Ewa Teodorowicz

Ameroseiidae (Acari, Mesostigmata) of Poland

A guide to females

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Recenzent
prof. dr hab. Sławomir Kaczmarek
Uniwersytet Kazimierza Wielkiego w Bydgoszczy

Opracowanie redakcyjne
Paulina Kaczmarek

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WYDAWNICTWO UNIWERSYTETU PRZYRODNICZEGO W POZNANIU
ul. Witosa 45, 61-693 Poznań
tel./faks: 61 848 78 08, e-mail: wydawnictwo@up.poznan.pl
http://www.wydawnictwo.up-poznan.net

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INTRODUCTION

The purpose of this work is to provide a guide to females of a selected mite family occurring in Poland. Acarologists find it unfortunate that, although the Acari most likely have an extant diversity many times that of spiders, the number of described species is similar (Walter and Proctor, 2013). It is evident from the estimates of biodiversity in the selected geographic regions that the true number of mite species in the world fauna is higher than 48 200 (Halliday, 2000) or even encompassing over 54 763 valid species (Zhang, 2011). Estimates of the actual number of extant mite species vary from 500,000 to 1,000,000, although recent hypotheses greatly increase estimates of the extant insect fauna (Gaston, 1991; Walter and Proctor, 2013; Seeman, 2020).

Mites have succeeded in colonizing a range of terrestrial, marine, and aquatic habitats that far exceed those occupied by any other arthropod group, including insects (Krantz and Walter, 2009). They live in a world they cannot see. They are also hard to see by the naked eye because of their very small body size (Saito, 2010). Due to their small size, they can easily hitchhike to either arthropods, which is known as phoresy or directly be carried by the air currents, which is known as anemochory. Many of them are free-living predators, some are very well-specialised parasites. Depending on whether they prey on parasite species treated as pests, mites can be very beneficial and often used as biological control agents. However, they can be those pests fought with or vectors of the very serious diseases transmitted to humans and animals.

Some species have shown promises as ecological indicators either of ecological succession or its degradation. Especially selected species that are the most sensitive to particular factors are predestined to be bioindicators, such as some oribatid or mesostigmatic mites (Aoki, 1979; Seniczak et al., 1997b, 1998, 1999b; Ruf and Beck, 2005). Mites react to any kind of stress much more quickly than vertebrates or plants. Although mites do have a significant presence generally in all known ecosystems, they still have a long way to go to achieve parity with related arthropods in high profile scientific publications (Walter and Proctor, 2013).

There is no applied science without science to be applied. Taxonomy underpins all biological research, with implications for many basic scientific and applied fields. Unfortunately, it seems it is facing a crisis because even fewer specialists are available. The utility of DNA sequences for taxonomic purposes is being established, whilst maintaining the importance of the morphological information associated with whole specimens (Tautz et al., 2003). The author has high hopes that this work will be informative and practical in use and, likewise will contribute to the overall knowledge of classical taxonomy. The elements like mite morphology and morphometrics, likewise keys for determining species, support a modern taxonomy which is not standalone but the integration of morphological and molecular taxonomic methods, providing DNA barcode coverage for already described species (Young et al., 2019).

MATERIAL AND METHODS

This study was mainly based on materials available in the zoological collections. The author also looked into private deposits of befriended acarologists. Some samples were collected in the field.
The latter were extracted via Berlese funnels for 4 days in 50 degrees upper heat using 100-watt bulbs. Specimens were mounted in permanent slides in Hoyer's medium and examined under a light microscope Zeiss Axioskop 2. All pencil drawings were made with the use of a drawing tube, scanned, and digitalised with a drawing tablet Wacom Cintique 21UX and Photoshop CS software. Measurements were taken in µm. **Idiosoma** lengths and widths and all shields were measured along the widest points possible. Setae were measured from base to tip. Segmented appendages like **Legs** and palps usually were measured in sections and then summarised. Measurements are typically presented as ranges from minimum to maximum.

Slides with given ameroseiid species from acarological collections have been studied (F = female; ZMB = Zoologisches Museum Berlin, ZMH = Zoologisches Museum Hamburg, ZSM = Zoologische Staatssammlung München): ***Ameroseiella macrochelae*** ZMB 39868 (F **Holotype**), ZMB42520 (F); ***Ameroseius corbiculus*** ZMB 40081 (F), ZMB 40082 (F), ZMB 40086a (F); ZSM 10.7.58 (F), ZSM 10.8.57 (F); ZSM 20.3.79 / 28 (F) ZSM 20.3.79 / 29 (F);ZSM 20.3.79 / 30 (F); ***Ameroseius corniculus*** ZMB 40091 (F **Holotype**); ***Ameroseius furcatus*** ZMB: 40199(F **Holotype**), ZMB: 40200 (F); ***Ameroseius georgei*** ZSM C117 /2 /5 (F), ZSM C117 /2 /6 (F); ***Ameroseius longitrichus*** ZSM K18 / 4680 (F), K18 / 4832 (F); ***Ameroseius sculptilis*** ZMB 41124 (F); ZMB 41125 (F); ZMB 41126 (F);ZMB 41127 (F); ZMB 41128 (F); ZMB 41129 (F); ZMB 41130 (F); ***Ameroseius ulmi*** ZSM K18 / 2662 (F); ***Kleemannia delicata*** ZMB 41008 (F); ZMB 41009 (F); ZSM 20.3.79 / 1 (F); ZSM 20.3.79 / 2 (F); ZSM 20.3.79 / 3 (F); ZSM 20.3.79 / 4 (F); ZSM 20.3.79 / 5 (F); ***Kleemannia pavida*** ZMB 40281 (F); ZSM 3c.4.79 / 12 (F); ZMH A41/73/1 (F); ZMH A41/73/2 (F); ZMH A74/74 (F); ***Kleemannia plumigera*** ZMH A41/73 (F); ZMH A11/74/1 (F); ZMH A11/74/2 (F); ***Kleemannia plumosa*** ZMB 41031 (F); ZSM K188 (F); ZSM V459 (F); ZSM 30/4 (F); ZSM 30/5 (F); ZSM 30/6 (F); ZMH A19/63 (F); ZMH A20/73 (F); ZMH A18/70 (F);

ZMH A24/72 (F); ***Kleemannia pseudoplumosa*** ZMH A53/71 (F); ZMH A53/7 (F); ***Kleemannia tenella*** ZMB 40156 (F **Holotype**). Descriptions and morphometry of ***Ameroseius fungicola***, ***Ameroseius lidiae***, ***Kleemannia insignis*** and ***Kleemannia plumea*** were based on private slides solely. ***Kleemannia elegans*** **Holotype** is beyond reach, and neither it was found in the field. Genus ***Epicriopsis*** in the authors' humble opinion requires a greater study, thus it was only briefly presented hitherto with maps and habitat preference, hoping to fully redescribe it in the future.

FAMILY CLASSIFICATION AND TAXONOMIC CONCEPTS

KINGDOM: ANIMALIA
subKINGDOM: Eumetazoa
PHYLUM: Arthropoda
subPHYLUM: Chelicerata
CLASS: Arachnida
subCLASS: ACARI

Advances in microscopy contributed to the birth of acarology in the late 1800s prospered during its first century, nurtured by the excitement of discovery and by medical, veterinary and agricultural needs (Walter and Proctor, 2013). They have been many contributors to the knowledge of mites so have the taxonomical concepts which from the past till present are in a state of flux.

The very beginning of the family Ameroseidae was in 1806 when the fist species was described by Sowerby named *Acarus corbicula*, as a little basket mite, nowadays known as *Ameroseius corbiculus* the type species of the genus *Ameroseius* as well as the entire family. Sowerby holds the 'prioritatsregel' of a type species, though the genus *Ameroseius* was created in 1903 by Berlese and the type species given by was *Seius hirsutus* Berl 1887 which was a synonym of *A. corbicula.* Berlese signed the genus *Ameroseius* to the family Laelaptidae, due to '*Laelaptidae paraxitismi causa characteribus mutatis'.* Discussion on higher taxon divisions continued, though there were some consistencies. Later the family underwent several revisions and the new taxonomical concepts were created by different acarologists. Some greater contributors to the knowledge on the family: Oudemans, 1929; Sellnick, 1941; Vitzthum, 1942; Baker, 1952, Evans, 1963; Lindquist and Evans, 1965; Westerboer nd Bernhard, 1963; Ishikawa, 1972, 1984; Bregetova, 1977; Karg, 1993; Halliday, 1997; Mašán, 2017. One of the two latest treatises by Krantz and Walter in 2009, marked out 10 genera in the Ameroseiidae family, and by Mašán in 2017 created the eleventh genus *Pseudoameroseius* and also retained *Sinoseius* as a separate genus, thus defining 12 genera in total.

Generally, taxonomical units have been arranged on the basis of apomorphies but also plesiomorphies. Nevertheless, the common issues are being solved and the only reliable steadfast method is a molecular analysis.

Krantz and Walter, 2009

Superordo Parasitiformes Reuter, 1909
Ordo Mesostigmata G. Canestrini, 1891
Cohort Gamasina Kramer, 1881
Subcohort Dermanyssiae Evans and Till, 1979
Superfamily Ascoidea Voigts and Oudemans, 1905

Family: Ameroseiidae Evans, 1961

Genus *Afrocypholaelaps* Elsen, 1972
Genus *Ameroseiella* Bregetova, 1977*
Genus *Ameroseius* Berlese, 1903
Genus *Asperolaelaps* Womersley, 1956
Genus *Brontispalaelaps* Womersley, 1956
Genus *Epicriopsis* Berlese, 1903
Genus *Hattena* Domrow, 1994
Genus *Kleemannia* Oudemans, 1930
Genus *Neocypholaelaps* Vitzthum, 1943
Genus *Seritympanum* Elsen and Whitaker, 1985

Mašán, 2017

Family Ameroseiidae Evans, 1961

Genus *Afrocypholaelaps* Elsen, 1972
Genus *Ameroseiella* Bregetova, 1977*
Genus *Ameroseius* Berlese, 1904
Genus *Asperolaelaps* Womersley, 1956
Genus *Brontispalaelaps* Womersley, 1956
Genus *Epicriopsis* Berlese, 1916
Genus *Hattena* Domrow, 1963
Genus *Kleemannia* Oudemans, 1930
Genus *Neocypholaelaps* Vitzthum, 1942
Genus *Pseudoameroseius* Mašán, 2017
Genus *Sertitympanum* Elsen and Whitaker, 1985
Genus *Sinoseius* Bai and Gu, 1995

*Underlined genera recorded in Poland.

MORPHOLOGY, BIOLOGY AND ECOLOGY

Morphology

Generally, adult ameroseiid mites are considered medium-sized. They often exhibit heavy sclerotisation of the dorsal side of **Idiosoma** that applies to them from light to dark chestnut-brown colour of the body (Evans, 1992). Juvenile stages show only slight traits of sclerotisation and thus their colour is close to dirty white in larvae and protonymphs or pale yellow in deutonymphs (Westerboer and Bernhard, 1963).

Holodorsal shield is a constant character of the family proper to the adult and deutonymph stages. Larva and protonymph exhibit pronotal and pygydial shields which is a common feature for those stages and in addition up to 3 pairs of mesonotal shields, located between, can also occur. Instars from larvae to deutonymph usually are covered with a reticulate ornamentation of the given shields that is sustained in an adult stage (Westerboer and Bernhard, 1963). Moreover, in the terminal stage, new structures can appear on the dorsal shield and sometimes partially on the ventral side. Thus are small tubercles which in shape's projection remind stars. Other structures are pit-like cavities that can cover up an entire shield usually termed as fossae. The first structure can be found in the genera *Epicriopsis* and *Aperolaelaps*, the latter in the genera *Ameroseius* and *Ameroseiella* (Mašán, 2017). The dorsal shield (Fig. 1) carries up to 30 pairs of varied length and shape setae. The most reliable character for the Ameroseiidae is the lack of setae J5 in the posterodorsal part. In some genera e.g. *Epicriopsis* or *Hattena* more pairs of setae are absent (Krantz and Walter, 2009).

The body **Venter** (Fig. 2) is represented by numerous shields, depending on the developmental stage and sex (Ehrnsberger and Błaszak, 1999). Usually the most conspicuous is a sternogenital shield lying between coxae in the podosomatic region. This kind of shield is present in the larva, protonymph, deutonymph and male. The female has a separate sternal and genital shield. In the podogastric region, regardless of sex, lies either the anal shield or ventri-anal shield (Westerboer and Bernhard, 1963). The anal opening is covered by two

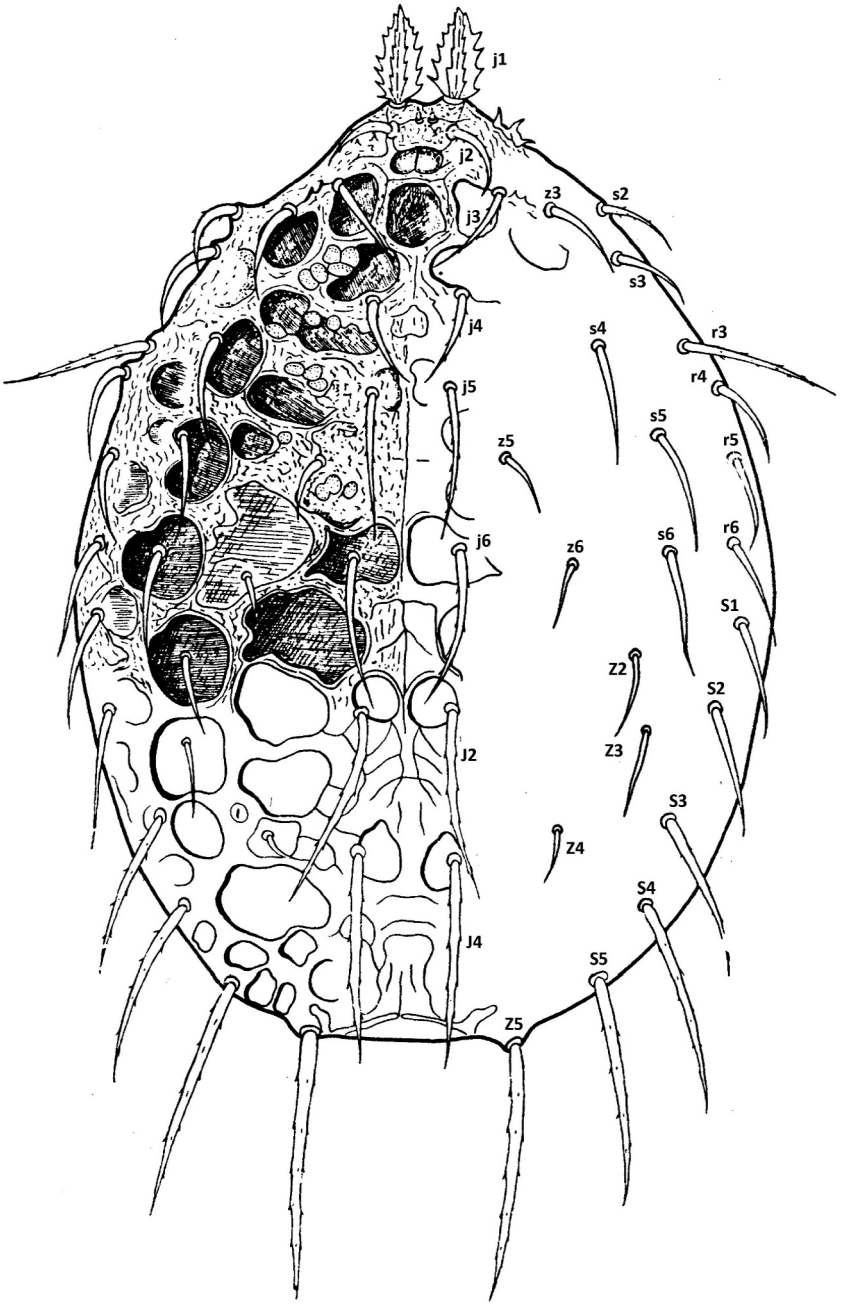

Fig. 1. *Ameroseius corbiculus* female dorsal chaetotaxy (after Westerboer and Bernhard, 1963)

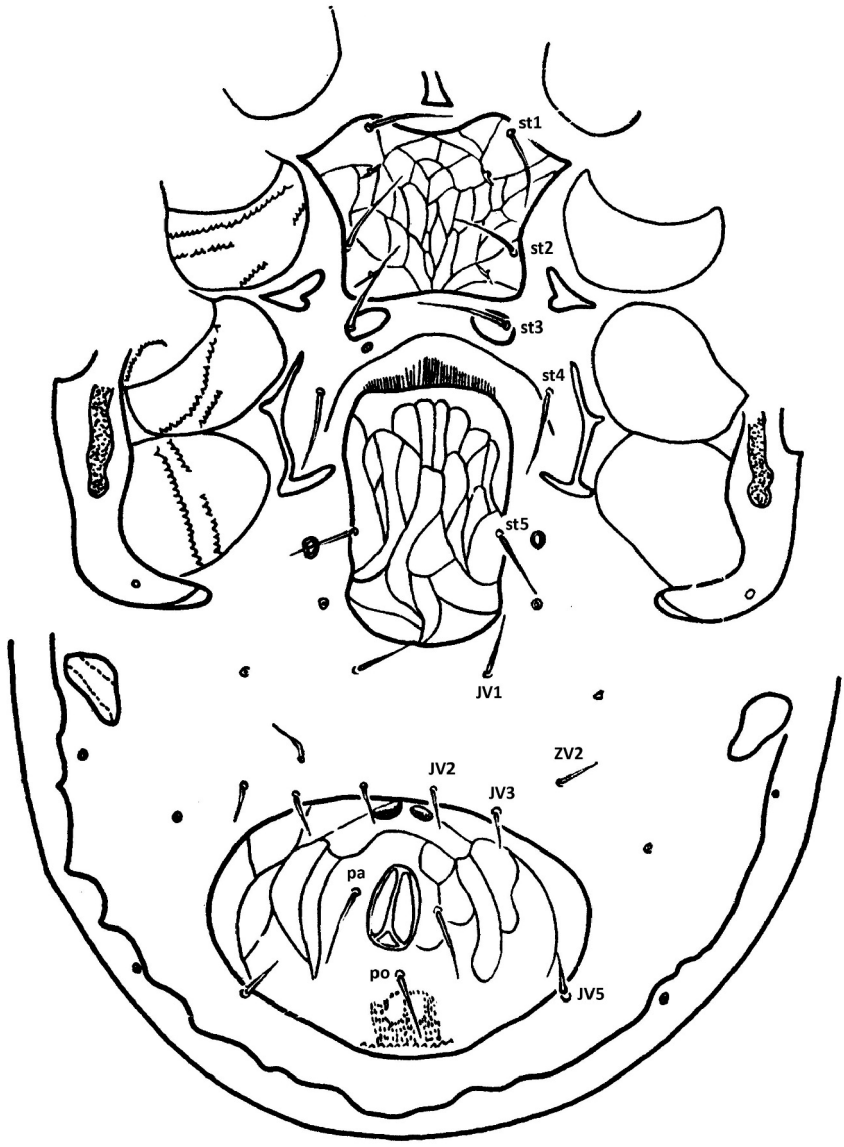

Fig. 2. *Ameroseius corbiculus* female ventral chaetotaxy (after Westerboer and Bernhard, 1963)

valves. In addition to the shields, several structures can be found in its proximities. Presternal plates are never present (Mašán, 2017). Endopodal shields are fused to each other or to a sternal or sternogenital shield or can remain free. Usually, they are in the form of arches on the inner side of the adjacent coxae, surrounding them. Only one pair of oval metapodal plates is situated in a region posterior to IV coxae. Between epigynal and anal shields 2–4 sclerites can be formed (Mašán, 2017). On the contrary to the dorsal side where many forms of setae appear, only simple ventral setae occur both on the shields an in a soft cuticle. However, instead of a pair of simple JV5 setae that flank the anal (ventrianal) shield a pair of long and serrate setae can appear (Westerboer and Bernhard, 1963). A pair of rounded stigmas is present, situated at the level of III–IV coxae. Stigmata are encircled by peritremes that run along the outer side of coxae IV–II. Peritremes lie within peritrematal shields that are well-defined in adults but absent in the preceding stages. Larva possesses stigmata only and no peritreme (Westerboer and Bernhard, 1963).

Gnathosoma lies in an antero-ventral cavity of the **Idiosoma** and is largely formed by the appendages and elements of the cheliceral and palpal segments. These structures come in pairs and only unpaired tritosternum is an exception (Westerboer and Bernhard, 1963). However, it has a pair of laciniae and it's functional role is supporting a fluid flow through the hypostomatal groove (Krantz and Walter, 2009). Chelicera is three-segmented and comprises a base, movable and fixed digits. Both digits are chelate-dentate, a fixed digit possesses a seta-like pilus dentilis and a movable digit of a male projects a spermatodactyl (Evans, 1992). Palps are five-segmented and serve a sensory role. The proximal segment, palptarsus, carries usually 2-tinned, appearing 3-tinned when 1 prong splits along the mid-length, apotele. Gnatosoma of ameroseiid mites is regarded as reduced due to the incomplete number of rows in deutosetrnal groove. Instead of 8, there are only 4–6 rows (Westerboer and Bernhard, 1963). Rows tend to be oligodentate *ca*. 3–5 teeth per row. Corniculi is short and sometimes robust, entire or divided into 2–4 parts. Three hypostomatal seta and palpcoxal setae lie on the ventral side of the **Gnathosoma** (Westerboer and Bernhard, 1963). The dorsal side is enclosed by epistom (Fig. 3). Its shape is subtriangular (Mašán, 2017) and usually two forms prevail, that is, either with a central prong or without it (Karg, 1993). Moreover, the anterior boarder can be smooth or toothed, and in addition, on the dorsal side, one to four strips of teeth can also occur (Westerboer and Bernhard, 1963; Karg, 1993).

Legs are combined via the first segment to a part of a ventral side called podosoma (Krantz and Walter, 2009). They comprise of six segments: coxa, trochanter, femur, genu, tibia and tarsus. Each segment can be defined by four surfaces, namely: dorsal, ventral, anterolateral and posterolateral (Evans, 1992). For all, except tarsus, a special formula of setation is commonly applied. In the

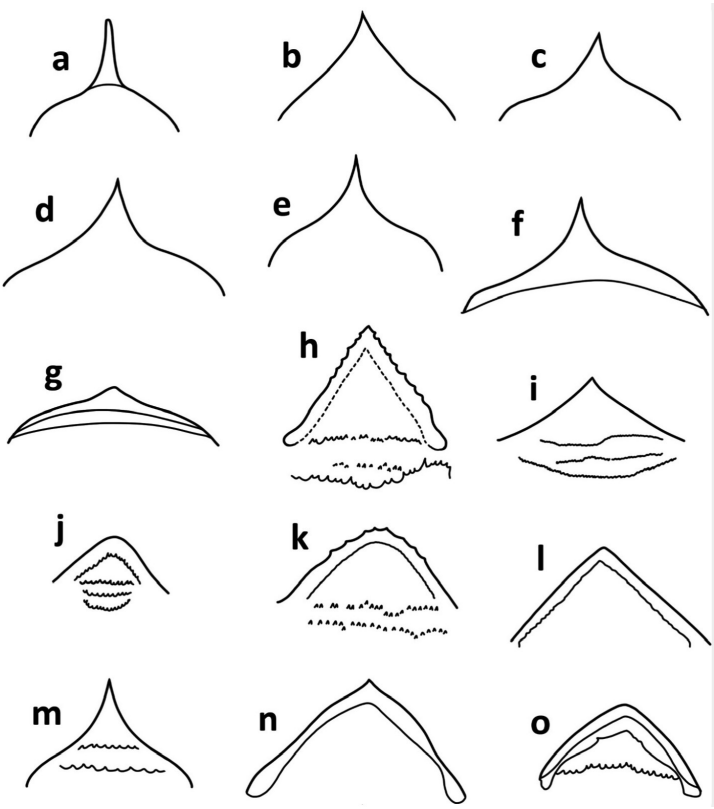

Fig. 3. *Ameroseidae spp.* female tectums (after Karg* 1971a, 1993): a – *Ameroseiella apodius*; b – *Kleemannia plumosa*; c – *K. plumigera*; d – *K. delicata*; e – *K. insignis*; f – *K. tenella*; g – *Ameroseius furcatus*; h – *A. georgei*; i – *A. longitrichus*; j – *A. ulmi*; k – *A. corbiculus*; l – *K. elegans*; m – *K. pavida*; n – *A. corniculus*; o – *A. sculptilis*.
*Corrections were made with *K. pavida.*

present study, a chaetotaxy is following that of Evans (1963, 1992), Lindquist and Evans, 1965. In addition, the **Legs** at the most terminal part can be provided with an uncounted compound pretarsus with an ambulacrum. For some genera, a lack of an ambulacrum or a part of it can be a differential character (Bregetova, 1977; Karg, 1993; Mašán, 2017). **Legs** II–IV serve a motoric function, while leg I in its function is more related to palps and plays a sensory function (Evans, 1992; Krantz and Walter, 2009).

Setae vary greatly in shape and number. However, none of ameroseiid mites shows a holotrichy, a condition when on a dorsal (or outside) shield lie 44 pairs of setae, all possible among three main rows called J (also i – innen) – dorsocentral, Z (z – zwischen) – mediolateral and S (s – seiten) – lateral (Westerboer and Bernhard, 1963). In ameroseiid mites generally, 29 pairs of setae are

situated on a holodorsal shield, but for genus *Epicriopsis* only 24 pairs of setae is a rule (except *E. walterii* with 22 pairs and *E. suedus* with 28) (Mašán, 2017). Moreover, in some species of the genus *Hattena* even fewer pairs of setae occur e.g. *Hattena cometis* or *Hattena floricola* exhibit only 18 pairs of setae (Halliday, 1997). Setae measure from a few μm to an enormous 265 μm (*E. stellata*) and comprise a fine diagnostic character along with their shape (Ishikawa, 1972). Both simple or pilose setae are not uncommon and seem to prevail in some genera. Quite very often j1, or vertical, setae differ from the latter. In certain species elongated serrate, lanceolate, and lanceolate-serrate, constitute the majority if not all dorsal setae (Mašán, 2017).

One can distinguish easily female from male and other developmental stages, as sexual dimorphism is well marked. Basically, the male sternogenital shield has an anal opening in its anterior part. The female has two separate sternal and genital shields. Other instars retain sternal shield without sexual characters (Westerboer and Bernhard, 1963). Moreover, male representatives of a subcohort Dermanyssiae are characterised by the presence of a spermatodactyl that is attached to a movable digit (Evans, 1992; Krantz and Walter, 2009). A secondary character is the size of a body. Males seem to be smaller than females or even deutonymphs, but this diagnosis can be applied to certain species only where a significant difference has been observed. Generally, both the chaetotaxy of the body **Dorsum** and the ornamentation are the same for both sexes (Westerboer and Bernhard, 1963).

Biology

Ameroseiids have stout rutella-like corniculi and coarsely toothed chelicerae adapted for feeding on fungi and ingesting spores and hyphal fragments, others have less robust mouthparts more suitable for feeding on pollen and nectar (Evans, 1963; Halliday, 1997; Krantz and Walter, 2009; Mašán, 2017). No observations have confirmed a predatory feeding behaviour for any ameroseiid species (Halliday, 1997; Mašán, 2017).

The life cycle is typical to mites of the Mesostigmata therefore comprises of egg, hexapod larva, octopod nymphal instars (protonymph, deutonymph) and adult (female, male) stage. There are a few species like *Amerosieus dendrovagans* (Flechtmann, 1985), *Kleemania plumea* (Ehrnsberger and Błaszak, 1999) or *Neocypholaelaps cocos* (Evans, 1963), of which an entire life-cycle is known or all developmental stages are drawn. Apparently, for the majority of species, only a female instar is described. Nevertheless, ameroseiids exhibit a phytoseiid type of insemination, which is podospermic (Athias-Henriot, 1975). Some females can also reproduce asexually via parthenogenesis (Evans, 1992).

Ecology

Ameroseiid mites are common dwellers of aboveground substrates, including moss, rotting straw, compost, manure, forest humus, decaying wood, and bracket fungi (Westerboer and Bernhard, 1963; Bregetova, 1977; Karg, 1971a, 1993; Halliday, 1997; Mašán, 2017). Many species are found in a very specific microhabitat like stored foods and nests of birds or mammals. Moreover, they can be found phoretic on mammals or insects. Likewise, they are found in associations with social insects like ants and bees. Some species show close affinity to fungi. Mašán (2017) distinguished five ecological groups of ameroseiid mites depending on microhabitat requirements (edaphic, saproxilic, saprophilous, aerial and insecticolous). Habitat preference of all species, according to the data found in publications concerning Poland, is presented within this guide.

KEYS AND DESCRIPTIONS

1 Holodorsal shield with 28 or fewer pairs of seta, usually barbed and some extremely elongate and placed on tubercles ..... ***Epicriopsis***

Holodorsal shield with 28 or 29 pairs of setae **2**

2 Leg I without ambulacrum; 4 very long regular seta present at the top of tarsus I ..... ***Ameroseiella***

Legs I–IV with a fully structured ambulacrum comprising pulvillum and claws **3**

3 Genu III with 1 *pl* seta, tectum triangular without spitz ..... ***Ameroseius***

Genu III with 2 *pl* setae tectum with more or less protruded spitz ***Kleemannia***

Genus *Ameroseiella* Bregetova, 1977

Ameroseiella Bregetova, 1977. Type species: *Ameroseius apodius* Karg, 1971 (= *Ameroseius macrochelae* Westerboer, 1963)

Dorsal shield strongly sclerotised, deep fossae covering anterior, central and lateral parts; with 29 pairs of setae, vertical j1 setae different in form from the remaining dorsal setae, usually wider and flattened; noticeable pair of pores between Z3 and Z4 setae; sternal shield with 2 pairs of setae, st3 and st4 in soft integument, st5 on epigynal shield; opisthogastric region with six pairs of setae JV1–JV4 and ZV2 rather short and simple but JV5 few times longer and barbed, all on soft integument; anal shield with only three circum-anal setae; corniculi usually bifurcate; setae h1 quite stout, h2, h3 and pcx slender; digitus fixus with 3 sharp large teeth and one distally flattened, digitus mobilis without a tooth; epistome triangular converging into a long central spitz; palptarsal apotele two-tined; genu III and tibiae III–IV with two anterolateral and two posterolateral setae; tarsi of **Legs** I with empodium only no claws developed but 4 elongated sensory setae; tarsi II–IV with a standard ambulacrum.

Ameroseiella macrochelae (Westerboer, 1963)

Synonyms: *Ameroseius apodius* Karg, 1971a, 1993; *Ameroseius macrochelae* Karg, 1971a; Bregetova, 1977; Karg, 1993; *Ameroseiella apodius* Bregetova, 1977; Błaszak and Madej, 1997; *Ameroseius apodus* Evans and Till, 1979; *Ameroseiella apoda* Evans and Till, 1979.
Holotype: not designated
Paratypes: not designated
Syntypes: ZMB: 42520 Kleinmachnow (labelled *Ameroseius macrochelae*)
Locus typicus: France, Nimes (compost from plant debris)
Occurrence in Poland: nests of the white-tailed sea eagle *Haliaeetus albicilla* (Gwiazdowicz et al., 2006); nests of the black stork *Ciconia nigra*, **Wielkopolska region*** (Błoszyk et al., 2009).

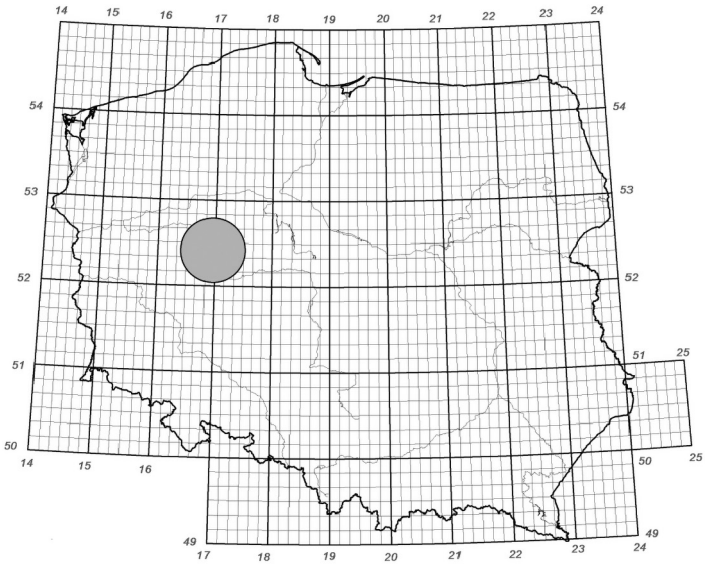

Fig. 4. Ocurence of *Ameroseiella macrochelae* in Poland – Wielkopolska region

Female description

Idiosoma: 475–490 long x 280–300 wide

Dorsum (Fig. 5): dorsal shield entire, oval-shaped, covered with small and medium-sized deep fossae located on anterodorsal and anterolateral part; posterodorsal part covered with a fine net pattern and two pairs of characteristic round

* In this book **bold locations** are presented on maps with grid lines.

