

Water mites of the genus *Atractides* Koch, 1837 (Acari: Parasitengona: Hygrobatidae) in the western Palaearctic region: a revision

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The western Palaearctic species of the water mite genus *Atractides* are revised, based on the available type material, data published in the literature, and additional material from various collections. This paper includes the following: (1) a survey of the classification history of the genus, with description of all important morphological features, including a brief discussion of the apomorphic characters of *Atractides* and its presumed sister-group relations; (2) documentation of variability and seasonal changes of morphological indices for a selected species, *A. nodipalpis*; (3) a detailed description and/or discussion of all published taxa, with designation of lectotypes, definition of diagnostic character combinations, and identification of *species dubiae*; (4) a dichotomic determination table for the accepted species in the study area. The main object of this study is to animate world-wide systematic and ecological work on this important genus, which is currently hampered by taxonomic confusion. Above species level, the following synonyms are confirmed: *Tetramegapus*, *Taeniomegapus*, *Megapoides* = *Atractides*; *Rhynchomegapus* = *Tympanomegapus*. The following new synonyms are proposed: *Octomegapus*, *Iranomegapus* = *Atractides*. *Tympanomegapus* and *Polymegapus* are redefined and accepted as distinct subgenera, while *Maderomegapus* is degraded to subgenus level. © 2003 The Linnean Society of London. *Zoological Journal of the Linnean Society*, 2003, 138, 141–378.

ADDITIONAL KEYWORDS: diversity – hyporheic – interstitial – seasonal variability – springs – taxonomy.

INTRODUCTION

TRACTIDES: DIVERSITY AND BIONOMICS

Water mites of the genus *Atractides* have been found in all biogeographical regions except for Australia and Antarctica. When this revision started, a total of 308 species was accepted, with an additional 20 species regarded as synonyms, and another 20 names lacking taxonomic significance (assigned to taxa not belonging to the genus, or published as *nomina nova* replacing older names erroneously considered to be homonyms). One hundred and twenty-three species are known from Europe, 72 from Asia, 27 from North America, 33 from Central and South Central America and 54 from Africa (Orghidan & Gruia, 1987; Otero-Colina, 1987;

K. O. Viets, 1987; Wiles, 1991; Conroy & Bilyj, 1992, 1998; Bader, 1994; Bader & Gerecke, 1996; Jin, 1997; Pešić & Asadi, 2002).

For *A. nodipalpis* Thor, 1899, the most common and best known European species, detailed information on life cycle, host range of parasitic larvae and habitat preference has been provided by Efford (1963, 1966), Ullrich (1978), Martin (1998) and Gerecke (2002). In Central Europe, this species mates and produces eggs in autumn, and larvae emerge in spring (Martin, 1998). Contrary to previous statements (revision by Smith, 1998) the larval stage includes a parasitic phase, with chironomid midges as preferred hosts (Efford, 1966; Martin, 1998). In early summer numerous deutonymphs are found; the adults emerge in late summer and autumn. No information is available on the morphology and duration of the proto- and tritonymph stages. Deutonymph and adult *Atractides nodipalpis* feed on small crustaceans and insect lar-

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vulae. The most apparent character of *Atractides*, the first leg with transformed distal segments, looks like a grasping organ, but has never been found involved in preying and feeding.

Several large-scale faunistic inventories have revealed that *A. nodipalpis* displays a certain tolerance of organic pollution. The species can be found in considerable numbers in slightly polluted running waters, but is absent from more heavily polluted habitats in Central Europe where *Hygrobatas fluviatilis* (Ström) and *H. nigromaculatus* Lebert predominate (Kowalik & Biesiadka, 1981; Meyer, 1986; Gerecke & Schwoerbel, 1991).

All the other species discussed here are collected much more rarely, and many are known only from single finds. Most were found only in clean water with well conserved substrates; they are probably sensitive to many forms of human impact. In general, *Atractides* species inhabit running water. Exceptions are *A. ovalis* Koenike, 1883 (the only known species with swimming setae on its legs), *A. pavesii* Maglio, 1905, *A. lacustris* (Lundblad, 1925) and *A. moniezi* Motaş, 1927, found regularly in ponds and lakes in northern and Central Europe.

A description of the larval morphology of four further species, *A. adnatus*, *A. panniculatus*, *A. macrolaminatus* and *A. walteri*, has recently been provided by Martin (in press). Because of the paucity of information on the life cycle of all other species obtaining an idea of the spectrum of ecological adaptation involves a brief investigation of the wide range of morphological diversity. There is a great variety of shapes of mouthparts and legs, as well as differences in idiosomal dimensions and integumentary structures. From field studies, one may deduce particular habitat patterns: many species are confined to springs, often with a preference for particular substrata (Schwoerbel, 1959b; Bader, 1975; Biesiadka, 1979b; Cicolani *et al.*, 1996; Gerecke *et al.*, 1998). Others are found exclusively in phreatic and groundwater habitats (Schwoerbel, 1986) often showing particular adaptations, such as smaller size, flattened shape of the idiosoma, depigmentation, and reduction of eyes. Among species coexisting in the benthos of a stream, considerable differences can be observed both in habitat preference and seasonal phenology (Gerecke, 2002).

Most of the extant information on taxa outside Europe includes morphological descriptions and distributional data only. As the result of taxonomic confusion within Europe, a separate systematics has been developed for all the other continents, which hampers our understanding of overall distribution. Few species are known to have a distribution area extending over more than one continent, although this suggests poor scientific communication rather than firm biogeographical

borders. However, several studies have revealed the richness and diversity of *Atractides* species in tropical areas (e.g. K. Viets, 1935b; Cook, 1980).

HISTORY OF THE GENUS NAMES *ATRACRIDES*, *MEGAPUS* AND *TORRENTICOLA*

The name *Atractides* (Greek, *atractoeides* = spindle-shaped, probably referring to the shape of segment I-L-5) was proposed for the first time in 1837 by C. L. Koch in vol. 11 of *Deutschlands Crustaceen, Myriapoden und Arachniden* as the common genus name of his three species *anomalous*, *spinipes*, and *setiger*. In 1842 he designated *spinipes* Koch, 1837, as *typus generis*. The other two species, as well as *sagulator*, *dimidiator* and *clavicornis*, belong, from the viewpoint of present-day systematics, to other genera and families (K. Viets, 1949).

Thirty years later Kramer (1875) described *A. spinipes*; he proposed enclosing it within a genus with the pre-occupied name *Nesaea* Koch, 1836. His figure indicates that he was describing a deutonymph.

Neuman (1880) introduced a new genus *Megapus* using the same species name '*spinipes*' for the *typus generis*, in order to underline the similarity in setation between his species and *A. spinipes*. However, by doing so, he clearly regarded this similarity as a convergence. It is likely that he knew *A. spinipes* only from Kramer's drawing. The factor which may have led him to erect a new genus was the differing ventral aspect, when in reality the difference was between a deutonymph and an adult.

Koenike (1883) synonymized *Megapus* with *Atractides*, but, under the same misapprehension as Neuman, he regarded Koch's and Neuman's *spinipes* as two separate species, and the latter as a homonym. As a consequence, he allocated '*ovalis*' as the second valid name of an *Atractides* species.

Thor (1899) proposed synonymizing *Torrenticola* Piersig, 1896 and *Rusetria* Thor, 1897 with *Atractides*, probably based on the fact that *A. anomalous* (since 1897, *Torrenticola anomala*) was the first to be described by Koch; however, he overlooked Koch's unequivocal designation of *spinipes* as *typus generis*.

The logical consequence of this was the reinstallation of *Megapus* as a recognized genus. After a few years, this new taxonomic assessment was generally accepted; Thor's error was not discovered until Viets (1949) was able to clarify the situation by making *Megapus* a synonym of *Atractides* and *Torrenticola* the valid name for all the species allocated during the previous 45 years to *Atractides*. However, Viets himself created further errors: believing that all the names previously allocated to *Torrenticola* as well as in *Atractides* would now become homonyms, he introduced ten unnecessary new names.

ATRACTIDES SPINIPES KOCH, 1837: THE UNRESOLVED PROBLEM OF THE *TYPUS GENERIS*

The first described species is not documented by a deposited type specimen, and the only information that can be gleaned from Koch's drawing published in 1842 is the character of the first leg with two long distoventral sword setae and a curved terminal segment.

As mentioned above, the second species of the genus, *ovalis*, owes its origin to Neuman's error, who regarded the ventral morphology of a deutonymph depicted by Kramer (1875) as a diagnostic adult feature. The specimen depicted by Neuman as *Megapus spinipes*, and baptized by Koenike in 1883 as *A. ovalis*, is lost. Further complicating the situation, Koenike based his first description on specimens from Canada, which he recognized in 1908 as representing '*crassipalpis*', a different species. The same year he published figures of a well-defined, clearly recognizable *A. ovalis*. All authors who had used this name in the previous 25 years could therefore not have known its morphological details, and in many cases probably based their identifications on the misunderstood character of number of acetabula.

During this period, researchers discovered the main lines of morphological diversification in the genus and described ten additional species (nine from Europe and one from Madagascar). Apart from *gabretae* Thon (1901) (probably a malformation) they are all clearly defined by important peculiarities, such as presence of dorsal idiosomal sclerites, shape of palps and first legs, and morphology of the genital area.

It seems likely that for many years the name of the type species *spinipes* has been used as a dumping ground for a variety of not easily determinable specimens often listed in faunistic surveys as single finds. Evidence for this is provided by the numerous speci-

mens given this name in the main European collections, which represent either unidentifiable juveniles and females, or aberrant, homoiomorphic males of different species. Koch's description probably referred to one of the more widely distributed species. A dubious benefit of the unavailability of his type specimen is that it helps avoid further taxonomic changes and confusion. In this paper, *Atractides spinipes* is redescribed on the basis of a neotype from a large population collected in southern Germany.

The taxonomic history of this species is unfortunately not atypical, with an initial published name used as a wastepaper bin for all poorly identified specimens. Consequently, early descriptions of the larval stages of *A. spinipes* (Piersig, 1894) and *A. ovalis* (Piersig, 1896) cannot be included in the taxonomic discussion.

THE IMPACT OF TAXONOMIC CONFUSION

In a species-rich taxonomic group, the number of species described reflects increasing knowledge of biodiversity. Figure 1 depicts the output of taxonomic work on *Atractides*. This appears to have occurred in three stages: slow development up to the end of the 19th century, a steep increase during the first half of the 20th, and stagnation occurring since the 1970s. In broad terms, this interpretation can be accepted for Europe. Numerous additional species probably remain to be detected in springs and the interstitial waters of the Mediterranean area, although this may be counterbalanced by the decrease due to synonymization.

In all the other continents, however, the paucity of species number largely reflects the stagnation of faunistic and taxonomic work in this field. The number of Nearctic species should not be expected to be lower than that for the western Palaearctic. One major prob-

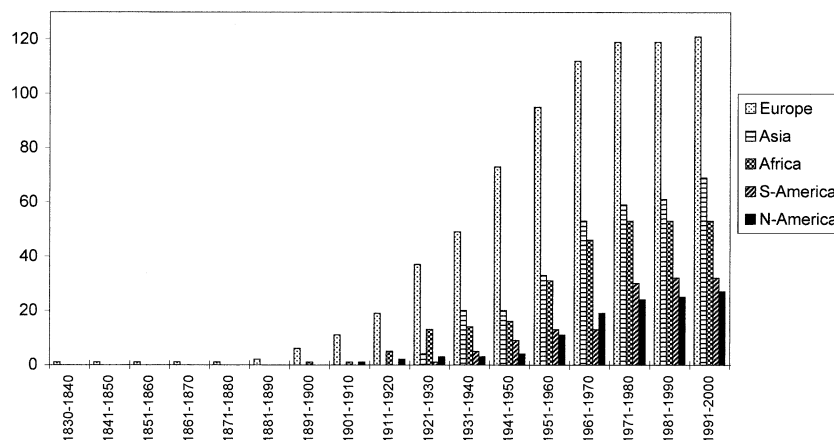


Figure 1. Graph showing pattern of increase and stagnation of knowledge about species numbers of *Atractides* in Europe, Africa, Asia & America 1837–2000 (no *Atractides* species are known from Australia).

lem is the high number of names available from Europe for species with unclear morphological characteristics. This is reinforced by the poor maintenance of many collections in European museums. No improvement of the situation is in sight. In fact, it is aggravated by the continuing transformation of museums into 'research institutes'. The revision of *Atractides* is in part a documentation of the effects of neglect. For c. 50% of the European species, type material is lost or in too poor a state for a study of this kind.

ATRACTIDES AND ITS SISTER GROUPS IN THE FAMILY
HYGROBATIDAE KOCH, 1842

Derived primarily from the fauna of temperate areas of the northern hemisphere, Hygrobatidae was for some time a distinct taxonomic unit, containing two large clades based on the presence (Megapusinae Thor, 1927 = Atractidinae Oudemans, 1941) or absence (Hygrobatinae Koch, 1842) of a modified first leg (K. Viets, 1936). However, the detection of numerous additional genera, mainly in the southern hemisphere, has blurred both the external distinction from neighbouring families such as Aturidae Thor, 1900, and the internal distinction between the two subfamilies synonymized by Cook (1974). At present, Hygrobatidae is defined by the following character combination (after Cook, 1974, modified): Lateral eyes beneath the integument; coxae 4 bearing a pair of glandularia; no movable genital flaps present, acetabula lying on sclerotized plates which in males normally fuse to a round genital shield completely surrounding the gonopore; a ventral seta always absent from second pedipalp segment.

Within this family there is a group of genera with characteristically modified first legs. The articulation furrow on the fifth segment bears a pair of variously modified setae arranged near its ventral margin; often the furrow is more or less extended; the medial seta arranged at the anterior margin of this segment is thickened basally and in most cases whip-shaped; the sixth segment bears numerous ventral setae arranged in a regular line or (mostly) in several distinct groups; in general, this segment is curved or variously modified. There is reason to assume that presence of this functionally not yet understood character combination documents a common, monophyletic origin of the genera in question (Gerecke, 2000).

A further important character complex rarely found in other families of Hydrachnidia concerns the more or less complete fusion of the gnathosoma to the anterior margin of coxae 1. Various species of *Australiobates* Lundblad, 1941 show differing degrees of fusion in the first coxae, with each side medially separate and a completely free gnathosoma with long proximal

anchoral process resulting in the formation of an entire coxognathosomal shield. In *Tetrabates* Thor, 1922, the gnathosoma is fused to the first coxae in males, but free in females.

If we assume a common origin for all *Atractides*-like genera (with first leg modified as described above) from a *Hygrobates*-like ancestor (with coxognathosomal shield), the presence of an unfused gnathosoma should be interpreted as a secondary phenomenon. The two Palaearctic genera could represent a model for that process. In *Mesobates* Thor, 1901, the proximal margin of the gnathosoma is completely fused with the first coxae, while in *Atractides* this fusion is clearly reversed. Only the presence of a small sclerotized bridge between the gnathosomal base and the anteromedial margin of the first coxae is a relictary character that testifies to *Atractides* being descended from more sclerotized ancestors. Also, from other points of view (fourth pedipalp segment lacking both an increased seta on the medial surface and a dense dorso-distal hair cover), *Mesobates* represents a plesiomorphic, *Hygrobates*-like morphological condition, while the first leg shows details characteristic for *Atractides*-like mites. An early radiation of the latter probably took place in the southern hemisphere, and only two of the genera reached temperate and colder zones of the Palaearctic region. Here, as in most other parts of the world, *Atractides* split into a large variety of running water-, spring- and interstitial-dwelling species, while *Mesobates* is represented only by localized populations of a few species characterized by modest morphological divergence (Gerecke, 2000).

Based on adult morphology (presence of a thickened medial seta on the fourth palp segment) *Atractides* is similar to two genera restricted to the southern hemisphere: *Paraschizobates* Lundblad, 1937 and *Australiobates* Lundblad, 1941. For a better understanding of phylogenetic relations within *Atractides*-like genera, of the general direction of evolutionary trends, and of the sister genus of *Atractides*, a more profound morphological knowledge of pre-adult instars is required.

The following adult character combination is diagnostic for the genus (after Cook, 1974, modified). Coxae 1 (Cx-1) fused medially, gnathosoma separated from the anterior margin of Cx-1 by a nearly complete membranous furrow, but joined to it by a narrow median bridge; anchoral process of gnathosoma obviously included in the medially fused area of Cx-1; glandularia of Cx-4 located near anterior suture lines between Cx-3 and Cx-4; fifth segment of first leg with two variously modified ventrodistal setae and a basally thickened mediolateral seta; sixth segment of first leg varies in shape, but is in most cases bowed, with numerous ventral setae generally arranged in

distinct groups; leg claws with ventral clawlet; fourth pedipalp segment with numerous dorsodistal fine hairs and a thickened medial seta, but without a ventral peg-like seta.

MATERIAL AND METHODS

COLLECTIONS

This study is based principally on slide preparations from collections in Amsterdam (Besseling collection, Zoological Institute of the University), Basel (Naturhistorisches Museum Basel), Berlin (Museum für Naturkunde der Humboldt-Universität), Brno (Moravian Museum), Dublin (National Museum of Ireland), Frankfurt (Forschungsinstitut und Naturmuseum Senckenberg), Stockholm (Naturhistoriska Riksmuseet), St. Petersburg (Zoological Institute, Russian Academy of Sciences) and from private collections: Gledhill (Ambleside), Schwoerbel (Möggingen) and Tuzovskij (Borok).

For all type specimens, detailed information concerning their state of conservation is provided. Most specimens in the collections of Dublin, Frankfurt, Stockholm and St. Petersburg are in a comparatively good state, with problems involving precipitation in the mounting fluid and/or the position of important appendages. A major proportion of the material in Basel and Berlin, and from private collections, is either lost or in too poor condition for revisional studies. Many specimens in Basel are divided between two slides, one bearing the idiosoma, the other the mouthparts and I-legs. In all the other collections, the mouthparts and idiosoma are mounted on the same slide. In most specimens the gnathosoma is detached and mounted separately; in Stockholm, however, the palps are detached while the gnathosoma is left *in situ*.

