilis* (C. L. Koch). Proc. Zool. Lond., vol. 119, no. 2, pp. 297-300.
- , 1953. *Nemastoma lugubre* (O. F. Muller) (Arachnida, Opiliones): First record of var. *unicolor* Roewer in Britain. Ann. Mag. Nat. Hist., ser. 12, vol. 6, pp. 27-29.
- SAVORY, TH. H., 1945. The Spiders and allied orders of the British Isles. sec. ed. London.
- , 1948. Synopsis of the British Fauna, no. 1: Opiliones (Arachnida) or Harvestman. The Linn. Soc. London. sec. ed.
- ŠILHAVÝ, V., 1938. Sur l'importance de la forme de l'appareil sexuel pour le système des Opilions et révision de quelques espèces européennes du genre *Opilio* Herbst. Sbornik Prirodovědeckého Klubu Rocnik, vol. 3, pp. 7-20.

- , 1939. Etude sur les Opilions du groupe *Nemastoma chrysomelas*. Entomologické Listy (Folia Entomologica), vol. 2, pp. 105-115.
- , 1950. Opiliones Sloveniae Orientalis. Entomologické Listy (Folia Entomologica), vol. 13, pp. 99-106.
- , 1956. Fauna Č.S.R., svazek 7, Sekaci-Opilionidea. Československá Akademie Véd. Praha.
- SIMON, E., 1872. Notice sur les Arachnides Cavernicoles et Hypogés. Ann. Soc. Ent. France, sér. 5, vol. 2, pp. 213-266.
- , 1879. Les Arachnides de France. vol. 7. Contenant les Ordres des Chernetes, Scorpions et Opiliones. Paris.
- SNELLEN VAN VOLLENHOVEN, S. C., 1859. De dieren van Nederland.
- SÖRENSEN, W., 1873. Bidrag til Phalangidernes Morphologi og Systematik. Naturhist. Tidsskr., ser. 3, vol. 8. Kjöbenhavn.
- SPOEK, G. L., 1957. De hooiwagens (Arachnoidea, Opiliones) van de Sint-Pietersberg en van andere delen van de provincie Limburg. Natuurh. Maandbl., vol. 46, pp. 40-50.
- STIPPERGER, H., 1928. Biologie und Verbreitung der Opilioniden Nord-Tirols. Arb. Zool. Inst. Univ. Innsbruck, vol. 3, no. 2.
- STRAND, E., 1928. Fautes de nomenclature dans un nouveau travail sur les Opiliones. Lambillionea Bruxelles, vol. 28, pp. 41-44.
- THORELL, T., 1876. Sopra alcuni Opilioni (Phalangidea) d'Europa e dell' Asia occidentale, con quadro dei generi europei di quest' Ordine. Ann. Mus. Civ. Storia Nat. Genova, vol. 8, pp. 452-508.
- TODD, V., 1948. Key to the Determination of the British Harvestmen (Arachnida, Opiliones). The Entomologist's Monthly Magazine, vol. 84, pp. 109-113.
- , 1949. The habits and Ecology of the British harvestmen (Arachnida, Opiliones), with special reference to those of the Oxford District. Journ. Anim. Ecology, vol. 18, no. 2, pp. 209-216.
- WESTWOOD, J. O., 1874. Thesaurus Entomologicus Oxoniensis, p. 202.