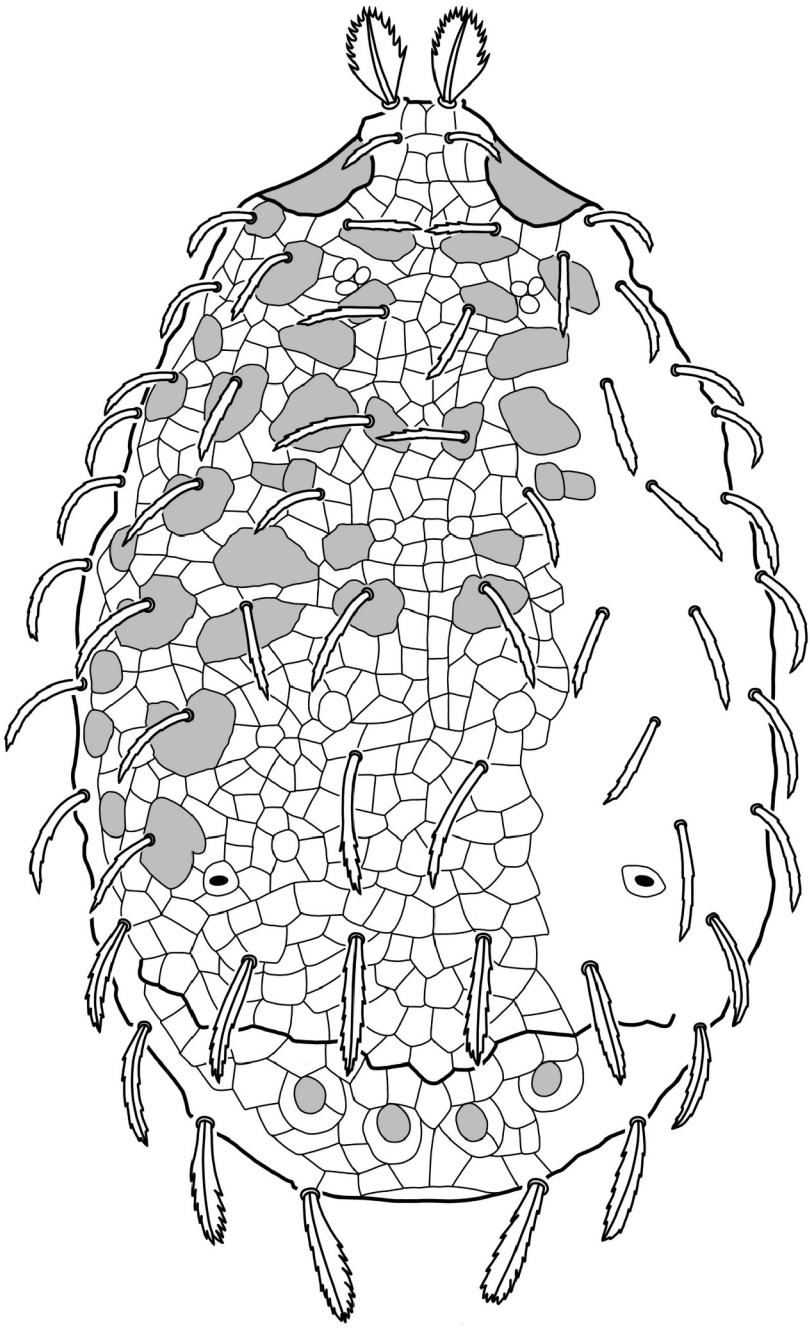

Fig. 5. *Ameroseiella macrochelae* female dorsal side

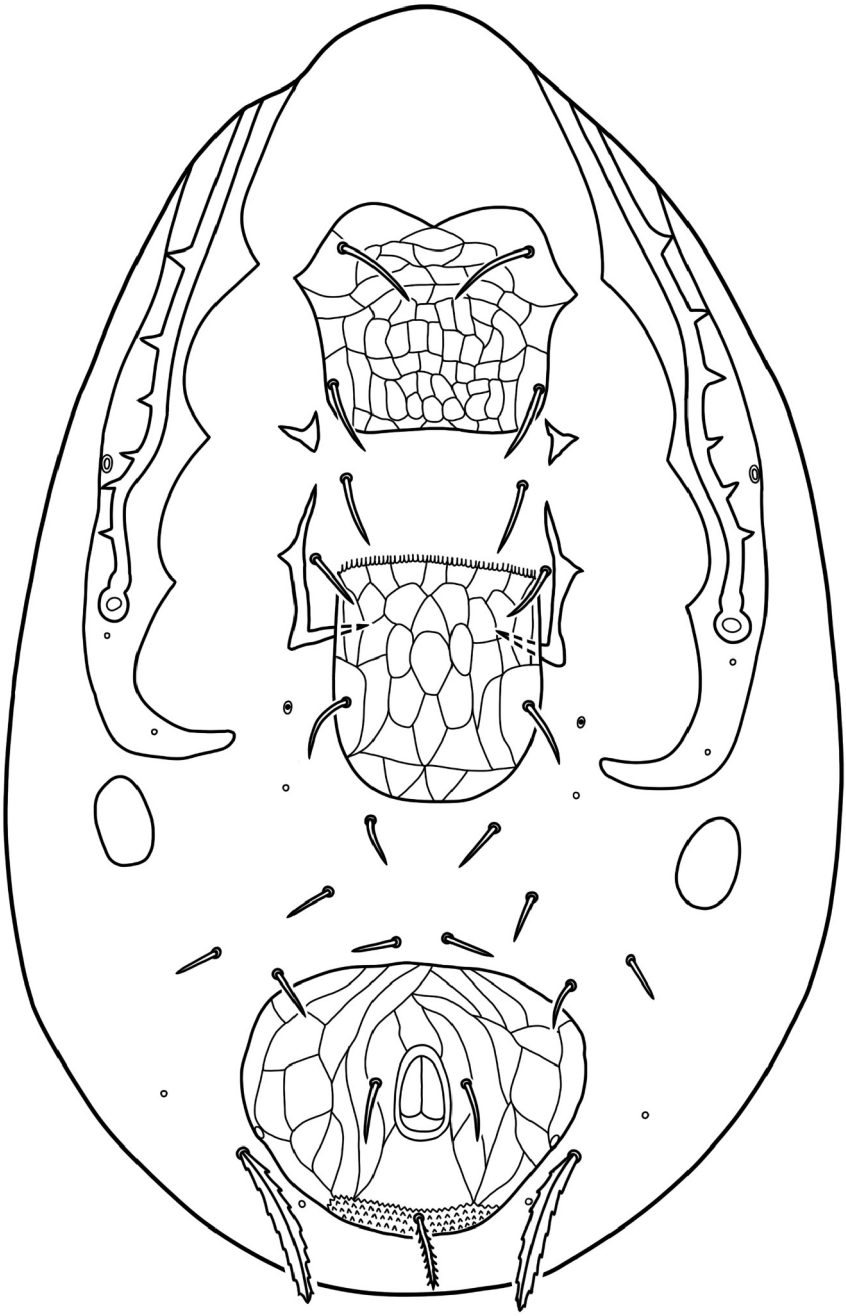

Fig. 6. *Ameroseiella macrochelae* female ventral side

shallow fossae; noticeable pair of pores halfway between Z3 and Z4 setae; full set of 29 moderately robust and barbed setae (except j1) though Z5 and S5 leaning towards brush like; the longest setae are J2, J4, Z5, S5 (above 50); vertical j1 leaflet shape with serration 38–41; setae length in j row increasing from j2 30–32 to j6 47–49; J2 and J4 55–60; z3, z5, z6 33–36; setae length in Z row increasing from Z2 46–47 to Z5 55–56; setae length in s row increasing from s2 34–36 to s6 42–43; S row setae long 45–48; setae length in r row increasing from r3 30–32 to r6 38–39.

Venter (Fig. 6): all shields finely reticulate; sternal shield 80–85 long x 105–110 wide with two pairs of simple setae st1–st2 27–30; st3 and st4 23–25 in a soft integument; st5 22–24 located on epigynal shield 85–90 long 75–80 wide and ovoid posterior margin; metapodal plates suboval 20–21 x 30–32; small triangular and long 'L' shaped endopodal sclerits present; anal shield heart shaped 95–100 long x 116–122 wide with anal opening 17 x 30 and simple paraanal setae 20 and furcate setae postanal 23–24 setae only, cribrum present; opisthogastric setae JV1 17–18, JV2–3 13–15 and ZV 2–3 12–15 needle like located in a soft integument, ZV5 57-60 long and strongly serrated.

Gnathosoma: tritosternum base 18–20 with laciniae 60–65; corniculi bifurcate 28–30; hypostomatal setae simple, h1 quite stout 30–31, h2 24–26, h3 23–25, pcx the longest 28–30; tectum triangular with a distinct central prong; movable digit 32–34 with 2 very small teeth proximally, fixed digit with 3 sharp teeth and subterminal flat tooth; palps 100–110 with palpapotele 2 – tinned.

Legs: lengths as given: leg I 375–400, leg II 285–310, leg III 280–305, leg IV 390–420 long; leg I without pretarsus, pretarsi II 25–27, pretarsi III 23–25, pretarsi IV 28–30 long; the number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–10–9; leg IV – 1–5–6–9–10.

Genus *Ameroseius* Berlese, 1904

Ameroseius Berlese, 1904. Type species: *Seius echinatus* Koch, 1839 (= *Acarus corbicula* Sowerby, 1806); Synonymy by Vitzthum (1942)
Cornubia Turk, 1943. Type species: *Cornubia ornata* Turk, 1943 (= *Acarus corbicula* Sowerby, 1806); Synonymy by Turk (1953)
Ameroseius Evans, 1963

Dorsal shield strongly sclerotised and covered in deep or sometimes shallow fossae of different sizes; generally 29 pairs of setae pilose or serrate from very

short to explicitely long; noticeable pair of pores between Z3 and Z4 setae; sternal shield with 2 pairs of setae, st3 either on metasternal platelets or likewise st4 in soft integument, st5 on epigynal shield; metapodal platelets present; opisthogastric region with five or six pairs of setae JV1–JV3, ZV2 and JV4 present or absent rather short and simple but JV5 possibly few times longer and barbed, all usually on soft integument, though JV3 can be inserted on anterior part of ventrianal shield; (ventri) anal shield with three circum-anal setae plus minus JV3; corniculi bifurcate; setae h1 rather stout, h2, h3 and pcx slender; digitus fixus with 3 sharp and large teeth, digitus mobilis without a tooth; epistome triangular with either smooth or denticulated margin and sometimes additional rows of denticles; palptarsal apotele two or three-tined; genu III and tibiae III–IV with two anterolateral and one posterolateral setae; tarsi I–IV with a standard ambulacrum comprising empodium and claws.

Key to species of *Ameroseius* occurring in Poland (females)

1 Setae JV3 on ventri-anal shield; additional metasternal platelets between reagular ones ..... ***Ameroseius furcatus* Karg, 1971**

anal shield with only three circum-anal setae; a pair of rounded standard metasternal platelets only **2**

2 Dorsal j-J row setae relatively short – none reaching a base of a subsequent setae **3**

Dorsal j-J row setae relatively long – some reaching a base of a subsequent setae **7**

3 Five pairs of opisthogastric setae (JV4 absent); vertical setae j1 different from other dorsal setae, (spiked club-like); vertex with a pair of horn-shaped structure ..... ***Ameroseius corniculus* Karg, 1971**

Six pairs of opisthogastric setae (JV4 present); vertical setae j1 similar in form to other dorsal setae (though pubescent and dense serrate); vertex without a pair of horn-shaped structures..... **4**

4 Setae j1, r3, Z4 and Z5 progressively broadening towards the tip (oblanceolate); only small fossae outer setae J2 ***Ameroseius ulmi* Hirschmann, 1963**

Setae j1, r3, Z4 and Z5 progressively narrowing towards the tip; big fossae outer setae J2 (starting from j6)..... **5**

5 All dorsal setae quite pubescent; clunal setae r3 outstanding; area between setae J2 and J4 with a polygonal reticulation ***Ameroseius lidiae* Bregetova, 1977**

All dorsal setae slender; clunal setae r3 indistinct; area between setae J2 and J4 with a special pattern **6**

6 Dorsal setae very delicately serrate; hexagonal z5 similar in lenght with j5; surface around J2 of a specific quadrancular form; anal shield subpentagonal ..... ***Ameroseius sculptilis*** **Berlese, 1916**

Dorsal setae strongly serrate; hexagonal z5 half of lenght of j5; surface between J2 and J4 rugose; anal shield suboval ***Ameroseius fungicola*** **Mašán, 1998**

7 Five pairs of opisthogastric setae present (JV4 absent); vertical setae j1 pubescent and strongly serrate, different from all other dorsal setae; all dorsal setae notably robust and slightly barbed, j-J row setae reaching the bases of subsequent setae only by little .... ***Ameroseius corbiculus*** **Sowerby, 1806**

Six pairs of opisthogastric setae present (JV4 present); vertical setae j1 not that different in form from other dorsal setae; dorsal setae normal in thickness, j-J row setae reaching the bases of subsequent setae by far..... **8**

8 Dorsal setae less obviously differing in lengths (shortes to longest ratio 5 times fold), j-J row setae reaching the bases of subsequent setae by one third; metapodal plates small and oval ***Ameroseius longitrichus*** **Hirschmann, 1963**

Dorsal setae very differing in lengths (shortest to longest ratio 10 times fold), j-J row setae reaching the bases of subsequent setae by half; metapodal plates large and elongated ..... ***Ameroseius georgei*** **Turk, 1943**

Ameroseius corbiculus Sowerby, 1806

Synonyms: *Acarus corbicula* Sowerby, 1806; *Seius echinatus* Koch, 1839, Canestrini and Fanzago, 1876; Kramer, 1882; Berlese, 1892; *Gamasus echinatus* Kramer, 1881; *Laelaps echinatus* Berlese, 1882; *Seuis* (sic) *hirsutus* Berlese, 1887b; *Seius hirsutus* Berlese, 1892; *Seiulus hirsutus* Halbert, 1915; *Ameroseius hirsutus* Berlese, 1916a; Castagnoli and Pegazzano, 1985; *Ameroseius corbicula* Oudemans, 1929; Turk 1943; Westerboer and Bernhard, 1963; Bregetova, 1977; Lapiņa, 1988; *Cornubia ornata* Turk, 1943; *Ameroseius ornata* Turk, 1953; *Ameroseius echinatus* Schweizer, 1961, Evans and Till, 1979; *Ameroseius crassisetosus* Ye and Ma, 1993; *Ameroseius qinghaiensis* Li and Yang, 2000; *Ameroseius norvegicus* Narita et al., 2015.

Holotype: not designated

Paratypes: not designated

Locus typicus: British Isles (moss *Hypnum molluscum*)

Occurence in Poland: soil with plant cover of halophytes, predominantly sea milkwort *Glaux maritima*, glasswort *Salicornia herbacea*, **Ciechocinek** (Willmann, 1949); soil of salt-marshes, **Ciechocinek** (Dziuba, 1972a, b); phoretic on common vole *Microtus arvalis*, **Błotnica** (Haitlinger, 1981); soil with plant

cover of burclover *Medicago sp*., Experimantal Department of Plant Protection in **Winnogóra** (Trojanowski and Błaszak, 1981); soil in urban parks, **Warsaw** (Niedbała et al., 1982); phoretic on bank vole *Clethrionomys glareolus* (Haitlinger, 1983); in nests of red wood ant *Formica rufa* (Kiełczewski and Wiśniewski, 1983; Gwiazdowicz, 2008a); in bark beetle galleries of fir engraver beetle *Pityokteines curvidens*, Świętokrzyski **National Park** (Michalski et al., 1985; Michalski and Ratajczak, 1989; Gwiazdowicz and Skorupski, 1996; Gwiazdowicz, 2008b); soil, **Turew** (Seniczak et al., 1987); soil at coal mine dumps, **Czeladź** (Madej, 1990a; Madej and Tomczok, 1990); soil at railway embankment, **Będzin**, **Siemianowice**, **Zabrze**, **Katowice** (Madej and Kudła, 1990); soil in urban parks, **Warsaw** (Niedbała et al., 1990); soil with plant cover of halophytes, predominantly glasswort *Salicornia herbacea*, **Janikowo** (Seniczak et al., 1993); soil of afforested excavations, **Sosnowiec** (Madej and Grec, 1994); soil with plant cover of burclover *Medicago sp*. (Kaczmarek and Szeflińska, 1996); soil with plant cover of meadow fuscue and orchard grass, **Mochełek**, **Kruszyn Krajeński** (Seniczak et al., 1991c); soil in scots pine *Pinus sylvestris* orchard (Kaczmarek and Seniczak, 1999a); soil at slope settlers of waste products, **Janikowo** (Klimek et al., 1991); soil of ecotones between forest and barley *Hordeum vulgare* crops, **Turew** (Seniczak et al. 1996a); soil of ecotones between forest and rapeseed *Brassica napus* crops, **Turew** (Seniczak et al., 1996b); soil of ecotones between

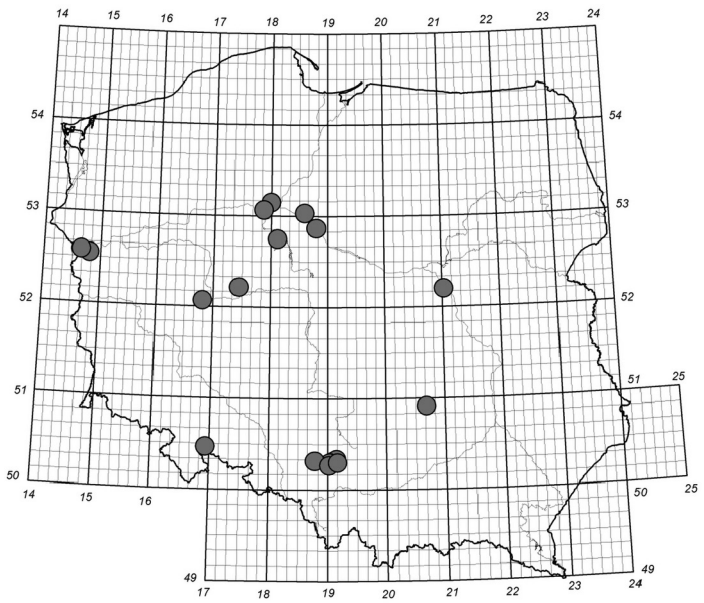

Fig. 7. Ocurence of *Ameroseius corbiculus* in Poland

mid-field shelters and meadow, **Turew** (Seniczak et al. 1996c); soil of ecotones between mid-field shelters and lucerne *Medicago sativa* crops, **Turew** (Seniczak et al., 1997a); soil with plant cover at meadows, **Toruń** (Seniczak et al., 1999a); turf, grass, xerothermic green, **Słońsk Nature Reserve** (Madej, 2000); litter, **Ujście Warty National Park** (Gwiazdowicz and Kmita, 2004); in white-tailed sea eagle *Halietus albicilla* nests (Gwiazdowicz et al., 2005); in white-tailed sea eagle *Halietus albicilla* nests (Gwiazdowicz et al., 2006).

Female description

Idiosoma: 510–540 long x 320–360 wide

Dorsum (Fig. 8): dorsal shield entire, oval shaped, covered with a small to large sized deep fossae located almost on the entire area with a barely marked net pattern between; noticeable pair of pores between Z3 and Z4 setae, closer to the latter; full set of 29 robust, especially the base, and barbed setae (except j1); the longest setae are j6, J2, J4, Z5, S3, S4, S5 (above 100); vertical j1 thickened with multiple serrations 40-42; setae in j-J row of variable lengths: j2 32–34, j3 52–55, j4 60–63, j5 94–96, j6 103–106, J2 105–107, 115–120; z–Z row setae variable lengths: z3 53–55, z5 40–42, z6 *ca*. 50, Z2, Z3 55–60, Z4 *ca*. 45, Z5 120–125; setae s3 the shortest in s row 45–46 compared to s4, s5, s6, S1, S2 of 75–80 S3, S4, S5 of 105–115; r row setae variable in lengths: r2 46–50, the longest and more robust r3 77–80, r4, r5 45–47, r6 66–68.

Venter (Fig. 9): three main shields with fine reticulate ornamentation; sternal shield 80–90 long x 120–130 wide with two pairs of simple setae st1–st2 26–30; st3 27–29 on a platelet; st4 17–19 in a membrane; st5 18–20 located on epigynal shield 115–120 long 70–75 wide; metapodal plates around 18–20x 32–35; small triangular and long 'L' shaped endopodal sclerits present; anal sield wider (170–175) than long (120–125) with anal opening 15 x 33, simple paraanal setae 20–24 and slightly shorter postanal 18–20 setae; five pairs of opisthogastric setae JV1 19–20, JV2–3 15–17 and ZV 2 15 simple, located in a soft integument, ZV5 23–25 long also simple thought more robust than the other ventral setae.

Gnathosoma: tritosternum base 15–16 with laciniae 60–65; corniculi bifurcate 28–30; hypostomatal setae simple of similar lengths 20–23; tectum triangular with rows of denticles; movable digit 24–25 with two proximal small teeth, fixed digit with 3 sharp teeth; palps 85–95 with a 2-tinned palpapotele.

Legs: lengths as given: leg I 450-470, leg II 345-365, leg III 365-370, leg IV 450-470 long; pretarsi: leg I 20 II 27–28, pretarsi III 27–28, pretarsi IV 37–40 long; number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–9–8; leg IV – 1–5–6–9–9.

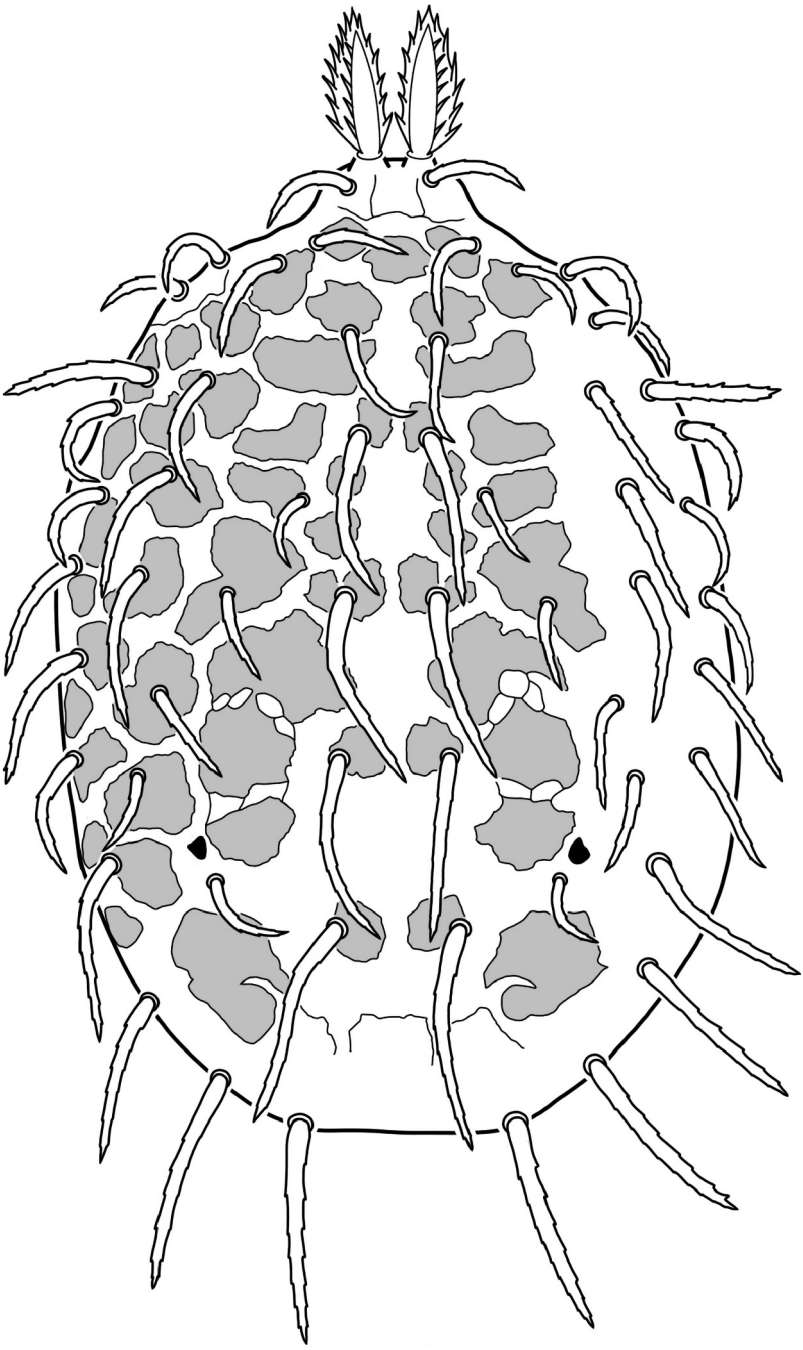

Fig. 8. *Ameroseius corbiculus* female dorsal side

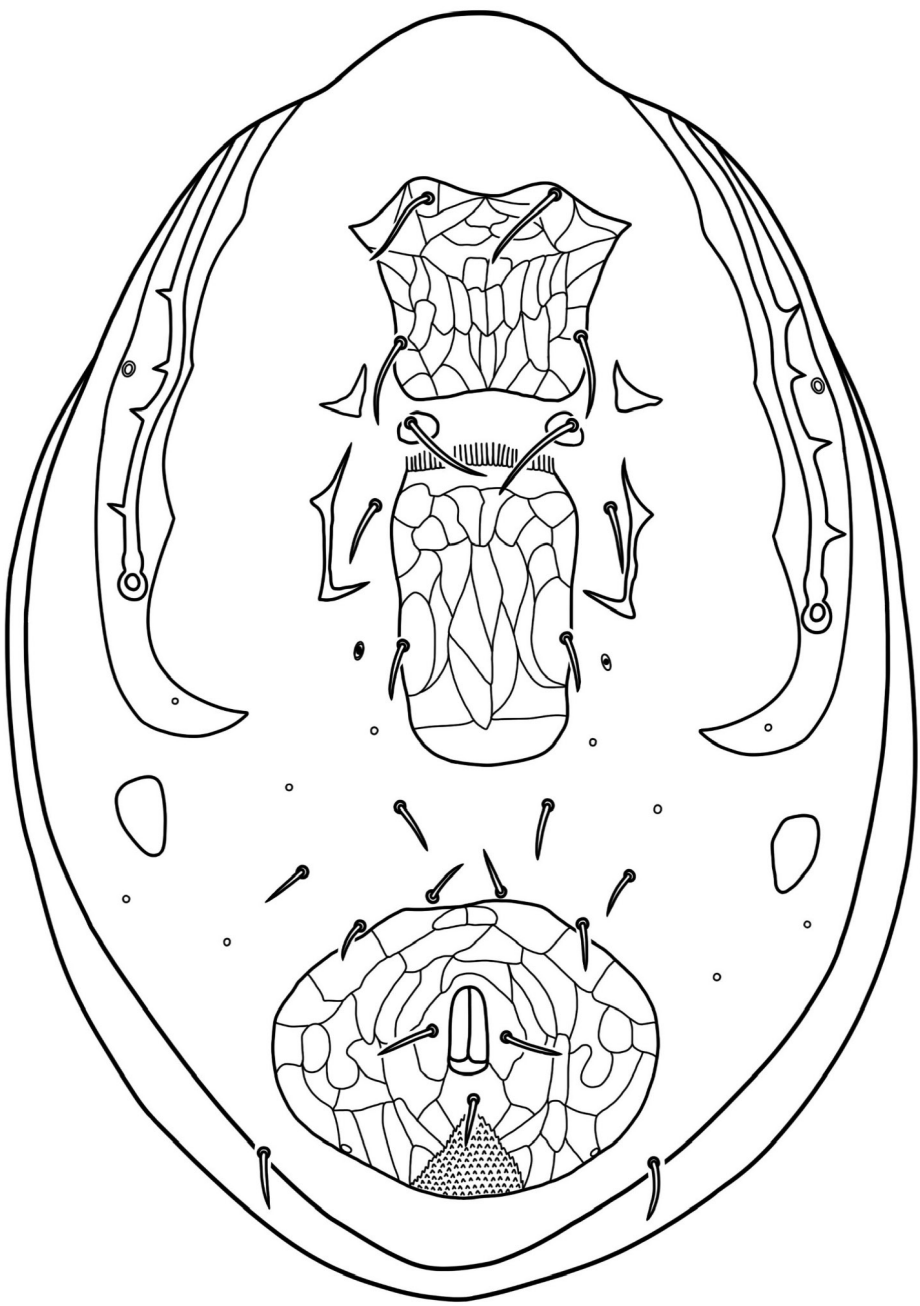

Fig. 9. *Ameroseius corbiculus* female ventral side

Ameroseius corniculus Karg, 1971

Holotype: ZMB: 40091 Mahndorf b. Halberstadt, Wiese a. d. Holt., Museum für Naturkunde, Berlin, Germany.

Locus typicus: Germany, Magdeburg Area, Holtemme at Halberstadt (in humus of meadow soils at the bank of the river)

Occurrence in Poland (Fig. 10): inside tree-hollow of hornbeam, **Białowieża National Park** (Gwiazdowicz, 1999a); bark with underbark sawdust, **Białowieża National Park** (Gwiazdowicz, 1999b, 2000; Gwiazdowicz et al., 2001); wood of rotten „Jagiełło" oak, **Białowieża National Park** (Gwiazdowicz and Skorupski, 1999); soil, rotting tree trunks and stumps, **Wielkopolski National Park** (Skorupski, 2001); rotten wood in mixed pine-oak stands, **Wielkopolska region** (Gwiazdowicz et al., 2011).

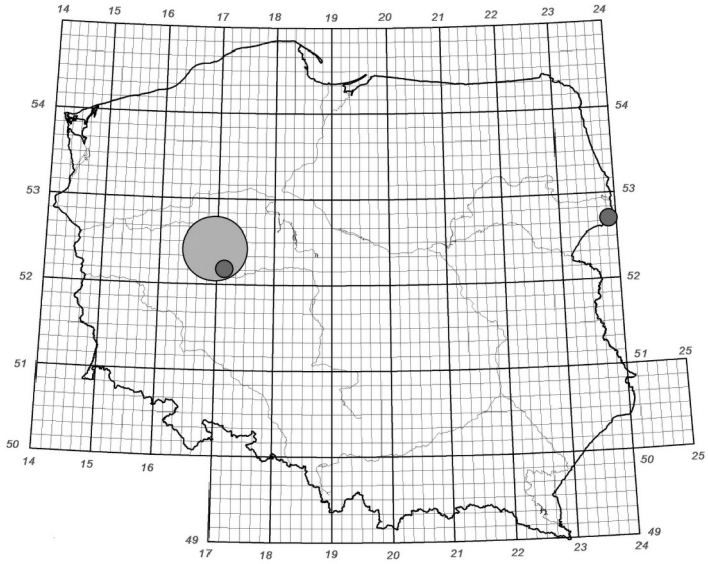

Fig. 10. Ocurence of *Ameroseius corniculus* in Poland

Female description

Idiosoma: 400–425 µm long x 240–265 µm wide

Dorsum (Fig. 11): dorsal shield entire, oval shaped, covered with a small to large sized deep fossae located on anterodorsal and anterolateral part; posterodorsal part covered with a fine reticulation; vertex with a horn like structures; noticeable pair of pores between Z3 and Z4 setae, very close to the latter;

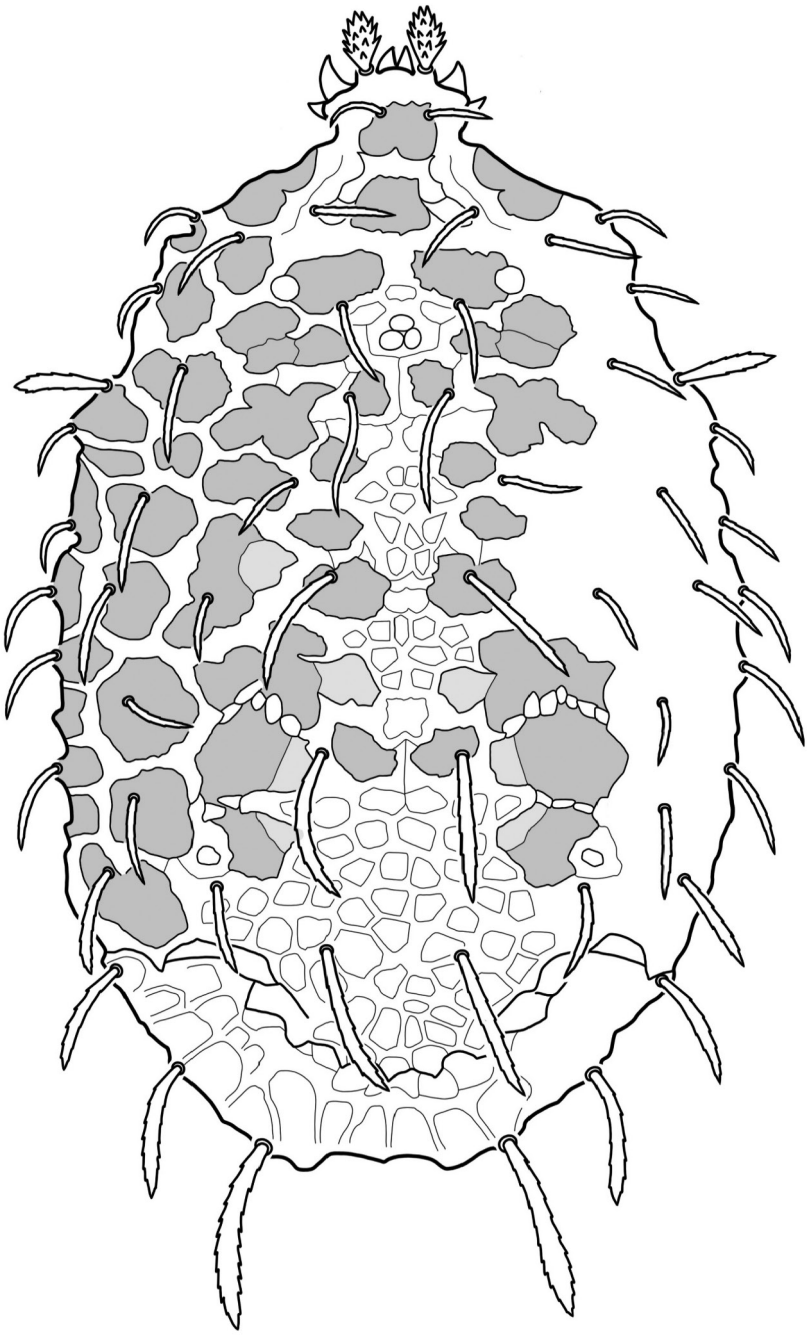

Fig. 11. *Ameroseius corniculus* female dorsal side

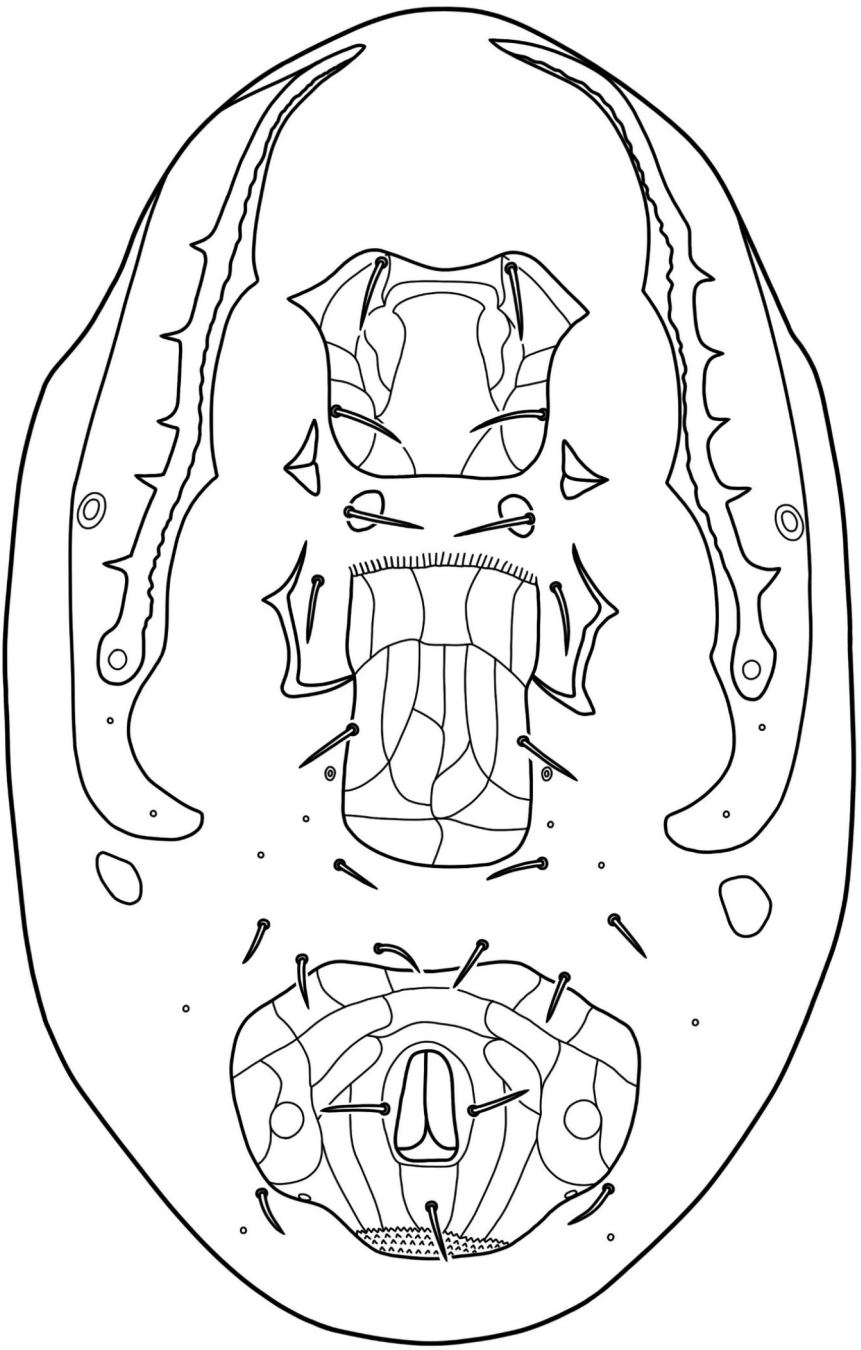

Fig. 12. *Ameroseius corniculus* female ventral side

29 barbed pairs of setae (except j1) in total; the longest setae are j6, J2, J4, Z5, S4, S5 (above 50 µm); vertical j1 setae clubbed 22–25 µm; setae length in j–J row increasing from j2 23–25, j3 30–32, j4 32–34, j5 42–45, j6 51–54, J2 and J4 55–58; z–Z row setae of not distant lengths except Z5: z3 30–32, z5 29–30, z6 26–30 µm, Z2 27–28, Z3 27–30, Z5 65–70; setae s3 18–20 visibly shorter than s4–s6 33–36 in s–S row and even longer S1–S3 35–40, S4 48–50, S5 66–70; r row setae variable in lengths: r2 24–26, the longest and more robust r3 32–36, r4– r5 23–24, r6 29–30.