The following institutions and persons were contacted unsuccessfully for loan of preparations: Natural History Museum, Bratislava (Láska collection) Laboratoire de Zoologie, Toulouse (E. Angelier collection) Dr E. Biesiadka (Olsztyn, private collection) Dr A. Petrova (Sofia, private collection). The following collections are lost: Szalay (Budapest), Husiatinski and Motaş (both Bucharest). In the 'Material examined' sections, specimen numbers are given as males/females/deutonymphs.

VARIABILITY STUDIES

Additional populations were investigated: the National Park Berchtesgaden (upper Bavaria, 10 year monitoring project; Gerecke, Franz & Schrankel, 2002) and the Goldersbach (Schönbuch,

Tübingen; Gerecke, 2002). All captures were made using a simple net. In Bavaria, mites were separated from substratum samples taken in springs at different altitudes and of varying typology. In the Goldersbach, moss, stone and pool faunas were collected separately in a stretch of stream about 200 m in length at regular distances over a 12-month period. Some of the alpine mites were conserved in 70° ethanol, others in Koenike's fluid.

PREPARATION AND CONSERVATION

Preparation techniques for water mites have often been described and discussed (e.g. K. Viets, 1936; Cook, 1974; Smith & Cook, 1991). As a general rule, for the study of the dorsal integument structure and sclerites, it is sufficient to extract the idiosoma through a hole opened frontally or caudally. Only in exceptional cases should dorsum and ventrum be separated using a horizontal incision. The technique of detaching the gnathosoma from the idiosoma is not recommended in *Atractides* because they are connected by a sclerotized bridge. The genital skeleton is morphologically rather uniform in *Atractides*, and best left *in situ*. Apart from extracting the idiosoma, the dissection of *Atractides* should concentrate on the palps and first legs. It is best to separate and position them in a manner that allows both lateral and medial observation of these paired appendages.

As will be demonstrated, in several species important characters are also found in the shape and setation of legs II–IV. Probably this is a fruitful field for future research; in this study, little attention could be paid to this character due to the fact that in slide preparations these legs are not generally in a position suitable for observation and measuring. The same is true of the chelicerae. In many type specimens these appendages are either missing or not in a position suitable for measuring. In several cases chelicera measurements were used to distinguish species groups or sibling species. They could be isolated without dissecting the gnathosoma, by extraction via an opening in the lateral idiosoma wall; their morphology merits further attention in future taxonomic work.

Hoyer's fluid was used in view of its very good optical properties and the possibility it afforded of producing high numbers of preparations in a short time. The study of large numbers of museum preparations has demonstrated that nearly all kinds of fluids have typical long-term disadvantages. Many of Lundblad's brilliant glycerine-based preparations have deteriorated due to crystalline precipitations and production of fine, oil-like droplets that cover the surface of the embedded subjects. Many specimens (in the Koenike, Walter and Schwoerbel collections) have suffered from

desiccation and crushing. Upton (1993) suggests the use of Euparal for the long-term conservation of important material. However, in view of its reduced optical quality, it is recommended that as many specimens as possible be conserved undissected. My experience over the years with *Atractides* is that specimens conserved in this way facilitate re-examination.

Specimens selected for SEM were dehydrated in a graded series of ethanol, critical point dried in CO₂ in a Polaron E 3000 Series II apparatus, sputter-coated with gold/palladium in a Balzers SCD 030 and examined under a Cambridge Stereoscan 250 Mk 2.

MEASUREMENTS

Unfortunately, published data are often not interpretable for two reasons. First, authors rarely describe their methodology precisely. For example, the length of a segment may be the maximum length or the dorsal length; the latter may refer to the exact dorsomedial line or include protrusions of the distal segment margin extending laterally from the medial line. Second, measurements may be wrong due to a simple failure to use optical equipment correctly. All measurements provided by Lundblad, for example, exceed the actual dimensions by *c.* 5%. This deviation, confirmed during this revision, still permits relationships to be established. Less uniform deviations are found in the data published by Szalay and Walter.

As far as possible therefore this study uses new measurements. Unfortunately, the data set compiled in this manner is incomplete due to the lack of accessible comparison material for many species, e.g. from south-east Europe, and due to the poor conservation state of many types. Measurements were taken only from idiosoma parts and appendages which were laid in a horizontal position and had not been crushed.

Measurements of membranous parts of slide-prepared specimens are of very limited value. Therefore, all values of both idiosoma and female genital field length or width, are of orientative significance only. Measurements of sclerotized idiosoma parts always include the borders created by secondary sclerotization. Figure 3 shows the exact end-points of the selected measurement spans.

Length measurements of segments were taken always in the exact median line (where the proximal/distal end of the thickened integument is best seen at focus) excluding all kinds of lateral extensions or protuberances. Terminal segments of palps and first legs were measured from the mediodorsal base to the tip, including claws in palps, but excluding them in first legs. In measurements of palp segments, all kinds of solid ventral extensions were included (insofar as they were part of the thickened integument of the segment itself) but no setae or seta-like appendages.

The first leg was measured with much detail. Measurement spans are explained in Figure 7. The following dimensions are important. Fifth segment: HA at the level of the strong ventral seta; HB perpendicularly from the ventrodiscal edge (the most ventral point of the articulation furrow) to the dorsal margin; HC from the ventrodiscal to the dorsodiscal edge (the most dorsal point of the articulation furrow). Sword setae: width is always maximum width; the distance between the two setae is measured from the facing basal edges of the two setae, not from their basal centres. Sixth segment: HA at the level of the proximoventral setae, in most cases a thickened basal reach of the segment; HB at the thinnest section of the segment, if the segment is thinned continuously from the base to the tip, halfway between HA and HC; HC at the proximal margin of the claw furrow.

STATISTICAL ANALYSIS

A statistical analysis was applied in cooperation with H. Van der Hammen in order to check a population of the species most frequently found in Europe, *A. nodipalpis*. The morphology of 103 specimens (47 males, 54 females, 2 intersexes) from a forest stream in south-west Germany was documented with a measurement series of palp and I-L segments. In each individual the gnathosoma or at least one of the palps, and one of the I-L were detached and mounted in lateral view together with the idiosoma in Hoyer's fluid. Both intersexes and eight juvenile female specimens with not yet hardened sclerites were excluded from the multivariate statistical investigation, such that it was based on 47 males and 46 females.

In order to examine seasonal change/stability, for each character measured scores were plotted as scattergrams against the months in which the animals were captured. For discriminant analysis, a technique that permits predicting into which of two groups a new case is most likely to fall (Klecka, 1989) was used; data were separated in a 'spring' (March–July) and an 'autumn' (September–February) group (no samples were taken in August). The chi-square transformation of Wilks' lambda (ratio of the within-groups sum of squares to the total sum of squares) was used in order to test whether the group-means of each variable are equal (Norusis, 1994).

For the Principal Component Analysis (PCA) an exploratory statistical technique that determines the combination of variables that best explains the greatest proportion of variation in a dataset – the PCA option of the SPSS package (Houck, 1992) – was used. The analysis was done with 23 variables, in view of the considerable sexual dimorphism separately for males and females.

INFORMATION ON HABITAT AND DISTRIBUTION

This revision focused on type material and populations from selected areas only, implying that the results do not permit a thorough reinterpretation of habitat preference and distribution patterns of the recognized species. Future ecological and zoogeographical studies of western Palaeartic species should be based on the data provided here. Only limited ecological information is given, as it can be deduced from confirmed collecting sites, mostly in Central Europe. The distribution of the species is based on a revised version of the tables published by K. O. Viets (1978) in the *Limnofauna Europaea*. Some highly improbable records (discussed in the text) are excluded; some new data uncovered during the revision are added, and the records of synonymized species attributed to the stem species. The zoogeographical information should be considered preliminary, in need of critical revision in most cases. For each species, general information is provided, and a list of numbers that represent the respective distribution areas recognized in the *Limnofauna Europaea*.

Anatomical abbreviations

Ac	acetabulum (numbered 1 to 3)
bS	basal segment
c	claw
Cx	coxae (numbered 1 to 4)
Cxgl	coxoglandularia
D	dorsalia
Dgl	dorsoglandularia
dL	dorsal length
Ex	excretory porus
Gsk	genital skeleton
H	height
HA–C	see ‘Measurements’, above
L	length
Lgl	lateroglandularia
I-L-n	first leg, n th segment
IL	lateral length
mL	median length
P	palp segment (numbered 1 to 5)
postoc	postocular
prefr	prefrontal
pregen	pregenital
postfr	postfrontal
S	seta
Sl	slit organs
Vgl	ventroglandularia
vL	ventral length
W	width

Institutional abbreviations

CSM	Schwoerbel collection, Möggingen
GER	Gerecke collection, Tübingen

MMB	Moravian Museum Brno
NHMB	Naturhistorisches Museum Basel
NHUB	Naturkundemuseum Humboldt Universität Berlin
NMI	National Museum of Ireland
SMF	Senckenberg Museum Frankfurt
SMNH	Swedish Museum of Natural History
ZISP	Zoological Institute, St. Petersburg

GENERAL ADULT MORPHOLOGY

IDIOSOMA

In many cases, the membranous integument is striated, with a series of fine pores (visible in SEM only) paralleling regularly arranged fine ridges about 1 µm in width (Fig. 4A). The distance between these ridges is subject to some individual variability, e.g. as a function of age and maturity in females and deutonymphs. In a certain number of species, ridges are distant and elevated as distinct lamellae (Fig. 4B,C). An integument of this type, with the distance between ridges 3–5 times the width of the ridges, is called ‘lineated’. A particular type of integument morphology is found in *A. walteri*, where knob-shaped papillae (diameter 1–2 µm) are dispersed in a net-like pattern over the lineated ground structure of the surface (Fig. 4D,E). An integument of this type, called ‘papillate’, is not equally developed all over the idiosoma surface (Fig. 4D shows a transition zone between papillate and striate integument). In individuals with a rather restricted extension of these ornamentations, they are typically contained in the interocular anterior part of the idiosoma.

Probably an effect of advanced age, the integument of certain specimens can become thickened, leathery, and dark brown in colour. In these cases, surface characteristics are nearly invisible (sometimes the sculptured upper layer can be seen disintegrating) but the presence of fine pore channels penetrating the integument, not noticeable in younger specimens, becomes more visible instead.

A schematized overview of the idiosoma is provided in Figure 2 (dorsal) and Figure 3 (ventral). A medial eye has never been observed in *Atractides*, but lateral eyes are generally present, with two lenses on each side, placed at the anterolateral edge of the idiosoma near the preocular seta and dgl-2. Each lens has its own cup-shaped retinula, noticeable in the light microscope due to presence of pigment. As lateral eyes are neither enclosed in sclerotized capsules, nor have any contact with the integument, they are frequently lost during preparation and generally not visible in slide preparations.

On the dorsal and ventral idiosoma surfaces, several structures are arranged in a regular, symmetric pat-

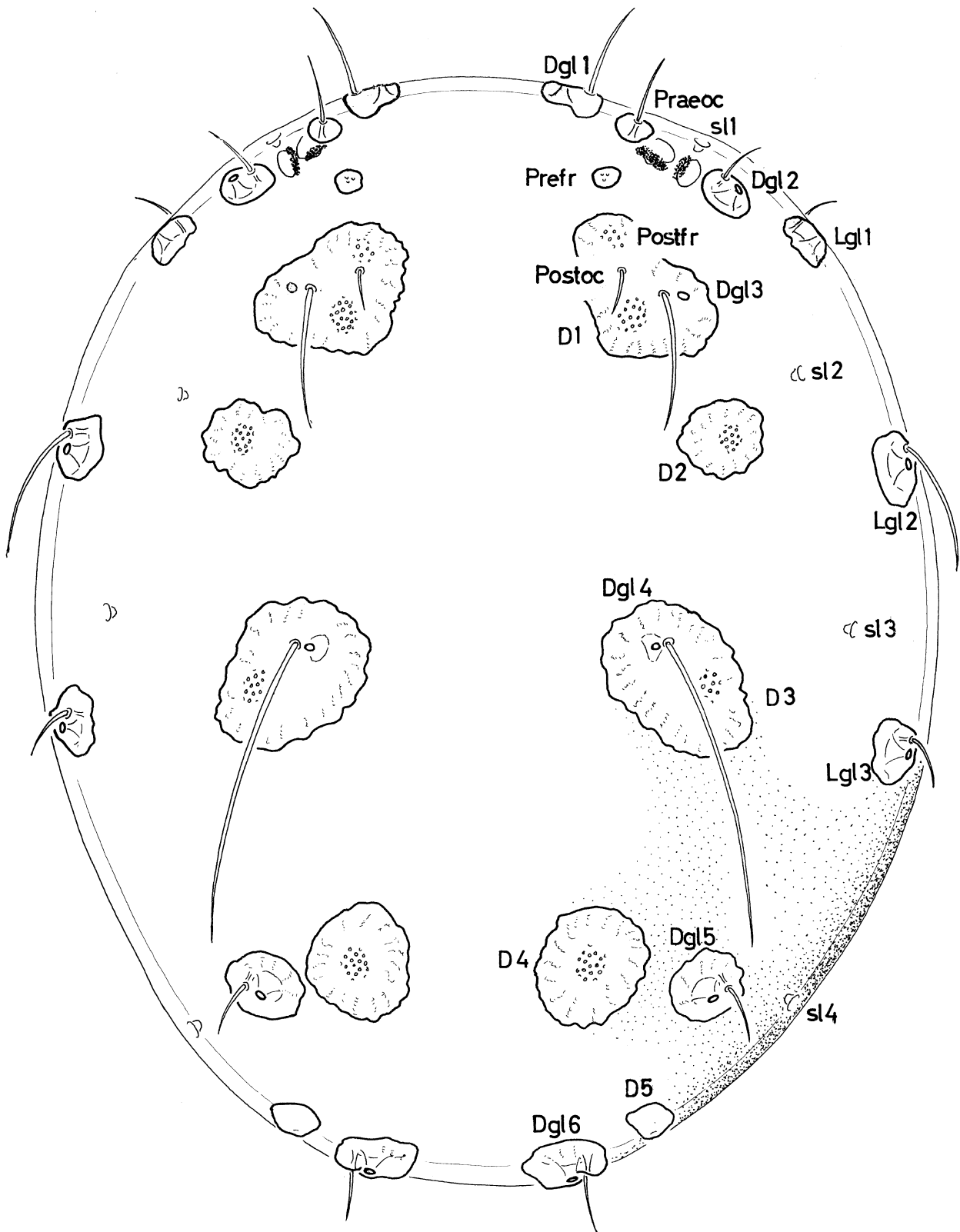


Figure 2. General idiosoma morphology and terminology of *Atractides*, dorsum. See 'Anatomical abbreviations'.

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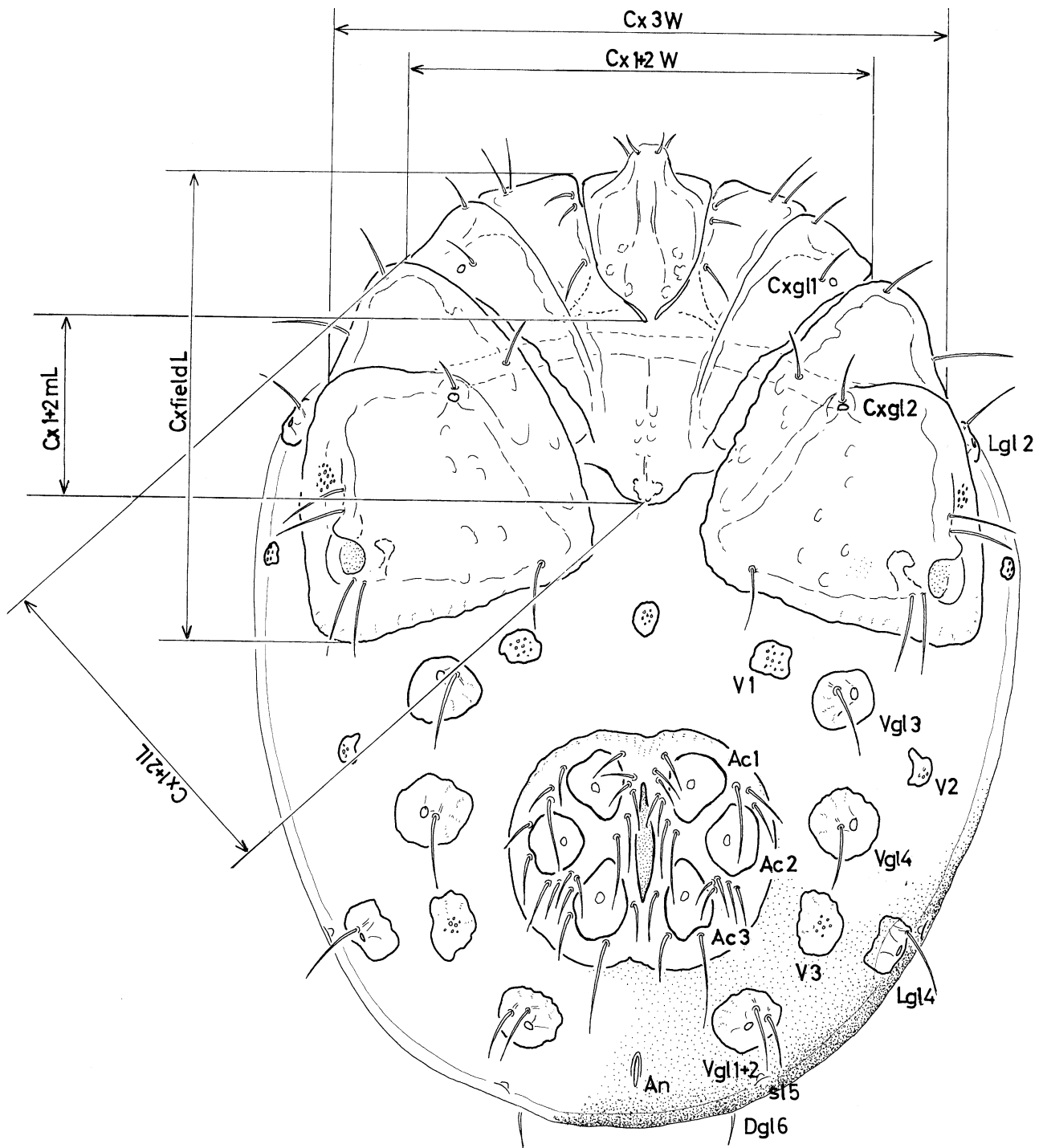


Figure 3. General idiosoma morphology and terminology of *Atractides*, ventrum. See 'Anatomical abbreviations'.

tern: glandular pores, seta-bearing platelets, slit organs and muscle insertion points. Following a proposal of Bader (1975) but with several modifications as explained below, the terminology for these organs is based on the scheme elaborated by Lundblad (1927a) for the Hydrphantidae.

All glandularia (Figs 2,3,4C) consist of a pore and a seta, placed together on a round platelet or imbedded in more extended sclerotized areas. They function as defence glands. More regularly than in other genera of Hydrachnidia, they are found exploded in conserved specimens: long bands of gelatinous material extend

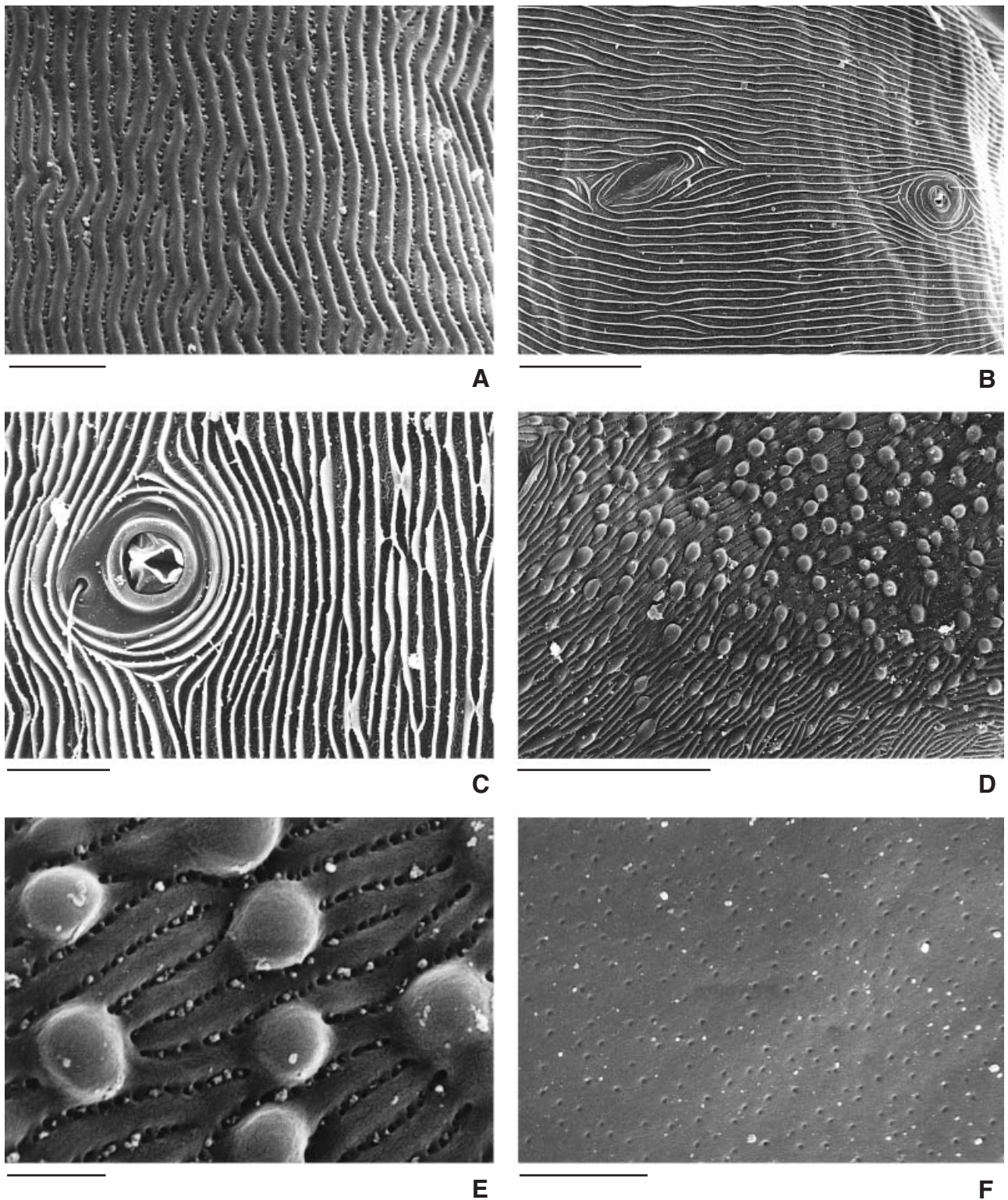


Figure 4. Types of integument morphology in *Atractides*, SEM photographs. A, finely striated (*A. macrolaminatus* ♂, Berchtesgaden), scale bar = 4 µm; B, lineated (with slit organ and glandular) (*A. panniculatus* ♀, Berchtesgaden), scale bar = 40 µm; C, ditto, detail (with glandular), scale bar = 10 µm; D, papillate (*A. walteri* ♀, Berchtesgaden), transition area between striated (at right, upper margin) and papillate (at left lower margin), scale bar = 40 µm; E, ditto, detail, scale bar = 2 µm; F, porosity of sclerified surface of Cx-4 (*A. nodipalpis* ♂, Goldersbach, SW Germany).

from the pores and can cover the whole animal in a sticky net.

On the dorsum (Fig. 2) one can recognize a medial line of dorsoglandularia (Dgl) including the frontally directed Dgl-1 ('Antenniformia', Lundblad; 'Preantenniformia', Bader) Dgl-2 ('Postantenniformia', Bader) placed near the lateral eyes, Dgl-3 and especially Dgl-4 with very long and extraordinarily strong accompanying setae (Fig. 5A,B). Dgl-5 again with short setae and Dgl-6 immediately at the caudal idiosoma margin. A further four pairs of lateroglandularia (Lgl-1–4) are placed at regular distances along the lateral idiosoma margin; Lgl-4 is shifted to the ventral surface.

Ventrally (Fig. 3) two pairs of coxoglandularia (Cxgl) are associated with the coxal plates: Cxgl-1 near the posterolateral margin of Coxae 2, and Cxgl-2 near the anterior margin of Coxae 4 (Fig. 5C,D); further four pairs of ventroglandularia (Vgl-1–4) are arranged laterally and caudally from the genital field (Fig. 5F). Enumeration follows Wiles (1997). The glandular opening of Vgl-1 is reduced, and the remaining seta-bearing sclerite is often fused to Vgl-2 (as illustrated in Fig. 3) but may be also separate, as a small, round sclerite knob (Fig. 5F). In some rare cases, there is a sexual dimorphism concerning this character, with Vgl-1 + 2 fused in males, but separate in females.

At present, there is no means of homologueizing glandularia of hygrobatid mites with those of the general scheme proposed by Lundblad for the Hydryphantidae. No trace is found of glandularia associated with first coxae (Lundblad's Cxgl-1) and I have no argument with Bader's proposal that the glandularia placed laterally from Cx-3 should be called Cxgl-3 rather than Lgl-1. Furthermore, the homologuey of the glandular opening on Cx-4, a particular feature of the family Hygrobatidae, is unclear. Due to the fact that on the dorsal side one complete set of serially homologueous organs (Dgl, Lgl, slit organs, muscle attachment points) is missing with respect to Hydryphantidae, the partial evolutionary reduction of an entire segment, accompanied by a change in position of a remnant pair of glandularia, is conceivable.

Two pairs of seta-bearing platelets not associated with glandularia are found in the frontal region: the preocular between Dgl-1 and -2, and the postocular anteromedial to Dgl-3.

In most species, muscle attachments are recognizable as areas of slightly granulated and condensed membrane only. In several species (species groups?) they are formed as real sclerite platelets that can fuse in numerous ways with neighbouring glandularia and/or other sclerotized areas. In extreme cases, the whole dorsum (Fig. 20A) and/or large parts of the perigenital area (Fig. 37G) can become armoured by extended sclerotization. Apart from the presence and extension

of sclerotization, the arrangement of muscle attachments (Fig. 2 illustrates an example with well-developed plates) constantly follows the same ground pattern: dorsally, two small round points in the frontal part (pre- and postfrontal; in Fig. 2 the postfr fused with Dgl-3) and a further five pairs of attachment points paralleling the median line (in Fig. 2 the first pair fused with postfr and Dgl-3; the 3rd fused with Dgl-4). On the ventral side, apart from the coxae with numerous, more or less irregularly distributed muscle insertions, one pair of fine insertion points is found laterally on the level of the insertions of the IV-legs; a further three pairs are staggered with the Vgl around the genital field. Furthermore, two unpaired insertion points are present: a small, roundish pregenital one, and a more strongly developed postgenital one, generally fused with the caudal margin of the genital plates.

The regular pattern of integumental muscle attachments in Hydryphantidae, induced Lundblad (1927a) to propose a system of enumeration corresponding to the system of glandularia. While in Hydryphantidae two files of insertions are found, medial 'dorsocentralia' and lateral 'dorsolateralia', in *Attractides* only one file is developed. Bader (1975) decided to term them jointly as 'dorsocentralia' (possibly with the implication that dorsolateralia were reduced). In reality, the situation seems more complex, as sometimes the muscles attach medially from Dgl (Dgl-3, Dgl-5) in other cases laterally (Dgl-4, Dgl-6). This pattern could be explained by an alternating reduction of dorsolateralia and dorsocentralia, or, still more complex, fusion of the respective insertions. In view of the general evolutionary plasticity of muscle arrangement and function, I currently envisage no means of identifying the phylogenetic origin of the insertion structures. For this reason, in this paper the dorsal sclerites associated with muscle insertions are neutrally termed 'dorsalia'. In view of the numerous types of arrangement, their terminology and enumeration has to be defined for each species or species group separately. For example, in Figure 2 there are five pairs of dorsalia: D-1 (first muscle attachment point, fused with postfr + Dgl-3 + postoc), D-2 (second muscle attachment point), D-3 (third muscle attachment point, fused with Dgl-4), D-4 (fourth muscle attachment point) and D-5 (fifth muscle attachment point).

Slit organs develop as openings in the membranous cuticle (Fig. 4B); under the light microscope they resemble small cup-shaped cavities; a total of five pairs (sl-1–5) is located in the lateral area of the dorsal integument and in the postgenital area, near Vgl-2 and -3.

As in all sclerotized parts, the surface of the coxae is perforated by rather fine porous channels (Fig. 4F) while no regularly arranged large pore openings such

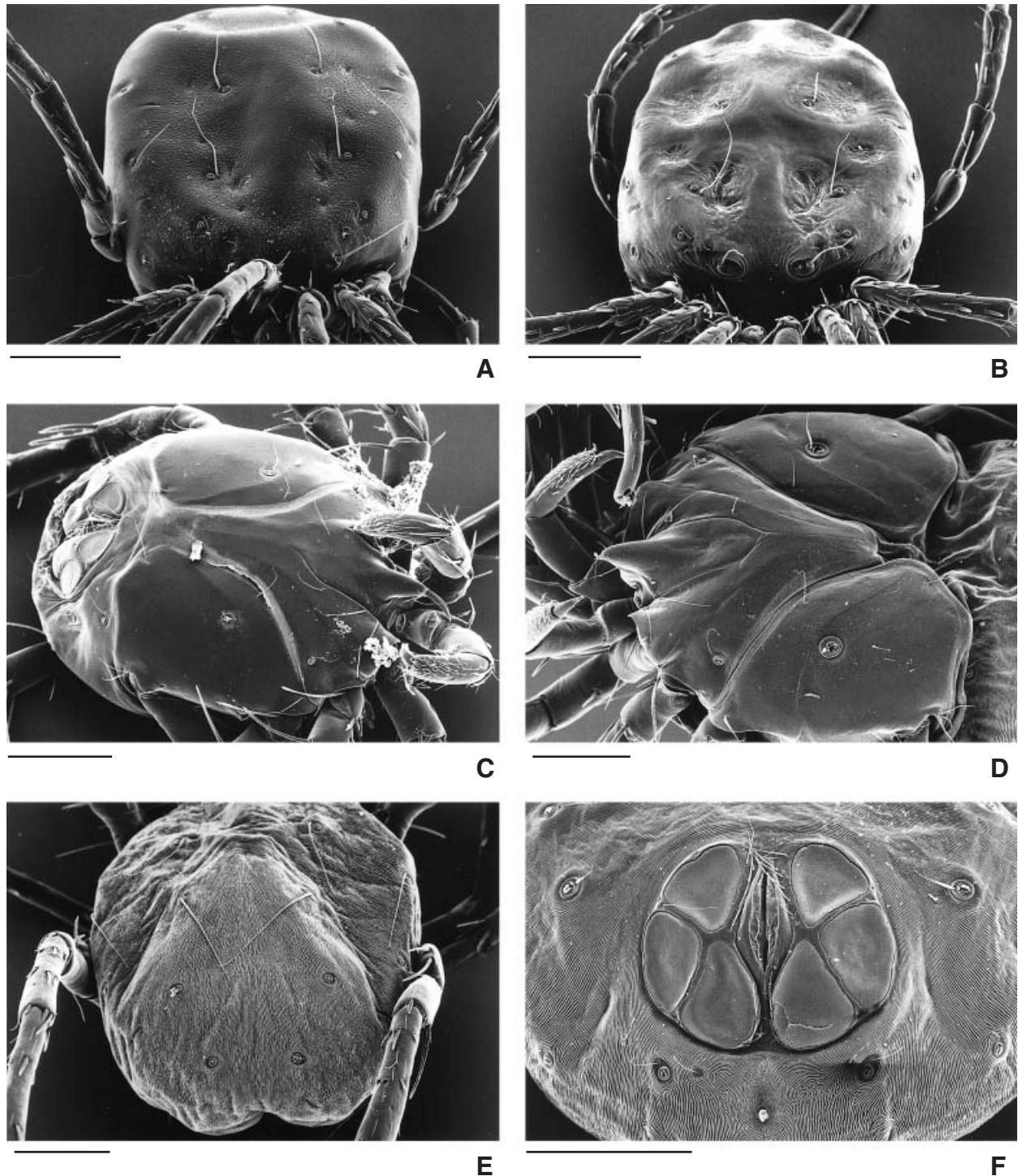


Figure 5. Idiosoma morphology of *Atractides*, SEM photographs, all scale bars = 100 μm . A, anterior view of the dorsum of *A. walteri* ♂ (Berchtesgaden), soft-skinned muscle insertions are visible as shallow pits; B, anterior view of the dorsum of *A. macrolaminatus* ♂ (Berchtesgaden), with sclerotized muscle insertions visible as enlarged plates partly covered by membranous integument; C, ventrum of *A. nodipalpis* ♂ (Goldersbach), showing extension of soft membrane and coxal sclerites; note the presence of a sclerotized bridge between anteromedial margin of Cx-1 and gnathosomal base; D, coxal field and gnathosoma of *A. panniculatus* ♀ (Berchtesgaden); E, posterodorsal view of *A. panniculatus* ♀ (Berchtesgaden); note the long setae of Dgl-3 and Dgl-4; F, genital area of *A. panniculatus* ♂ (Berchtesgaden) – Vgl-1 not fused with Vgl-2, excretory pore unsclerotized.