Venter (Fig.12): all shields with delicate ornamentation; sternal shield 65 µm long x 90 µm wide with two pairs of simple setae st1–st2 25–26 µm; st3 22–24 µm on a platelet; st4 19–20 µm on a membrane; st5 19–21 µm located on epigynal shield 100 µm long 60 µm wide; metapodal plates around 10 x 20 µm; small divided triangular and long 'L' shaped endopodal sclerits present; anal sield wider (125) than long (90) with quite large anal opening 20 x 36 µm, simple paraanal setae 18–19 µm and postanal 17 µm setae; five pairs of opisthogastric setae JV1 17–18 µm, JV2–3 15–17 µm and ZV 2 15–16 µm simple, located in a soft integument, ZV5 17–18 µm short similar to the other ventral setae.

Gnathosoma: tritosternum base 18 µm with laciniae 50 µm; corniculi bifurcate 18–19 µm; hypostomatal setae simple of similar lengths h1–h3 and pcx 14–16; tectum; movable digit 20–22 µm with no visible teeth, fixed digit with 3 sharp teeth; palps palpapotele.

Legs: lengths as given: leg I 330–360 µm, leg II 265–280 µm, leg III 250–275 µm, leg IV 325–360 µm long; pretarsi: leg I 15 leg II 25 µm, leg III 27 µm, leg IV 30 µm long; number of setae per segment (coxa–trochanter–femur–genu–tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–9–8; leg IV – 1–5–6–9–9.

Ameroseius fungicola Mašán, 1998

Synonyms: *Ameroseius fungicolis* Mašán, 1998; *Ameroseius fungicolis* Kazemi and Rajaei, 2013; *Ameroseius* (*Ameroseius*) *fungicolis* Hajizadeh et al., 2013.

Holotype: Institute of Zoology, Slovak Academy of Sciences, Bratislava, Slovakia.

Locus typicus: Slovakia, Podunajská Nížina Lowland, Brunovce (in floodplain forest, on fruiting body of willow bracket fungus, *Phellinus igniarius*)

Occurrence in Poland: fruiting bodies of *Bjerkandena adusta, Fomes fomentarius*, *Phellinus igniarius*, *Trametes hirsuta*, **Zielonka Experimental Forest** (Gwiazdowicz and Łakomy, 2002).

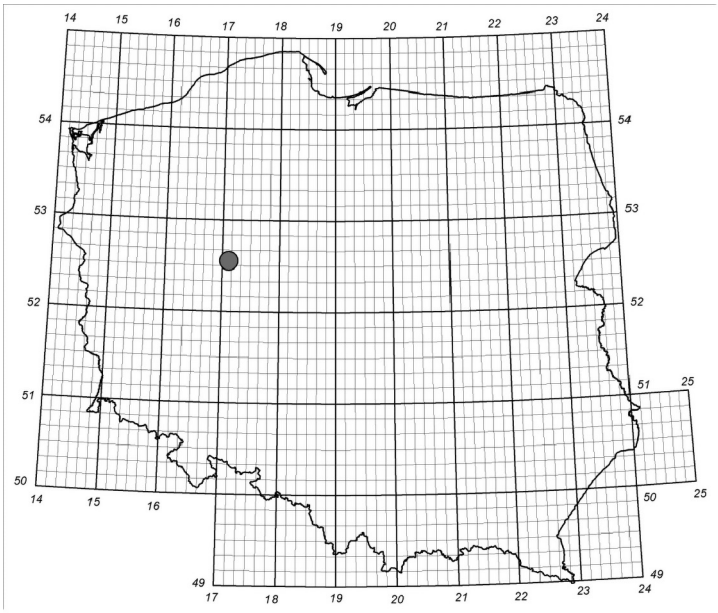

Fig. 13. Ocurence of *Ameroseius fungicola* in Poland

Female description

Idiosoma: 415–450 long x 240–265 wide

Dorsum (Fig. 14): dorsal shield entire, oval in shape, covered with a small to large sized rough fossae and atypical inward ornamentation (hardly reflected in a figure); noticeable pair of pores between Z3 and Z4 and S4; 29 barbed pairs of setae in total; the longest setae are Z5, S5 (above 50); vertical j1 setae more robust 21–23; setae length in j–J row increasing except J4 from j2 and j3 29–30, j4 and j5 32-35, j6 38–41, J2 41–42, J4 37–38; z–Z row setae are the shortest except z3 and Z5: z3 36–38, z5 14–16, z6 24–25, Z4 19–20, Z5 54–56; setae in s–S row as given: s3 29–30 s4 36–37, s5 35–37, s6 39–40, S1, S2 38-40, S3 44–45, S4 36–37, S5 54–56; r row setae range from 32–34 (r2, r4, r5) to 35–36 (r3, r6).

Venter (Fig. 15): all shields with a fine reticulation; sternal shield 55 long x 95 wide with two pairs of simple setae st1–st2 24–26; st3 22–24 on a metasternal platelets; st4 22–23 on a membrane; st5 25–27 located on epigynal shield 100 long 75 wide; metapodal plates narrow 5 x 20; small divided triangular and long 'L' shaped endopodal sclerits present; anal sield wider (140) than long (90) with anal opening 15 x 30, simple paraanal setae 20–21 and slightly shorter postanal 15 setae; six pairs of opisthogastric setae JV1–JV3 15–16, ZV2–3 11–12 simple, located in a soft integument, ZV5 16–18 pilose.

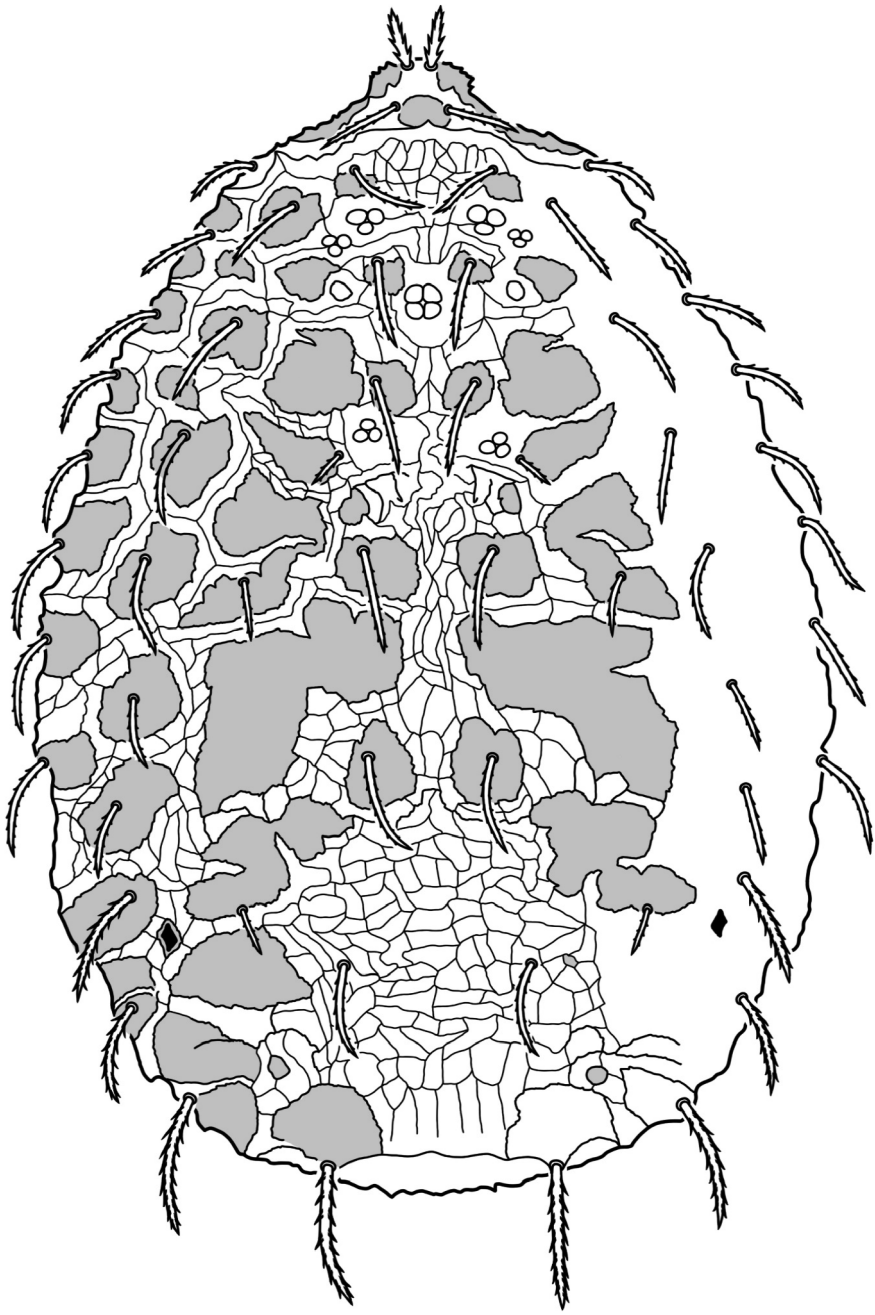

Fig. 14. *Ameroseius fungicola* female dorsal side

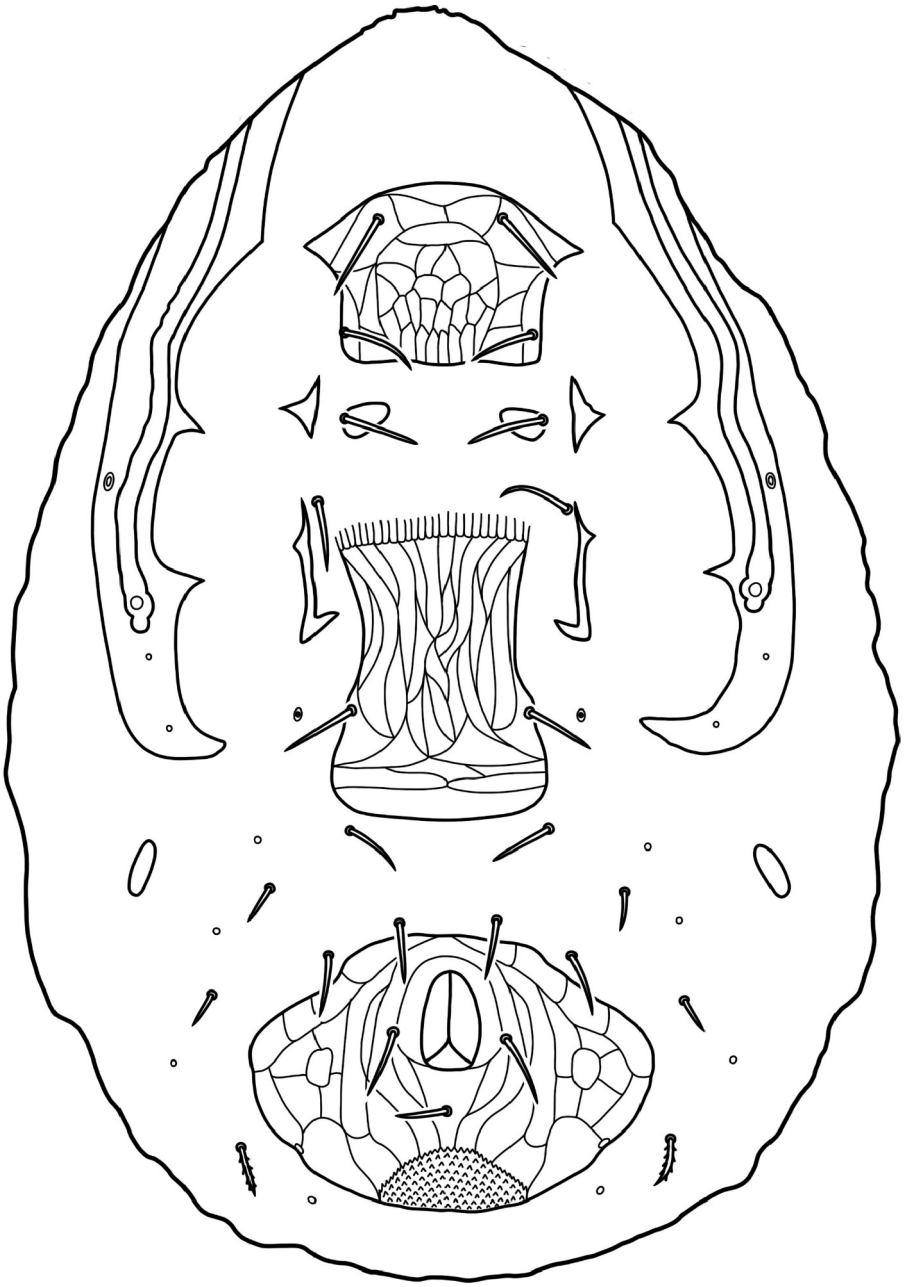

Fig. 15. *Ameroseius fungicola* female ventral side

Gnathosoma: tritosternum base 20 with laciniae 40–45; corniculi not divided 13–14; hypostomatal setae simple of similar lengths h1–h3 19–23 and pcx 25–26; tectum triangular with inconspicuous teeth; movable digit 12–14 with two teeth, fixed digit also with two teeth; palps palpapotele two–tinned 9–11.

Legs: lengths as given: leg I – 305–315, leg II – 240–250, leg III – 240–250, leg IV – 310–315 long; pretarsi: leg I – 25, leg II – 27, leg III – 28, leg IV – 32 long; number of setae per segment (coxa–trochanter–femur–genu–tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–9–8; leg IV – 1–5–6–9–9.

Ameroseius furcatus Karg, 1971

Synonyms: *Ameroseius pseudofurcatus* Livshits and Mitrofanov, 1975.
Holotype: ZMB: 40199, Museum für Naturkunde, Berlin, Germany;
Paratypes: ZMB: 40200, Museum für Naturkunde, Berlin, Germany;
Locus typicus: Kalktuffniedermoor, SW from Oechsen/Rhön (grass and roots on a western slope)
Occurrence in Poland: litter, rotting wood, **Pieniny National Park** (Skorupski and Gwiazdowicz, 1996, 1997, 1998; Błaszak et al., 2000); litter, **Białowieski National Park** (Gwiazdowicz, 2000; Gwiazdowicz et al., 2001); soil, Wielkopolski National Park (Skorupski, 2001); litter, rotting wood, **Bielinek Odra Reserve** (Skorupski and Łabędzki, 2004).

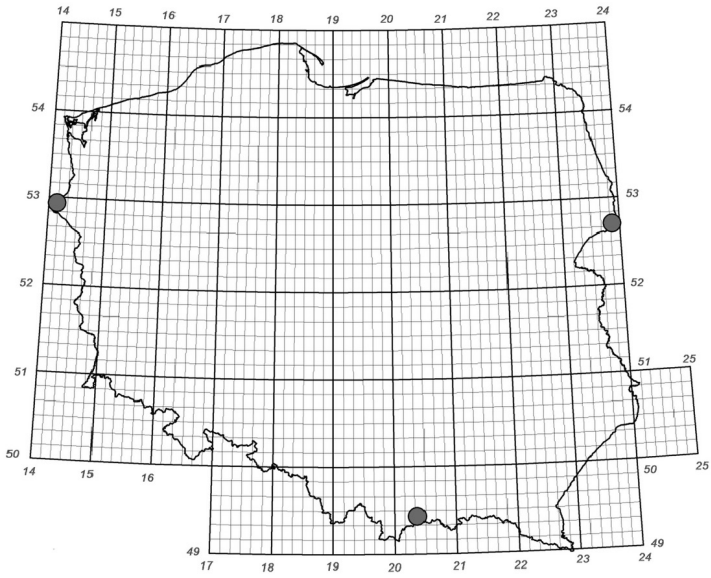

Fig. 16. Ocurence of *Ameroseius furcatus* in Poland

Female description

Idiosoma: 325–375 long x 225–260 wide

Dorsum (Fig. 17): dorsal shield entire, oval shaped, covered with a small to medium sized deep fossae spread out on the major part of **Dorsum** with a fine reticulation here and between; noticeable pair of pores between Z3 and Z4 setae, very close to the latter; 29 lightly serrated pairs of setae in total; the longest setae are J4, Z5, S3 (100 or above); vertical j1 setae more robust 23–26; setae length in j–J row increasing from j2 21–24, j3 28–32, j4 29–33, j5 44–48, j6 53–56, J2 60–65, J4 90–100; z-Z row setae as given: z3 38–40, z5 29–31, z6 30–33, Z2 40–43, Z3 53–56, Z4 42–45, Z5 107–112; s-S row setae very variable in length s2 22–24, s3 19–23, s4 43–47, s5 52–56, s6 56–60, S1 23–26 S2 50–53, S3 95–100, S4 30–32, S5 107–112; r row setae on the shorter side: r3, r4 30–34, r5 18–22, r6 27–30.

Venter (Fig. 18): ventral shields covered with delicate ornamentation; sternal shield 58–63 long x 70–78 wide with two pairs of simple setae st1–st2 22–25; st3 18–20 on a platelets; two additional metasternal platelets; st4 19–20 on a membrane; st5 16–18 located on epigynal shield 100–110 long 60–65 wide; metapodal plates round 10–15 x 20–25; nor small divided triangular neither long 'L' shaped endopodal sclerites not noticed; anal shield wider (115–125) than long (85–90) with anal opening 18 x 25, simple paraanal setae 16–17 and postanal 17–18 setae; six pairs of opisthogastric simple setae located in a soft integument: JV1, JV2, JV3, ZV2, ZV4 16–17, ZV5 exceptionally longer *ca*. 55.

Gnathosoma: tritosternum base 18–20 with laciniae 50–53; corniculi bifurcate 13-15; hypostomatal setae simple of similar lengths h1–h3 and pcx 12–14; tectum triangular with row of denticles and dentate margin; movable digit 14–16 with no visible teeth, fixed digit with 3 sharp teeth; palps 68–70 with palpapotele 12–13 two-tinned.

Legs: lengths as given: leg I 310–330, leg II 220–230, leg III 215–225, leg IV 265–275 long; pretarsi: leg I 13 leg II 25, leg III 25, leg IV 32 long; the number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–9–8; leg IV – 1–5–6–9–9.

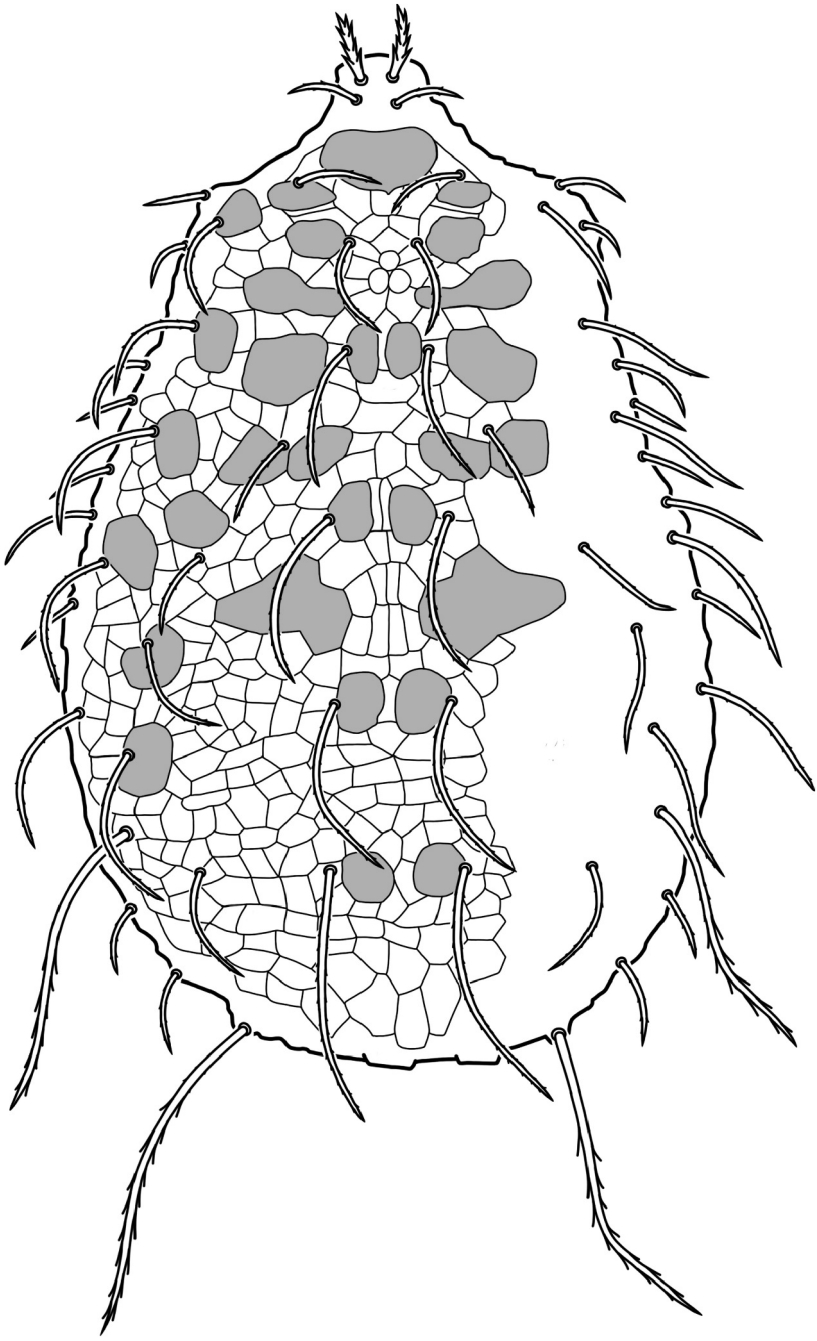

Fig. 17. *Ameroseius furcatus* female dorsal side

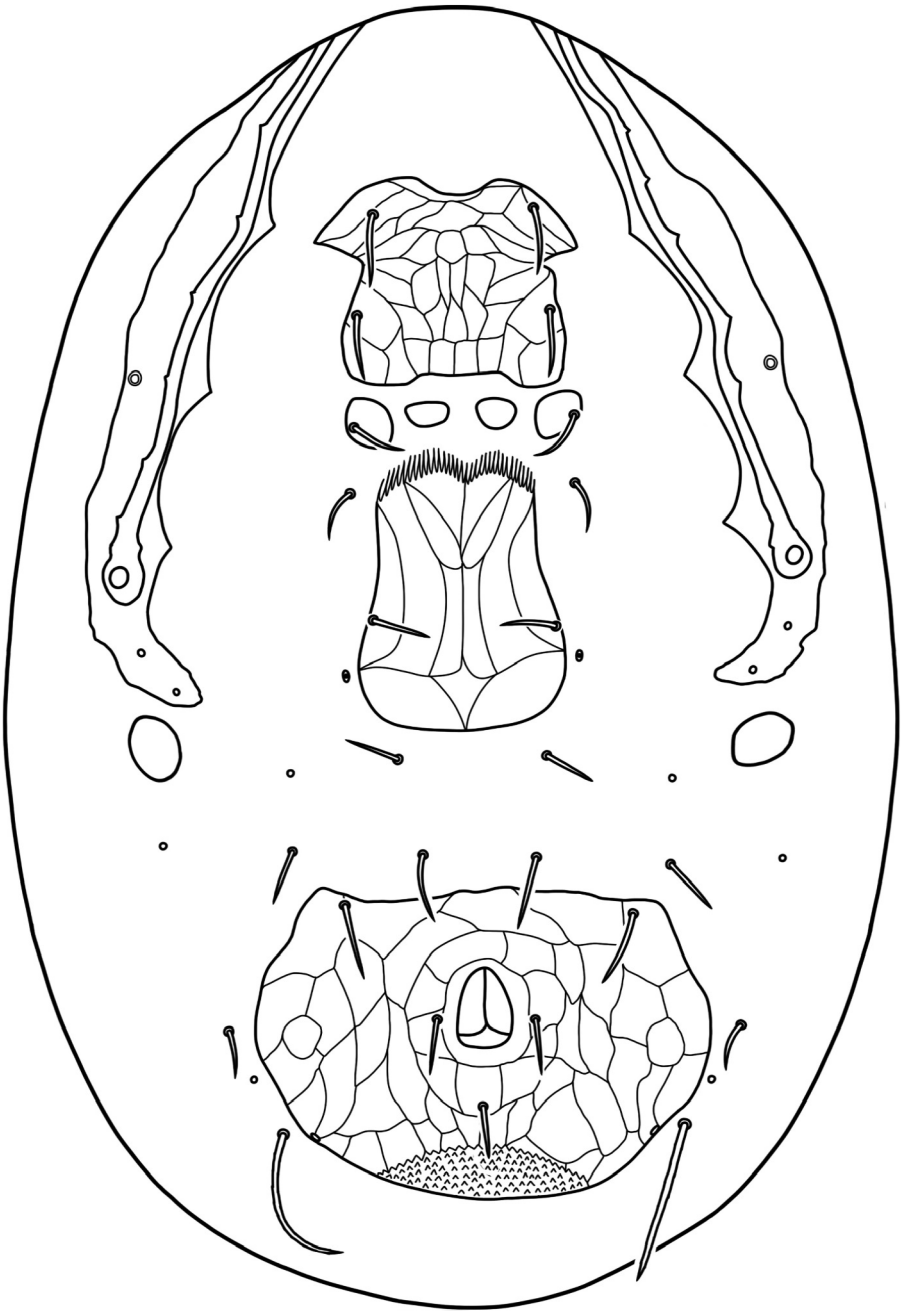

Fig. 18. *Ameroseius furcatus* female ventral side

Ameroseius georgei Turk, 1943

Synonyms: *Epicrius canestrenii* (sic) George, 1906; *Epicrius canistrinii* (sic) George, 1906; *Epicrius canestrinii* Turk, 1943; *Cornubia georgii* (sic) Turk, 1943; *Ameroseius imparsetosus* Westerboer, 1963; Karg, 1971a, Bregetova, 1977; Karg, 1993; Błaszak et al., 1997.
Holotype: not designated
Paratypes: not designated
Syntypes: BMNH: E010147155, E010147156 Ranmore, United Kingdom.
Locus typicus: United Kingdom, England, Cornwall (habitat unknown)
Occurrence in Poland: soil, **Wielkopolski National Park** (Skorupski, 2001); fruiting bodies of *Bjerkandena adusta, Fomes fomentarius*, *Phellinus igniarius*, *Trametes hirsuta*, **Zielonka Experimental Forest** (Gwiazdowicz and Łakomy, 2002); rotting wood, **Bielinek Odra Reserve** (Skorupski and Łabędzki, 2004).

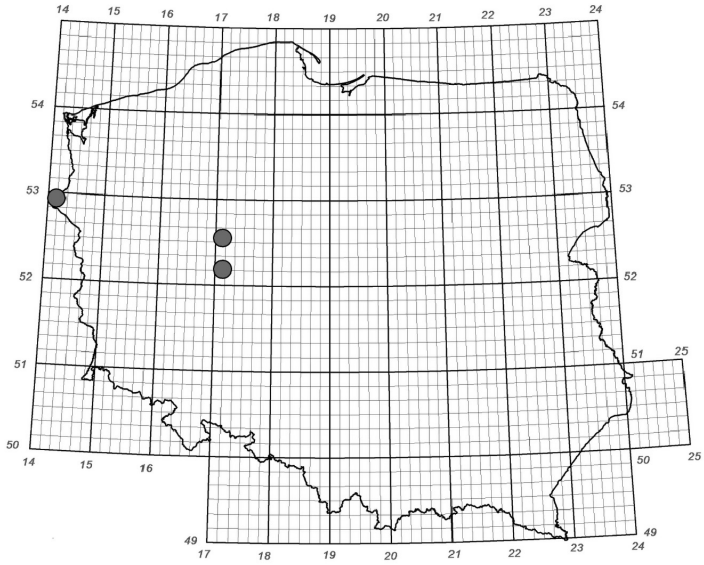

Fig. 19. Ocurence of *Ameroseius georgei* in Poland

Female description

Idiosoma: 500–540 long x 345–365 wide

Dorsum (Fig. 20): dorsal shield entire, oval shaped, covered with small to medium sized deep fossae on the major part of **Dorsum** with a fine reticulation between; noticeable pair of pores halfway between Z3 and Z4 setae; 29 from

very short to very long serrated pairs of setae in total; the longest setae are s6, j6, J2, J4, S3, S5 (above 200); vertical j1 dense serrate 38–42; setae length in j–J row very variable in length j2 37–39, j3 45–47, j4 19–20, j5 175–180, j6 225–230, J2 215–225, J4 215–230; z–Z row setae as given: z3 175–180, z5 25–26, z6 16–18, Z2 17–18, Z3 18–19, Z4 15, Z5 135–145; s–S row setae likewise variable in length s2 26–28, s3 28–30, s4 180–190, s5 175–185, s6 245–255, S1 50-55 S2 55–60, S3 240–250, S4 58–62, S5 225–235; r row setae on the shorter side: r3, r4 30–35, r5, r6 47–52.

Venter (Fig. 21): ventral shields covered with ornamentation; sternal shield ca. 80 long x 110 wide with two pairs of simple setae st1–st2 28–30; st3 and st4 27–30 on a membrane; st5 27–29 located on epigynal shield ca 120 long 75 wide; metapodal plates 18 x 22 x 30–35; small triangular and long 'L' shaped endopodal sclerits noticed; anal sield wider (175) than long (125) with anal opening 15 x 28, simple paraanal and postanal setae 28–30 setae; six pairs of opisthogastric simple setae (except JV5) located in a soft integument: JV1, JV2, JV3, ZV2 25–30, ZV4 shorter 18–20, JV5 exceptionally longer and barbed *ca*. 65.

Gnathosoma: tritosternum base 27–30 with laciniae 55–65; corniculi bifurcate 23–25; hypostomatal setae simple of slightly different lengths h1 more stout and shorter ca. 25, h2 and h3 28–30 and pcx longer 36–37; tectum flattened triangular with 2–3 rows of denticles and dentate margin; movable digit 25–27 with no visible teeth, fixed digit with 3 sharp teeth; palps 75–80 with palpapotele 15–16 two-tinned.

Legs: lengths as given: leg I 435–450, leg II 315–325, leg III 315–325, leg IV 425–425 long; pretarsi: leg I 22 leg II 33, leg III 35, leg IV 45 long; number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–9–8; leg IV – 1–5–6–9–9.

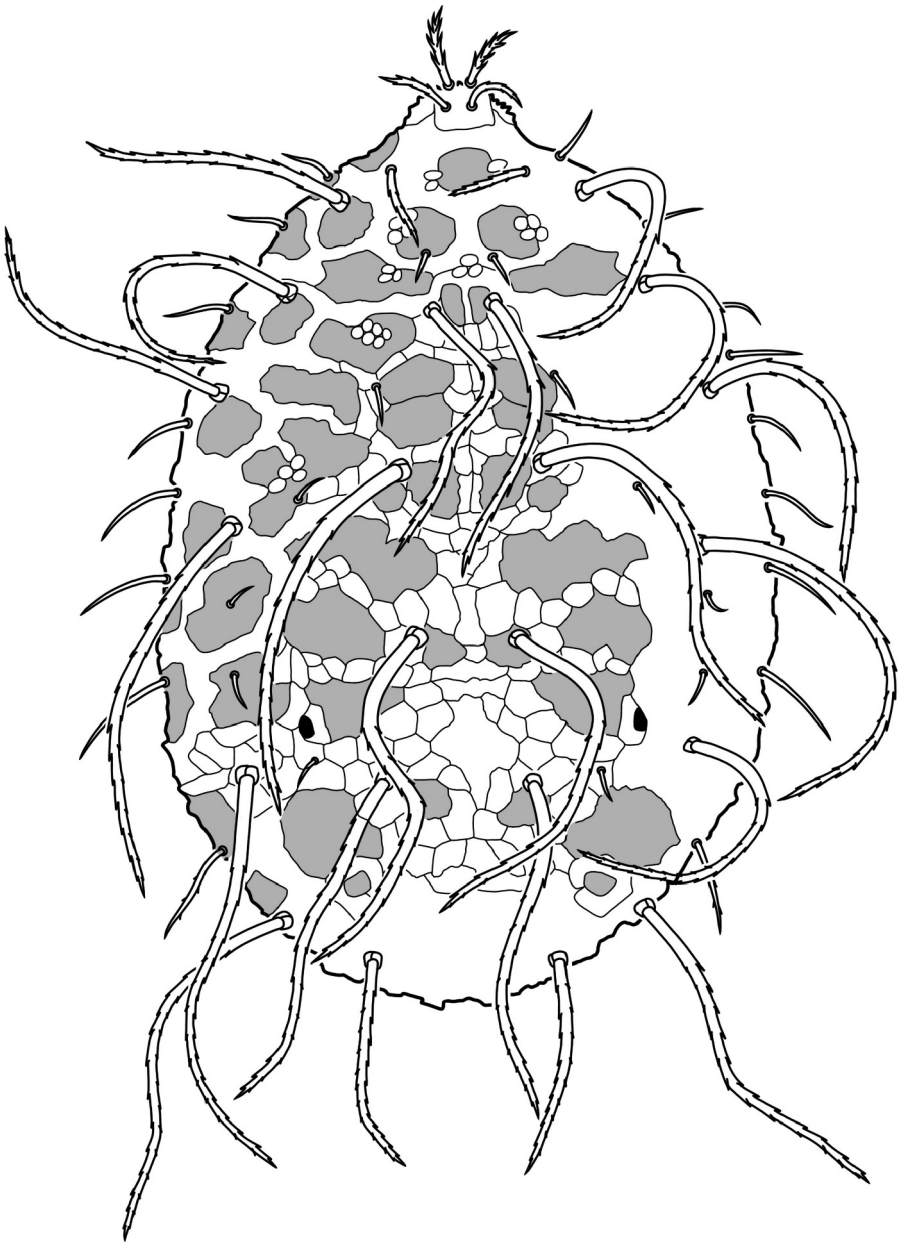

Fig. 20. *Ameroseius georgei* female dorsal side

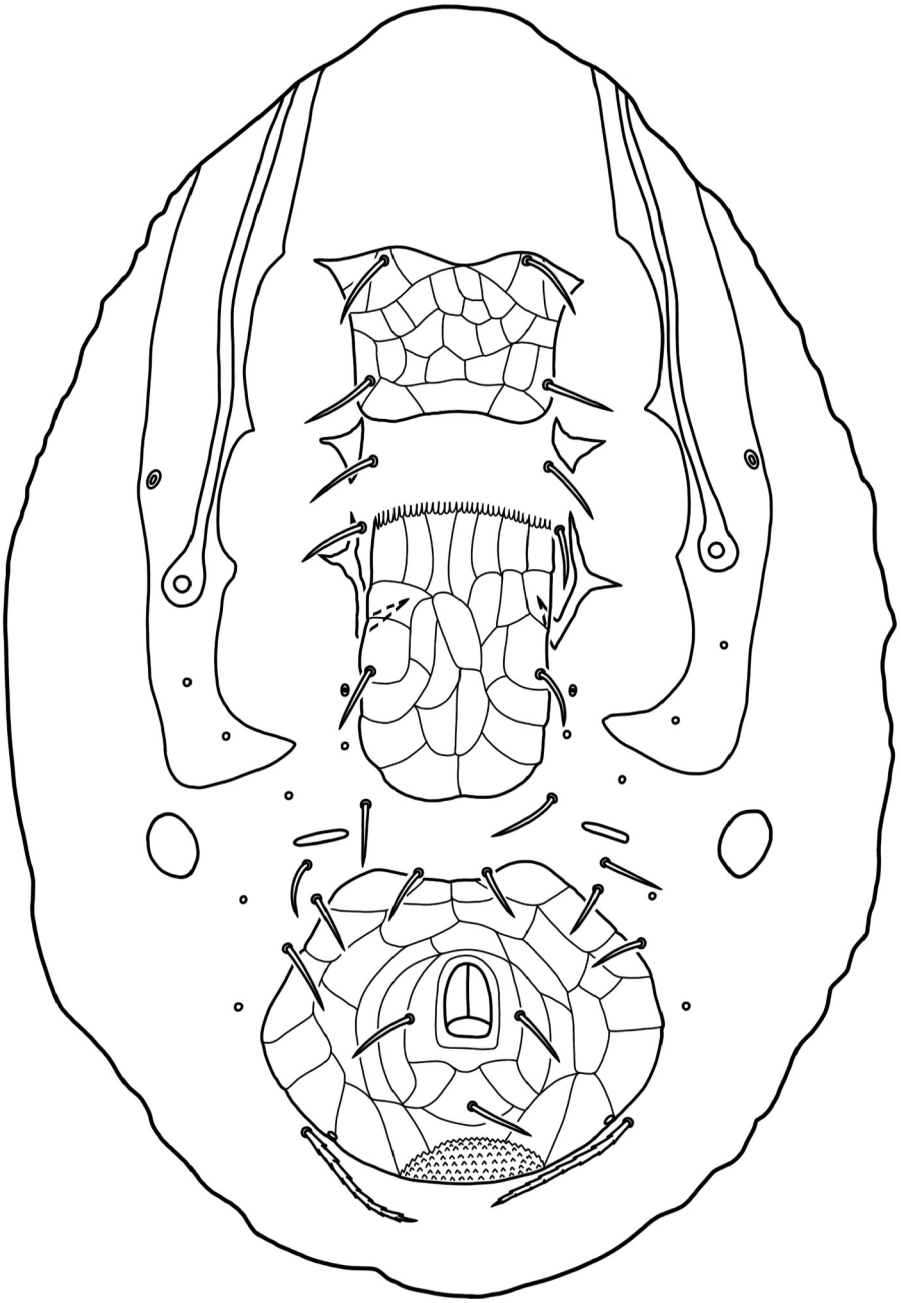

Fig. 21. *Ameroseius georgei* female ventral side

Ameroseius lidiae Bregetova, 1977

Holotype: Zoological Institute, Russian Academy of Sciences, Saint Petersburg, Russia

Locus typicus: Ukraine, an estuary of Dnieper River (hollow of willow tree)

Occurrence in Poland: nests of the white-tailed sea eagle *Haliaeetus albicilla*, **Wielkopolska region** (Gwiazdowicz et al., 2006)

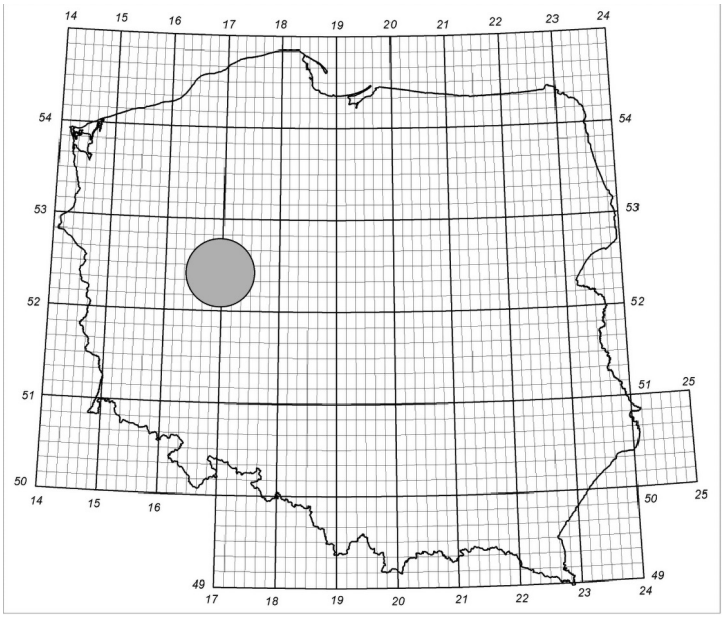

Fig. 22. Ocurence of *Ameroseius lidiae* in Poland

Female description

Idiosoma: 450–470 long x 270–290 wide

Dorsum (Fig. 23): dorsal shield entire, oval-shaped, covered with small to large-sized deep fossae on the almost entire dorsal area with a net reticulation between; noticeable pair of pores halfway between Z3 and Z4 setae close to the latter; 29 serrated pairs of setae in total; the longest setae are Z5, S3, S4, S5 (above 50); vertical j1 dense serrate 31–3; setae length in j–J row as given: j2 27–29, j3 32–34, j4 26–28, j5 27–30, j6 40–43, J2 45–46, J4 73–76; amog z–Z row some shortest setae: z3 38–39, z5 20–23, z6 23–25, Z2 23–25, Z3 32–35, Z4 24–26, Z5 73–76; s-S row progressively increasing in length s2 27–29, s3 236–38, s4 39–41, s5 42–44, s6 43–46, S1 46–48 S2 48–50, S3 50–53, S4 52–55, S5 73–75; r row setae with outstanding humeral setae r3 43–45, r4 29–31, r5 31–33, r6 34–36.

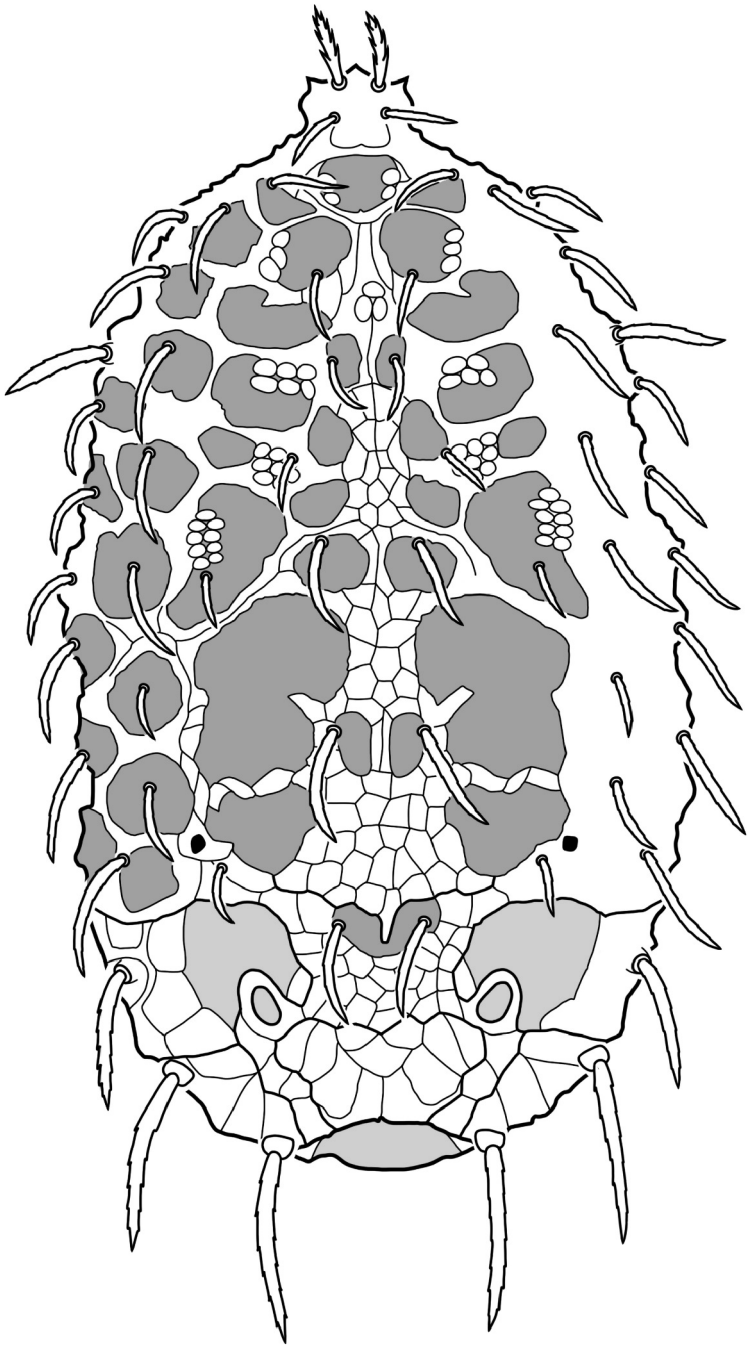

Fig. 23. *Ameroseius lidiae* female dorsal side

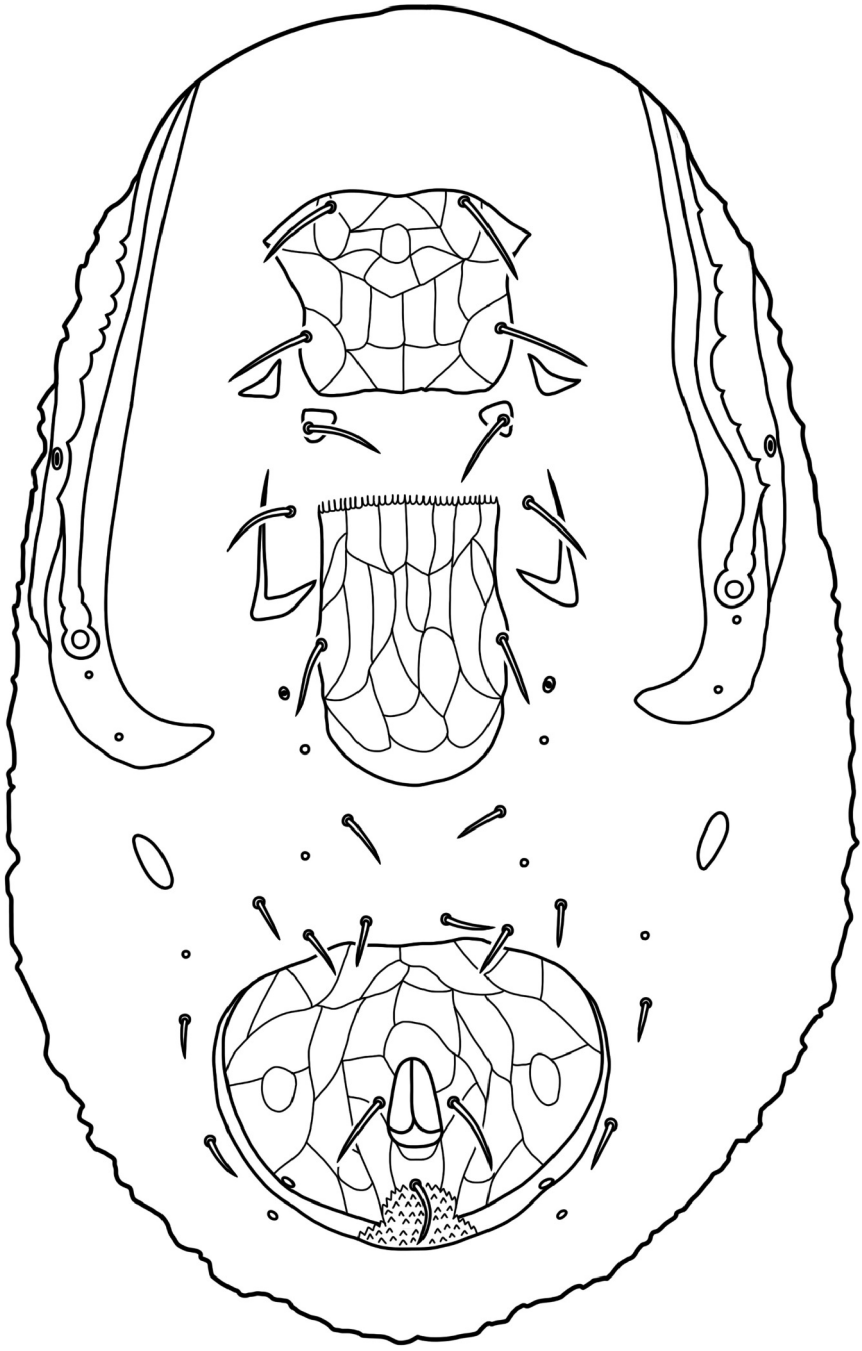

Fig. 24. *Ameroseius lidiae* female ventral side

Venter (Fig. 24): ventral shields ornamented; sternal shield 68–71 long x 88–92 wide with two pairs of simple setae st1 26–28 and st2 22–23; st3 20–22 on a platelet st4 16–17 on a membrane; st5 16–17 located on epigynal shield 95–100 long 60–65 wide rounded posteriorly; metapodal plates elliptical 4–5 x 22–24; small triangular and long 'L' shaped endopodal sclerits present; anal sield wider (130–140) than long (98–103) with anal opening 14 x 22, simple paraanal and postanal setae 18–20 setae; six pairs of opisthogastric simple setae located in a soft integument: JV1, JV2, JV3, ZV2, ZV4, JV5 15-17.

Gnathosoma: tritosternum base 17–18 with laciniae 45–50; corniculi bifurcate 18–20; hypostomatal setae simple of slightly similar in lengths h1, h2, h3 17-18 and pcx 18–19; tectum triangular with 2–3 rows of denticles and dentate margin; movable digit 20–22 with no visible teeth, fixed digit with 3 sharp teeth; palps 75–80 with palpapotele 13–15 three-tinned.

Legs: lengths as given: leg I 335–350, leg II – 260–280, leg III 260–275, leg IV 335–350 long; pretarsi: leg I 15 leg II 26, leg III 27, leg IV 32 long; the number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–9–8; leg IV – 1–5–6–9–9.

Ameroseius longitrichus Hirschmann, 1963

Holotype: not designated
Paratypes: not designated
Locus typicus: Germany (from several localities, in wood detritus of spruces and firs, and galleries of various scolytine bark beetles)
Occurence in Poland: ant nests of *Formica rufa* (Wiśniewski, 1980; Gwiazdowicz, 2008a); feeding grounds of *Hylurgops palliatus, Tomicus piniperda, Tomicus minor, Crypturgus cinereus* (Kiełczewski and Wiśniewski, 1983; Gwiazdowicz, 2008); feeding grounds of *Polygraphus poligraphus*, Świętokrzyski **National Park** (Michalski and Ratajczak, 1989); feeding grounds of *Ips typographus*, **Białowieża National Park**, **Gorce National Park**, **Roztocze National Park** (Michalski et al., 1992a; Kaczmarek and Michalski, 1994, 1995a, b, c; Gwiazdowicz, 2008); feeding grounds of *Cryphalus piceae*, *Tomicus piniperda* **Gorce National Park**, Świętokrzyski **National Park** (Michalski et al., 1992b; Michalski and Ratajczak, 1989; Gwiazdowicz, 2008); feeding grounds of *Dryocetes autographus* (Kaczmarek et al., 1992); feeding grounds of *Ips typographus*, *Ips acuminatus*, *Polygraphus poligraphus*, *Pityokteines curvidens*, *Dryocetes autographus*, *Hylurgops paliatus* (Kaczmarek and Michalski, 1995c; Gwiazdowicz, 2008); **Białowieża National Park**, **Gorce National Park**, **Roztocze National Park,** Świętokrzyski

National Park (Gwiazdowicz and Skorupski, 1996); litter, bark with underlying sawdust, **Pieniny National Park** (Skorupski and Gwiazdowicz, 1996; 1997); soil with litter in beech forest, **Gorce National Park** (Szymkowiak, 1998); anthills, **Białowieża National Park** (Gwiazdowicz, 2000; Gwiazdowicz et al., 2001); soil, ant nests of *Lasius niger*, layers beneath tree bark, **Wielkopolski National Park** (Skorupski, 2001; Gwiazdowicz, 2008); rotten roots in alder swamp, **Biebrza National Park** (Gwiazdowicz and Klemt, 2004); in fruiting bodies of *Piptoporus betulinus*, **Zielonka Experimental Forest** (Gwiazdowicz and Łakomy, 2002); in the nests of the wite-tailed sea eagle *Haliaeetus albicilla* (Gwiazdowicz et al., 2006).

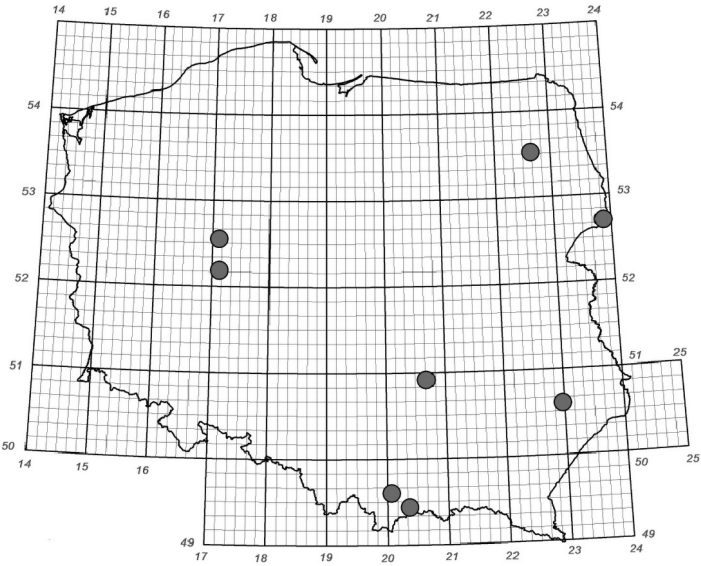

Fig. 25. Occurrence of *Ameroseius longitrichus* in Poland

Female description

Idiosoma: 435–460 long x 250–290 wide

Dorsum (Fig. 26): dorsal shield entire, oval shaped, covered with a small to medium sized deep fossae covering densely entire dorsal area, some net reticulation between; noticeable pair of pores halfway between Z3 and Z4 setae; 29 barbed pairs of setae totally; the longest setae are s4, s5, s6, J2, J4, Z5, S3, S5 (close to 100 and above); vertical j1 thickened and strongly serrate 33–35; in j–J row setae lengths as given: j2 30–32, j3 40–42, j4 26–28, j5 82–86, j6 87–92, J2 96–99, J4 113–115; z–Z row setae lengths as given: z3 85–88, z5 23–25, z6 20–23, Z2 22–25, Z3 22–23, Z4 35–38, Z5 96–99; s–S row setae lengths as given:

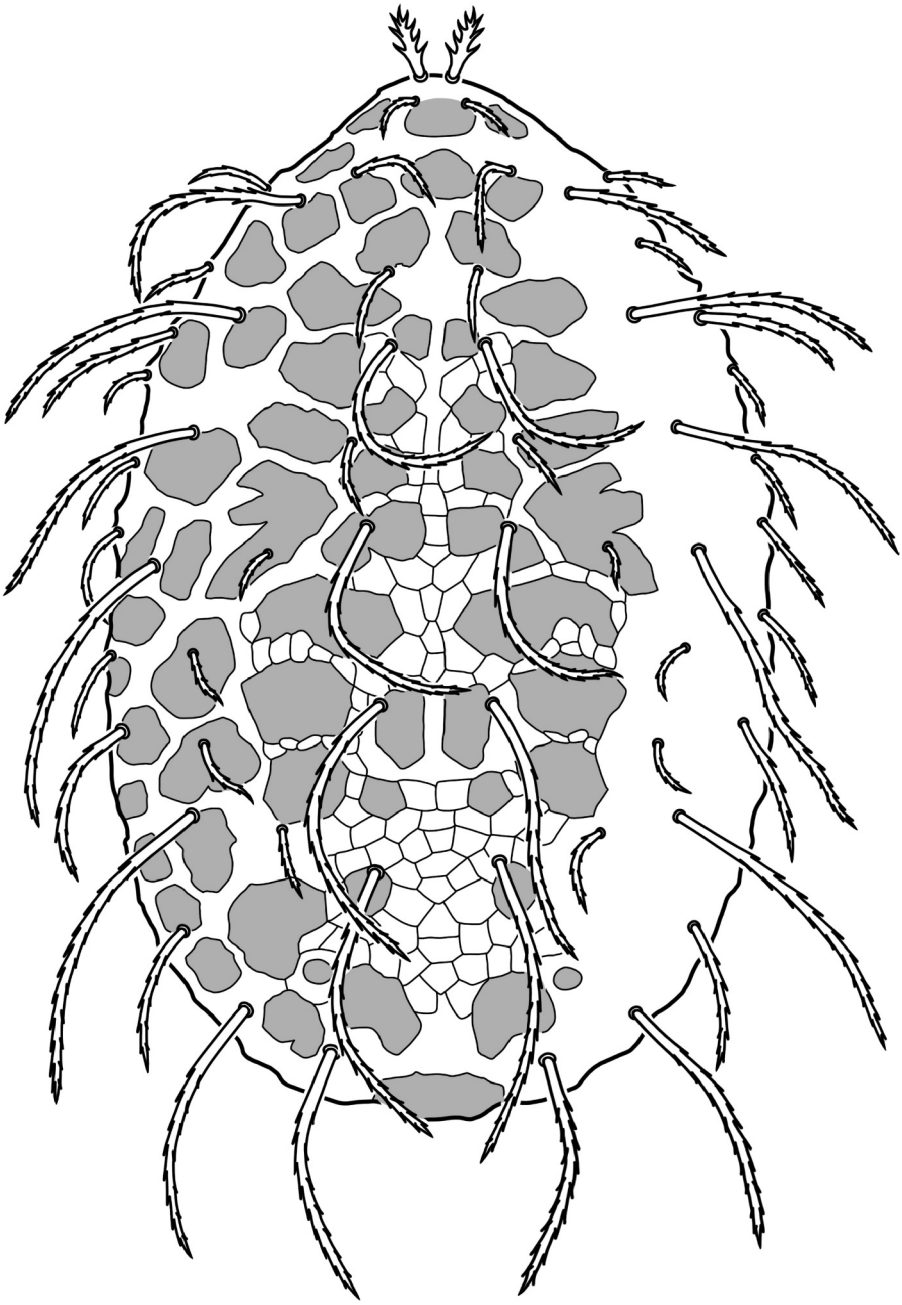

Fig. 26. *Ameroseius longitrichus* female dorsal side

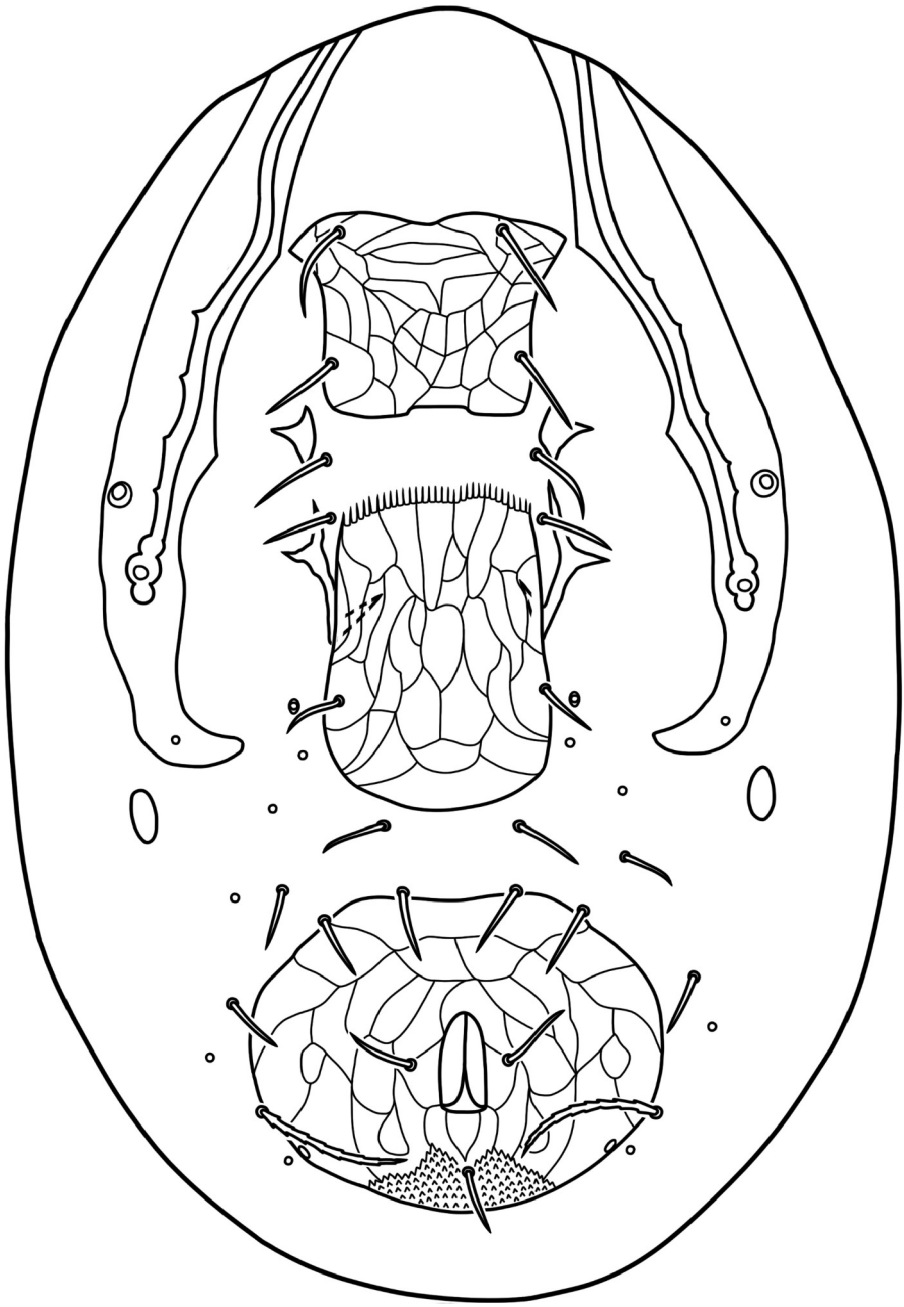

Fig. 27. *Ameroseius longitrichus* female ventral side

s2 30–33, s3 29–31, s4 90–99, s5 97–100, s6 115–125, S1 50–53 S2 62–65, S3 118–122, S4 58–60, S5 98–101; r row setae lengths as given r3 65–68, r4 31–33, r5 44–46, r6 52–54.

Venter (Fig. 27): ventral shields with reticulation; sternal shield 75-80 long x 85–90 wide with two pairs of simple setae st1 33–36 and st2 30–33; st3 25–27 inserted on a platelets, st4 22–25 on a membrane; st5 20-22 located on epigynal shield 100–110 long 70–75 wide; metapodal plates quite small 5–6 x 13–15; small triangular and long 'L' shaped endopodal sclerits present; anal sield wider (125–140) than long (85–90) with anal opening 15 x 30, simple paraanal 25–28 and postanal slightly shorter setae 22–25 setae; six pairs of opisthogastric simple setae located in a soft integument: JV1, JV2, JV3, ZV2, ZV4 21–25 and JV5 exceptionaly long and serrated 53–56.

Gnathosoma: tritosternum base 23–25 with laciniae 40–45; corniculi bifurcate 18–20; hypostomatal setae simple: h1 and h3 20–21, longer h2 24–25 and the longest pcx 27–28; tectum triangular with a rather smooth margin; movable digit 23–25 with no visible teeth, fixed digit with 3 sharp teeth; palps 80–85 with palpapotele 12–13 two-tinned.

Legs: lengths as given: leg I 320–340, leg II 245-280, leg III 240–270, leg IV 315–345 long; pretarsi: leg I 20 leg II 28, leg III 29, leg IV 34 long; number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–9–8; leg IV – 1–5–6–9–9.

Ameroseius sculptilis Berlese, 1916

Synonyms: *Ameroseius pulcher* Westerboer, 1963; Bregetova, 1977; Karg, 1971a; Ishikawa, 1972; Karg, 1993; *Kleemannia sculptilis* Haitlinger, 1991.

Holotype: ISZA: 169/3 Vallombrosa, musco – Firenze, Giardino R. Stazione. Istituto Sperimentale per la Zoologia Agraria, Firenze, Italy;

Paratypes: ISZA: 190/19 Firenze, Giardino R. Stazione. Istituto Sperimentale per la Zoologia Agraria, Firenze, Italy;

Locus typicus: Italy, Vallombrosa (in moss)

Occurence in Poland: phoretic on *Ips typographus*, **Białowieża National Park** (Gwiazdowicz et al., 2012).

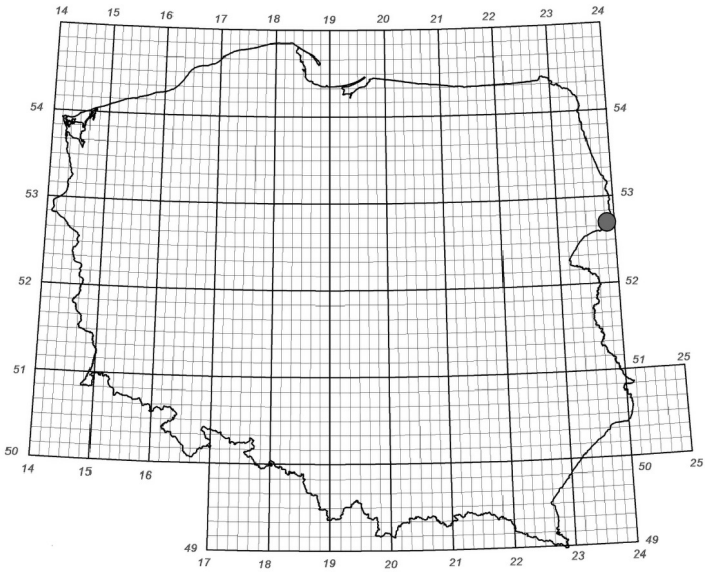

Fig. 28. Occurrence of *Ameroseius sculptilis* in Poland

Female description

Idiosoma: 415–455 long x 255–295 wide

Dorsum (Fig. 29): dorsal shield entire, oval shaped, covered with a small and medium deep fossae mainly on the anterior part of the **Dorsum**, to large and shallow fossae in the middle, all joint with a net reticulation between; clearly visible pair of pores halfway between Z4 and S3 setae; 29 delicately serrate pairs of setae in all; the longest setae are j6, J4, Z3, Z5, S3 (sometimes reaching 50); vertical j1 exquisitely pubescent and dense serrate 26–28; setae length differ in j–J row as follow: j2 26–28, j3 26–28, j4 25–28, j5 30–34, j6 46–50, J2 42–45, J4 47–50; z–Z row setae likewise: z3 30–31, z5 27–31, z6 33–35 , Z2 37–39, Z3 46–50, Z4 38–42, Z5 50–54; s-S row progressively increasing in length s2 27–29, s3 236–38, s4 39–41, s5 42–44, s6 43–46, S1 46–48 S2 48–50, S3 50–53, S4 52–55, S5 73–75; r row setae with outstanding humeral setae r3 43–45, r4 29–31, r5 31–33, r6 34–36.