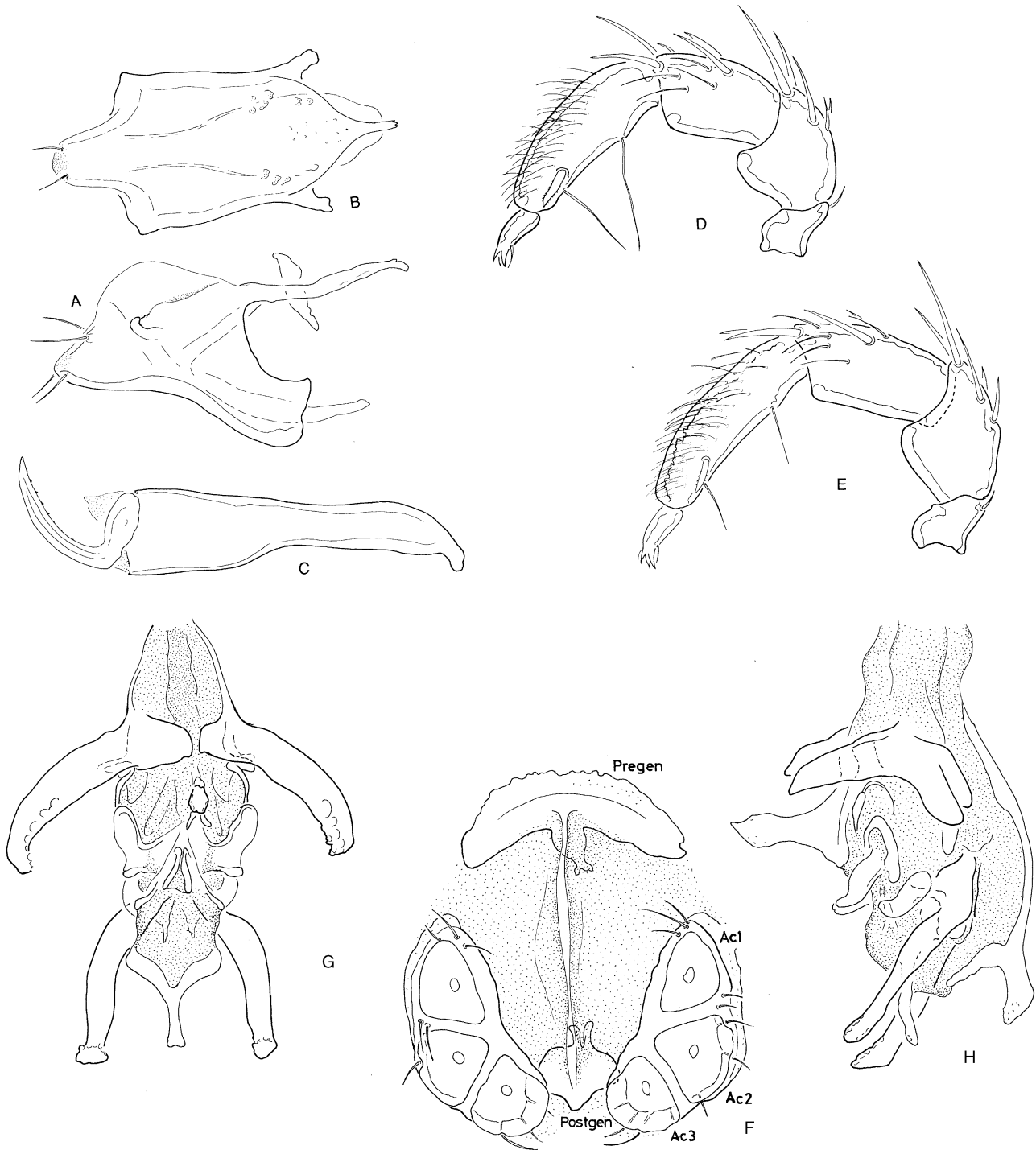


Figure 6. Morphology and terminology of *Atractides* (A–F, *A. walteri*, Berchtesgaden). A–D, male; A, gnathosoma, lateral view; B, gnathosoma, ventral view; C, chelicera, lateral view; D, palp, medial view; E, F, female; E, palp, medial view; F, genital field, terminology: see ‘Anatomical abbreviations’; G, H, *A. panniculatus* ♂ Berchtesgaden, ejaculatory complex; G, anterior view; H, lateral view.

as in hydryphantid mites are found. Cx-1 and Cx-2 are completely fused along their margins and also medially, forming a continuous anterior coxal plate. The gnathosoma is connected by a tiny sclerotized bridge to the medial tip of the gnathosomal bay (Fig. 5C,D); possibly, parts of the medial fusion area of Cx-1 originate from the anchoral process of the gnathosomal base (Gerecke, 2000). Also Cx-3 and Cx-4 are fused on each side to a pair of posterior coxal plates, separated medially by a large area of membranous integument, and in most cases from the anterior coxal plates by a straight membranous strip.

The gonopore is flanked by a pair of genital plates which in males fuse completely, forming a round genital shield (Figs 3,5F), but remain separate in females (Fig. 6F). These plates bear fine, often nearly invisible setae (numerous in males, fewer in females) and the acetabula (Ac), organs of osmoregulatory function. The acetabular surface is perforated by a sieve of micropores visible only in SEM preparations (Fig. 5F). In most cases, three pairs of Ac are present, but an additional pair is found in *Atractides octoporus*, and there are more in most species of the subgenus *Poly-megapus*. Specimens with a reduced number of four or five acetabula are observed within populations of various species. Formerly, they were the cause of descriptions of separate species placed in their own subgenus, *Tetramegapus*, but here they are considered as misshaped individuals (see below). In females, pre- and postgenital sclerites are found at the anterior and posterior ends, respectively, of the gonopore, the posterior ones in contact with genital plates, but not fused with other sclerotized parts (Fig. 6F). In males, they fuse with the anterior and posterior margins of the genital shield. The ejaculatory complex follows the ground-plan as found in *Hygrobates* (e.g. Gerecke, 1991, see Fig. 6G,H).

The excretory pore perforates the integument between Vgl-2. In most cases, it is unsclerotized (Figs 3,5F) but in some species it is surrounded by a sclerite ring (Figs 18C,40B).

LEGS

Figure 7 illustrates a complete set of legs of *A. nodipalpis*. Very little information has been published concerning the morphology of legs 2–4 in species of the genus. With the exception of *A. ovalis*, characterized by the presence of several long swimming hairs on the posterior legs, only the particular shape and specific formation of the terminal segments of the anterior leg pair has attracted the attention of taxonomists, while legs 2–4 were considered rather uniform. This general line is followed for two reasons: (1) previous descriptions need to be discussed, and (2) collection specimens are in most cases prepared in a manner that

permits checking of the separated first legs while the other legs remain *in situ*. First legs are of particular importance for recognizing and classifying *Atractides*-like mites, but it is probable that a future study on the proportions and setation of other legs could reveal additional details of interest from both the taxonomic and ecological points of view.

The first leg is described in considerable detail, and a series of abbreviations is introduced (Fig. 8). An extended number of measurements is used in order to overcome problems with old and deteriorated type material, where the first leg is often the best conserved part of the animal. A series of morphological indices is calculated for defining and comparing species.

The fifth segment of the first leg (I-L-5) is distally more or less enlarged, with protruding lateral margins which cover the base of the terminal segment like a sheath (Fig. 9A,B,D). On the ventral side, it bears an unpaired short seta in most cases located distally from the centre, and a pair of modified, often strong and blade-like setae at the distal margin. At this site in most hygrobatid water mites, a pair of such setae is found on all legs; however, the characteristic feature of *Atractides* is their particular shape (distally thickened, bowed, flattened, often sword-like) and arrangement (in most cases at a certain distance from each other; this is henceforth termed the setal interspace, and qualified as being wide or narrow). Both setae are inserted at the proximal margin of the large membranous cavity of the articulation of I-L-6, covered laterally by the lamellar distal margin of I-L-5 (Fig. 9B,D,F). Often, the proximal seta (S-1) is longer and slightly more slender, the distal one (S-2) shorter and more compressed. The interspace between them is measured between the distal basal edge of S-1 and the proximal basal edge of S-2. For both 'sword' setae, the total length (including the basal part covered by the sheath) and maximum width are provided. Further measurements of this segment are: dorsal length (dL) ventral length (vL) between the base and the distal edge near the insertion of S-1, height A (HA) at the insertion of the ventral seta, height B (HB) on the level of the ventrodiscal edge, and height C (HC) measured from the ventrodiscal edge to the dorsodiscal edge. HA/HB is a measure of the distal swelling of the segment, while HC/HB describes the degree of inclination of the insertion area of the sword setae. At the mediobasal margin of the segment, a characteristically curved whip-seta is present (Fig. 9A).

In most cases, I-L-6 has a species-specific modified shape, being more or less curved (Figs 56E,57A) swollen or very delicate (Figs 64E,69B) with the area of the claw insertions thicker or thinner than the basal part of the segment (Figs 63A,90C). As a ground pattern, on the ventral side, basally a group of ventral setae is

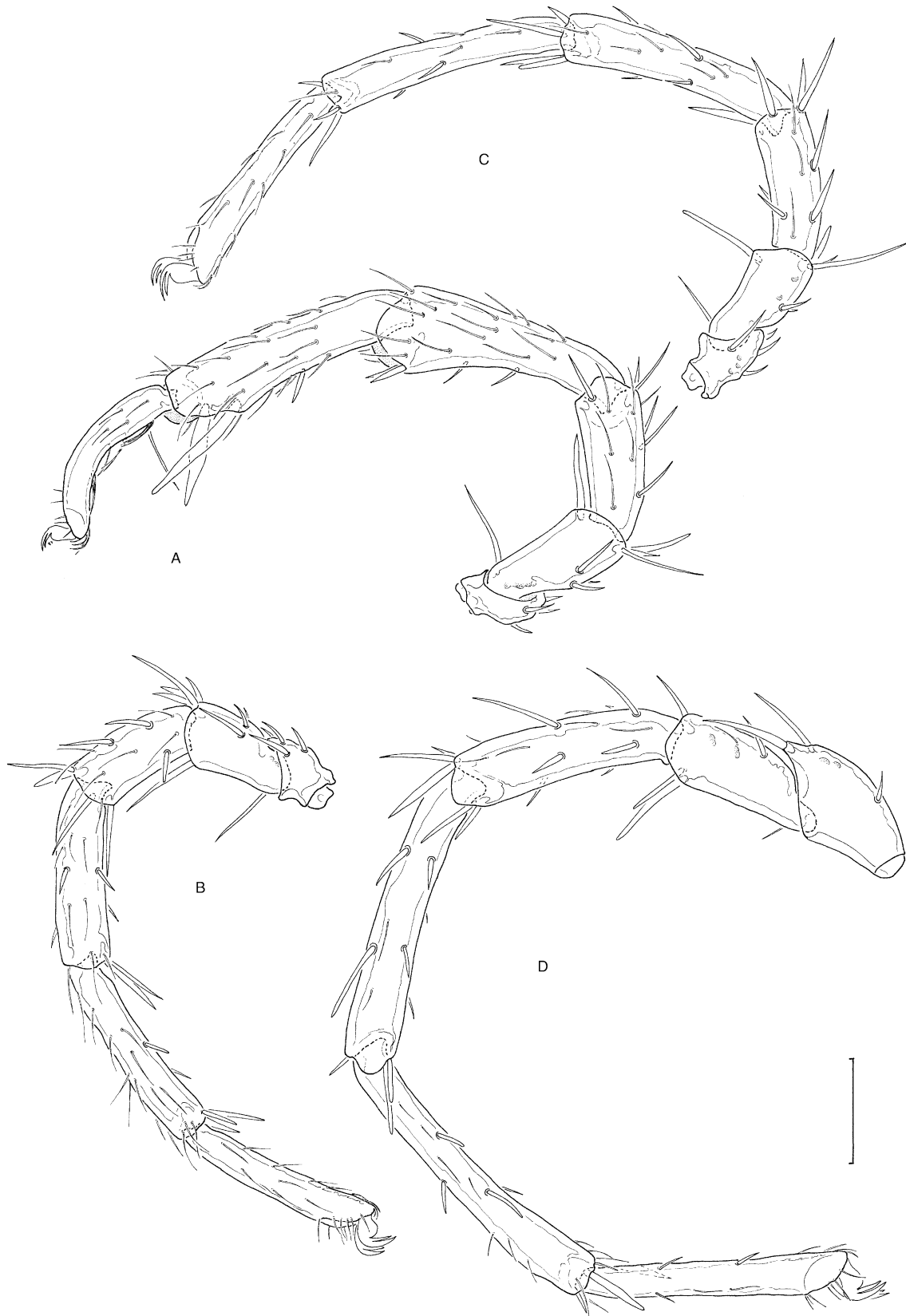


Figure 7. Morphology of the legs of *Atractides nodipalpis* ♂ (Goldersbach). A, I-L; B, II-L; C, III-L; D IV-L.

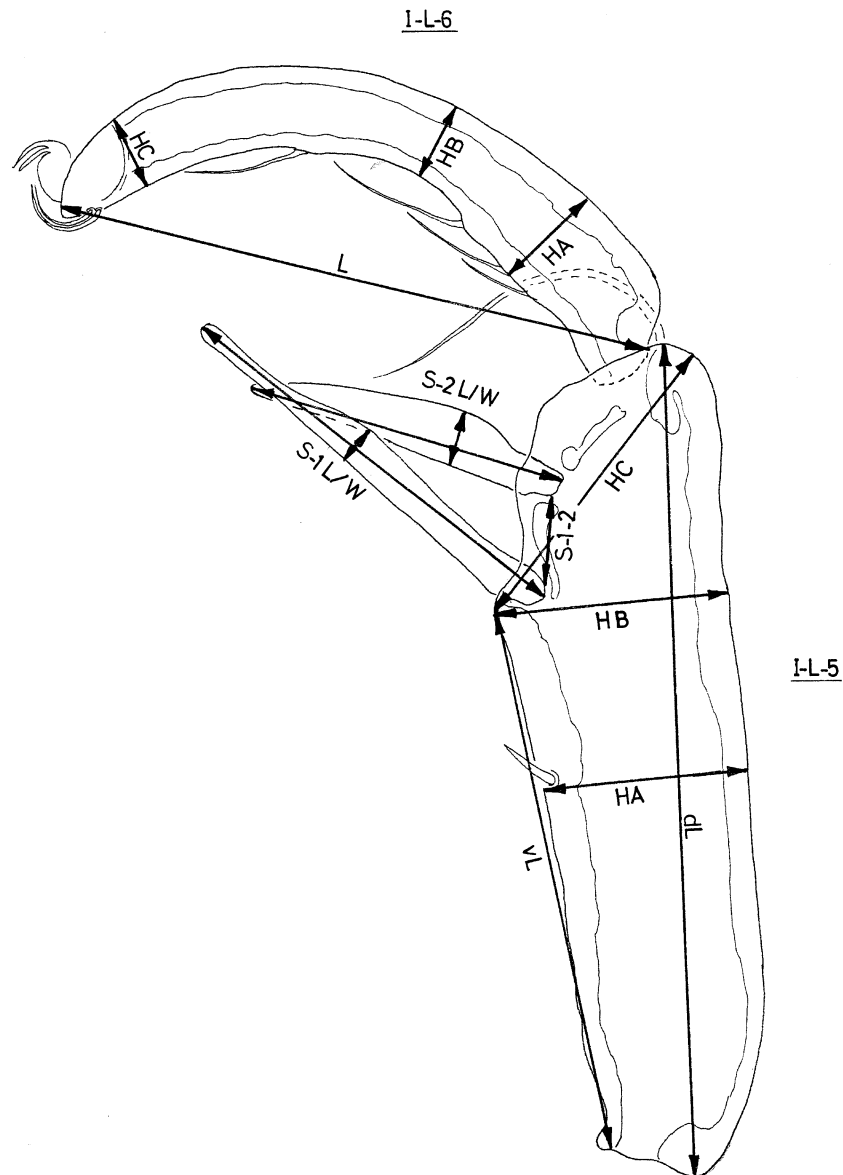


Figure 8. Morphology and terminology of *Atractides*. First leg, terminal segments, schematic view. See ‘Anatomical abbreviations’.

lined up in a shallow groove (Fig. 9A,C) and distally a tuft is inserted, with the tips of setae curving around the distal edge and directed towards the claws (Fig. 9E). Under the light microscope, all these ventral setae appear to be distally fused, while SEM photographs reveal that they are closely bundled but not fusing. For this segment, the dorsal length (dL) is measured between the dorsal base and the distal tip (including the claw groove); the basal height (HA) is the maximum height associated with the proximal setae, the medial height (HB) is the minimum height in the centre, and the distal height (HC) at the prox-

imal margin of the claw groove. HA/HB describes the degree of basal swelling, while HB/HC describes the distal swelling of the segment.

Apart from the spectacularly different *Maderomegapus hystricipes* Lundblad, 1941 (Fig. 94) endemic to Madeira and here considered to be a subgenus of *Atractides*, no further example of sexual dimorphism in legs of *Atractides*-like mites is known. The function of the modified I-L is still unclear. The interpretation as a grasping organ prescribed by general morphology has never been corroborated by ethological observations – only the palps are involved in feeding.

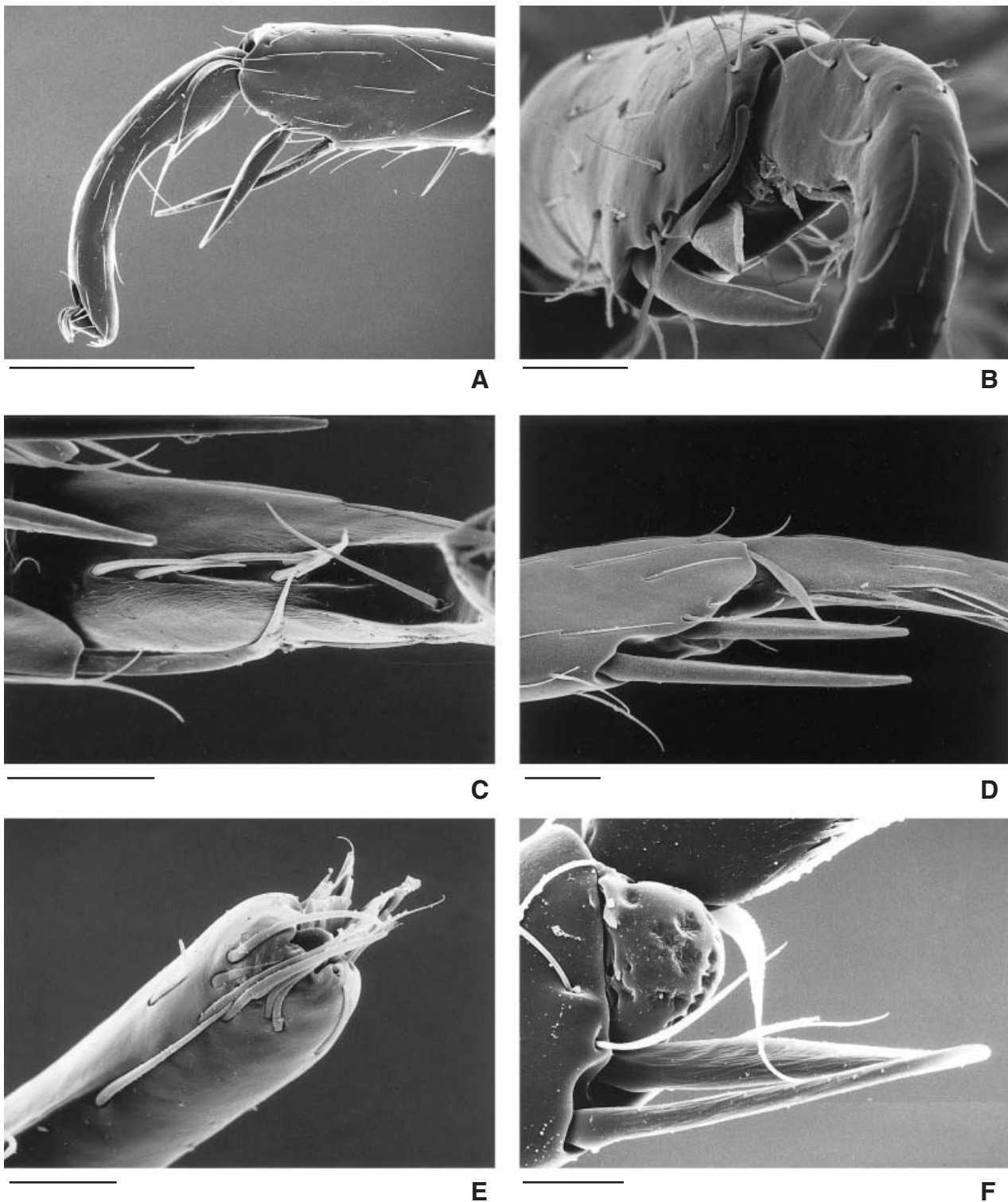


Figure 9. Morphology of the first leg in *Atractides*, SEM photographs. A, *A. nodipalpis* ♂ (Goldersbach), anterior view, scale bar = 100 µm; B, *A. nodipalpis* ♂ (Goldersbach), insertion of S-1 and -2, scale bar = 20 µm; C, *A. nodipalpis* ♀ (Goldersbach), basal setae-bearing groove of I-L-6, scale bar = 20 µm; D *A. panniculatus* ♀ (Berchtesgaden), insertion of sword setae on I-L-5, scale bar = 20 µm; E, *A. panniculatus* ♀ (Berchtesgaden), I-L-6, ventrodistal setae and claws, scale bar = 10 µm; F, *A. macrolaminatus* ♂ (Berchtesgaden), insertion of sword setae I-L-5 and swollen articulation membrane, scale bar = 10 µm.