Venter (Fig. 30): ventral shields with reticulation; sternal shield 73–78 long x 95–100 wide with two pairs of simple setae st1 29–30 and st2 28–30; st3 26–28 on a subtriangular platelet st4 25–27 on a soft membrane; st5 21–23 situated on epigynal shield 75–80 long 58–65 wide rounded and narrowed posteriorly; metapodal plates large and oval with a margin 33–38 x 20–22; small triangular and long 'L' shaped endopodal sclerits present; anal shield wider (135–150) than long (113–123) with anal opening 22 x 35, simple paraanal and postanal

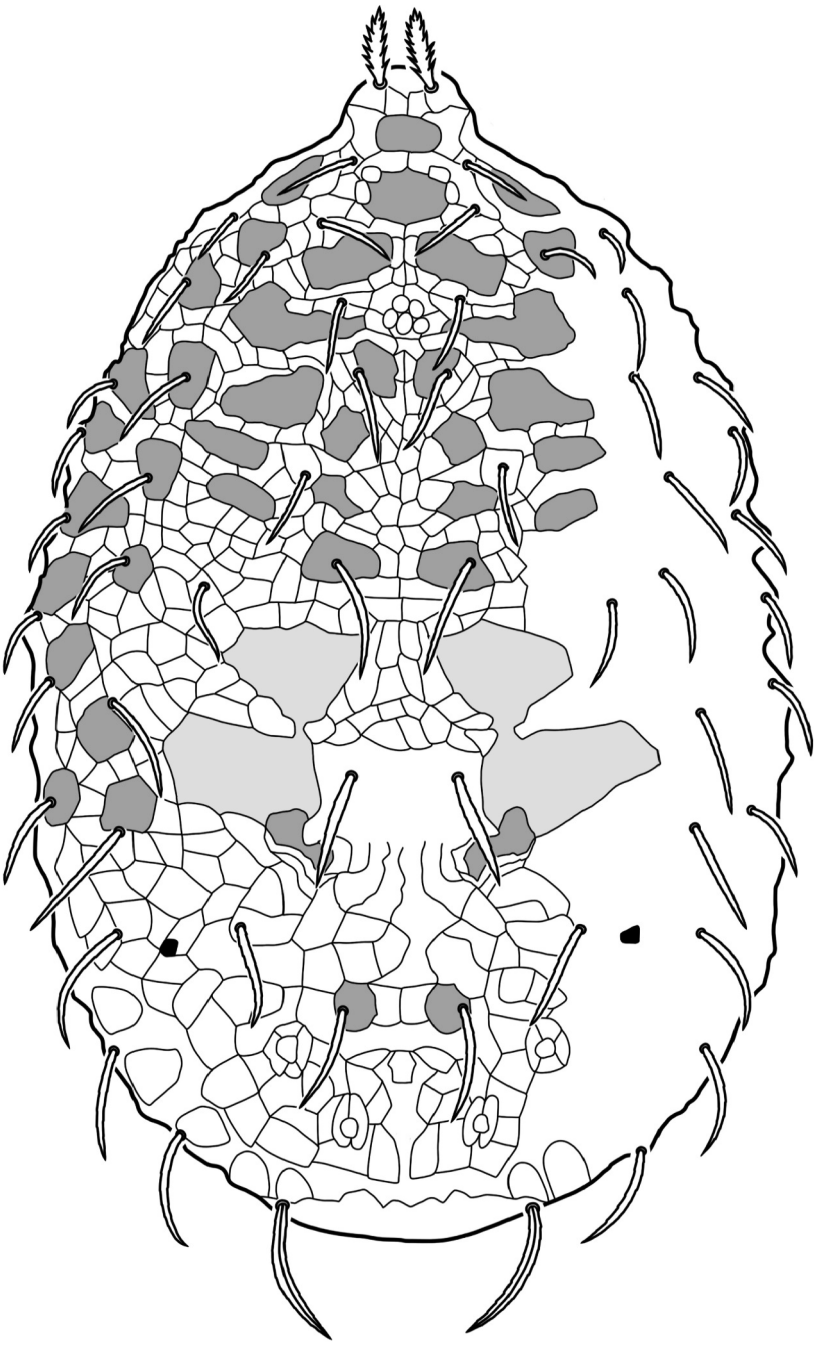

Fig. 29. *Ameroseius sculptilis* female dorsal side

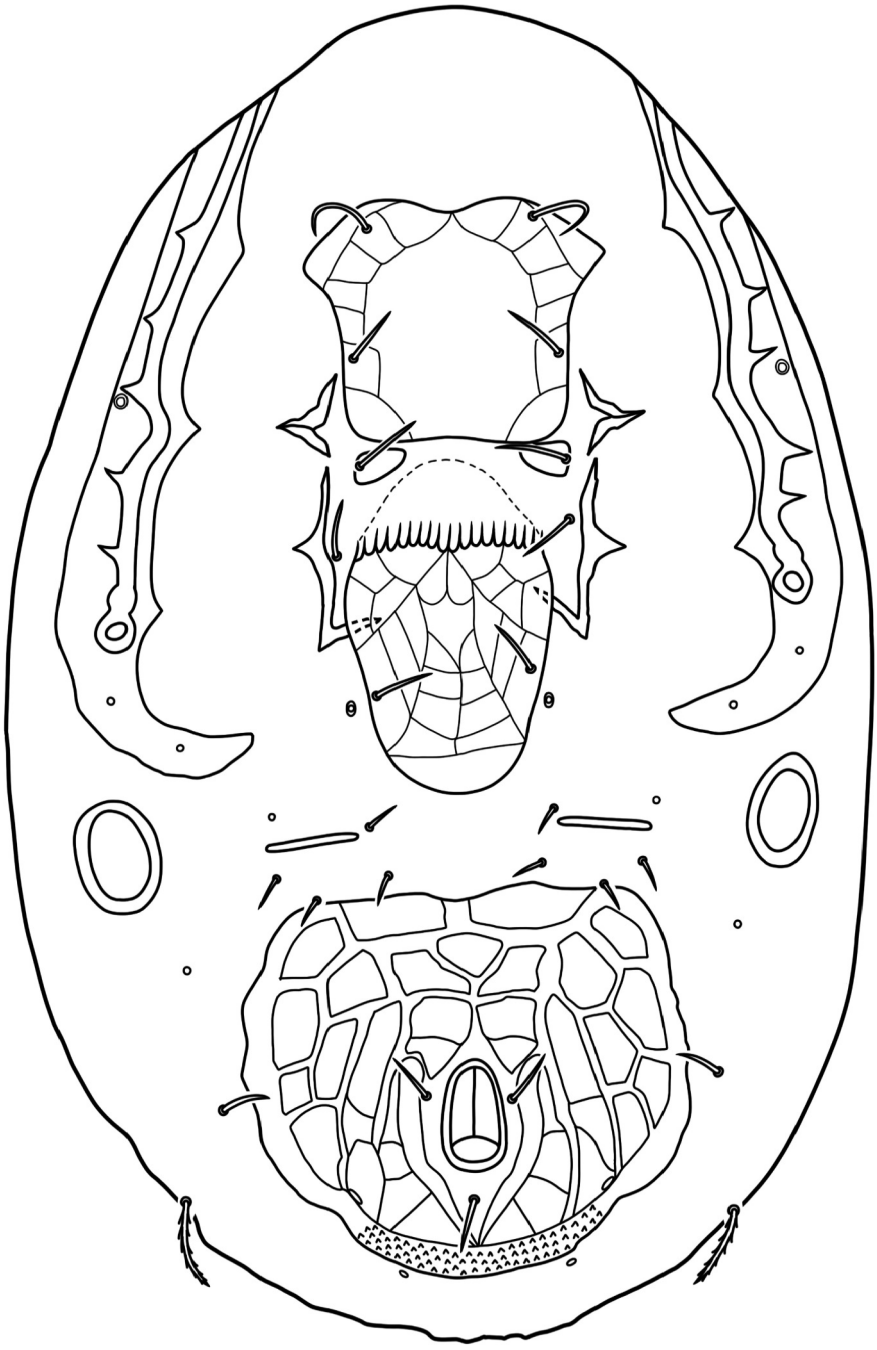

Fig. 30. *Ameroseius sculptilis* female ventral side

setae 16–17 setae; five pairs of opisthogastric simple setae located in a soft integument: JV1, JV2, JV4, ZV2 12–15 and longer barbed JV5 24–77.

Gnathosoma: tritosternum base 15–16 with laciniae 50–55; corniculi bifurcate 15–16; hypostomatal setae simple of slightly different in lengths h1 more stout 15–16, h2, h3 18–19, and pcx 23–25; tectum triangular and smooth margin; movable digit 19–20 with no visible teeth, fixed digit with 4 sharp teeth; palps 73–78 with palpapotele 12–13 three-tinned.

Legs: lengths as given: leg I 270–300, leg II – 225–240, leg III 230–245, leg IV 320–335 long; pretarsi: leg I 20 leg II 28, leg III 29, leg IV 33 long; the number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–9–8; leg IV – 1–5–6–9–9.

Ameroseius ulmi Hirschmann, 1963

Holotype: not designated
Paratypes: not designated
Locus typicus: Germany, München, Englischer Garten (in the gallery of bark beetle *Scolytus scolytus* on elm tree *Ulmus* sp.)
Occurrence in Poland: **Wielkopolski National Park** (Gwiazdowicz and Skorupski, 1996); bark with underlying sawdust, **Wielkopolski National Park** (Skorupski, 2001); phoretic on *Rosalia alpina* (Haitlinger, 2008b).

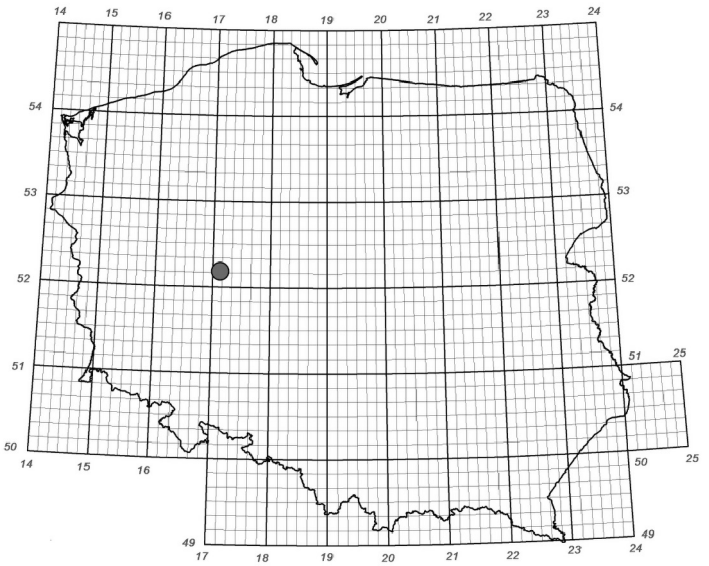

Fig. 31. Ocurence of *Ameroseius corbiculus* in Poland

Female description

Idiosoma: 435–475 long x 260–275 wide

Dorsum (Fig. 32): dorsal shield whole, oval shaped, covered with a small to medium sized rather deep fossae located almost on entire area with a net pattern between; noticeable pair of pores between Z3 and Z4 setae; full set of 29 barbed setae; vertical setae j1, clunal setae r3, Z5, S5 pubescent and strongly barbed more than remaining dorsal setae; the longest setae are j6, J2, J4, Z5, S3, S4, S5 (at least 40); setae in j–J row increasing in lengths: j2 27–28, j3 28–30, j4 31–33, j5 32–34, j6 38–40, J2 40–43, 43–45; z–Z row setae lengths as given: z3 27–28, z5 25–27, z6 24–26, Z2 28–29, Z3 32–34, Z4 34–35, Z5 59–62; setae in s–S row are as follows: s2 25–27, s3 29–30, s4 36–38, s5 35–37, s6 37–39, S1 36–38, S2 34–37, S3 36–39, S4 37–39, S5 of 45–48; r row setae variable in lengths: r3 44–46, r4 24–25, r5 27–29, r6 33–35.

Venter (Fig. 33): all shields with a fine reticulate ornamentation; sternal shield 73–77 long x 95–105 wide with two pairs of simple setae st1–st2 36–40; st3 30–34 on a platelet; st4 25–27 in a soft membrane; st5 26–27 located on epigynal shield 90–100 long 65–70 wide; metapodal plates measuring 25–26 x 11–12; small triangular and long 'L' shaped endopodal sclerits present; anal shield wider (140–145) than long (90–95) with anal opening 24 x 35, simple paraanal setae 26–28 and shorter postanal 21–23 setae; six pairs of opisthogastric setae: JV1, JV2, JV3 22–24 and ZV2 15–16, ZV3 10–11 simple, located in a soft integument, JV5 barbed reaching 26–28.

Gnathosoma: tritosternum base 20–22 with laciniae 45–50; corniculi bifurcate 18–21; hypostomatal setae simple of similar lengths 22–24, though h1 quite stout, and pcx longer than other 25–27; tectum triangular with a row of denticles; movable digit 24–26 with no teeth, fixed digit with 3 sharp teeth; palps 75–80 with a 2-tinned palpapotele.

Legs: lengths as given: leg I 330–340, leg II 260–270, leg III 255–265, leg IV 355–365 long; pretarsi: leg I 20 II 26, pretarsi III 28, pretarsi IV 30 long; number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–9–8; leg IV – 1–5–6–9–9.

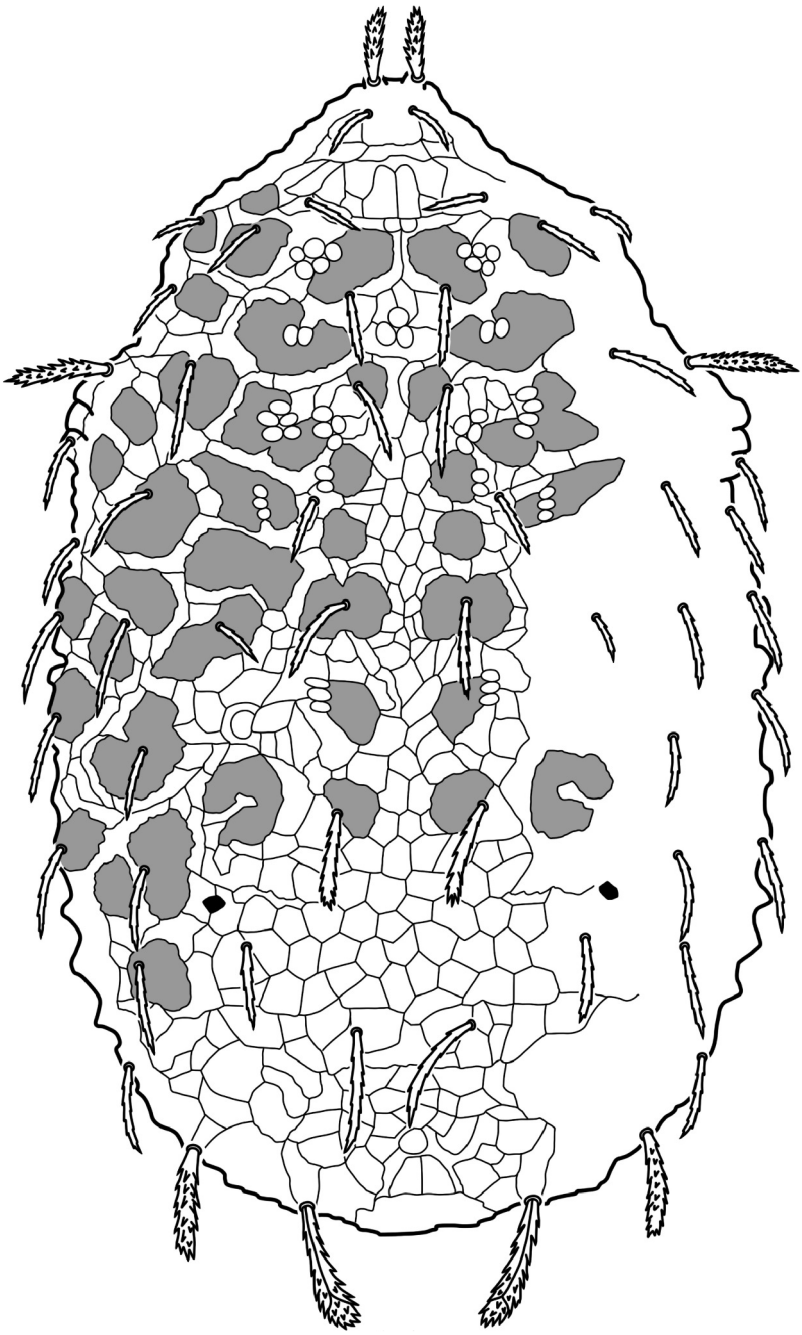

Fig. 32. *Ameroseius ulmi* female dorsal side

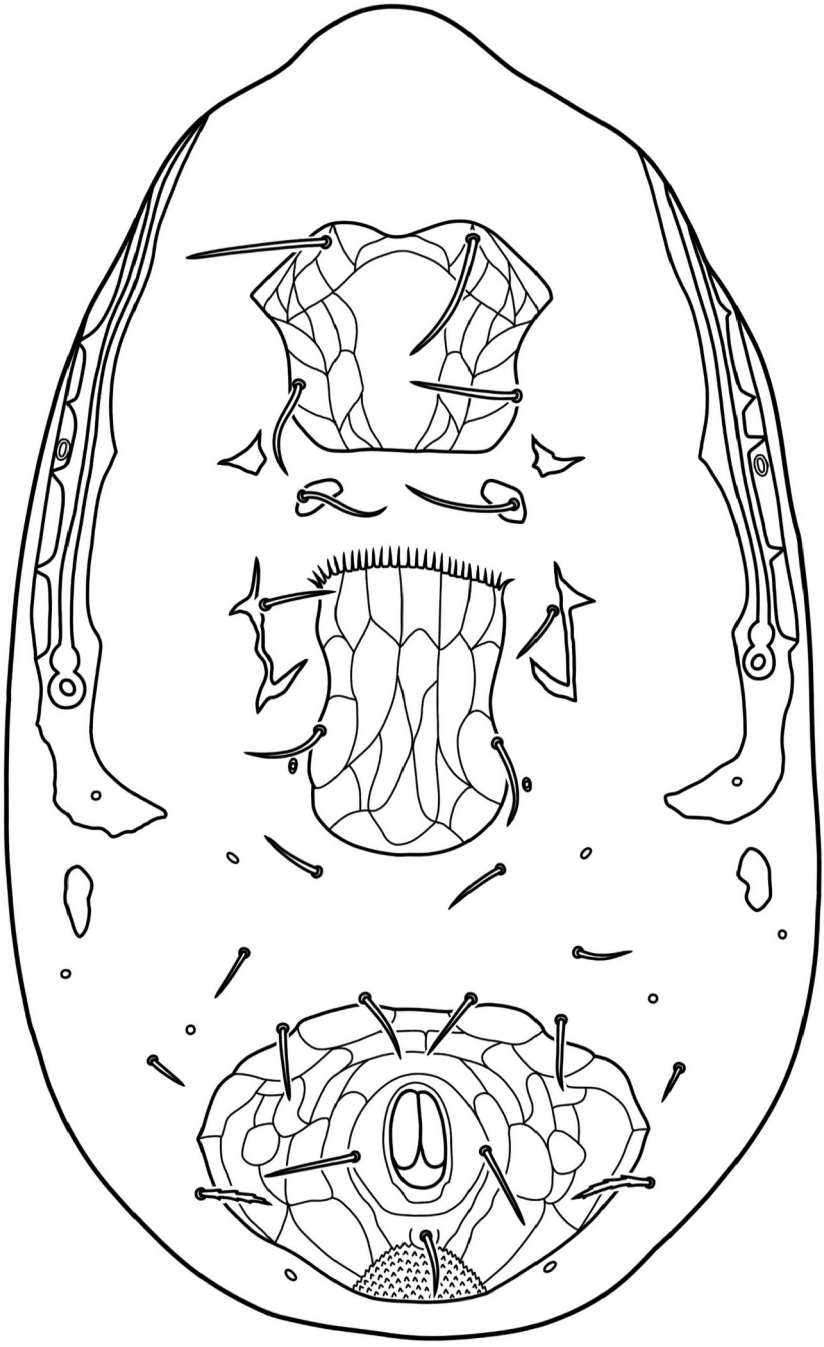

Fig. 33. *Ameroseius ulmi* female ventral side

• Genus *Epicriopsis* Berlese, 1916

Epicriopsis Berlese, 1916. Type species: *Gamasus horridus* Kramer, 1876, *Epicriopsis* Evans, 1963; Karg, 1971a; Bregetova, 1977; Karg, 1993

Dorsal shield heavily sclerotised and ornamented with a star-like or polygonal tubercles; dorsal shield with 22–28 pairs of setae; dorsal setae from conspicuous small and simple 10 μm long and hard to see to extremely long 250 μm, thick and serrate; sternal shield with two pairs (st1 and st2), next two in soft integument (st3 and st4), and the last on epigynal shield (st5); anal shield bearing 3 pairs of opisthogastric setae; opisthogastric soft integument with 5 pairs of setae; corniculi undivided and stout; fixed digit of chelicera with 3 teeth; palptarsal apotele three-tined; genu III and tibiae III–IV with two anterolateral and one posterolateral setae; tarsi I–IV each with empodium and claws.

Key to species of *Epicriopsis* occurring in Poland (females)

Dorsal hexagon j5 – z5 – j6 complete **2**

Dorsal hexagon j5 – z5 – j6 incomplete (j6 absent) ***Epicriopsis horridus* (Kramer, 1876)**

2 Dorsal hexagon setae with a very pubescent, serrate and very elongated j5 plus short both z5 and j6 (tips never reaching insertions of j6 and J2) .. ***Epicriopsis palustris* Karg, 1971**

Dorsal hexagon setae with a slender long j5 and medium length z5 and j6 (z5 reaching base of consequent setae j6 and j6 reaching J2) ..... ***Epicriopsis mirabilis* Willmann, 1956**

Epicriopsis horridus Kramer, 1876

Synonyms: *Gamasus horridus* Kramer, 1876; *Epicrius mollis* Haller, 1881; Berlese, 1887a; Oudemans, 1903; George, 1906; Turk, 1943; *Hypoaspis mollis* Oudemans, 1903, 1904; *Epicriopsis horrida* Berlese, 1916; *Epicriopsis berlesei* Oudemans, 1939; Karg, 1971a, 1971b.

Holotype: not designated

Paratypes: not designated

Locus typicus: Germany, Thuringia, Schleusingen (in litter)

Occurrence in Poland: in nests of *Formica rufa* (Wiśniewski, 1980; Gwiazdowicz, 2008a); bark with underlying sawdust, **Białowieża National Park**

(Gwiazdowicz, 1999b, 2000); bark of *Betula pendula*, **Polesie National Park** (Gwiazdowicz, 2002); soil at coal mine dumps, **Czeladź** (Madej and Tomczok, 1990); soil, **Dolinka Murckowska** (Madej, 1988); soil at ironworks dumps, **Bytom** (Cyran and Madej, 1990); soil with litter, **Włocławek** (Seniczak et al., 1988a); soil at railway embankment, **Katowice** (Madej and Kudła, 1990); soil with litter, sod of grass, **Bory Tucholskie National Park**, **Wierzchlas** (Kaczmarek, 2002); litter, sod of grass, **Tatra National Park** (Gwiazdowicz and Cichocki, 2002); **Białowieża National Park** (Gwiazdowicz et al., 2001); soil, litter, rooting wood, **Bielinek Odra Reserve** (Skorupski and Łabędzki, 2004); rotting wood of hornbeam *Carpinus betulus*, **Białowieża National Park** (Gwiazdowicz, 1993); soil of coal mine dumps, **Bytom, Czeladź, Gliwice** (Madej, 1990b,c); soil with litter, **Police** (Kaczmarek and Seniczak, 1999b); soil with litter, **Bielawy** (Seniczak et al., 1999b); excrements, rotten roots, **Biebrza National Park** (Gwiazdowicz and Klemt, 2004); soil, **Błociszewo**, **Janikowo** (Seniczak et al., 1991b,d); **Wielkopolski National Park** (Gwiazdowicz and Skorupski, 1996); soil, bark with underlying sawdust, **Wielkopolski National Park** (Skorupski, 2001); litter, sod of grass with *Phragmites* sp., **Słońsk Nature Reserve** (Madej, 2000).

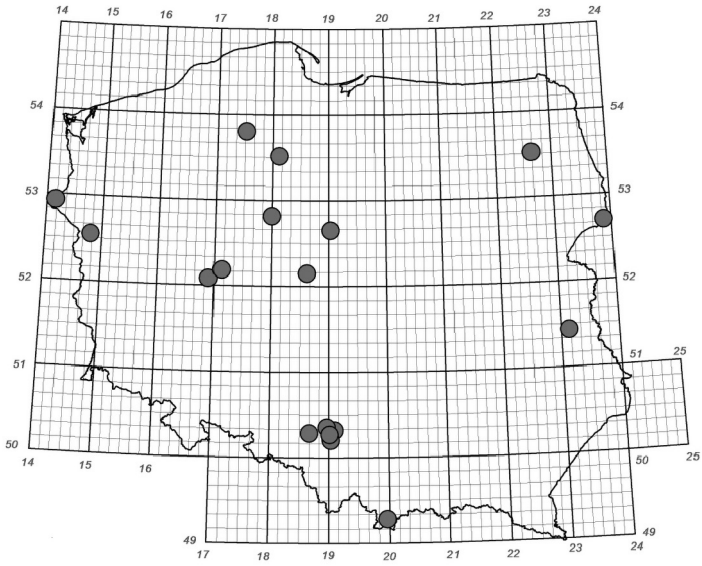

Fig. 34. Ocurence of *Epicriopsis horridus* in Poland

Epicriopsis mirabilis Willmann, 1956

Synonyms: *Epicriopsis rivus* Karg, 1971a, 1971b; Bregetova, 1977; Kandil, 1978; Karg, 1993, Narita and Moraes, 2016.

Holotype: ZMB: 41221 Suderode, Harz, Friedr. brunn, Laub, am Bach, 2927; Zoologischen Staatssammlung München, Germany

Paratypes: ZMB: 41223, 41224 Nähe Hasselfelde/Harz, Kahlschlag, Moos, Humusschicht, Buchenlaub, Zoologischen Staatssammlung München, Germany

Locus typicus: Czech Republic, Králický Sněžník Mt., southern slope with the growth of European white hellebore *Veratrum album* (in moss *Sphagnum sp*., *Hypnum sp*.)

Occurence in Poland: soil with litter in beech forest, **Gorce National Park** (Szymkowiak, 1998).

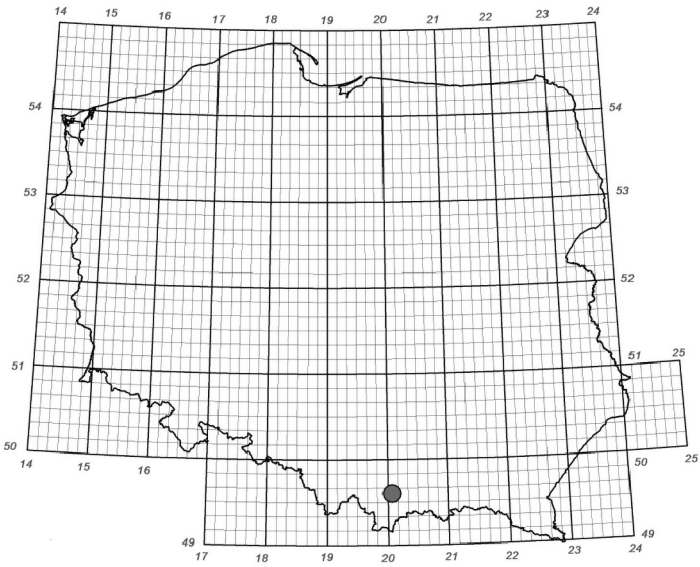

Fig. 35. Ocurence of *Epicriopsis mirabilis* in Poland

Epicriopsis palustris Karg, 1971

Synonyms: *Epicriopsis langei* Livshits and Mitrofanov, 1975; *Epicriopsis baloghi* Kandil, 1978.

Holotype: ZMB: 40957 male, Kalktuffniedermoor/Rhön, Laubstreu unter Weißdorn; Museum für Naturkunde, Berlin.

Paratypes: ZMB: 40958 Kalktuffniedermoor/Rhön, Laubstreu unter Weißdorn; ZMB: 40959 Mahndorf b. Halberstadt, Lehm; Museum für Naturkunde, Berlin.
Locus typicus: Germany, Kalktuffniedermoor Nature Reserve, Oechsen/Rhön (leaf litter under hawthorn *Crataegus sp*.)
Occurence in Poland: soil with sod of grass of *Cirsium arvense*, *Phragmites sp*., **Słońsk Nature Reserve** (Madej, 2000); soil with litter, **Ojcowski National Park** (Solarz et al., 2001).

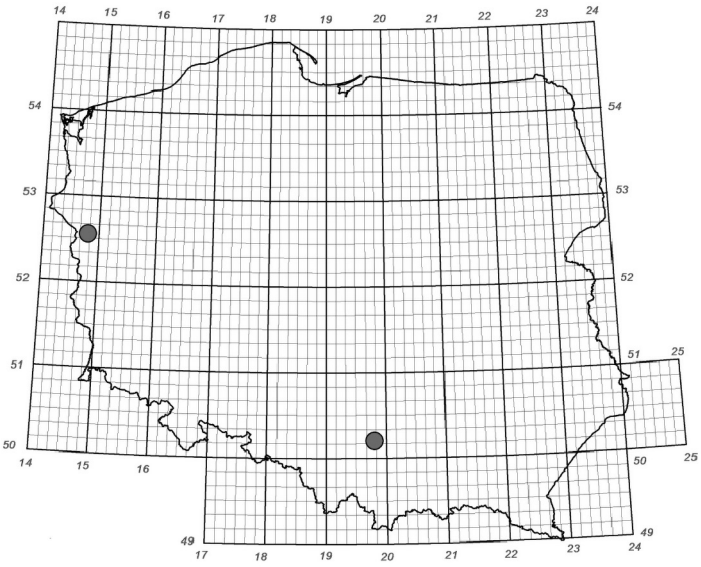

Fig. 36. Ocurence of *Epicriopsis palustris* in Poland

Genus *Kleemannia* Oudemans, 1930

Kleemannia Oudemans, 1930. Type species: *Zercon pavidus* C. L. Koch, 1839.
Primoseius Womersley, 1956. Type species: *Zercoseius macauleyi* Hughes, 1948 (= *Seiulus plumosus* Oudemans, 1902) Synonymy by Hughes (1961).
Kleemannia Evans, 1963. Type species: *Seius spathuliger* Leonardi, 1899. Incorrect synonymy by Oudemans (1939).

The dorsal shield is generally less sclerotised and with lesser fossae or none, normally with 28–29 pairs of setae; dorsal setae usually barbed or feather-like, short or medium lengths; noticeable pair of pores between Z3 – Z4 – S3 setae area; st1 and st2 on sternal shield, st3 on metasternal platelets or likewise st4 on soft integument, st5 on epigynal shield; five or six pairs of opisthogastric

setae; JV5 type different from remaining ventral setae that are short and simple; metapodal platelets present; corniculi bifurcate or trifurcate; setae h1 stout; fixed digit of chelicera with four teeth; epistome with a central spitz; palpapotele usually two-tined; genu III and tibiae III–IV with two anterolateral and two posterolateral setae; all tarsi I–IV ended with an ambulacrum.

Key to species of *Kleemannia* occurring in Poland (females)

1 Dorsal shield with 28 pairs of setae (z6 absent) **2**

Dorsal shield with 29 pairs of setae (z6 present) **3**

2 Sternal shield with an inverted U-shaped sclerotised structure; tips of setae J2 not reaching bases of J4 ..... ***Kleemannia plumosa* (Oudemans, 1902)**

Sternal shield with a standard reticulate pattern; tips of setae J2 reaching bases of J4 ..... ***Kleemannia pseudoplumosa* (Rack, 1972)**

3 Dorsal shield densely granulated; Idiosoma significantly smaller in size reaching at maximum only 300 in length and under 200 in width ***Kleemannia insignis* (Bernhard, 1963)**

Dorsal shield without any granulation; Idiosoma of an average size **4**

4 Dorsal setae shorter, delicately barbed or lanceolate; consecutive setae j6 not reaching J2 and J2 lacking to J4 ..... **5**

Dorsal setae longer, densely barbed; consecutive setae j6 reaching J2 and J2 suffice to J4 ..... **6**

5 Dorsal setae lanceolate; shallow fossae along sides of a dorsal shield; metapodal plates large and ringed; setae JV5 lanceolate ***Kleemannia pavida* (C. L. Koch, 1839)**

Dorsal setae delicately barbed; no fossae present on a dorsal shield; metapodal plates medium sized and plain; setae JV5 barbed ***Kleemannia elegans* (Bernhard, 1963)**

6 Dorsal shield with no fossae or only a few shallow along the sides; setae j3, j4 and j5 of similar lengths or gradually increasing; 6 pairs of opishogastric setae; setae JV5 long; metapodal plates mid-sized and plain **7**

Dorsal shield well covered with fossae in anterior and central part and alongside; one of setae j3, j4 and j5 different in lengths; 5 pairs of opishogastric setae; setae JV5 mid-length; metapodal plates large and ringed ... **8**

7 Dorsal shield with reticulate ornamentation only; setae Z5 and S5 widening at the tips; ventri-anal shield suboval, slightly wider than long, with setae JV2 situated at the anterior brink .. ***Kleemannia delicata* (Berlese, 1918)**

Dorsal shield with shallow fossae along sides; setae Z5 and S5 narrow at the tips; ventri-anal shield heart-shaped, as wide as long, with reaching JV1 outside the anterior brink . . . . . ***Kleemannia plumigera*** **Oudemans, 1930**

8 Dorsal setae j4 shorter than j3 and j5; setae j5 not reaching base of j6; epigynal shield with inverted U-shaped sculptural structure ***Kleemannia plumea*** **Oudemans, 1930**

Dorsal setae j4 same length as j3; setae j5 twice as long as j3 and j4 and reaching base of j6; epigynal shield with a longitudinal reticulation only ***Kleemannia tenella*** **(Berlese, 1916)**

Kleemannia delicata Berlese, 1918

Synonyms: *Ameroseius delicatus* Berlese, 1918; *Lasioseius gracilis* Halbert, 1923; *Ameroseius (Kleemania)* (sic) *gracilis* Athias-Henriot, 1959; *Ameroseius delicatus* Westerboer and Bernhard, 1963; Karg, 1971a; Bregetova, 1977; Castagnoli and Pegazzano, 1985; Karg, 1993; *Ameroseius gracilis* Westerboer and Bernhard, 1963; Karg, 1971a; Bregetova, 1977; Karg, 1993; Christian and Karg, 2006; *Ameroseius stramenis* Karg, 1976; *Kleemania* (sic) *gracilis* Luxton, 1998.

Holotype: not designated

Paratypes: not designated

Syntypes: ISZA: 190/15, 190/16, 194/18, 190/17, 210/37, 210/38 Padova, fiorume. Istituto Sperimentale per la Zoologia Agraria, Firenze, Italy

Locus typicus: Firenze, Padova, Italy (in hay)

Occurence in Poland: rotting wood of scots pine *Pinus sylvestris*, **Wielkopolska SW region** (Gwiazdowicz et al., 2011).

Female description

Idiosoma: 430–475 long x 240–290 wide

Dorsum (Fig. 38): dorsal shield entire, oval shaped, covered with a fine reticulation; 29 serrate pairs of setae in total; the longest setae are j6, J2, J4, Z4, Z5 (above 75); vertical j1 setae strongly serrated 26–27; setae length in j–J row increasing from j2 37–39, j3 43–46, j4 50–53, j5 56–59, j6 70–75, J2 and J4 90–100; setae length in z–Z row generally increasing (except Z5) from z3 46–48, z5 50–55, z6 56–59, Z2 70–75, Z3 70–75, Z4 80–85, Z5 70–73; likewise setae in s–S row gradually increasing in lengths: s2 35–40, s3 40–45, s4 47–50, s5 48–52, s6 50–54, S1–S3 50–55, S4–S5 54–60; r row setae of almost same lengths: r3–r6 45–50 (clunal seta r3 indifferent).

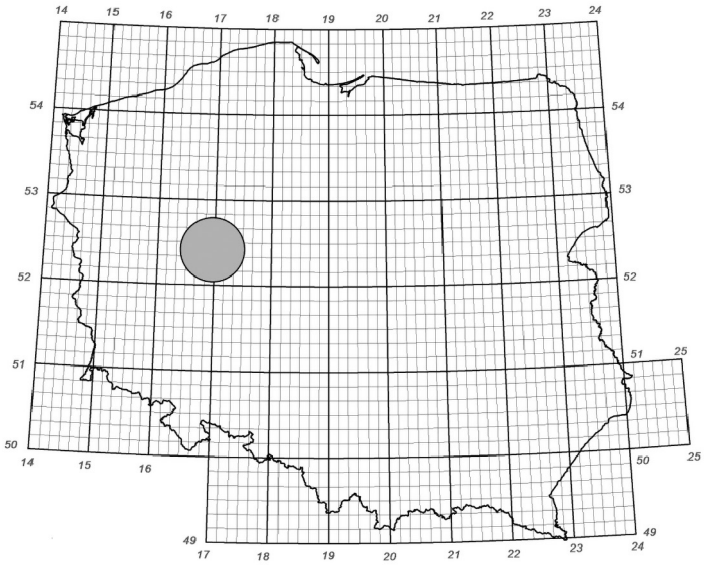

Fig. 37. Occurrence of *Kleemannia delicata* in Poland

Venter (Fig. 39): all shields with a delicate ornamentation; sternal shield 73 long x 78 wide with two pairs of simple setae st1–st2 27-30; st3 25–27 on a platelet; st4 24–25 on a membrane; st5 24–26 located on epigynal shield 98–104 long 90–95 wide; metapodal plates elongated 10–12 x 40–43; small triangular and long 'L' shaped endopodal sclerits present; ventrianal shield not much wider (135–145) than long (125–135) with quite large anal opening 20 x 35, simple paraanal setae 25 and longer serrated postanal 30–33 setae; six pairs of opisthogastric setae: simple JV2, JV3 25–26 located on ventrianal shield, JV1, ZV1 21–25 and shorter ZV2 12–13 outside shield, JV5 the longest, serrated, 77–83 located in soft integument.

Gnathosoma: tritosternum base 15–17 with laciniae 60–65; corniculi trifurcate 22-24; hypostomatal setae simple: h1 stout and shorter 21–22, h2–h3 24–26, pcx longer 28–30; tectum triangular with a protruded central spitz; movable digit 23–24 with no visible teeth, fixed digit with 4 sharp teeth; palps 85-90, palpapotele 2-tinned.

Legs: lengths as given: leg I 325–355, leg II 255–290, leg III 255–285, leg IV 325–360 long; pretarsi: leg I 17 leg II 20, leg III 20, leg IV 25 long; number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–10–9; leg IV – 1–5–6–9–10.