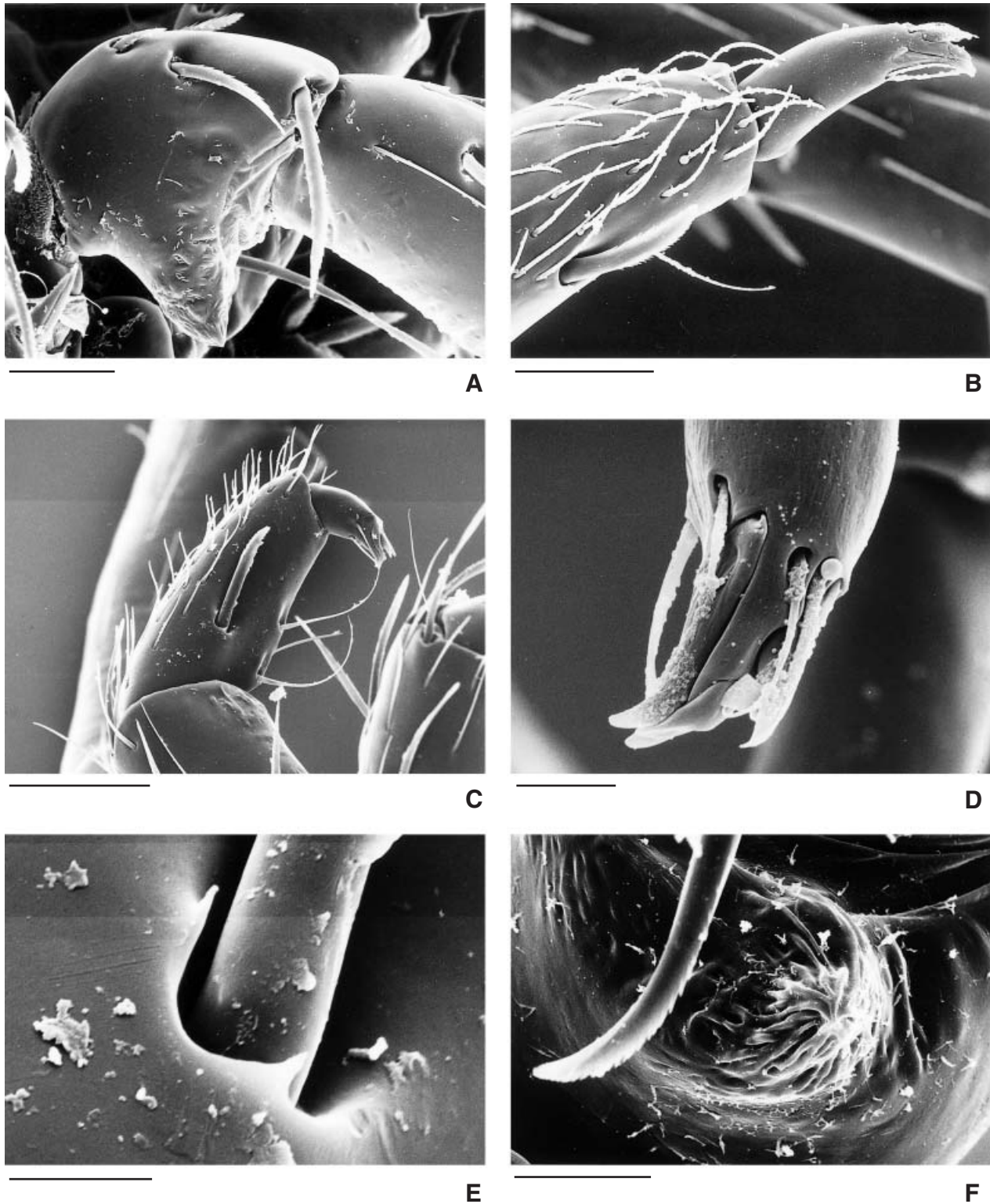


Figure 10. Morphology of the palp in male *Atractides*, SEM photographs. A, *A. nodipalpis* (Goldersbach), ventral protuberance of P-2, scale bar = 20 μm ; B, *A. panniculatus* (Berchtesgaden), distal part of P-4 with pennate medial seta, and P-5, scale bar = 20 μm ; C, *A. nodipalpis* (Goldersbach) P-4 and P-5, scale bar = 40 μm ; D *A. walteri* (Berchtesgaden), P-5 claws, scale bar = 4 μm ; E, *A. nodipalpis* (Goldersbach), P-4, insertion of medial seta, scale bar = 4 μm ; F, *A. nodipalpis* (Goldersbach), ventral protuberance, ventral view, scale bar = 10 μm .

GNATHOSOMA

The gnathosoma (Fig. 6A,B) has a pointed rostrum which varies in length, and proximal projections as muscle attachment points. In all specimens studied, it is directly joined to the medial part of the gnathosomal bay (made up of the anteromedial margins of Cx-1) by a tiny sclerotized bridge (Fig. 4C,D). As a consequence, there is only very restricted relative mobility between gnathosoma and idiosoma. Probably, the lateral slits separating the regions from each other allow only slight up and down movements, with the sclerotized bridge as an elastic hinge.

The chelicerae (Fig. 6C) are rather uniform in shape, but occasionally with species-specific morphological adaptations. Their measurements are given as length of the basal segment (bS), length of the claw (cl), height of the basal segment (H) and total length ($L = bS + cl$); also the proportions bS/cl and L/H.

The morphological groundplan and setation of palps are illustrated in Figure 6D,E, and details of setae and claws of P-5 in Figure 10. Segments are numbered from basis to tip as P-1 to P-5. Measurements are dorsal length, maximum height (excluding eventual hyaline protuberances), total length (L P-1–5), L/H ratio for each segment, and relative length of each segment (L/total L [%]). There are considerable species-specific differences in proportion. Furthermore, sexual dimorphism in shape of palps is frequent, sometimes concerning slightly different segment proportions; in other cases, extreme differences have induced previous workers to describe males and females as separate species. The male palp can display protuberances on the ventral margins of P-2 and P-3 (Fig. 10A,F), a differently shaped medial seta on P-4 (Fig. 10C,E) and an extended field of densely arranged fine dorsal hairs on P-4 (Fig. 10B,C).

REGULARLY FOUND MALFORMATIONS

On several occasions, the appearance of malformed specimens has induced the description of species or subgenera in *Atractides*. Therefore, it is useful to document cases of individual aberrations regularly found in populations of the genus. When taxonomic studies are based on single specimens, characters should be critically weighted in view of their possible origin from developmental disorder rather than genetic diversity.

Malformed appendages

As in other genera (Thor, 1926; Láska, 1955b), specimens are occasionally found with unusual ramifications of legs. A particular case is documented in Figure 11H. The I-L bears a quadruplet set of distal sword setae (S-1 and -2) and paired distal segments

arranged side by side. The left I-L-6 is longer and bears two pairs of claws, the right one is shorter and provided with the usual single pair of claws. While such spectacular aberrations are easily recognized as individual malformations, more subtle deviations can easily cause taxonomic confusion. For example, the ventral seta of I-L-5 may become similar in shape to the ventrodiscal sword seta (Fig. 11G). As the ventral seta of the other I-L-5 of the specimen figured is normally shaped, there can be no doubt that the particular seta has been produced by developmental disorder. In species with sexual dimorphism of palps, males can occasionally be found with nonmodified, female palps (see below and Fig. 11D,F)

Changes in number of acetabula

In the groundplan of *Atractides*, the gonoporus is surrounded by three pairs of acetabula. In rare cases, also within populations of the tetracetabulate *A. octoporus*, hexacetabulate specimens can be found with asymmetric genital field bearing four pairs on one side, and three on the other (Fig. 11A). This observation supports the view that the species in question is more closely related to other hexacetabulate species than to the remainder included in the former subgenus *Octomegapus* (see 'Subgenera', below).

Also in hexacetabulate species, specimens with reduced numbers of acetabula are frequently found. In many cases, a knob-shaped area of stronger sclerotization with some fine surface pores is found instead of the reduced acetabulum (Fig. 11B,C), although no trace of the right Ac-1 can be seen in the male in Figure 11B. In several cases, deformations in shape of the genital field were observed, accompanied by reduced or absent sexual dimorphism of the palp (see below). The taxonomic assessment of such specimens may become difficult or even impossible without detailed knowledge of the general composition of the mite fauna at the collecting site.

Intersexes

Within larger populations of *A. nodipalpis*, single specimens are regularly found which combine typical female genital plates with a well-developed genital skeleton (Fig. 11E). In these individuals, the gonopore area more closely resembles that of the male than the female, with small genitalia which lack reinforced genital lips. However, the setation of the genital plates is typically female, without any setae arranged medially from Ac-1. All encountered hermaphroditic *A. nodipalpis* presented female-type palps without a ventral protrusion of P-2 and a lower number of dorsal hairs on P-4. Thus, they could be attributed to the species only due to a detailed knowledge of the *Atractides*

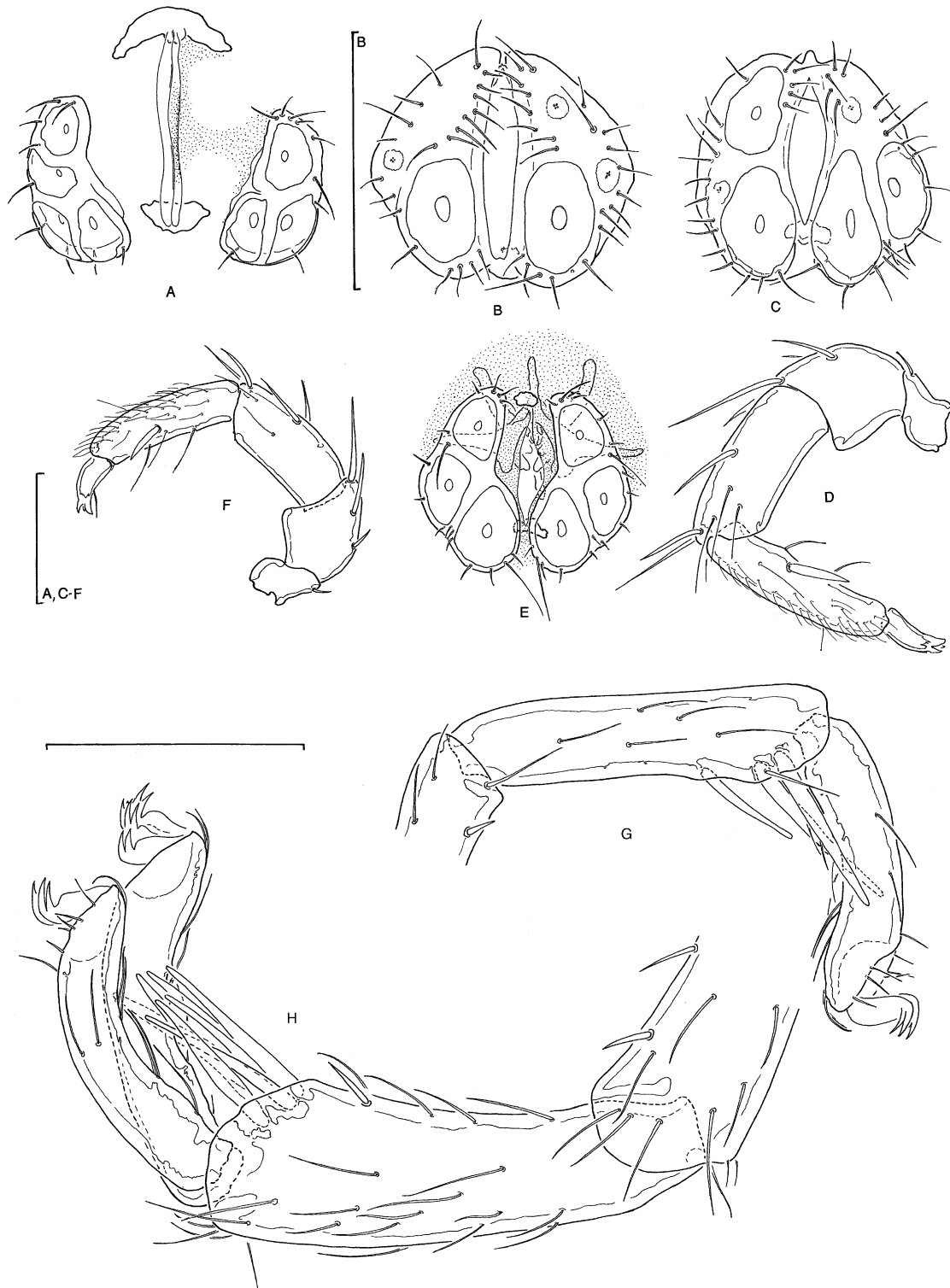


Figure 11. Morphology of *Atractides*. Malformations. A, *A. octoporus* ♀ (Goldersbach), genital field with reduced number of left Ac; B, *A. nodipalpis* ♂ (Brigach, S Germany), genital field with reduced Ac-1/2; C, D, *A. nodipalpis* (Brigach) C, genital field with reduced left Ac-1 and right Ac-2; D, palp, medial view; E; F, *A. nodipalpis* intersex (Goldersbach) E, genital field with genital skeleton *in situ*; F, palp, medial view. G, A *A. spinipes* ♀ (Goldersbach) with ventral seta on I-L-5 similar in shape to blade setae S-1 and -2; H, *A. nodipalpis* ♂ (Goldersbach) with doubled I-L-6, quadrupled S-1 and -2, and doubled claws on left I-L-6. Scale bars = 100 µm.

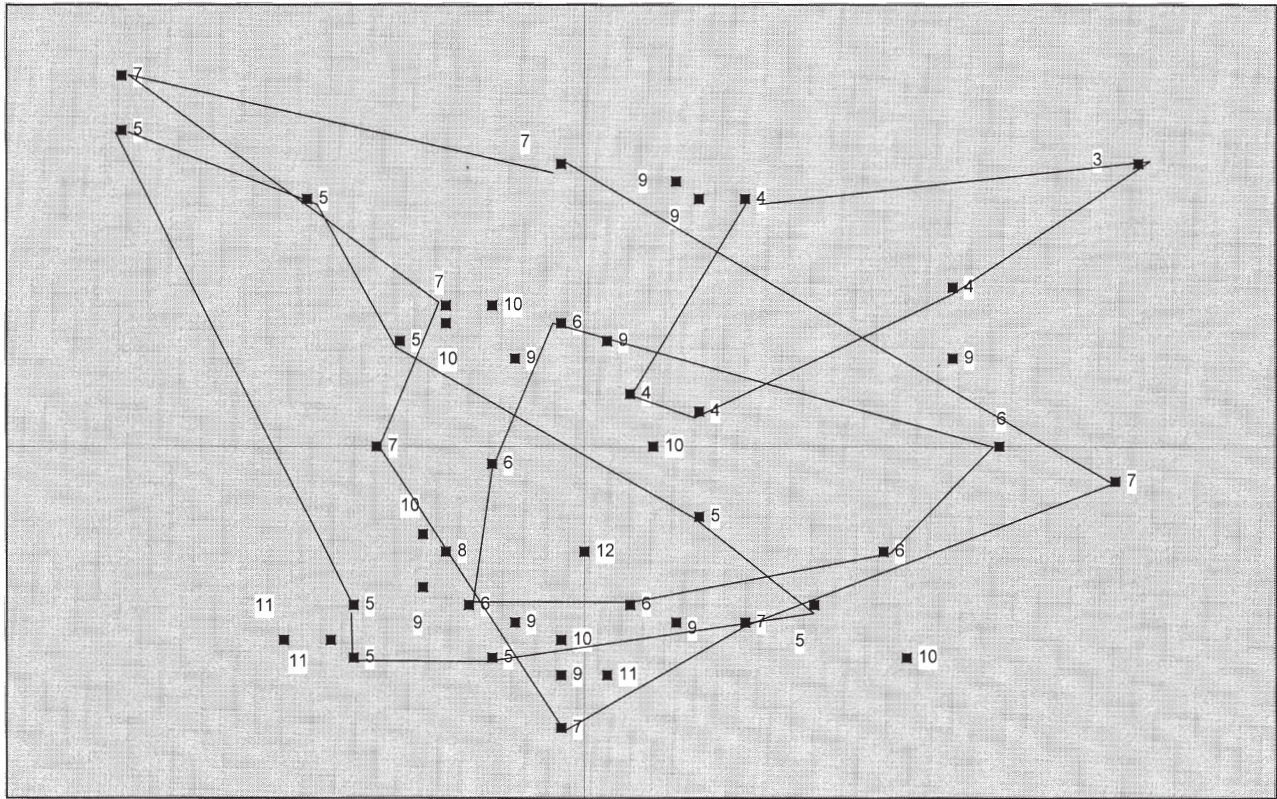


Figure 12. Plot of a PCA analysis based on palp and I-L measurements in males of a population of *A. nodipalpis* from Goldersbach. Score numbers refer to the months in which specimens were collected. In order to better display the widely overlapping morphological features of specimens collected at different dates, values for April (4), May (5), June (6), and July (7) are each linked to a polygon (from a cooperation with H. Van der Hammen).

fauna at the collecting site. Clearly, hermaphroditic *Atractides* have caused taxonomic problems in the past. As documented in museum collections, they were often attributed to *A. spinipes*, increasing the mystery of that species.

SEASONAL CHARACTER STABILITY AND ALLOMETRIC VARIATION: *A. NODIPALPIS* THOR

During an early stage of this revision the classification of *Atractides* from streams in southern Germany suggested the seasonal vicariance of several species, mainly of *A. spinipes sensu* K. Viets (1936) and *A. nodipalpis* Thor, 1899. In order to obtain further insight into this problem, year-round collections were taken from the Goldersbach (Gerecke, 2002) and *nodipalpis*-like *Atractides* were studied using several statistical methods.

The results of the PCA indicate that in both sexes the first component is mostly influenced by the measurements of I-L-5 (dL, HA-HC) and P-2. In males it also involves L I-L-6, and in females L P-4. However,

at around 60%, the explanatory power of the first three components is low. An ordination based on the character scores of the first two components when labelled with the month of collection does not produce seasonal groups: the males are spread over all four quadrants, and the females tend to group with strong superposition. Thus, variation in the measurements of the palp and I-L is largely independent of season. Slight differences between spring and autumn females are best explained by the presence of two consecutive generations (Gerecke, 2002). In agreement with this observation, scattergrams of all 23 variables used in this test, plotted individually against month of capturing, did not show any significant seasonal change.

In order to investigate whether an a priori grouping gives different results, the dataset was split into spring–summer and autumn–winter groups. The chi-square transformation of Wilks' lambda resulted in only one variable in the male group (S-1 L); no variable in the female group showed a significance level below 0.02. There is little or no difference between the



Figure 13. Comparison of palps and I-L of both the largest and smallest specimens in a population of *A. nodipalpis* in Goldersbach. A–D, males, E–H females. A, B, G, H, I-L-5 and -6; C–F palps. Scale bar = 100 μ m.

means of the two seasonal groups: in the males, 32% are misclassified in spring–summer, and 39% in autumn–winter. In females, the respective values are 27% and 40%.

This observation demonstrates that there is a very slight morphometric differentiation between the spring–summer and autumn–winter specimens. The combined results indicate that the *A. nodipalpis* population from Goldersbach is genetically homogeneous.

Therefore, the palp and I-L measurement range observed there can be used in this revision to: (1) interpret the diagnostic significance of these characters in closely related (sub)species; (2) provide an example of the possible variability of these characters for taxonomically distant species.

Table 1 provides a survey of the mean values and range of variability of the studied I-L and palp measurements in the Goldersbach population.

Table 1. *Atractides nodipalpis* from Goldersbach, palp and I-L-measurements [μm]; $n = 47$ (males), 54 (females), for explanations of abbreviations, see text and Fig. 8

	Males				Females			
	Mean	Min.	Max.	St.dev.	Mean	Min.	Max.	St.dev.
P-1 L	35	29	40	2.08	40	36	45	2.29
P-1 H	35	29	40	2.20	38	34	43	2.18
P-2 L	85	74	99	5.16	100	83	112	6.77
P-2 H	75	63	99	6.74	69	56	87	6.32
P-3 L	91	81	105	5.46	131	108	148	8.42
P-3 H	55	45	72	4.68	54	45	67	5.07
P-4 L	110	99	128	6.17	142	121	164	9.42
P-4 H	43	38	54	2.99	37	31	43	2.83
P-5 L	43	38	47	1.82	48	45	56	2.31
P-5 H	16	16	18	0.95	18	13	20	1.19
Palp total	364	323	408	17.52	462	392	515	26.18
P-1 L/H	1.01	0.89	1.15	0.06	1.06	0.89	1.19	0.06
P-2 L/H	1.15	0.93	1.26	0.06	1.45	1.17	1.57	0.08
P-3 L/H	1.66	1.43	1.99	0.11	2.42	1.93	2.76	0.15
P-4 L/H	2.55	2.20	3.17	0.17	3.83	3.39	4.20	0.15
P-5 L/H	2.67	2.38	2.86	0.14	2.66	2.33	3.33	0.17
P-2/P-4 L	0.77	0.63	0.84	0.03	0.70	0.66	0.78	0.02
I-B-5 L	225	180	275	16.62	278	225	315	19.36
I-B-5 HA	50	38	65	5.13	63	49	81	7.70
I-B-5 HB	62	45	76	5.64	73	60	90	6.62
I-B-5 HC	74	52	92	7.41	95	76	116	9.04
I-L-5 L/HB	3.63	3.25	4.02	0.18	3.80	3.24	4.29	0.25
I-L-5 HA/HB	0.67	0.58	0.78	0.04	0.86	0.78	1.00	0.04
S-1 L	110	74	125	8.13	132	116	150	7.27
S-1 W	11	6	14	1.27	13	10	15	1.07
S-1 L/W	10.17	7.79	12.86	0.93	10.40	8.24	11.69	0.70
S-2 L	85	67	96	5.20	101	92	112	4.74
S-2 W	14	9	17	1.33	17	13	20	1.39
S-2 L/W	6.16	5.24	7.79	0.53	6.09	5.23	7.97	0.51
L S-1/S-2	1.29	1.10	1.42	0.06	1.31	1.20	1.49	0.07
S-1-2	23	9	31	4.25	33	25	43	4.76
I-L-6 L	154	126	176	9.84	192	167	216	9.83
I-L-6 HA	30	27	34	1.77	33	29	38	1.69
I-L-6 HB	22	18	25	1.34	24	20	27	1.83
I-L-6 HC	24	20	27	1.65	27	20	31	2.44
I-L-6 dL/HB	7.07	5.63	8.79	0.67	8.14	6.53	9.60	0.66
I-L-6 HA/HB	1.38	1.20	1.67	0.11	1.39	1.17	1.67	0.10
I-L-6 HA/HC	1.27	1.17	1.56	0.09	1.23	1.03	1.56	0.11
L I-L-5/6	1.46	1.39	1.59	0.05	1.45	1.32	1.56	0.05

TAXA ABOVE AND BELOW SPECIES LEVEL

SUBGENERA

In *Atractides*, 10 subgenera have been proposed: *Tympanomegapus* Thor, 1923; *Megabates* (K. Viets, 1924; described as a separate genus); *Tetramegapus* K. Viets, 1926; *Octomegapus* K. Viets, 1926; *Polymegapus* K. Viets, 1926; *Taeniomegapus* Maglio, 1928; *Megapoides* Lundblad, 1936; *Allomegapus* Lundblad, 1942a; *Rhynchomegapus* Motaş & Tanasachi, 1948; *Iranomegapus* Schwoerbel & Sepasgozarian, 1976. In the world catalogue published by K. O. Viets (1987) only *Megabates*, *Octomegapus*, *Polymegapus*, and *Iranomegapus* are recognized as valid systematic units. Here, I provide a brief review and discussion of all subgeneric units and propose degrading *Maderomegapus* Lundblad, 1941, to subgenus level.

Tympanomegapus: As Lundblad (1942c, 1956) pointed out, *Atractides* species with an elongated gnathosomal rostrum do not form a homogeneous group and possibly have evolved independently in various, not closely related, species groups. However, the type species of this subgenus, *A. pavesii* Maglio (1905) (syn. *A. spinirostris* Thor, 1923) and all other species here attributed to *Tympanomegapus* agree in a very long P-1, and the particular shape of P-4 (with reduced hair cover). Unlike Lundblad, I am convinced that this character combination is sufficient for retaining the subgenus as a distinct taxonomic unit.

Megabates: This taxon was first described as a separate genus due to the unbowed terminal segment of I-L. In the meantime, numerous species have been described in *Atractides* which bridge the presumed gap between both taxa. Cook (1974) retained a subgeneric rank, but most probably *Megabates* is a synonym of *Atractides*. Restricted to Africa and India, this taxon is not included in this revision.

Tetramegapus was installed for some species which can now be regarded with certainty as invalid taxa. The character giving the subgenus its name, the presence of two pairs of acetabula only, appears occasionally as an individual aberration in populations of hexacetabulate species.

Octomegapus was erected for the European species *A. octoporus*, a species with four pairs of acetabula. Since then, six further species have been described from Asia, Africa and Central America. A preliminary review of the published data and figures indicates that these octacetabulate species do not form a phylogenetic unit. There are marked differences in morphology of the mouthparts, legs and idiosomal sclerites, and, as observed by Cook (1974), several characters in the type species of the subgenus indicate that it is more closely related to the hexacetabulate *A. digitatus*

than to the other species assigned to *Octomegapus*. Therefore, *Octomegapus* is here synonymized with *Atractides*.

Polymegapus has the distinct *A. polyporus* as type species. It differs from most remaining *Atractides* species not only in the number of acetabula (14–16) but also in the particular shape of the foreleg: The ventrodorsal edge of I-L-5 extends clearly over the dorsodorsal one, the sword setae are arranged side by side, with the S-2 extremely enlarged basally, and somewhat spiralized; I-L-6 is shortened, proximally inflated, distally strongly narrowed. Since the erection of *Polymegapus*, an additional five species have been assigned from India, Israel, Africa and North America. As pointed out by Cook (1974) they represent separate phylogenetic lines that have developed polyacetabulatism independently. In this context, this fact is demonstrated by a comparison of *A. polyporus* and *A. heversi*, two species which, beyond the increased number of acetabula, do not have anything in common. This observation is not surprising. In other water mite families it is possible to observe that acetabular numbers are increased many times convergently in separate species groups. On the other hand, as first stated by Lundblad (1956) with regard to the morphology of I-L, there are striking similarities between *A. polyporus* and some triacetabulate species such as *A. rutae*. I propose maintaining *Polymegapus*, but with a new definition that replaces the name-giving acetabula number. The diagnostic feature defining the subgenus is the particular shape of I-L.

Taeniomegapus was introduced for *A. taeniolatus*, a species with a lineated integument later synonymized with *A. legeri*. This character is found in numerous *Atractides* species which are clearly not closely related, and also in other hygrobatid genera. As first proposed by K. Viets (1956), *Taeniomegapus* is a synonym of *Atractides*.

Megapoides (a name later changed erroneously to *Megapodides* Lundblad, 1941) was introduced for a species with strong ventral and dorsal sclerotization in the male. This character is by no means suitable for grouping *Atractides* species, as has been pointed out by K. O. Viets (1963) who consequently synonymized *Megapoides* with *Atractides*.

Allomegapus was proposed for *A. rutae* from Madeira, in view of the particular shape of the provisional genital organ of the deutonymph (with acetabula on two separate plates rather than a unique central plate as in other *Atractides*). Cook (1974) pointed out the problem of fitting a subgenus based on pre-adult characters within a system based on adult morphology, and K. O. Viets (1987) proposed synonymizing it with *Atractides*. In fact, the degree of fusion of the acetab-

ular plates is obviously variable in *Atractides* deutonymphs (Tuzovskij, 1990). In view of the shape of I-L, I propose including *A. rutae* within *Polymegapus* and synonymizing *Allomegapus* with *Polymegapus*. In deutonymphs of *A. polyporus*, the genital plates are only partially fused with their anterior margins (K. Viets, 1922).

Rhynchomegapus was incorrectly introduced as a new name when Motaş and Tanasachi gave a more extended definition for *Tympanomegapus*. It is a synonym of the latter taxon (Lundblad, 1956).

Iranomegapus was introduced in order to accommodate *Atractides baderi* Schwoerbel & Sepasgozarian, 1976, a species bearing ventral protrusions on both P-2 and P-3. This character is found also in *A. gibberipalpis* and *A. inflatus*, but is here restricted to males only. However, *A. inflatus* females also show a clearly recognizable swelling of the ventral margin of P-3; it is known from other *Atractides* species that modifications of the palp can be restricted to males, or appear in both sexes, and are also seen in closely related species. Also, the relatively small diameter of the acetabula is a character occasionally found in other *Atractides* species not suitable for defining subgenera. *Iranomegapus* is a synonym of *Atractides*.

Maderomegapus has been described as a separate genus. As pointed out by Cook (1974) there is no doubt that it has evolved from triacetabulate *Atractides* ancestors. Notwithstanding the outstanding sexual dimorphism in leg morphology not found in any other *Atractides* species, the subgeneric rank (as proposed here) is questionable from a phylogenetic point of view. *Maderomegapus* could be a classical example of a taxonomist's chimaera (Mound, 1985) a species clearly attracting much attention for its particular morphology, but not representing a phylogenetic line that merits its own systematic category.

SUBSPECIES, FORMS AND VARIETIES

Taxonomic uncertainty, increasing in parallel to the number of introduced species names, has induced many taxonomists to rank new taxa as subspecies only to subsequently describe them as 'varieties' or 'forms'. This was the case in 'nodipalpis-like' mites, taxa having in common a particular shape of P-2 in males. Obviously, many of them are not even closely related, and in no case is there ethological or zoogeographical evidence (La Greca, 1987) justifying the acceptance of subspecies in *Atractides*. Consequently, in this paper all published names are treated as representing taxonomic units on an equal hierarchical level, independent of the rank the author attributed to them in the

original description, and independent of the actual state of the discussion presented in K. O. Viets (1987). Discussion of the taxonomic significance of geographical variability and of behavioural differences between localized populations will be the subject of future studies.

REVISION OF *ATRACTIDES* IN EUROPE

SUBGENUS *ATRACTIDES* S.S.

Diagnosis: No pronounced sexual dimorphism in setation of I- and II-L; ventrodorsal tip of I-L-5 not extending beyond dorsodorsal margin of the segment (I-L-5 dL > vL) S-2 not extremely inflated, and I-L-6 not strongly shortened; P-1 subquadratic or only slightly elongated (L/H < 1.5); chelicera robust (L/H < 8.0).

Discussion: The subgenus is a typical paraphylum, a dumping ground used when species groups with well-defined common characters are separated. Within it, several groups of related species emerge and are discussed in the sections concerning the respective species. It is too early, and the geographical area considered is too restricted, for further taxonomic decision-making. *Atractides* is a highly diverse water mite subgenus and remains a complicated study subject with many characters appearing many times in numerous combinations within clearly distant species groups.

ATRACTIDES SPINIPES KOCH, 1837 (FIGS 11G AND 14A–I)

Type series: Missing. *Locus typicus* of the first description: southern Germany, Rheinland Pfalz, Schwarzbach near Zweibrücken. Neotype ♂, here designated: Germany, D453/4, Bad.-Württ. (TÜ) Schönbuch, Goldersbach bei Teufelsbrücke, 390 m, 5.10.1995 –Steine–, dissected (gnathosoma separate, palps and both I-L lateral) mounted on slide in Hoyer's fluid; Paraneotypes: 1/6/0, deposited at SMF. Further paraneotypes: 6/35/0, same collecting site, various collecting dates, in Gerecke collection, Tübingen.