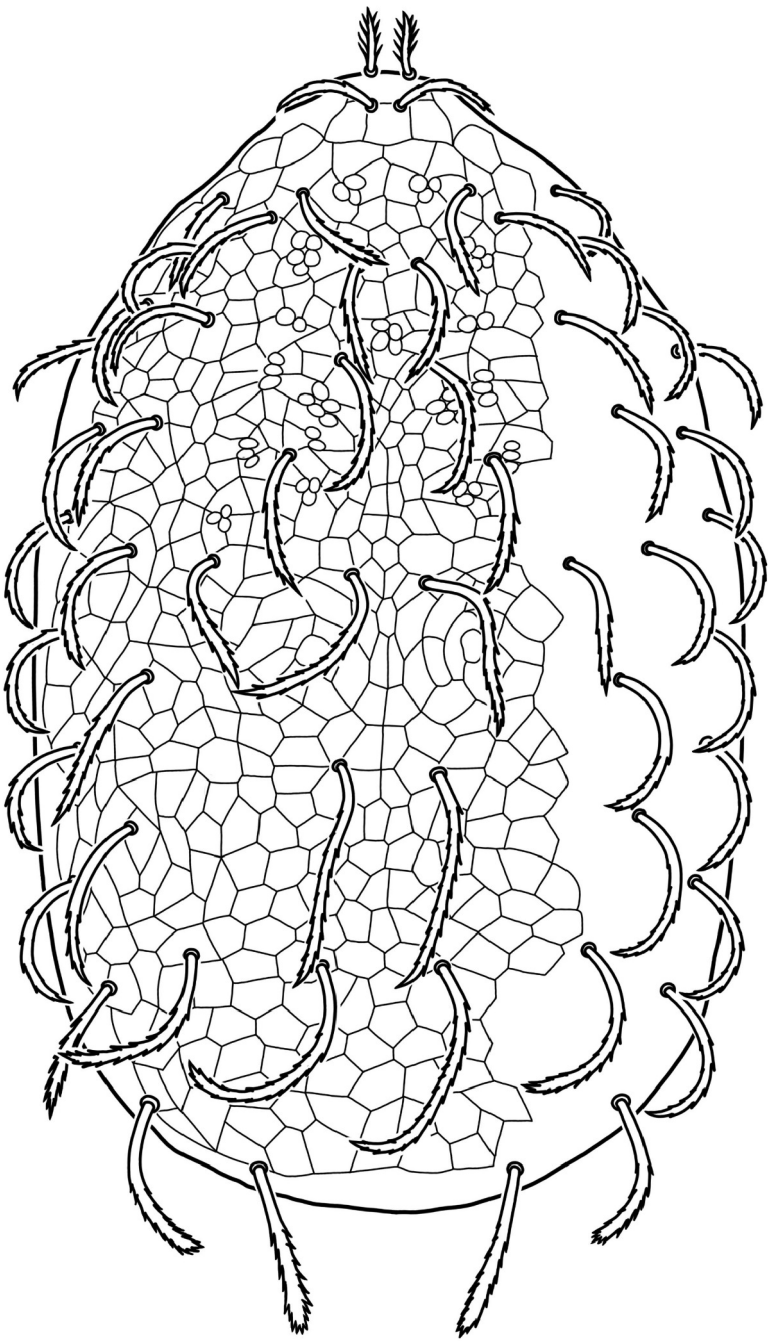

Fig. 38. *Kleemannia delicata* female dorsal side

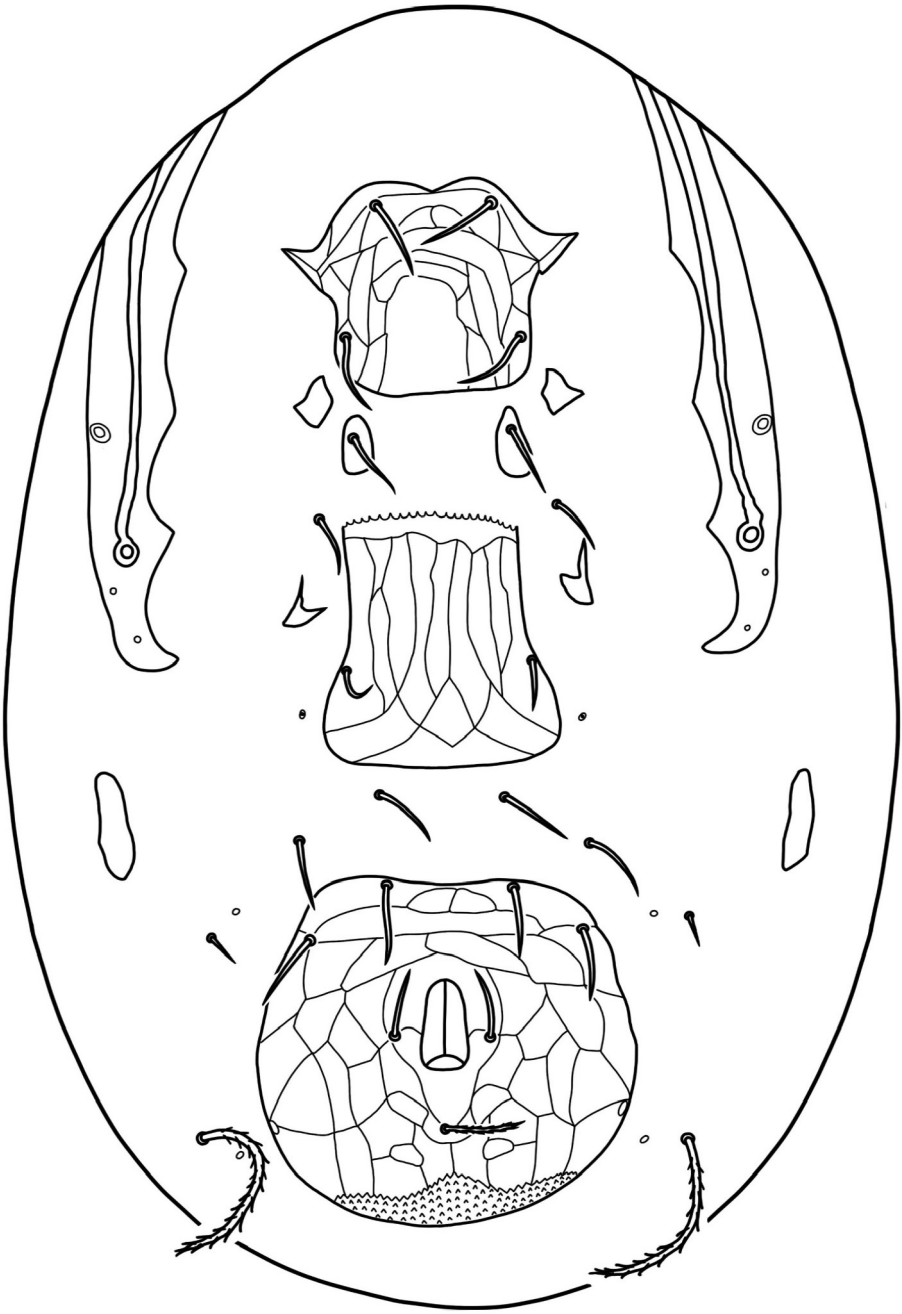

Fig. 39. *Kleemannia delicata* female ventral side

Kleemannia elegans Bernhard, 1963

Synonyms: *Ameroseius elegans* Bernhard, 1963; Karg, 1971a; Bregetova, 1977; Karg, 1993; Błaszak et al., 1997.
Holotype: not designated
Paratypes: not designated
Locus typicus: Germany, Erlangen (in a heap of weed plants of field habitat)
Occurrence in Poland: soil of salt-marshes, **Ciechocinek, Kołobrzeg** (Dziuba, 1972a, b); phoretic on *Microtus arvalis*, **Zubrzyca** (Haitlinger, 1987); in nests of white-tailed sea eagle *Halietus albicilla* (Gwiazdowicz et al., 2005).

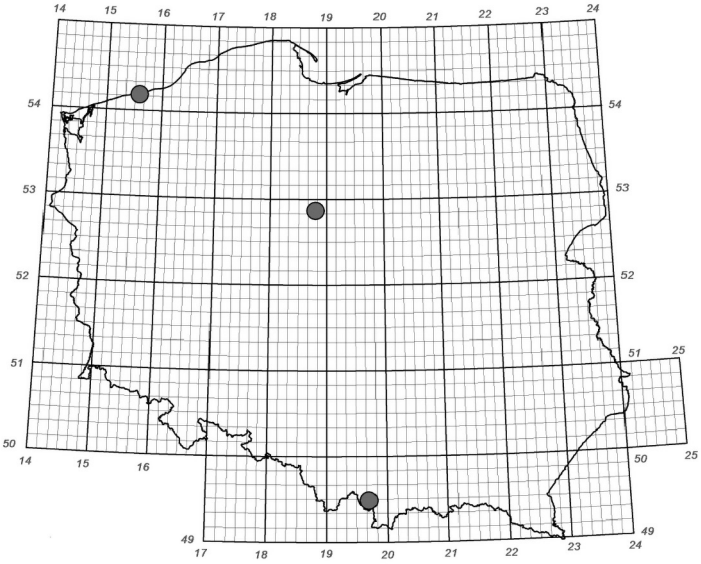

Fig. 40. Occurrence of *Kleemannia elegans* in Poland

Female description

Idiosoma: 430–475 long x 240–290 wide

Dorsum (Fig. 41): dorsal shield entire, oval shaped, covered with a fine reticulation; 29 serrate pairs of setae in total; the longest setae are j6, J2, J4, Z4, Z5 (above 75); vertical j1 setae strongly serrated 26–27; setae length in j–J row increasing from j2 37–39, j3 43–46, j4 50–53, j5 56–59, j6 70–75, J2 and J4 90–100; setae length in z–Z row generally increasing (except Z5) from z3 46–48, z5 50–55, z6 56–59, Z2 70–75, Z3 70–75, Z4 80–85, Z5 70–73; likewise setae in s–S row gradually increasing in lengths: s2 35–40, s3 40–45, s4 47–50, s5 48–52, s6

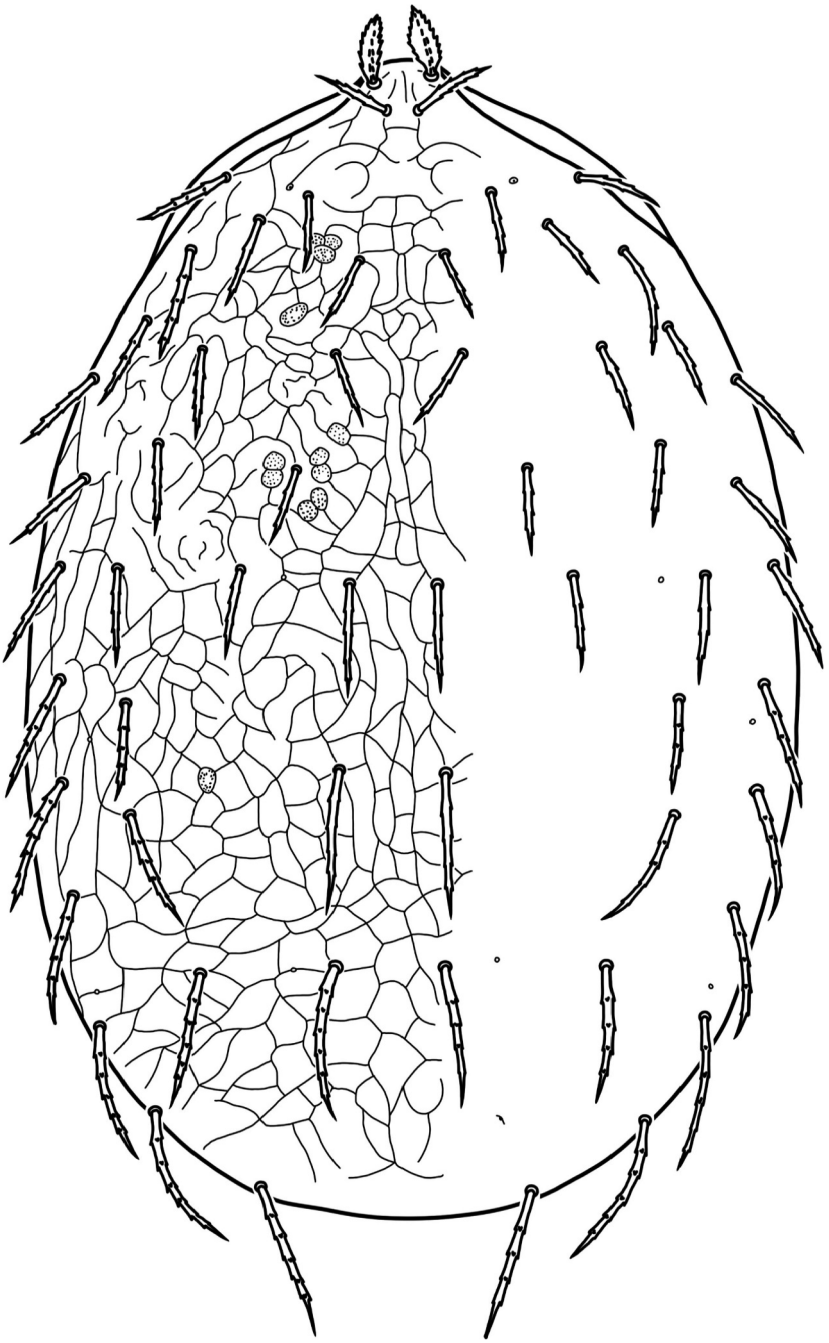

Fig. 41. *Kleemannia elegans* female dorsal side (after Westerboer and Bernhard, 1963)

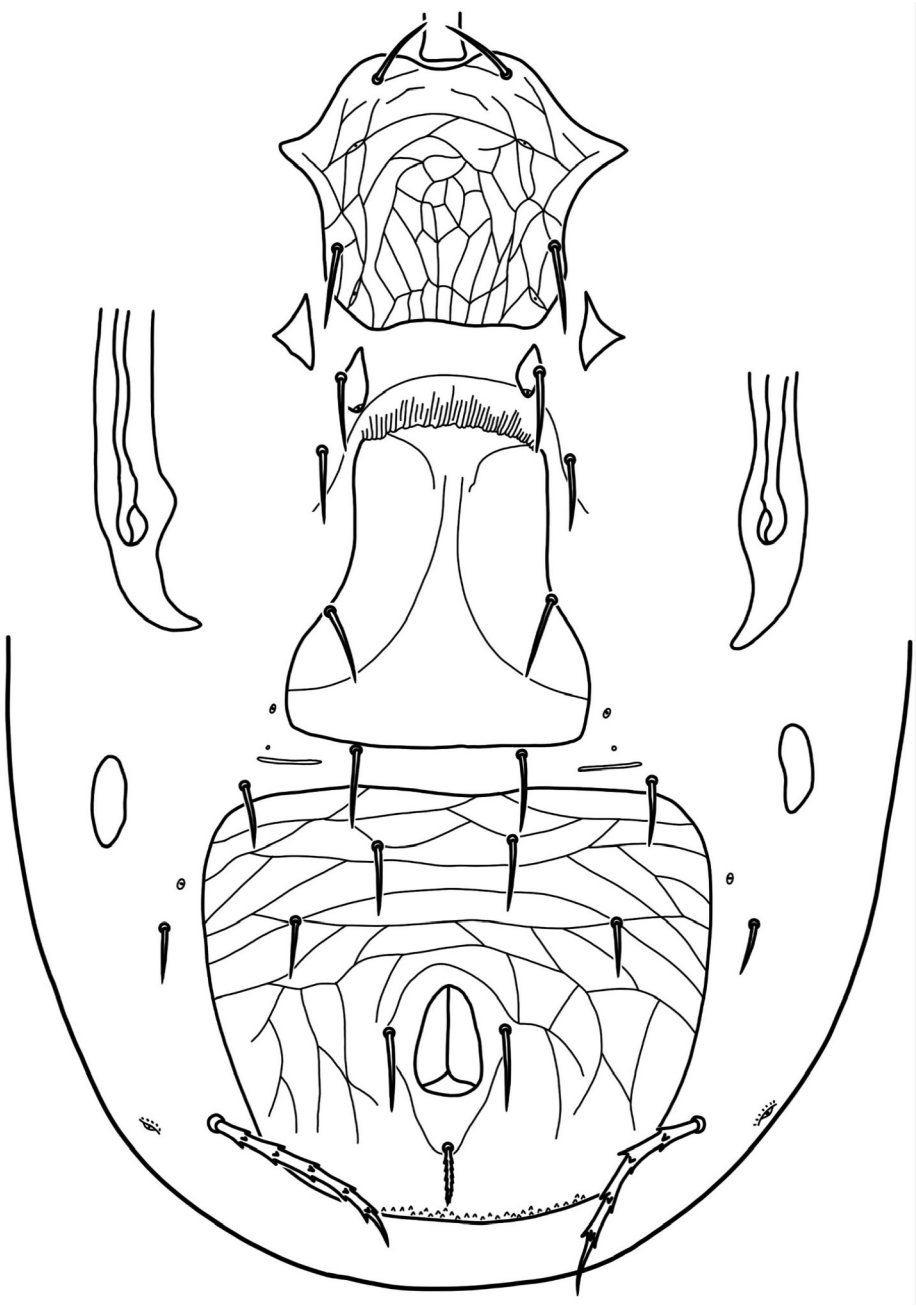

Fig. 42. *Kleemannia elegans* female ventral side (after Westerboer and Bernhard, 1963)

50–54, S1–S3 50–55, S4–S5 54–60; r row setae of almost same lengths: r3–r6 45–50 (clunal seta r3 indifferent).

Venter (Fig. 42): all shields with a delicate ornamentation; sternal shield 73 long x 78 wide with two pairs of simple setae st1–st2 27–30; st3 25–27 on a platelet; st4 24–25 on a membrane; st5 24–26 located on epigynal shield 98–104 long 90–95 wide; metapodal plates elongated 10–12 x 40–43; small triangular and long 'L' shaped endopodal sclerits present; anal shield not much wider (135–145) than long (125–135) with quite large anal opening 20 x 35, simple paraanal setae 25 and longer serrated postanal 30–33 setae; six pairs of opisthogastric setae: simple JV2, JV3 25–26 located on anal shield, JV1, ZV1 21–25 and shorter ZV2 12–13 outside shield, JV5 the longest, serrated, 77–83 located in soft integument.

Gnathosoma: tritosternum base 15–17 with laciniae 60–65; corniculi bifurcate 22–24; hypostomatal setae simple: h1 stout and shorter 21–22, h2–h3 24–26, pcx longer 28–30; tectum triangular with a central spitz; movable digit 23–24 with no visible teeth, fixed digit with 4 sharp teeth; palps 85–90, palpapotele 2-tinned.

Legs: lengths as given: leg I 325–355, leg II 255–290, leg III 255–285, leg IV 325–360 long; pretarsi: leg I 17 leg II 20, leg III 20, leg IV 25 long; number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–10–9; leg IV – 1–5–6–9–10.

Kleemannia insignis Bernhard, 1963

Synonyms: *Ameroseius sichanensis* (sic) Fan and Li, 1993; *Ameroseius sichuanensis* Fan and Li, 1993; *Ameroseius* (*Kleemannia*) *insignis* Hajizadeh et al., 2013; *Ameroseius marginalis* Narita et al., 2015.
Holotype: not designated
Paratypes: not designated
Locus typicus: Germany, Erlangen, Nürnberg (from horse dung, rabbit dung; rotting leaves of northern water hemlock *Cicuta virosa*)
Occurrence in Poland: rotting wood of scots pine *Pinus sylvestris*, **Wielkopolska SW region** (Gwiazdowicz et al., 2011).

Female description

Idiosoma: 280–300 long x 175–190 wide

Dorsum (Fig. 44): dorsal shield entire, oval-shaped, covered with a fine reticulation along with a characteristic granulation; overall 29 pairs of serrate setae;

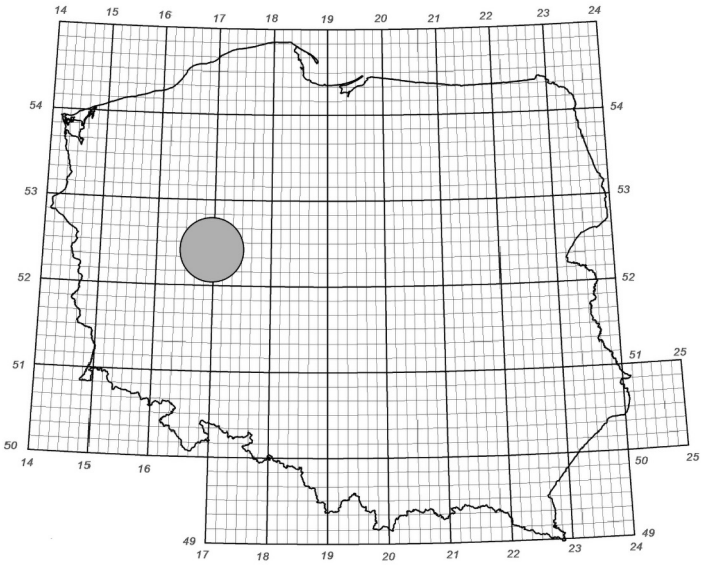

Fig. 43. Occurrence of *Kleemannia insignis* in Poland

the longest setae are J2, J4, Z5 (reaching 40 or above); vertical j1 setae strongly serrated 17–20; setae lengths in j–J row generally increasing from j2 22–25, j3 20–23, j4 23–25, j5 28–30, j6 33–35, the longest J2 46–50, J4 45–48; some setae length in z–Z row differing z3 24–26, z5 28–30, the shortest z6 17–20, Z2 and Z3 27–30, Z4 35–38, Z5 37–40; setae in s–S row of similar lengths, just the latter longer by few: s2 22–25, s3 25–26, s4–s6 24–26, S1–S4 27–30, S5 30–33; r row setae of almost same lengths: r3–r6 24–26.

Venter (Fig. 45): all shields with a delicate ornamentation; sternal shield 45–50 long x 85–95 wide with two pairs of simple setae st1–st2 16–19; st3 13–14 on quite large platelets; st4 11–13 on a membrane; st5 12–14 located on epigynal shield 73–77 long 58-62 wide; metapodal plates 10–12 x 20–23; small triangular and long 'L' shaped endopodal sclerits present; ventrianal shield heart shaped, wider 118–125 than long 83–86 with rather small anal opening 15 x 23, simple paraanal setae 13–15 and longer postanal 16–17 setae; five pairs of opisthogastric setae: simple JV3 14–15 located on anal shield, likewise simple JV1, JV2, ZV1 16–17 outside shield, JV5 the longest 21–23, serrated, located in soft integument.

Gnathosoma: tritosternum base 10–15 with laciniae 40–50; corniculi bifurcate 14–15; all hypostomatal setae simple of similar lenghts: h1 stout, h2–h3, pcx 16–18; tectum triangular with a central spitz; movable digit 18–19 with no visible teeth, fixed digit with 4 sharp teeth; palps 60–65, palpapotele 3-tinned.

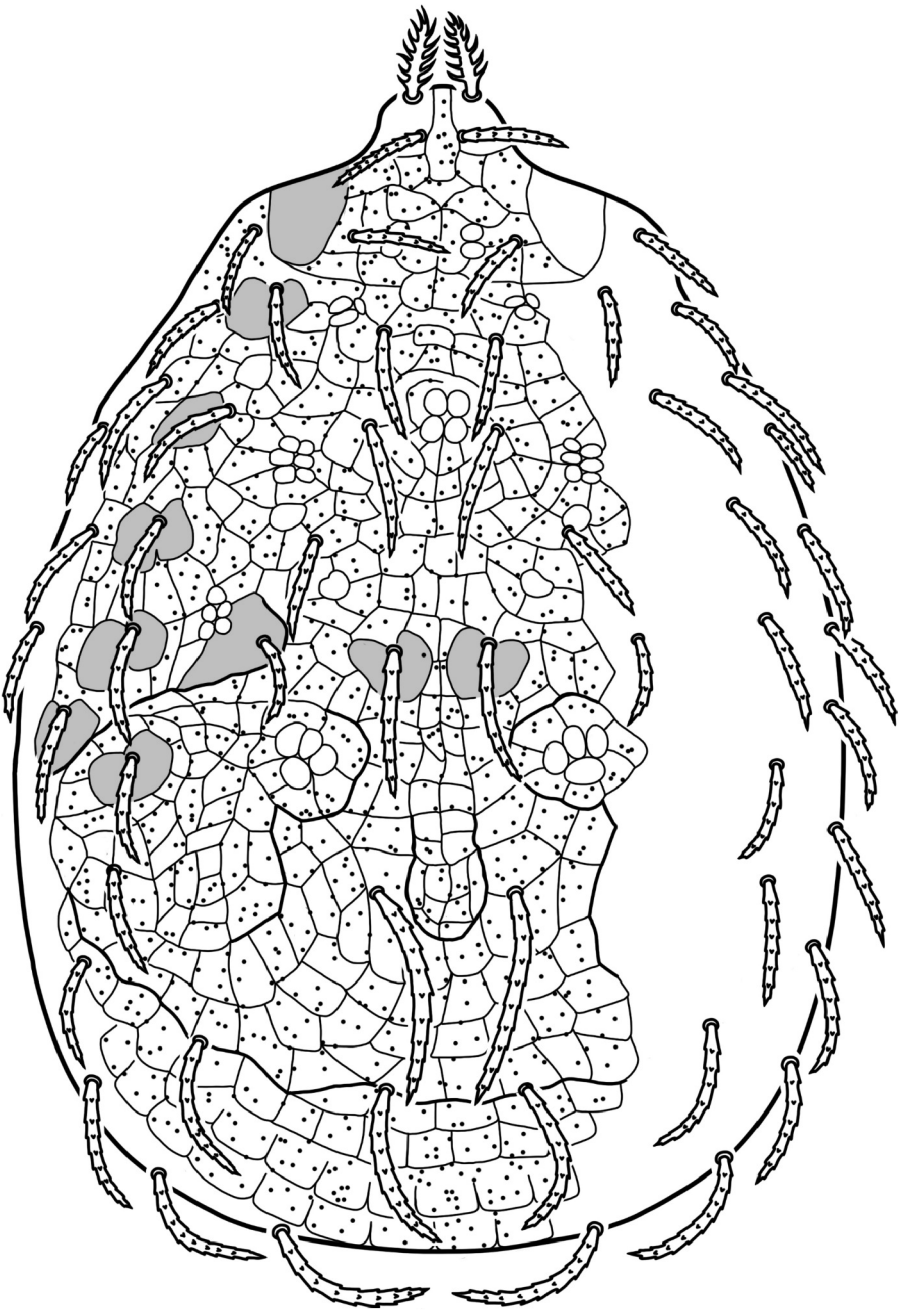

Fig. 44. *Kleemannia insignis* female dorsal side

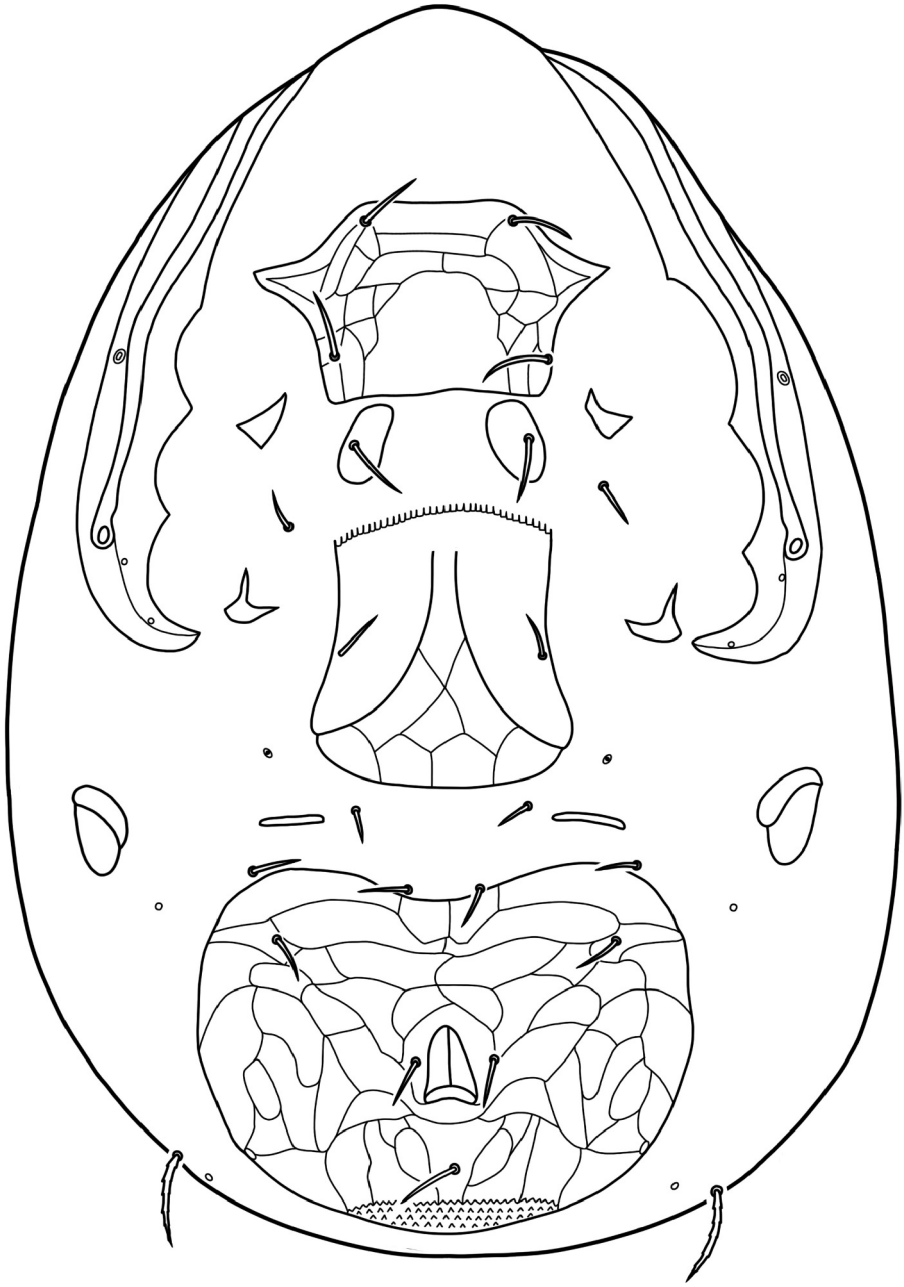

Fig. 45. *Kleemannia insignis* female ventral side

Legs: lengths as given: leg I 230–240, leg II 165–175, leg III 160–170, leg IV 185–195 long; pretarsi: leg I 13 leg II 13, leg III 13, leg IV 15 long; number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–10–9; leg IV – 1–5–6–9–10.

Kleemannia pavida Koch, 1839

Synonyms: *Zercon pavidus* C. L. Koch, 1839; *Seiulus plumosus* Oudemans, 1902; *Hypoaspis pavidus* Oudemans, 1902; Berlese, 1904; *Kleemannia pavidus* Oudemans, 1930; *Ameroseius pavidus* Westerboer and Bernhard, 1963; Karg, 1971a; Bregetova, 1977; Karg, 1993; Błaszak et al., 1997; *Ameroseius lanceosetis* Livshits and Mitrofanov, 1975; Ma, 1996; Hajizadeh et al., 2013; *Ameroseius* (*Kleemannia*) *lanceosetis* Hajizadeh et al., 2013.
Holotype: not designated
Paratypes: not designated
Syntypes: ZMB: 40282, ZMH: A41/73 **Museum** für Naturkunde **Berlin**
Locus typicus: Germany, unspecified substrate in houses, especially stables, in hay and straw
Occurence in Poland: soil, **Dolinka Murckowska** (Madej, 1988)

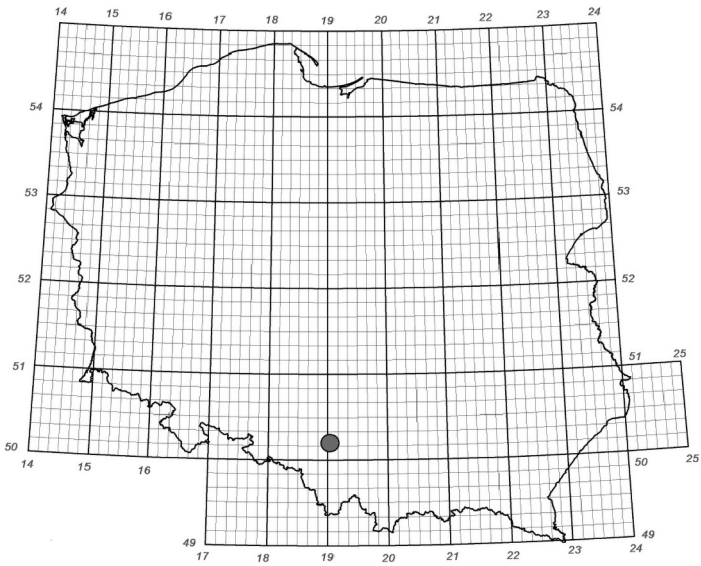

Fig. 46. Occurrence of *Kleemannia pavida* in Poland

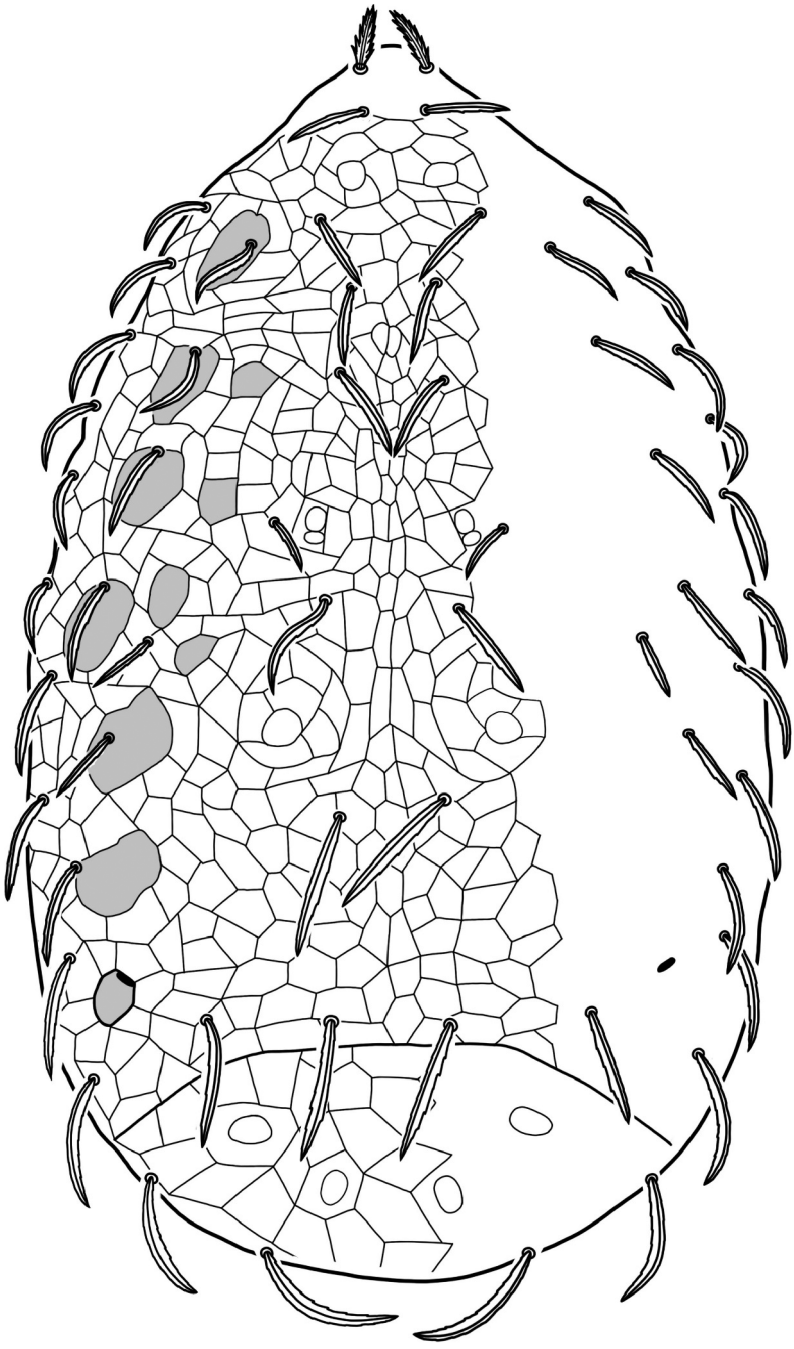

Fig. 47. *Kleemannia pavida* female dorsal side

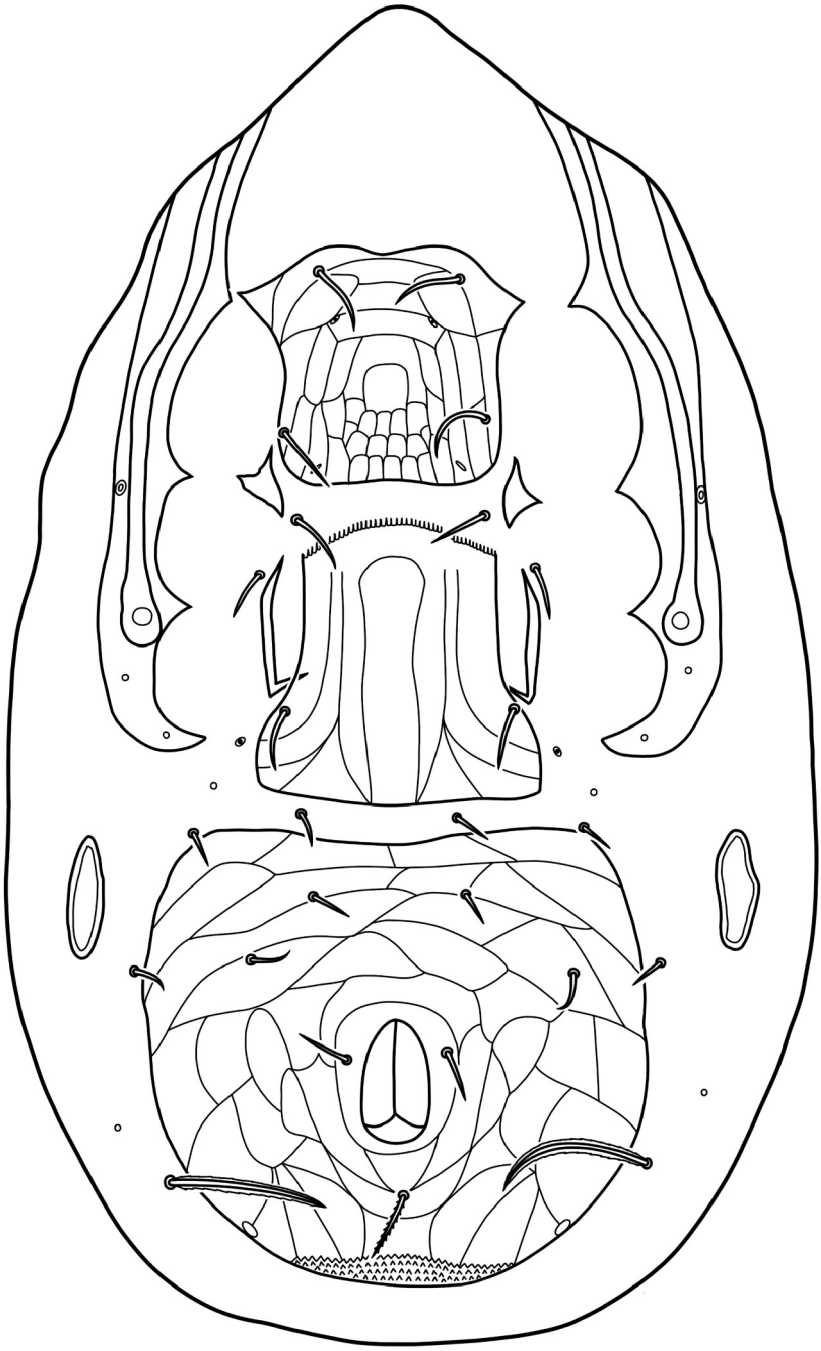

Fig. 48. *Kleemannia pavida* female ventral side

Female description

Idiosoma: 375–410 long x 235–265 wide

Dorsum (Fig. 47): dorsal shield entire, oval-shaped, covered with a fine reticulation and shallow fossae along sides; 29 pairs of serrate setae in total; the longest setae are J2, J4, Z5, S5 (reaching 50 or above); vertical j1 setae strongly serrated 23–26; setae lengths in j–J row increasing from j2 27–32, j3 30–33, j4 28–32, j5 31–34, j6 38–42, the longest J2 47–57, J4 48–58; setae in z–Z row different in lengths z3 30–35, z5 24–29, z6 25–30, Z2 28–35, Z3 35–45, Z4 46–53, Z5 48–53; setae in s–S row of as follow: s2 28–32, s3 31–34, s4 33–36, s5 35–40, s6 37–42, S1–S4 35–43, S5 43–50; r row setae of almost same lengths: r3–r6 32–38. **Venter** (Fig. 48): all shields delicately ornamented; sternal shield 69–77 long x 95–105 wide with two pairs of simple setae st1–st2 23–25; st3 22–24 on platelets; st4 22–23 on a membrane; st5 19–22 located on epigynal shield 78–86 long 75–80 wide; metapodal plates with a specific upper margin 10–12 x 20–23; small triangular and long 'L' shaped endopodal sclerits present; ventrianal shield large, not much wider 138–143 than long 125–130 with large anal opening 33 x 20, simple paraanal setae 19–21 and longer barbed postanal 20–21 setae; six pairs of opisthogastric setae: simple JV2 and JV3 14–15 located on ventrianal shield, likewise simple JV1, ZV1, ZV2 10–14 outside shield, JV5 the longest 45–55, serrated, located in soft integument.

Gnathosoma: tritosternum base 11–13 with laciniae 47–52; corniculi bifurcate 16–17; all hypostomatal setae simple of similar lengths: h1 stout, h2–h3, pcx 20–24; tectum triangular with a central spitz and rows of denticles; movable digit 21–22 with no visible teeth, fixed digit with 4 sharp teeth; palps 70–75, palpapotele 3-tinned.

Legs: lengths as given: leg I 260–300, leg II 210–255, leg III 205–250, leg IV 270–315 long; pretarsi: leg I 18 leg II 19, leg III 19, leg IV 20 long; number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–10–9; leg IV – 1–5–6–9–10.

Kleemannia plumea Oudemans, 1930

Synonyms: *Seiulus plumosus* Oudemans, 1902; *Ameroseius plumeus* Westerboer and Bernhard, 1963; *Ameroseius plumea* Shcherbak (in Bregetova 1977, 149) Błaszak et al., 1997; Ehrnsberger and Błaszak, 1999; Kazemi and Rajaei, 2013; Nemati et al., 2013; Narita et al., 2015; *Ameroseius tauricus* Livshits and Mitrofanov, 1975.
Holotype: not designated

Paratypes: not designated

Syntypes: ACA.P.4300 National Museum of Natural History, Naturalis Biodiversity Center, Leiden, Netherlands.

Locus typicus: Netherlands, Arnhem – on red squirrel *Sciurus vulgaris*

Occurrence in Poland: rotting wood of common fir silver fir *Abies alba*, **Pieniny National Park** (Skorupski and Gwiazdowicz, 1996, 1998; Błaszak et al., 2000); in moss and lichens, **Tatra National Park** (Gwiazdowicz, 2010); rotting wood of scotch pine *Pinus sylvestris*, **Wielkopolska SW region** (Gwiazdowicz et al., 2011); inside tree-hollows of horse chestnut *Aesculus hippocastanum* and small-leaved lime *Tilia cordata*, **Bydgoszcz, Kcynia** (Kaczmarek et al., 2011).

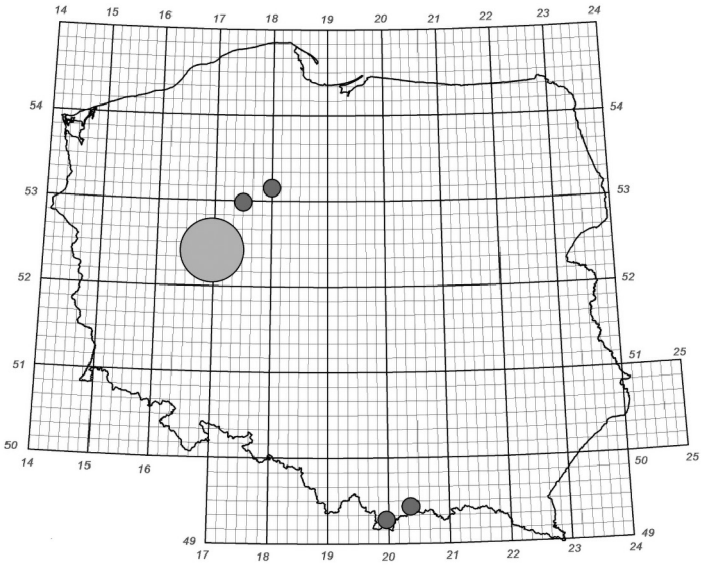

Fig. 49. Occurrence of *Kleemannia plumea* in Poland

Female description

Idiosoma: 325–370 long x 220–240 wide

Dorsum (Fig. 50): dorsal shield entire, oval shaped, covered with a fine reticulation and shallow fossae along sides and midline anterior part; 29 pairs of serrate setae in total; the longest setae are j6, J2, J4, Z5, S5 (reaching 50 or above); vertical j1 setae densely barbed 18–20; setae lengths in j–J row gradually increasing (except j4) from j2 28–32, j3 30–34, j4 24–26, j5 44–48, j6 51–59, J2 61–67, J4 64–68; setae in z–Z row different in lengths z3 33–36, z5 33–39, z6 28–30, Z2 33–39, Z3 34–39, Z4 40–45, Z5 45–50; setae in s–S row of as follow:

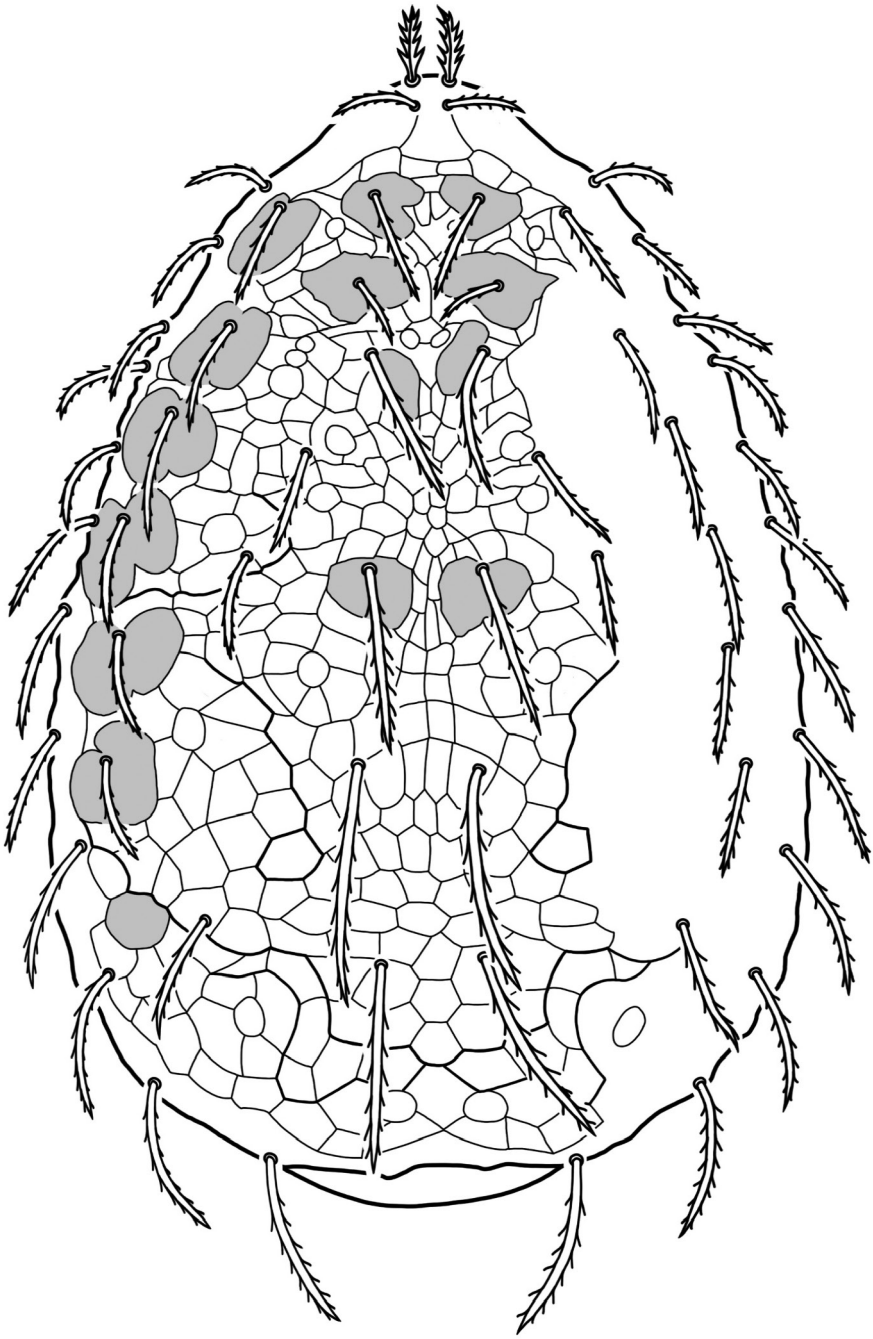

Fig. 50. *Kleemannia plumea* female dorsal side

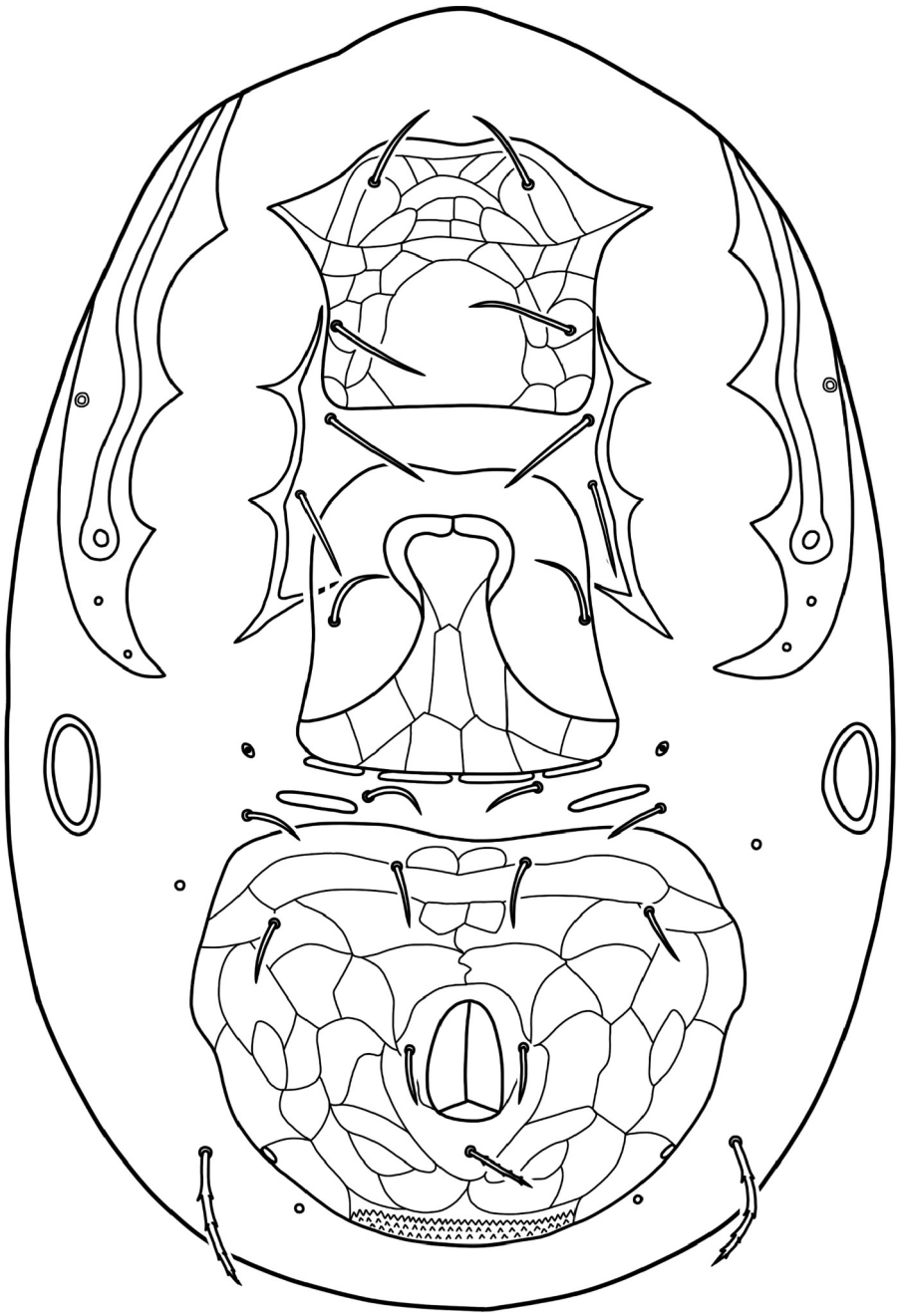

Fig. 51. *Kleemannia plumea* female ventral side

s2 28–31, s3 30–35, s4 38–44, s5 43–48, s6 38–44, S1–S4 38–44, S5 44–50; r row setae lengths ranges: r3–r6 37–44.

Venter (Fig. 51): all shields with a reticulate pattern; sternal shield 70–75 long x 95–105 wide with two pairs of simple setae st1–st2 25–29; st3 23–25 and st4 23–26 on a soft membrane; st5 20–23 located on epigynal shield 88–93 long 90–95 wide, with a characteristic and strongly marked "omega" opening; metapodal plates quite large 13–15 x 35–36; endopodal sclerits fused with "L" shaped sclerits, running from st2 to st5 outside sternal and epigynal shields; ventrianal shield large, heart shaped, wider 160–165 than long 120–125 with large anal opening 30 x 20, simple paraanal setae 19–20 and barbed postanal 18–19 setae; five pairs of opisthogastric setae: simple JV2 and JV3 18–19 located on ventrianal shield, likewise simple JV1, ZV1 16–18 outside shield, JV5 the longest 33–38, serrated, located in soft integument.

Gnathosoma: tritosternum base 12–15 with laciniae 45–50; corniculi bifurcate 18–19; all hypostomatal setae simple of lenghts: stout h1 18–20, h2–h3 18–19, pcx 23–25; tectum triangular with a central spitz; movable digit 22–23 with no visible teeth, fixed digit with 4 sharp teeth; palps 75–80, palpapotele 2-tinned.

Legs: lengths as given: leg I 240–265, leg II 200–225, leg III 200–230, leg IV 250–265 long; pretarsi: leg I 17 leg II 18, leg III 18, leg IV 20 long; the number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–10–9; leg IV – 1–5–6–9–10.

Kleemannia plumigera Oudemans, 1930

Synonyms: *Zercoseius gracei* Hughes, 1948; *Zercoseius gracei* Turk, 1953; *Zercoseius plumigera* Evans, 1954; *Lasioseius* (*Zercoseius*) *gracei* Womersley, 1956; *Kleemannia delicata* Schweizer, 1961; *Kleemania* (sic) *plumigera* Hughes, 1961; *Ameroseius plumigerus* Karg, 1971a, 1993; Błaszak et al., 1997; Kazemi and Rajaei, 2013; Nemati et al., 2013; *Ameroseius plumigera* Bregetova, 1977; Narita et al., 2013; *Ameroseius gilarovi* Petrova (in Petrova and Koshchanova, 1986, 31), 1986; Koshanova, 1987; *Ameroseius* (*Kleemannia*) *plumigerus* Hajizadeh et al., 2013.

Holotype: not designated

Paratypes: not designated

Syntypes: RMNH: ACA.P.4301 National Museum of Natural History, Naturalis Biodiversity Center, Leiden, Netherlands

Locus typicus: Netherlands, Helder (from common eelgrass *Zostera marina*)

Occurrence in Poland: in coffee *Coffea arabica* grains imported from Kamerun, **Szczecin** (Chmielewski, 1971); in dust on deep sea ships (Wegner, 1980);

phoretic on *Microtus arvalis*, **Zubrzyca** (Haitlinger, 1987); soil, **Dolinka Murckowska** (Madej, 1988); soil with litter in beech forest, **Gorce National Park** (Szymkowiak, 1998); **Babiogórski National Park** (Skorupski et al., 2004).

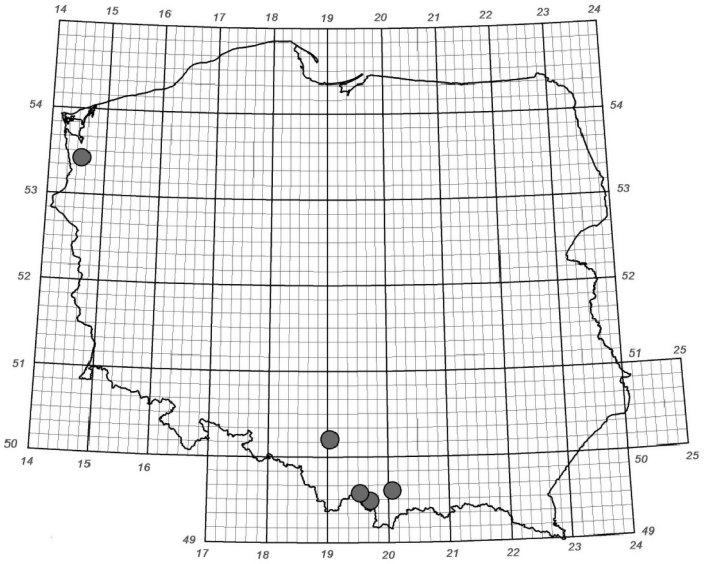

Fig. 52. Occurrence of *Kleemannia plumigera* in Poland

Female description

Idiosoma: 415–450 long x 260–280 wide

Dorsum (Fig. 53): dorsal shield entire, oval shaped, covered with a fine reticulation and shallow fossae along sides; 29 pairs of serrate setae in total; the longest setae are J2, J4, Z4 (75 and above); vertical j1 setae densely serrate 26–28; setae lengths in j–J row gradually increasing from j2 32–34, j3 37–40, j4 40–45, j5 44–48, j6 67–70, J2 80–85, J4 85–90; setae in z–Z row different in lengths z3 40–45, z4 45–50, z5 40–45, z6 44–48, Z2 61–64, Z3 62–68, Z4 70–75, Z5 58–65; setae in s–S row gradually increasing from s2 34–36, s3 41–43, s4 38–40, s5 47–50, s6 49–50, S1–S4 48–52, S5 53–58; r row setae lengths ranges: r4 38–40, r5 45–49, r6 40–43.

Venter (Fig. 54): all shields ornamented with a reticulate pattern; sternal shield 75–85 long x 100–105 wide with two pairs of simple setae st1–st2 27–30; st3 25–27 on platelets, st4 23–25 on a soft membrane; st5 23–25 located on truncate epigynal shield 80–90 long 83–88 wide; metapodal plates elongated

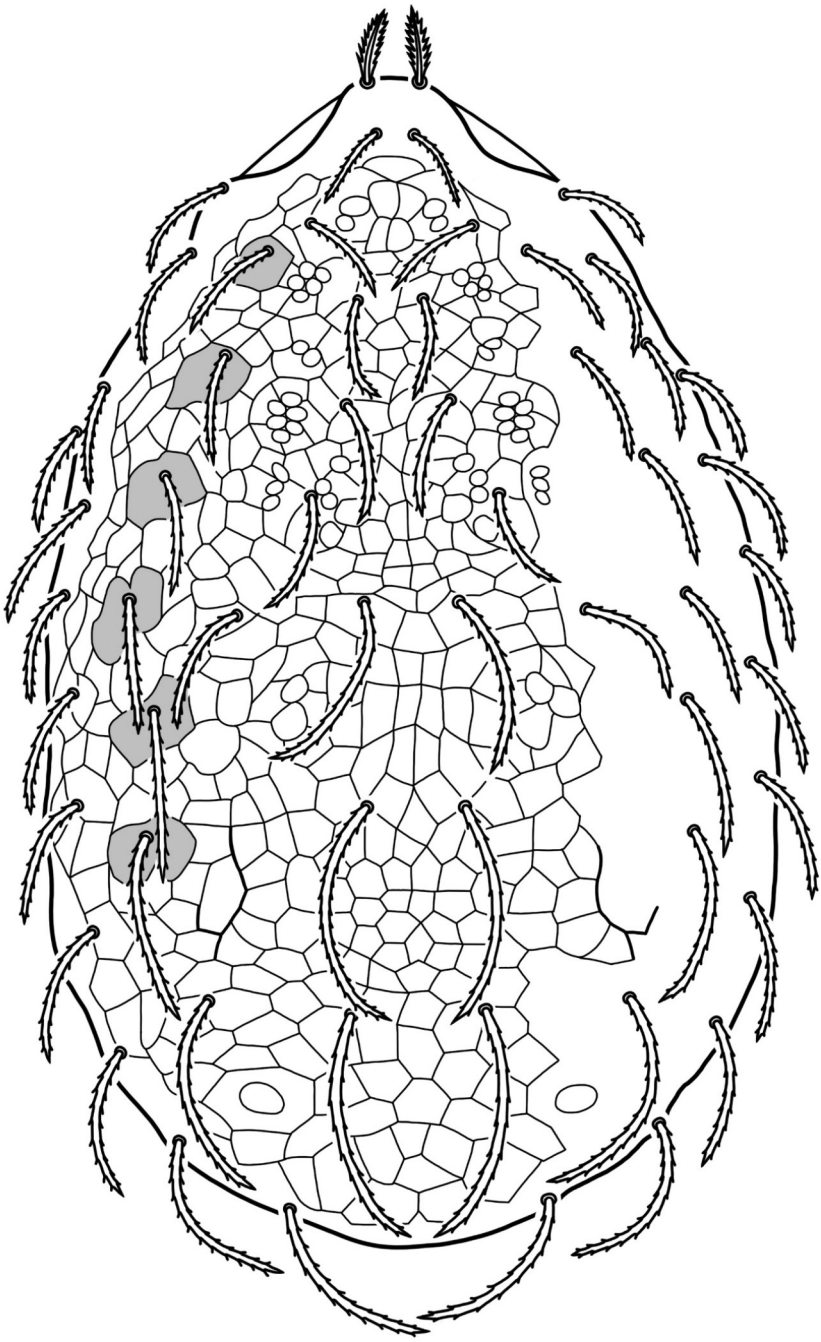

Fig. 53. *Kleemannia plumigera* female dorsal side

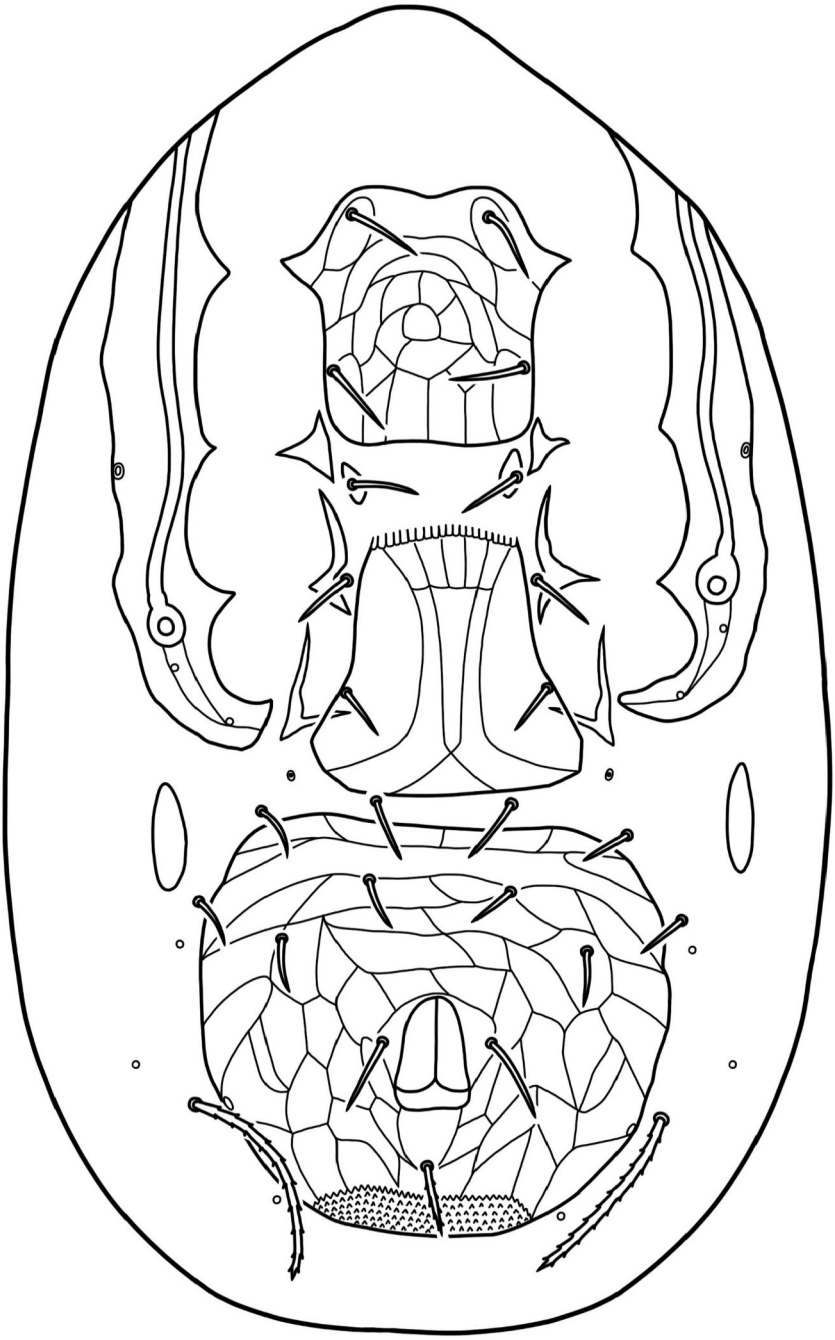

Fig. 54. *Kleemannia plumigera* female ventral side

10–11 x 37–40; endopodal sclerits and "L" shaped sclerits, visible; ventrianal shield almost as wide 135–140 as long 130–140 with large anal opening 35 x 25, simple paraanal setae 23–25 and barbed postanal 27–30 setae; six pairs of opisthogastric setae: simple JV2 and JV3 14–16 located on ventrianal shield, JV1 19–20, ZV1, ZV2 14–16 outside shield, JV5 the longest 63–67, serrated, located in soft integument.

Gnathosoma: tritosternum base 14–16 with laciniae 55–60; corniculi bifurcate 22–23; all hypostomatal setae simple: stout h1 18–20, h2–h3 20–22, pcx 25–27; tectum triangular with a central spitz; movable digit 20–22 with no visible teeth, fixed digit with 4 sharp teeth; palps 83–87, palpapotele 2-tinned.

Legs: lengths as given: leg I 325–335, leg II 245–255, leg III 245–255, leg IV 325–335 long; pretarsi: leg I 20 leg II 19, leg III 19, leg IV 22 long; number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–10–9; leg IV – 1–5–6–9–10.

Kleemannia plumosa Oudemans, 1902

Synonyms: *Seiulus plumosus* Oudemans, 1902; Berlese, 1904; Moraes et al., 2016; *Lasioseius plumosus* Hull, 1918; *Ameroseius dubitatus* Berlese, 1918; *Kleemannia plumosus* Oudemans, 1930; Domrow, 1974; Hughes, 1976; *Zercoseius macauleyi* Hughes, 1948; Turk, 1953; *Zercoseius plumosus* Turk, 1953; Evans, 1954; *Zercoseius macauleyi*; *Lasioseius* (*Zercoseius*) *macauleyi* Womersley, 1956; *Kleemania* (sic) *plumosus* Hughes, 1961; *Lasioseius macauleyi* Westerboer and Bernhard, 1963; *Ameroseius dubiatus* (sic) Westerboer and Bernhard, 1963; Solomon, 1969; *Ameroseius plumosus* Westerboer and Bernhard 1963, Karg 1971a, Bregetova 1977, Karg 1993, Błaszak et al., 1997; Narita et al., 2013; Kazemi and Rajaei, 2013; Nemati et al., 2013; Khalili-Moghadam and Saboori, 2014, 2016; *Kleemannia maculeyi* (sic) Bhattacharya, 1972; *Ameroseius dubitatus* Castagnoli and Pegazzano, 1985.

Holotype: not designated

Paratypes: not designated

Syntypes: RMNH: ACA.P.4303 Zool. Lab. Nijmegen. National Museum of Natural History, Naturalis Biodiversity Center, Leiden, Netherlands

Locus typicus: Netherlands, Sneek (on pond bat *Vespertilio dasycneme*)

Occurrence in Poland: in coffee *Coffea arabica* grains imported from Kamerun, **Szczecin** (Chmielewski, 1971); in dust on sea-going ships (Wegner, 1980); soil with sod of grass, **Słońsk Nature Reserve** (Madej, 2000); rotting wood, **Wielkopolski National Park** (Skorupski, 2001); phoretic on *Mus*

musculus, **Pajęczno** (Haitlinger and Turek, 2006); phoretic on *Bombus lapidarius* (Haitlinger, 2008a); rotting wood of scotch pine *Pinus sylvestris*, **Wielkopolska SW region** (Gwiazdowicz et al., 2011).

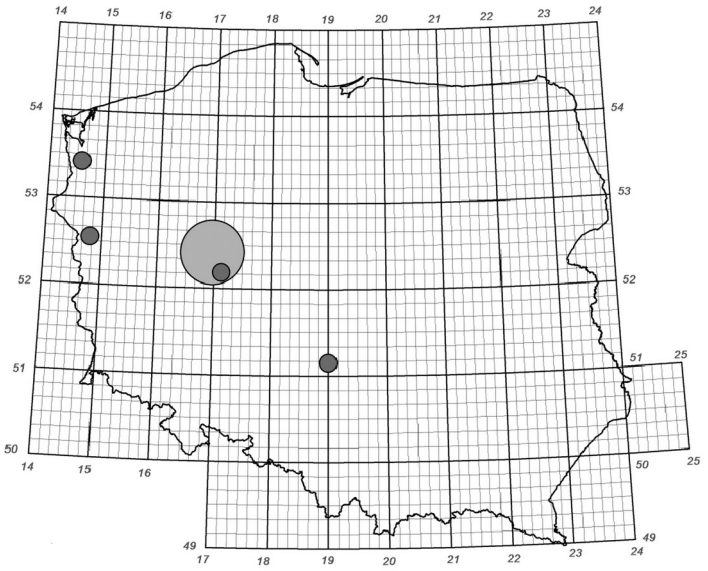

Fig. 55. Occurrence of *Kleemannia plumosa* in Poland

Female description

Idiosoma: 415–450 long x 260–280 wide

Dorsum (Fig. 56): oval shaped, dorsal shield entire, reticulated pattern covering the surface, some shallow fossae emerging on the anterior part only; totally 29 pairs of leaflike setae with serrated margins; vertical j1 setae alike 21–23; the longest setae are j6, J2, J4, Z4, Z5 (reaching 50 and above); setae lengths in j–J row gradually increasing from j2 25–28, j3 30–33, j4 33–36, j5 42–47, j6 57–62, J2 60–65, J4 60–65; setae in z–Z row of different lengths z3 31–35, z5 45–50, z6 43–48, Z2 40–45, Z3 47–52, Z4 50–55, Z5 54–56; setae lengths in s–S row increasing from s2 30–32, s3 36–39, s4 36–40, s5 42–47, s6 43–47, S1–S4 45–48, S5 47–50; r row setae lengths ranges: r3 33–38, r4 30–35, r5 38–40, r6 36–39.