Rejected species classifications. CSM: 6 slide-mounted females labelled as *A. spinipes* (nos. 316, 673, 676, 678, 680 from Black Forest, 672 unclear). NHMB: ex Piersig collection, without locality specification, 2 ♂, 1 ♀: *Megapus spinipes* Koch coll. Piersig; IX/40–41 [old nrs: 480/480a], ♂, two slides with idio-/gnathosoma, completely desiccated, various legs missing; IX/42–43 [old nrs: 481/481a], ♂, two slides with idio-/gnathosoma, idiosoma in good state, gnathosoma + r. I/II-L desiccated, but partly interpretable; IX/07–08, ♀, two slides with idio-/gnathosoma, idiosoma in good state, palps and I-L strongly crushed, gnathosoma and chelicerae desiccated; *Megapus spinipes* Koch ♀ Lüneburg. Heide coll. Koenike IX/05–06, two slides with idio-/gnathosoma, idiosoma damaged at both Cx-3, one I-L missing, gnathosoma and the other I-L desiccated but not crushed. NHUB: Lüneburger Heide, Böhme in der Böhme, H.Müller leg. VII, 1901: 1056, ♂, with air bubbles, genital field inclined, Cx-1 + 2 damaged; 1059, ♂, in reality ♀, some leg segments missing, genital field strongly inclined; 1057 ♀, undissected, legs distorted; Bad Eilsen, in der Aue Koenike leg. 2.8.07: 1062? ♀ undissected. SMNH: 6274, *Megapus* ♂? *spinipes* (C.L.Koch) Jylland: Letbaek Mølle vid Nørholm, Sig.Tistrup. 14°C Kl.2c.m. leg. J.K. Tindal 16.6.1918 dorsum and several legs absent, in reality ♀. MMB: (partly mounted together with specimens of other genera/species) 163, Velké Losiny potok 20.8.1957 ♀; 181, Pritok Morávky n Músy 3.8.1950 ♀; 369, Potok Ratibor 4.7.1950 ♂, 3 ♀; 370, Oravice nad

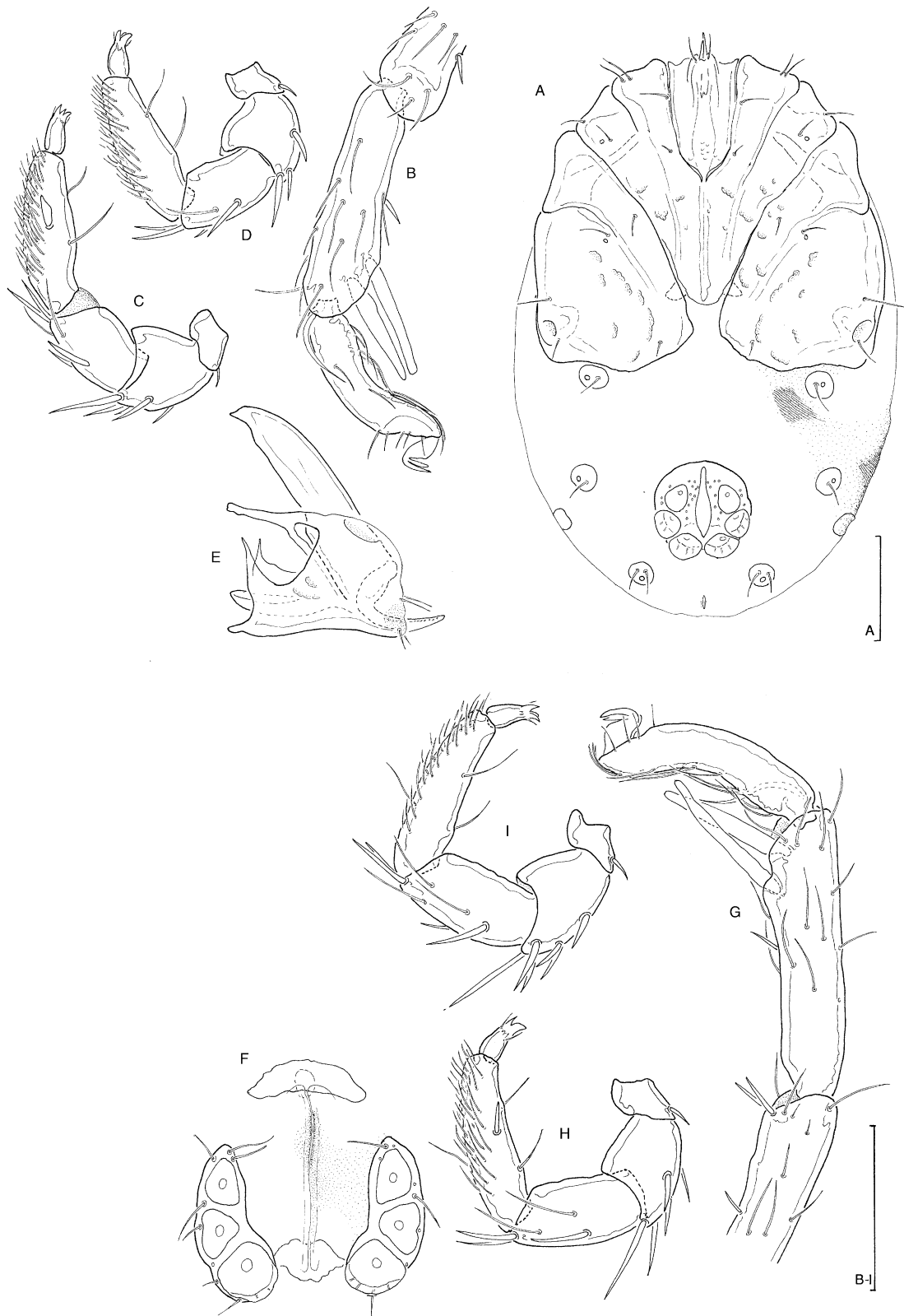


Figure 14. *Atractides spinipes*, neotype series. A–E, neotype ♂, F–I paraneotype ♀. A, ♂ idiosoma, ventral view; B, ♂, I-L-5 and -6; C, ♂ palp, medial view; D, ♂ palp, lateral view; E, ♂ gnathosoma and chelicera, lateral view; F, ♀, genital field; G, ♀, I-L-5 and -6; H, ♀ palp, medial view I ♀ palp, lateral view. Scale bars = 100 µm.

Tristenov 5.7.1950 ♀ 378, Potok pod Kubinskov Melov 6.7.1950 ♀; 395, Orava v Nizné 10.7.1950 ♂ ♀; 472, Potok jezerny n Vet. Kartovic Beskydy 23.8.1950 ♀; 598, Studený p. v Podbietu 16.7.1951 ♀; 616, Váh n Kralovan, 19.7.1951 ♀; 812, Pramený pot. pod Javorníkem 17.8.1953 ♂ ♀.

Description: The preparations from the various collections provide some idea about the character combinations interpreted by early researchers as diagnostic for this species. An important common feature of most specimens listed is that they are juveniles: idiosomal sclerites are weakly sclerotized, the sclerite rings surrounding glandular openings and their accompanying setae are nearly invisible, and in many cases appendages are distorted. Some common morphological features (to the extent that they are visible) are: integument striated (7–10/10 µm) glandularia diameter about 20 µm, Vgl-1/2 unfused, excretory pore unsclerotized. In view of the problematic definition of *A. spinipes*, the individual preparations merit the following remarks.

CSM: All specimens juvenile, some damaged by crushing. Except for 676 (*A. pennatus*) they have characters typical for *A. nodipalpis*. In several cases deformations are due to juvenility and weak sclerotization. NHMB IX/42–43: Cx-4 asymmetric, insertion area of right IV-L deformed; genital plates fused anteriorly and posteriorly by weak bridges including the pre- and postgenital sclerites, regarding setation similar to females (no median setae on the level of Ac-1 and -2, a group of 5–6 setae anteriorly from Ac-1, gonopore rather large, not well confined).

NHMB IX/40–41: genital field similar, genital skeleton *in situ*. NHMB IX/05–06, NHMB IX/07–08: palps rather thick, probably a mounting artefact. NHUB 1056: Cx-4 with protruding posterior angles, genital field with weakly sclerotized anterior and posterior bridges between acetabular plates similar to NHMB IX/42–43, but with male-typical setae medially from Ac-1 and Ac-3, and normally shaped gonopore. I-L-5 longer and with higher HB than in NHMB IX/42–43, I-L-6 strongly tied up centrally; P-2 without ventral protrusion, but P-4 male-typical, strongly thickened at the level of insertion of the proximoventral seta, ventral setae placed close together (3 : 2 : 3) sword seta strong, on the level of the proximoventral seta, dorsal hairs densely arranged.

NHUB 1057, 1059: juvenile ♀, dorsal L P-3/4 130/135 µm; 1062?: dorsal L P-3/4 117/135 µm. SMNH 6274: rather old specimen (integument leathery, extended postcoxal idiosoma) but with weak sclerotization and small glandularia (<20 µm); genital field rather small, with female-typical genital plates bearing round, triangularly arranged Ac, genitalia small, gonopore short; P-2 ventrally without protrusion but with rugose surface and pointed ventrodistally, P-3 with hyaline ventrodistal area, P-4 with a large medial sword seta.

MMB: Only a few collecting sites provided on the slides have been published unequivocally (370, 395, 598: Láška, 1963). On the other hand, I was unable to examine preparations of the specimens published earlier (Láška, 1955a, 1957, 1959) and am unable to understand Láška's morphological concept of *A. spinipes*. From his only comment on morphology (Láška, 1966: 98) one can deduce that he followed the key of K. Viets (1936): equal dorsal length of P-3 and P-4, male genital field with anterior and posterior incisions, female acetabula not arranged in a triangle). The females he filed under this name are heterogeneous with regard to integument structure (mainly striated, but specimens with lineated integument on preps 369, 616, 812; in his 1966 paper he states that the integument should be papillate), position of the sword seta on P-4 (near the proximal or distal ventral hair) and shape of the genital plate (Ac in a more or less triangular arrangement). In most cases, the length ratio of P-3/4 does not fit the diagnosis provided by K. Viets (1936). The main part of the material falls within the range of variability found in *A. nodipalpis*; some specimens are probably aberrant representatives of different species. The two males in Láška's collection are obviously juveniles. One of them (369) is weakly sclerotized, with a genital field of female aspect and a strange sclerotized structure within the idiosoma that could be interpreted as an early stage of a developing Gsk, but also as an artefact due to folded integument. The other male (472) is most probably a hermaphrodite as described above (Fig. 13E,F), with genital plates nearly unfused medially, the Gsk present, but a female-type palp.

Neotype series

General features

dorsal integument: striated (8–9/10); muscle attachments: unsclerotized coxal field: little protruding anterior edges of Cx-1–3
I-L: S-1 and -2 similar in dimensions and shape, narrow interspace, with bluntly rounded tips; I-L-6 stout and weakly curved
excretory pore: smooth; Vgl-1: fused to Vgl-2
palp: weak sexual dimorphism

Males

Neotype, in parentheses 4 paraneotypes
genital field: anterior margin convex, posterior margin weakly indented
palp: P-2 ventral margin convex, ventrodistal edge right-angled, but not protruding; P-3 ventral margin slightly convex; P-4 ventral margin 1 : 1 : 1, sword seta halfway between ventral hairs
idiosoma L/W 380 (360–405)/280 (260–290); glandularia 26
coxal field L 220 (210–230), Cx-3 W 252 (229–252), Cx-1 + 2 mL 90 (81–92), IL 162 (153–162), W 202 (184–202)
I-L-5 dL 114 (109–116), vL 83 (81–87), dL/vL 1.37 (1.32–1.37), HA-HC 28 (26–32), 35 (33–35), 41 (19–41), dL/HB 3.26 (3.11–3.52)
S-1 L 60 (54–60), L/W 10.0 (8.6–10.0), S-2 L 55 (52–55), L/W 7.9 (6.8–7.9), interspace 8 (8–10), L S-1/2 1.09 (1.04–1.11)
I-L-6 L 87 (85–91), HA-HC 22 (21–22), 19 (17–20), 18 (17–18), dL/HB 4.58 (4.40–5.35); L I-L-5/6 1.31 (1.27–1.31)
genital field L/W 72 (65–78)/72 (67–74), Ac-1–3 L 24, 19, 24
gnathosoma vL 83 (76–90), chelicera L 143 (138–143), L/H 5.30 (5.30–5.52), bS/claw 2.33 (2.21–2.33)

palp	P-1	P-2	P-3	P-4	P-5
L/W	21/20	43/49	49/32	77/25	23/9
(ratio)	1.05 (1.05–1.16)	1.14 (1.12–1.18)	1.53 (1.53–1.60)	3.08 (3.08–3.30)	(2.56) (2.44–2.78)
rel.L	10	22	22	35	11
total L:	P-2/4 0.64 (0.59–0.65)				
213 (214–227)					

Occasionally, integument striation nearly invisible; anterolateral contour line of coxae regular, without particularly protruding anterior edges or deep indentations at interfaces between coxae; mediocaudal margin of Cx-1 + 2 strongly convex in a parabolic curve, apodemes of Cx-2 short and strongly curved, not extending over the level of the caudal tip of the plate; posterior margin of Cx-4 with two straight or slightly concave sectors medially and laterally forming a protruding apodeme, with a narrow border of secondary sclerite; I-L-4 with well developed distal sheaths embracing the articulation of I-L-5; genital field with Ac-3 protruding caudally, flanking only the posterior 5th of the gonopore; six pairs of stronger setae flanking the gonopore and a further 12–14 pairs of setae lined up at the lateral and posterior margins of the plate.

Females

Five paraneotypes:
genital field: Ac in a weakly curved line, Ac-2 trapeziform
palp: P-2 with weakly convex ventral margin and ventrodistal edge forming an obtuse angle; P-3 ventral margin straight; P-4 ventral margin 2 : 3 : 2, sword seta halfway between ventral hairs
idiosoma L/W 490–710/360–490; glandularia 26
coxal field L 229–288; Cx-3 W 288–356; Cx-1 + 2 mL 85–95, IL 153–189, W 207–256
I-L-5 dL 132–159, vL 94–114, dL/vL 1.32–1.42; HA-HC 29–34, 36–40, 47–54; dL/HB 3.67–3.98

S-1 L 71–77, L/W 10.1–11.0; S-2 L 62–70, L/W 7.4–8.1; interspace 14–16; L S-1/2 1.09–1.15
 I-L-6 L 98–121, HA-HC 22–27, 17–20, 20–22, dL/HB 5.42–6.05; L I-L-5/6 1.28–1.37
 genital field L/W 112–143/108–148; Ac-1–3 L 30, 30, 30
 gnathosoma vL 90–108; chelicera L 161–196, L/H 5.16–5.55, bS/claw 2.29–2.38

palp	P-1	P-2	P-3	P-4	P-5
L/W	23–25/ 21–23	52–60/ 37–43	63–77/ 30–37	81–94/ 22–25	24–29/ 9–10
(ratio)	1.09–1.14	1.40–1.46	2.05–2.14	3.68–3.78	2.40–2.90
rel.L	9	21	26–27	33–34	9–10
total L:	P-2/4 0.62–0.65				
	243–285				

I-L-5 and -6 more slender than in males; pregen equally convex, not particularly thickened, postgen a massive quadratic sclerite, genital plates small and slender, anteriorly pointed, caudally enlarged and with convexly rounded posterior margin, Ac-1 longish, Ac-2 trapeziform, Ac-3 rounded but with margin facing Ac-2 flattened, caudally slightly protruding over the posterior margin of the genital plate, ovigerous specimens with up to ten eggs (diameter 100–120 µm); P-2 to -4 distinctly more slender than in males.

Discussion: The original description of *A. spinipes* does not provide any elucidating information on possible diagnostic features of the species (see Introduction). The interpretation of most preparations is difficult due to the poor state of conservation and/or individual morphological aberrations. K. Viets (1936) based his diagnosis of the male of *A. spinipes* on NHUB 1056/1059 without recognizing that it was probably misshaped, juvenile and female, and consequently most characters used in his key refer to individual aberrations. Length ratio P-3/4 is not suitable for species definition in both sexes. This study has documented a wide range of intraspecific variation for this character. Most later records of this species based on the unsatisfactory definition provided by Viets refer to single finds only (for a complete bibliography see K. Viets, 1956; K. O. Viets, 1987). The only references dealing with larger numbers of specimens come from Poland (Biesiadka, 1970, 1972a; Kowalik & Biesiadka, 1981); unfortunately I was unable to gain access to these collections. Halbert (1944) refers to *A. spinipes* as ‘common and widely distributed’ in Ireland. However, in his discussion of his *A. spinipes montanus* (1911) he attributes to the stem species swimming hairs ‘on the last three pairs of legs’. This suggests that he confused it with *A. ovalis*. The need for a sound definition of the *typus generis* of *Atractides*, as well as the numerous complications that would emerge when trying to select another species as *typus generis*, induce me to redescribe the species on the basis of a population from southern Germany (*locus typicus* of *A. spinipes* near Zweibrücken, Rheinland-Pfalz). Specimens of the population in question display a distinct

character set not found in any of the other early descriptions, and resemble *A. spinipes sensu* Viets in having a weak sexual dimorphism of palps.

The newly defined *A. spinipes* is relatively small, but with remarkable size variation in females. Males are often weakly sclerotized and much less variable in dimensions. A description of larvae provided by Piersig (1894) probably refers to a different species.

Habitat: Rhithrobiont. Males rare, found only in autumn (September/October). Females overwinter, and probably deposit their eggs in early spring. No adults were found from May to August (Gerecke, 2002).

Distribution: Germany, Montenegro, Serbia (Pešić, in press a,b) (5,9).

TRACTIDES SETIGER KOCH, 1837

syn. to *Hygrobatas longipalpis* (Hermann, 1804) (K. Viets, 1956)

TRACTIDES CLAVICORNIS KOCH, 1842

syn. to *Piona clavicornis* (Müller, 1776) (K. Viets, 1956)

TRACTIDES SAGULATOR KOCH, 1842

syn. to *Brachypoda sagulator* (Koch, 1842) *spec. inc.* (K. Viets, 1956)

TRACTIDES DIMIDIATOR KOCH, 1842

syn. to *Brachypoda versicolor* (Müller, 1776) (K. Viets, 1956)

TRACTIDES OVALIS KOENIKE, 1883 (FIG. 15A–G)

Type series: Missing. First described under the name *Megapus spinipes* Neuman, 1880, based on a female specimen from Sweden (not conserved in Neuman collection, SMNH). Neotype (here designated): SMNH 830 ♂ Möens Klint, Kunosö, 19.9.1925 leg. O. Lundblad.

Material examined: NHUB: *Megapus ovalis* Koen; Seeland [non deciph.] 24.7.1895, ten specimens on one slide, completely desiccated; seven specimens in Hoyer's fluid, three specimens transferred to Euparal; *Atractides ovalis* Koen. ♀ *Megapus*; Mecklenburg Moritz-See leg Dr Zacharias Farrants Medium, completely desiccated, transferred to Hoyer's fluid; 1054 *Megapus ovalis* (Koen.) ♂ Bremen Kattenesch, Mühlenbach, Koen. leg. 27.7.06; 1055 *Megapus ovalis* (Koen.) ♀ Seeland, Lyngby, See, Koen. leg. 40.7.1895; 1061 *Megapus ovalis* (Koen.) ♂ Seeland, Hulsee, Koen. leg. 29.7.1895; 1063 *Megapus ovalis* (Koen.) Ny., Holstein, Gremsmühlen, Koen. leg., 18.8.1895; 1064 *Megapus ovalis* (Koen.) ♀, Seeland, Hoggraard Koen. leg. 29.7.1895. NHMB: *Megapus ovalis* ♂ ♀; P.S. Grosszschocher [ex coll. Piersig] two slides containing idiosoma/gnathosoma + I-L resp., completely desiccated; *Megapus placophorus* ♀ Walter Vierwaldst. See, 18.6.13 coll. Wacker; Typus [never published species name, well-conserved specimen]. SMF: 5859, *Atractides ovalis* (Koen.) ♀ ♂; Bremen Wumme 9.9.1907 Viets coll. 1 ♂, 5 ♀ [♀ not *ovalis*], well conserved. SMNH: 830, ♂ Möens Klint, Kunosö, 19.9.1925 leg. O. Lundblad [Neotype]; 831, ♀ Möens Klint, Jydelejet 20.9.1925 leg. O. Lundblad; 6272, ♀ *Megapus ovalis* Koenike ♀ Bremen Habenhausen Werder, Bracke, 11.6.1892 leg. et det. F. Koenike O. Lundblad, well conserved but undissected.