Venter (Fig. 57): three main shields manifest a reticulate ornamentation; sternal shield with a characteristic "omega" sclerotisation, 80–90 long x 110–115 wide with two pairs of simple setae st1–st2 26–28; st3 24–25 on platelets, st4 22–23on a soft membrane; st5 23–25 located on truncate epigynal shield *ca*. 85 long 90–100 wide; metapodal plates elongated 8–10 x 35–40; endopodal

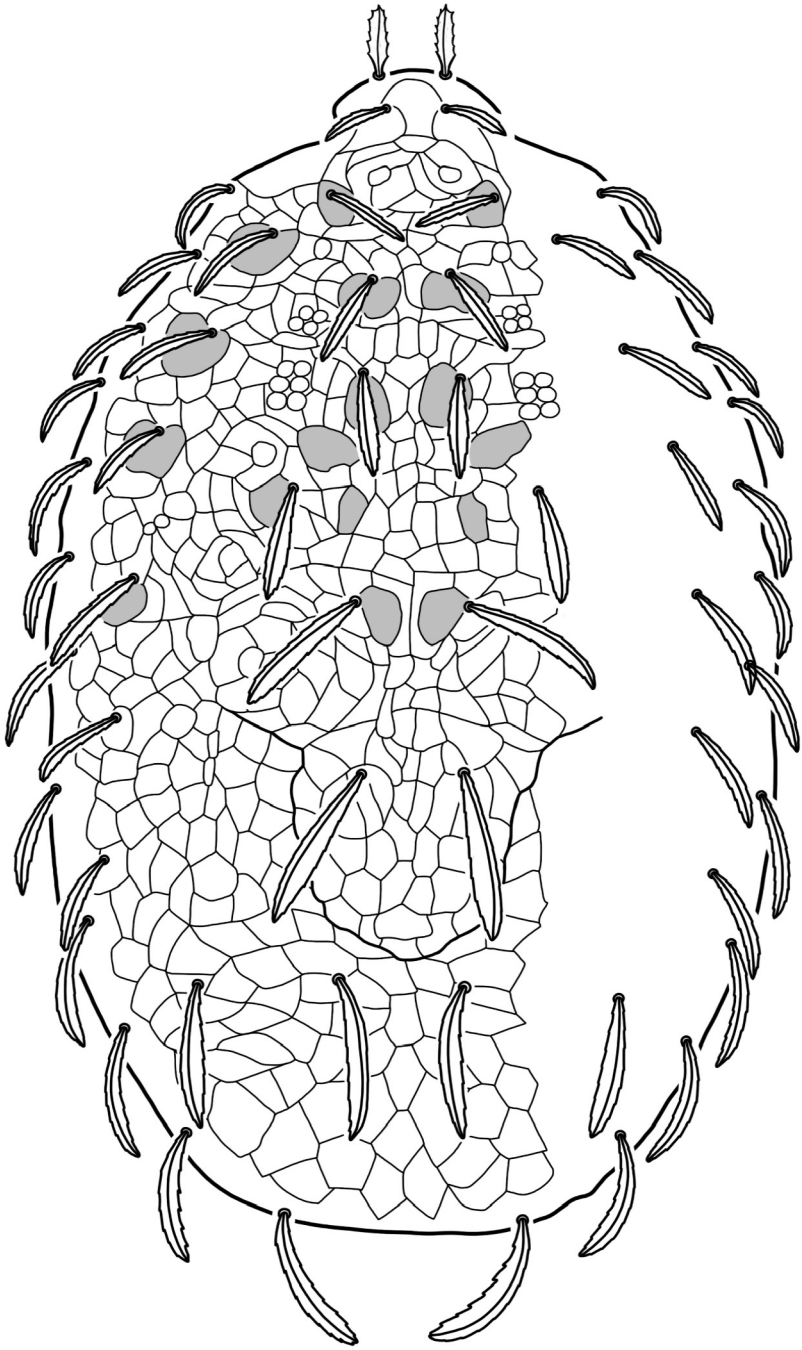

Fig. 56. *Kleemannia plumosa* female dorsal side

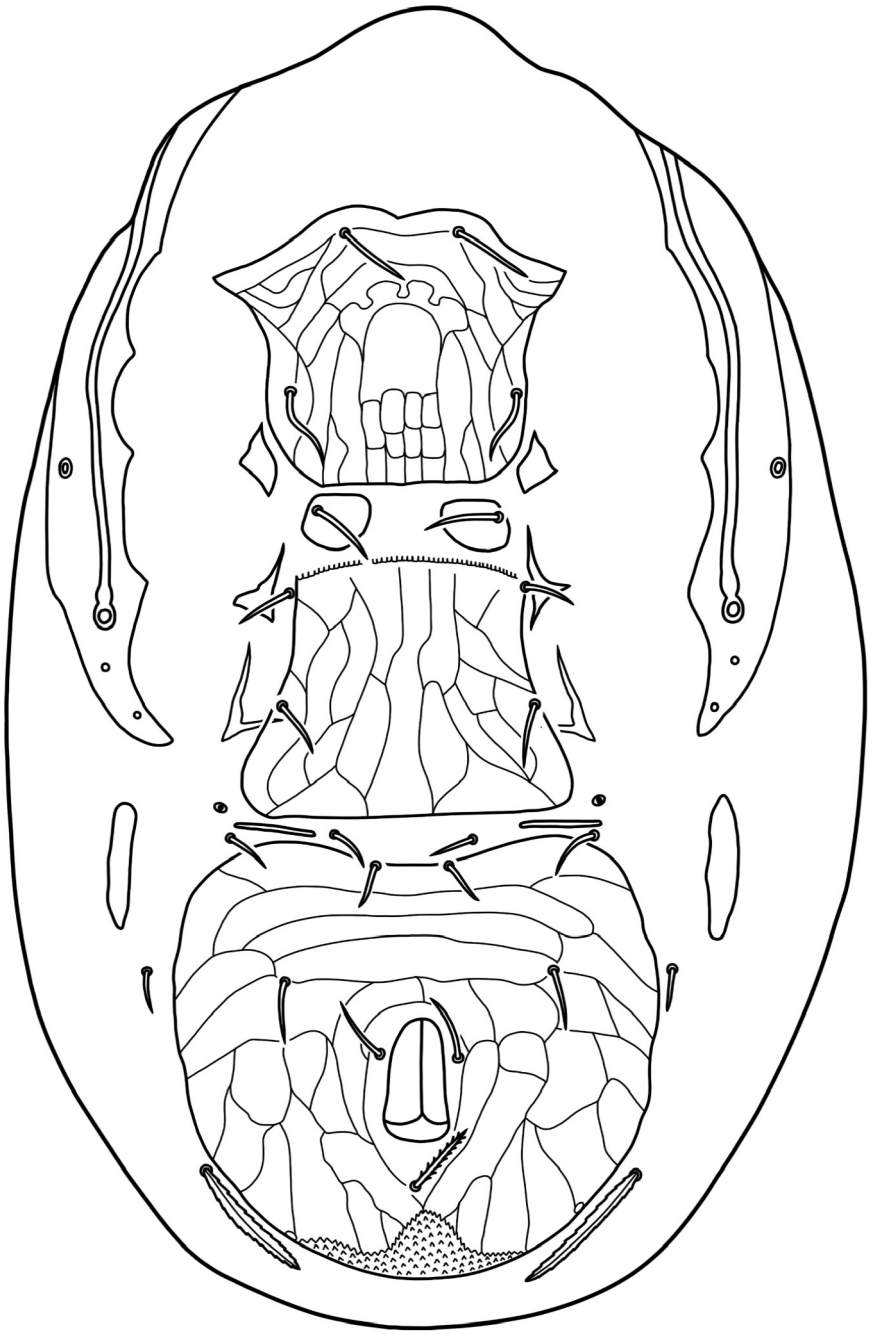

Fig. 57. *Kleemannia plumosa* female ventral side

sclerits and "L" shaped sclerits, present; ventrianal shield wider *ca*. 150 than long 125–130 with large anal opening 35 x 20, simple paraanal setae 18–20 and barbed postanal 25–26 setae; six pairs of opisthogastric setae: simple JV2 17–19 located on the edge on ventrianal shield and JV3 16–17; JV1 18–19, ZV1 15–16, ZV2 7–8 outside shield, JV5 the longest 63–66, leaflike with serrated margins, located in soft integument.

Gnathosoma: tritosternum base 19–20 with laciniae 45–50; corniculi trifurcate 21–23; all hypostomatal setae simple: stout h1 23–24, h2 16–18, h3 21–23, pcx 25–26; tectum triangular with a long central spitz; movable digit 21–23 with no visible teeth, fixed digit with 4 sharp teeth; palps 78–83, palpapotele 2-tinned.

Legs: lengths as given: leg I 315–335, leg II 245–255, leg III 240–250, leg IV 320–330 long; pretarsi: leg I 20, leg II 19, leg III 19, leg IV 23 long; number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–10–9; leg IV – 1–5–6–9–10.

Kleemannia pseudoplumosa Rack, 1972

Synonyms: *Primoseius macauleyi* Womersley, 1956; *Ameroseius pseudoplumosus* Rack, 1972; *Ameroseius eumorphus* Bregetova, 1977; *Kleemannia potchefstroomensis* Kruger and Loots, 1980; *Kleemannia plumosus* Zaher, 1986; *Ameroseius* (*Kleemannia*) *eumorphus* Hajizadeh et al., 2013; *Ameroseius eumorphus* Narita et al., 2013b; Kazemi and Rajaei, 2013; Nemati et al., 2013; Khalili-Moghadam and Saboori, 2016: 538. *Ameroseius potchefstroomensis* Narita et al., 2013b: 2325; Khalili-Moghadam and Saboori, 2016; *Ameroseius pseudoplumosus* Kazemi and Rajaei, 2013; Nemati et al., 2013; Khalili-Moghadam and Saboori, 2016.

Type depository: Zoologischen Institut und Zoologischen Museum der Universität Hamburg, Germany

Type locality: Germany, Bischofsheim (at Frankfurt am Main), in new building

Occurrence in Poland: phoretic on *Mus musculus*, **Pajęczno** (Haitlinger and Turek, 2006).

Female description

Idiosoma: 410 long x 235 wide

Dorsum (Fig. 59): dorsal shield entire and oval shaped, with a fine reticulate pattern ornamentation on the entire surface, mediocre fossae; total of 29 pairs of serrate setae; vertical j1 setae leaflike 23 with a serrated margin; the longest setae

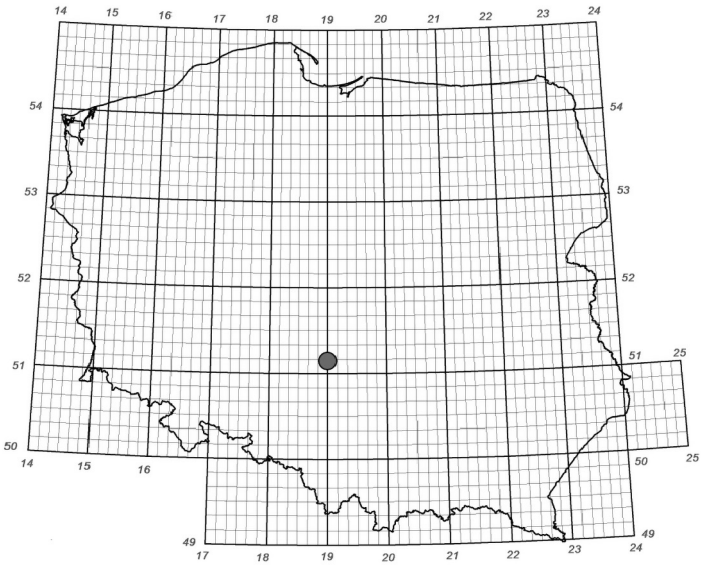

Fig. 58. Occurrence of *Kleemannia pseudoplumosa* in Poland

are J2, J4, Z4, Z5, S4, S5 (reaching 50 and above); setae lengths in j–J row around j2–j5 23–27, j6 30, J2 50, J4 57; setae in z–Z row of different lengths z3 and z5 30, Z4 52, Z5 60; setae lengths in s row from 30 to 38, in S row described S1–S3 38–42, S4 up to 50 and S5 54; r row setae lengths range from 30 to 33.

Venter (Fig. 60): ventral shields ornamented; sternal shield wider than long with two pairs of simple setae st1–st2 23; st3 21 on platelets, st4 21on a soft membrane; st5 20–22 located on truncate epigynal shield; metapodal plates small; endopodal sclerits and "L" shaped sclerits not drawn; ventrianal shield wider than long with large anal opening, simple paraanal setae 21and barbed postanal setae; six pairs of opisthogastric setae: simple JV2 21and JV3 located on the edge on ventrianal shield; JV1 23, ZV1 21 outside shield, JV5 the longest 64, serrate, located in soft integument.

Gnathosoma: tritosternum base with bifurcate laciniae; corniculi bifurcate; all hypostomatal setae simple: stout h1, h2, h3 and pcx thin; tectum triangular without a central spitz either dentate or smooth (sic); movable digit with no visible teeth, fixed digit with 4 sharp teeth; palps and palpapotele unknown.

Legs: lengths as given: leg I 340, leg II 245, leg III 242, leg IV 315 long; number of setae per segment not confirmed.

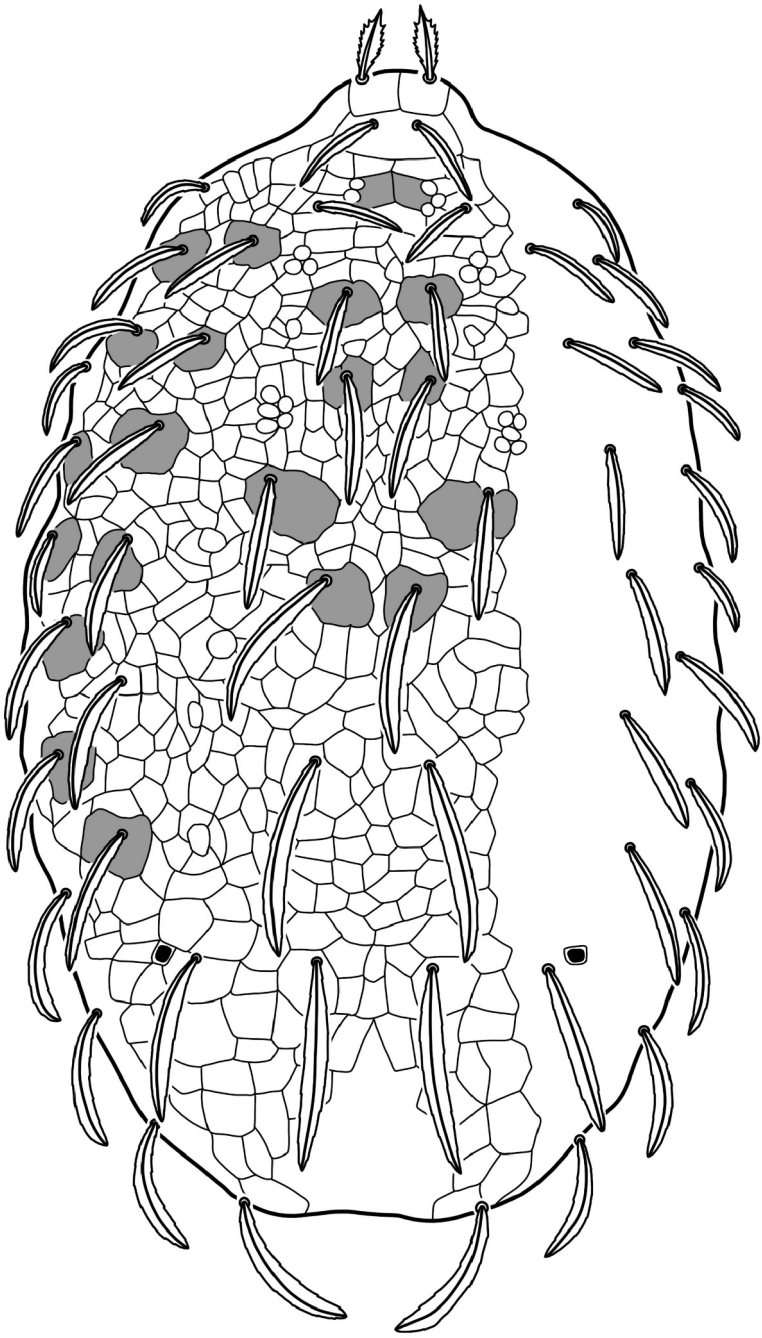

Fig. 59. *Kleemannia pseudoplumosa* female dorsal side

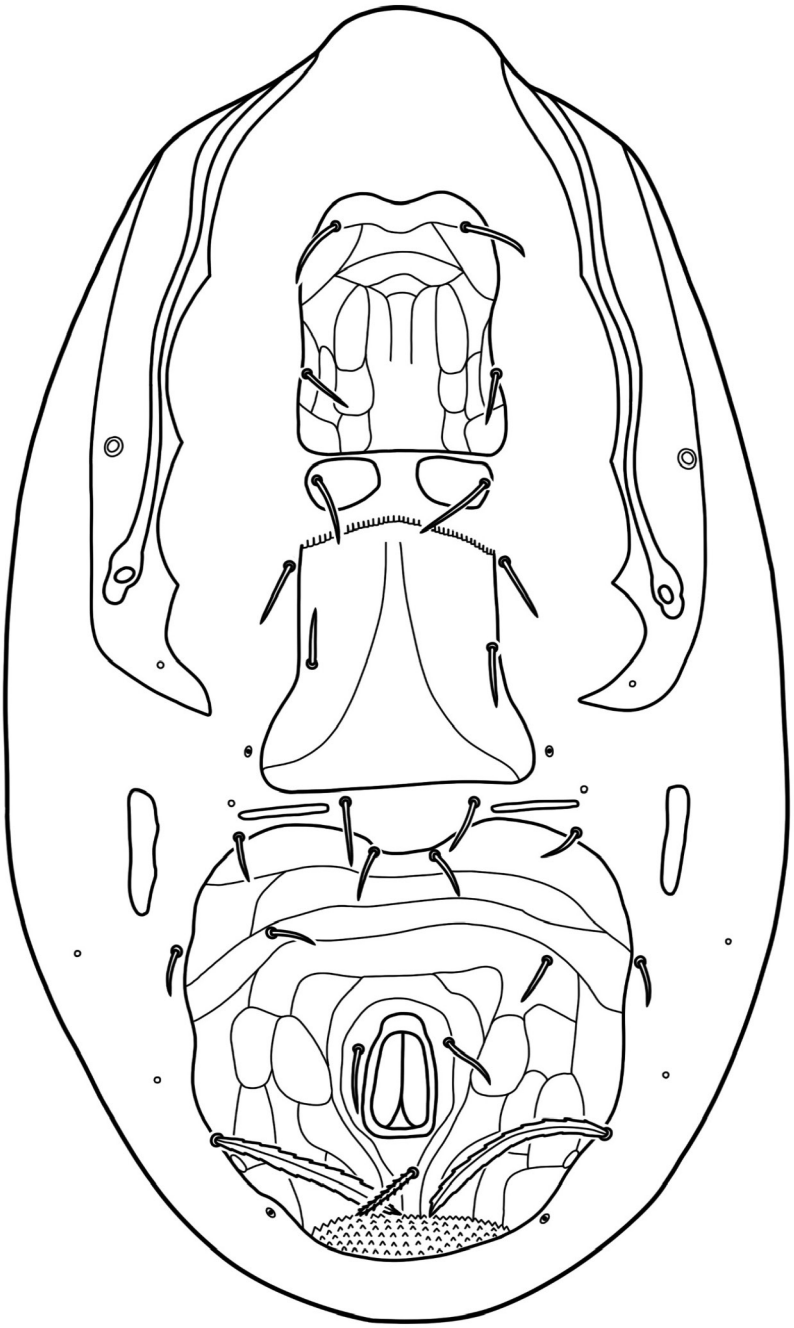

Fig. 60. *Kleemannia pseudoplumosa* female ventral side

Kleemannia tenella Berlese, 1916

Synonyms: *Ameroseius tenellus* Berlese, 1916; Castagnoli and Pegazzano, 1985; *Ameroseius lanatus* Solomon, 1969; Bregetova, 1977; Błaszak et al., 1997; *Ameroseius fimetorum* Karg, 1971a; Bregetova, 1977; Karg, 1993; Narita et al., 2015.

Holotype: ISZA: 171/12 Firenze, musco. Istituto Sperimentale per la Zoologia Agraria, Firenze, Italy.

Paratypes: ISZA: 171/13 Firenze, musco; ISZA: 21/8 Tiarno, Trentino, inflorescence; ISZA: 168/50 Tiarno, Trentino, in hay; ISZA: 171/14 Palermo, musco; Istituto Sperimentale per la Zoologia Agraria, Firenze, Italy.

Locus typicus: Italy, Firenze (in moss)

Occurrence in Poland: phoretic on *Microtus arvalis*, **Karczewiec** (Haitlinger, 1987); phoretic on *Spermophilus suslicus*, **Miączyn** (Haitlinger, 2010).

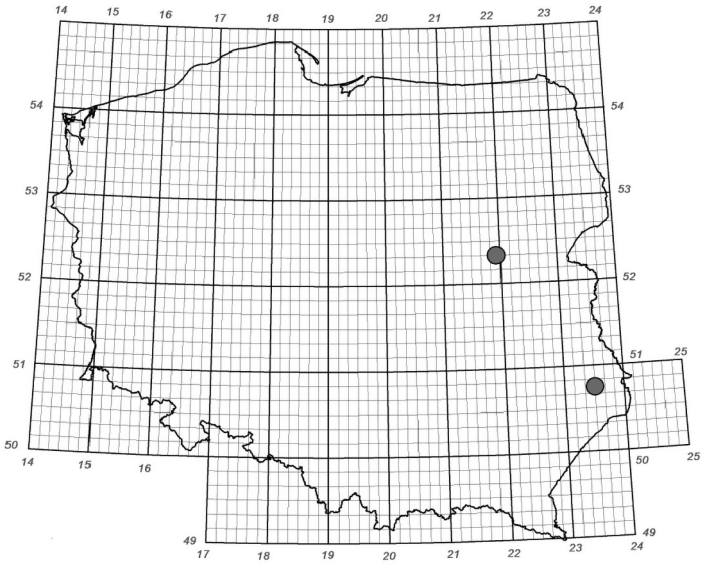

Fig. 61. Occurrence of *Kleemannia tenella* in Poland

Female description

Idiosoma: 485 long x 335 wide

Dorsum (Fig. 62): dorsal shield entire, oval shaped, with a reticulated pattern covering the surface, deep fossae occurring on the marginal, anterior and central parts; totally 29 pairs of serrated setae; vertical j1 setae about 21–23 with

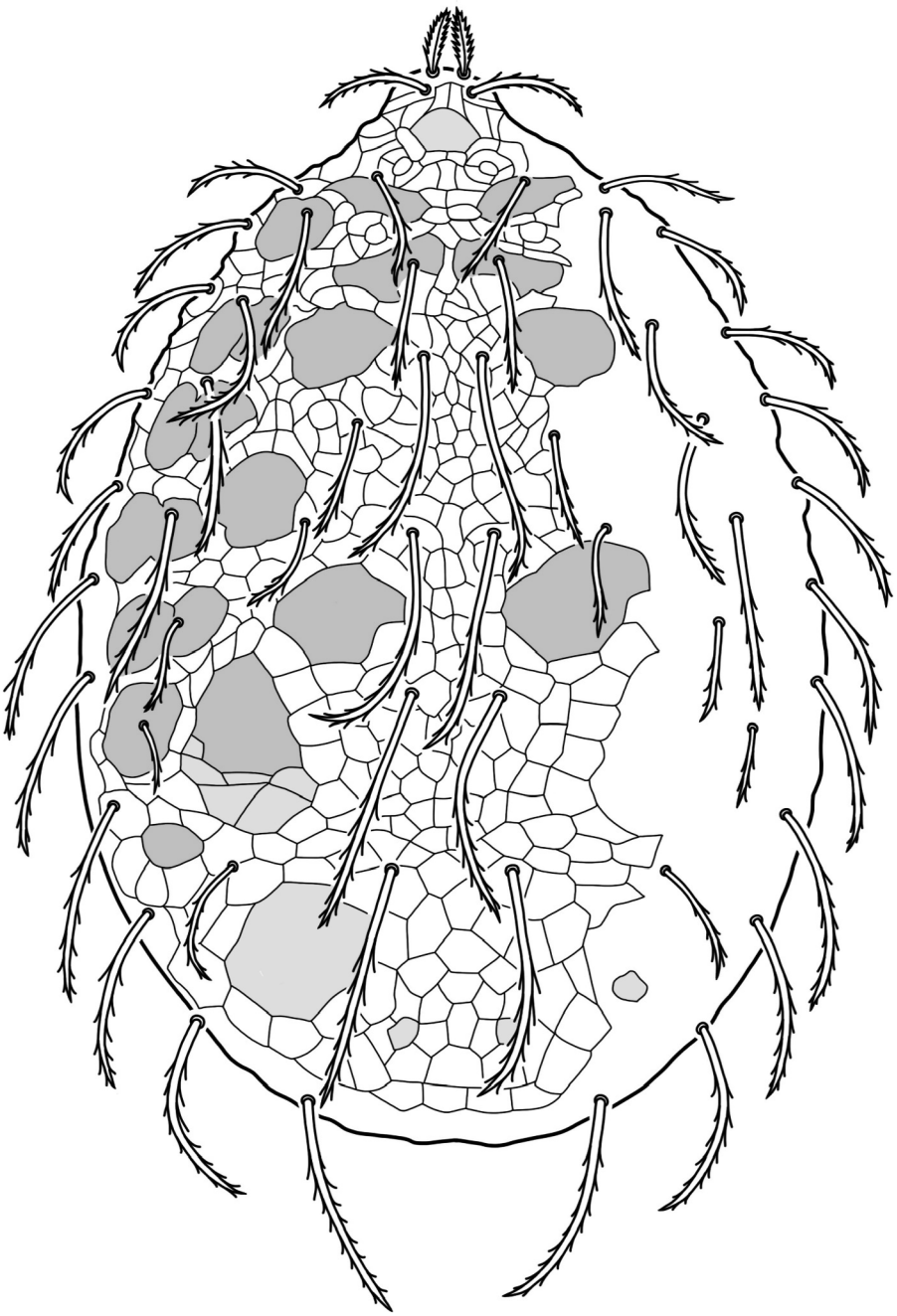

Fig. 62. *Kleemannia tenella* female dorsal side

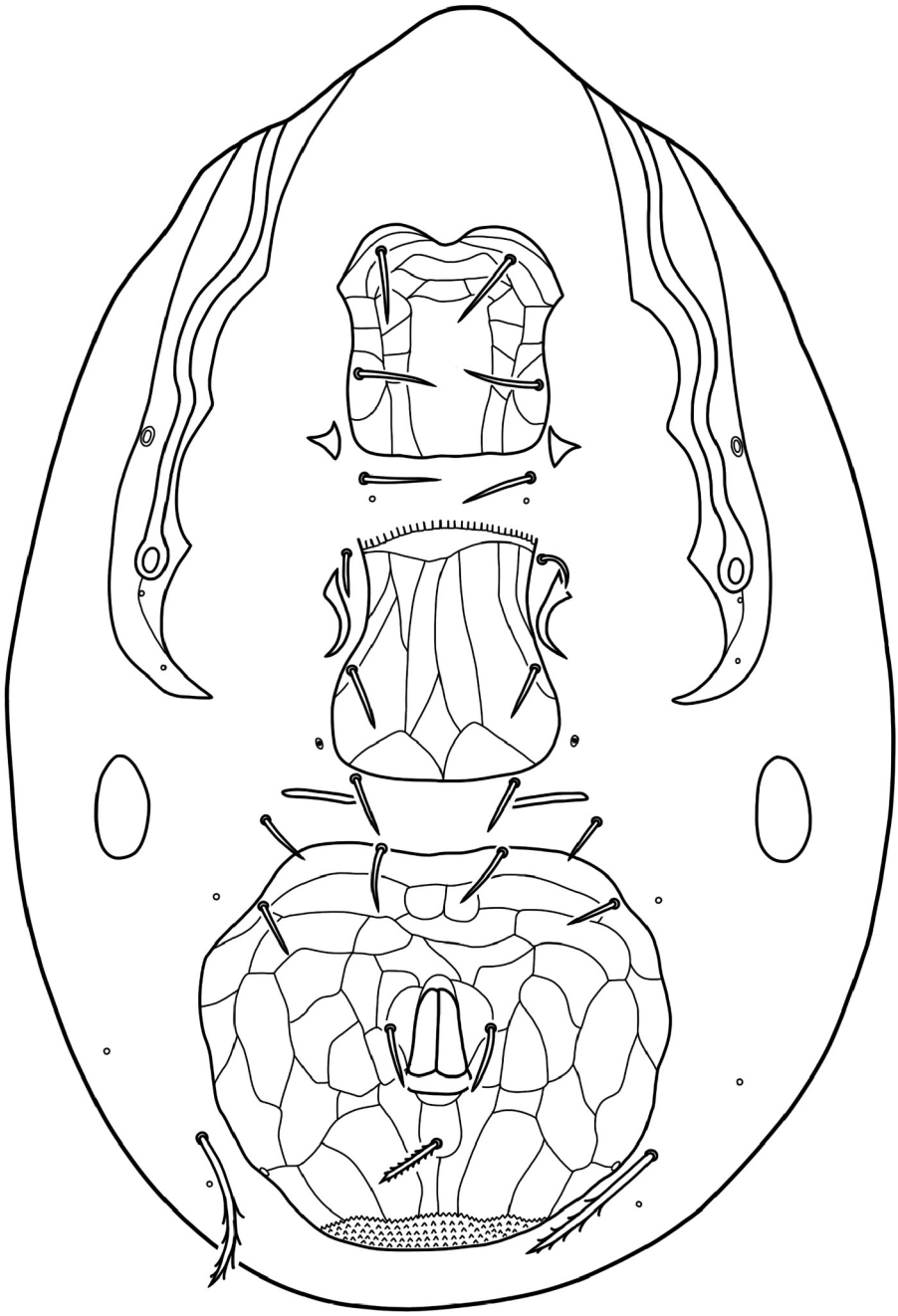

Fig. 63. *Kleemannia tenella* female ventral side

a dense serrate margin; the longest setae are j5, j6, J2, J4, Z5 (reaching 100 and above); setae lengths in j–J row gradually increasing from j2 47–50, j3 51–53, j4 58–60, j5 102–105, j6 106–109, J2 110–115, J4 112–117; setae in z–Z row of different lengths z3 63–66, z5 53–55, z650–53, Z2 41–44, Z3 38–40, Z4 50–54, Z5 100–104; setae lengths in s row increasing from s2 50–53, s3 54–56, s4 70–75, s5 80–85, s6 85–90, all S row alike S1–S5 80–86; r row setae lengths ranges: r3 56–58, r4 56–58, r5 60–62, r6 63–65.

Venter (Fig. 63): ventral shields conspicously ornamented; sternal shield 90 long x 85 wide with two pairs of simple setae st1–st2 27–30; st3 24–25 and st4 19–20 on a soft membrane; st5 25–27 located on epigynal shield 100 long 85 wide; metapodal plates elongated 18–19 x 35–37; endopodal sclerits and "L" shaped sclerits partially observed; ventrianal shield wider *ca*. 175 than long 140 with anal opening 35 x 20, simple paraanal setae 21–22 and barbed postanal 25 setae; five pairs of opisthogastric setae: simple JV2 25–27 and JV3 24–26 located on the edges on ventrianal shield; JV1 24–26, ZV1 18–19 simple and JV5 the longest 58–60, serrated, located in soft integument.

Gnathosoma: tritosternum base 20 with laciniae 65; corniculi bifurcate 23–25; all hypostomatal setae simple: stout h1 25, h2 21–22, h3 22–23, pcx 22–24; tectum triangular with a small central spitz; movable digit 25–27 with no visible teeth, fixed digit with 4 sharp teeth; palps 85–90, palpapotele 13–15 two-tinned.

Legs: lengths as given: leg I 335–345, leg II 280–285, leg III 280–290, leg IV 375–365 long; pretarsi: leg I 25, leg II 25, leg III 24, leg IV 28 long; number of setae per segment (coxa-trochanter-femur-genu-tibia) as given: leg I – 2–6–12–12–12; leg II – 2–5–10–11–10; leg III – 2–5–6–10–9; leg IV – 1–5–6–9–10.

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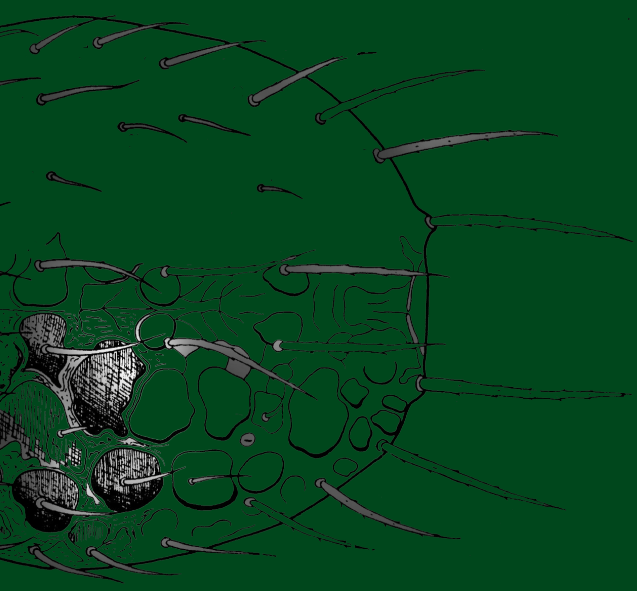
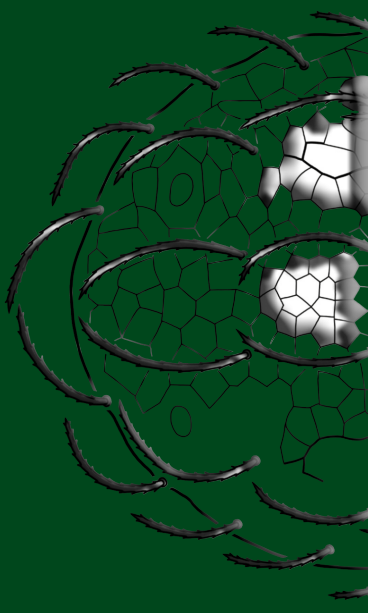
SUMMARY

This little book concerns the mites of a selected family ameroseiidae. The author is giving away an illustrated guide to females with 41 drawings of good quality representing ameroseiid mites occurring in Poland and far beyond. The guide contains detailed descriptions of 19 species representing 3 genera: *Ameroseiella*, *Ameroseius*, *Kleemannia* and honourably mentions 3 species among the genus *Epicriopsis*. Importantly, it covers the latest taxonomical classification and terminology. Moreover, it displays 22 zoogeographical maps defining the selected species distribution and microhabitat preferences. The author has high hopes that this work is both informative and useful and, likewise will contribute to the overall knowledge on mites being perceived more and more nowadays.





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