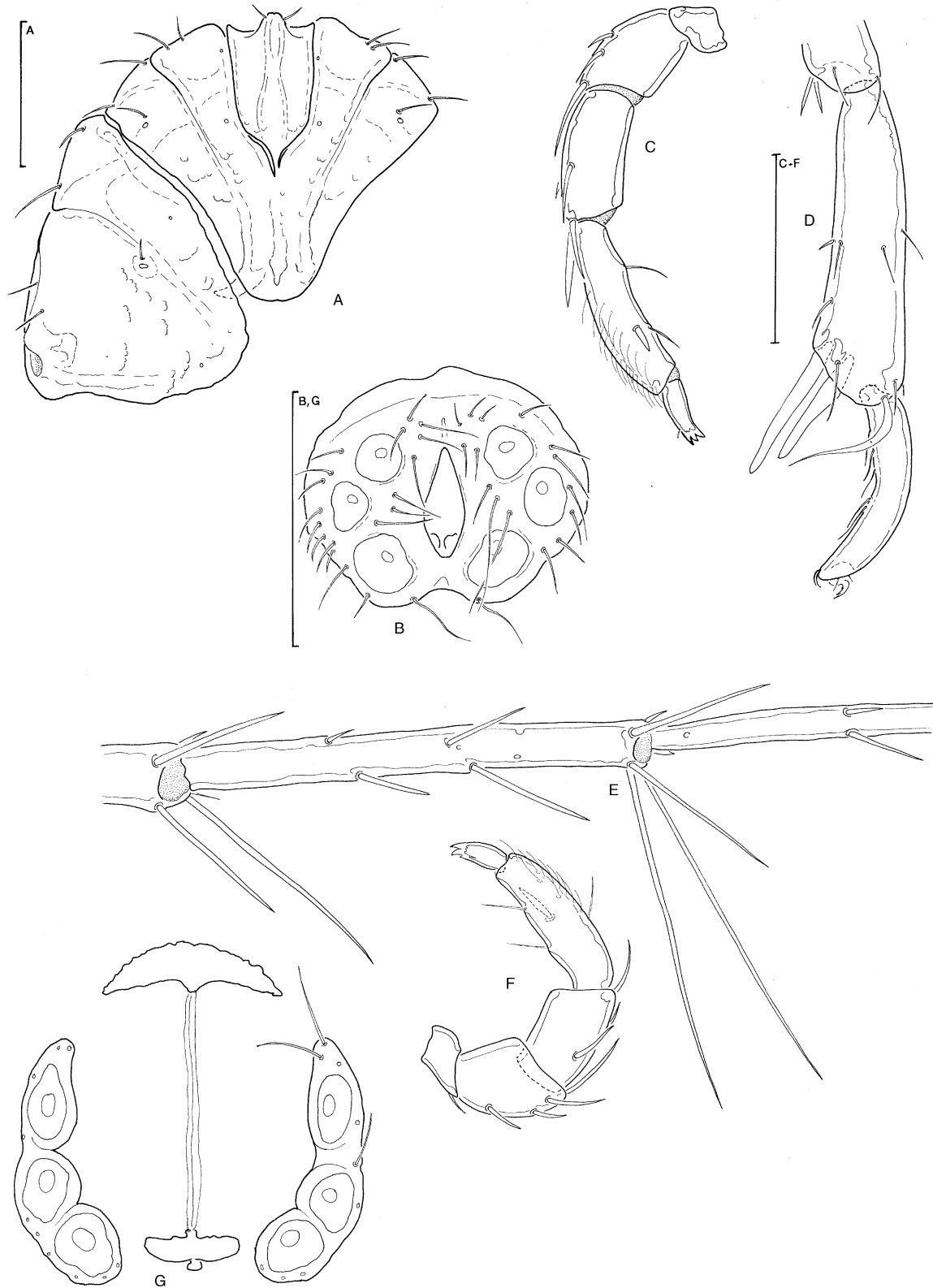


Figure 15. *Atractides ovalis*. A, SMF 5859, B–D, SMNH 830, E–G SMNH 831. A, ♂ coxal field and gnathosoma, ventral partial view; B, ♂ genital field; C, ♂ palp, medial view; D, ♂ I-L-4/5; E, ♀ IV-L-5; F, ♀ palp, lateral view; G, ♀ genital field. Scale bars = 100 μ m.

*Description:**General features*

dorsal integument: striated (8/10); muscle attachments: unsclerotized

coxal field: slightly protruding anterior edges of Cx-1-3

I-L: S-1 and -2 close to each other; I-L-6 continuously narrowed distally, with minute claws

II/IV-L: very slender, IV-L-4 with 3, IV-L-5 with 4 specialized 'swimming' setae at distal margin, longest seta reaching 4/5 L IV-L-6

excretory pore: smooth; Vgl-1: not fused to Vgl-2

palp: weak sexual dimorphism

Males

SMNH 830, male in SMF 5859

genital field: anterior margin irregularly convex, posterior margin with concave indentation

palp: ventral margin of P-2 and P-3 straight, ventral margin P-4 1 : 2 : 1, sword seta near distoventral hair

idiosoma L/W 500-380; glandularia 27

coxal field L 174; Cx-3 W 306; Cx-1 + 2 mL 102, IL 187, W 248

I-L-5 dL 169, vL 140, dL/vL 1.21, HA-HC 39, 50, 53, dL/HB 3.38

S-1 L 85, L/W 9.4, S-2 L 67, L/W 6.7, interspace 9; L S-1/2 1.27

I-L-6 L 105, HA-HC 22, 18, 16, dL/HB 5.83; L I-L-5/6 1.61

genital field L/W 93/114, Ac-1-3 L 21, 23, 27

gnathosoma vL 111; chelicera L 184, L/H 4.84, bs/claw 2.68

palp	P-1	P-2	P-3	P-4	P-5
L/W	26/23	66/39	76/34	101/25	35/15
(ratio)	1.13	1.69	2.23	4.04	2.33
rel.L	9	22	25	33	12
total L:	P-2/4 0.65				
	304				

Mediocaudal margin of Cx-1 + 2 slightly convex or straight; posterior legs, in particular IV-L, slender, with elongated distal margin setae: IV-L-4 with two setae *c.* 65 µm, and one *c.* 110 µm in length, IV-L-5 with two setae *c.* 65 µm, two *c.* 150 µm in length, but without true swimming hairs (constant in diameter from the base to the tip, arranged in rows on the segment surface); leg claws with ventral lamella and dorsal and ventral clawlets; genital field with anterior border of secondary sclerite slightly protruding medially; Ac-1 and -2 relatively small and roundish, Ac-3 larger, many specimens bearing more numerous setae on caudal margin of genital field than illustrated in Fig. 15(B) for the neotype; palp slender, without protrusions, sword seta of P-4 short.

Females

SMNH 831, 6272

genital field: Ac in a weakly curved line

palp: P-4 ventral margin 1 : 1 : 1, sword seta halfway between ventral hairs

idiosoma L/W 550/420; glandularia 25

coxal field L 283; Cx-3 W 363; Cx-1 + 2 mL 108, IL 207, W 286

I-L-5 dL 199, vL 158, dL/vL 1.26, HA-HC 48, 57, 61, dL/HB 3.49

S-1 L 99, L/W 11.0, S-2 L 82, L/W 6.8, interspace 12; L S-1/2 1.21

I-L-6 L 123, HA-HC 26, 18, 18, dL/HB 6.8; L I-L-5/6 1.62

genital field L/W 134/140, Ac-1-3 L 30, 26, 26

gnathosoma vL 123; chelicera L 230, L/H 5.48, bs/claw 2.77

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/29	79/44	95/37	117/26	38/15
(ratio)	1.00	1.80	2.57	4.50	2.53
rel.L	8	22	27	33	11
total L:	P-2/4 0.68				
	358				

Genital plates without secondary sclerotization, with a small anterior protrusion bearing 2-3 setae and medial indentations at the borders separating Ac, pre-gen large and slender.

Discussion: Koenike (1883) introduced the name '*ovalis*' in a brief taxonomic remark for a female described by Neuman (1880) under the name of '*spinipes*'. A more detailed description (Koenike, 1895) was based on specimens from Canada which later were assigned by the author himself to a separate species, *A. crassipalpis*, in the same paper in which he gave the first sound description of *A. ovalis* (Koenike, 1908). Extracted from Koenike's unpublished collection catalogue (NHUB) this description was based on his preparations 1061 and 1064 (Seeland, Denmark) and 1063 (Holstein, Germany). However, neither these specimens nor the one conserved in NHUB 1054 can be considered types (as done by K. Viets, 1936). Selection of a neotype from the well conserved Swedish specimens is the most convincing procedure to guarantee taxonomic stability. For a long time, this species was little known, and only Besseling (1964) published a drawing of the key character of *A. ovalis*, the long distal setae of IV-L-4/5. The misidentification of the female in SMF 5859 indicates that also Viets' ideas on its morphology were not clear. The figures and information published by Soarec (1942) clearly demonstrate that her specimens do not represent *A. ovalis*, and the Romanian collecting site published later on (hyporheic interstitial; Motaş & Tanasachi, 1948) suggests that this record refers to a different species as well. The description of larvae provided by Piersig (1896) also probably refers to a different species.

Habitat: One of the few *Atractides* species living mainly in lakes, occasionally in lake outflows or slow moving streams (Lundblad, 1962b). This unusual habitat was probably reached after the species had adapted to limnocratic springs (Lundblad, 1926).

Distribution: Northern and Central Europe, two records published from the south-west Palaearctic region (Italy: Nocentini, 1973; Turkey: Özkan, 1982). Records from Romania probably refer to a species different from *A. ovalis* (see above) (3, 4, 8, 9, 11, 13-16, 22, 23, y).

ATTRACTIDES LORICATUS PIERSIG, 1898 (FIG. 16A-F)

Syn. *A. barsiensis* (Szalay, 1929): Lundblad, 1956; *A. firmus* (Walter, 1947): syn. nov.

Type series: Lectotypus, here designated: NHMB *Megapus loricatus* ♀ Piersig Hohe Tatra coll. Piersig; Pr. 475; desiccated, all legs missing or only with basal segments, gnathosoma lateral, one palp lateral, the other one missing. *Locus typicus:* Tatra, Quellbach des Felklersees.

Material examined: MMB: (under the name of *A. barsiensis*) 1109, 1228-5, Pramen nad Ostruznou Jeseniky. 7.8.1957 5 ♂, 1 ♀.

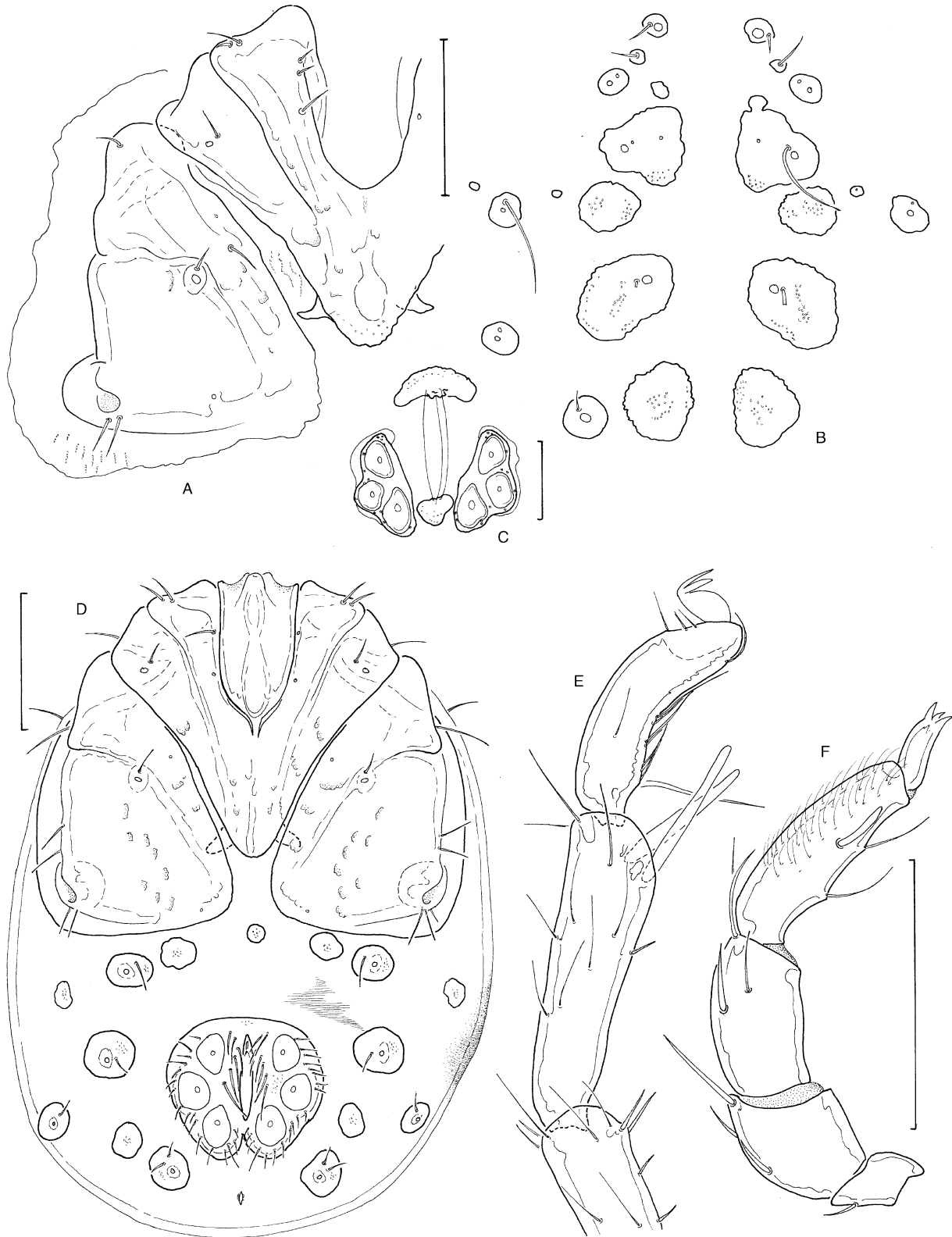


Figure 16. *Atractides loricatus*. A–C, lectotype ♀ NHMB, D–F, ♂ MMB 1109, 1228–5 (labelled *A. barsiensis*). A, ♀ coxal field; B, ♀ dorsal sclerites; C, ♀ genital field; D, ♂ idiosoma, ventral view; E, ♂ I-L-5 and -6; F, ♂ palp, medial view. Scale bars = 100 μ m.

Rejected determinations: (1) referring to *A. brendle* sp. nov.: MMB: 154; 1121–1. potok v Tatranske Pojané. 7.9.1956 1 ♀ 1049; 1107. Javorinka n novárny pod Hamanem. Belan. Tatry. 4.9.1956 1 ♂. NHMB: *Megapus lorica-tus* ♀ juv. Piersig coll. Piersig; P.S. on two slides, idiosoma Pr 476, gnathosoma (lateral, dissected) + I-L 476a, without collecting site identification; (2) referring to an unidentified species: Quelle zwischen Arabba und Prodojoch. Dolomiten 1900 m; specimen without dorsal plates, erroneously published by Walter (1922b) under the name *A. loricatus*.

Description:

General features

dorsal integument: striated (9/10); muscle attachments: sclerotized, postoc fused with D-1 and Dgl-3 (occasionally also prefr), Dgl-4 fused with D-3
coxal field: extended secondary sclerotization
I-L: S-1 and -2 close together, homoiomorphic, with rounded tips; I-L-6 short and thick, curved, only slightly narrowed centrally
excretory pore: smooth; Vgl-1: fused to Vgl-2
palp: weak sexual dimorphism

Males

Specimen from MMB

genital field: anterior margin straight or weakly convex, posterior margin deeply indented

palp: ventral margin of P-3/3 straight, ventral margin P-4 1 : 1 : 1, sword seta strong, near distoventral hair

idiosoma L/W 470/330; glandularia 30

coxal field L 238; Cx-3 W 265; Cx-1 + 2 mL 99, IL 175, W 211

I-L-5 dL 119, vL 96, dL/vL 1.24, HA-HC 28, 35, 38, dL/HB 3.40

S-1 L 58, L/W 9.7, S-2 L 55, L/W 7.9, interspace 4; L S-1/2 1.05

I-L-6 L 85, HA-HC 22, 21, 23, dL/HB 4.05; L I-L-5/6 1.40

genital field L/W 103/112, Ac-1–3 L 26, 28, 31

gnathosoma vL 99; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	24/19	52/39	60/33	88/29	29/10
(ratio)	1.26	1.33	1.82	3.03	2.90
rel.L	9	21	24	35	11
total L:	P-2/4 0.59				
	253				

Arrangement of glandularia and muscle attachments as illustrated in Figures 2 and 3. Maximum diameter of platelets containing Dgl-3 and Dgl-4, respectively, about 80 µm; posteromedial margin Cx-1 + 2 equally rounded, apodemes of Cx-2 directed perpendicularly to the median line or slightly caudally; both P-2 and P-3 with distal end of ventral margin in most specimens slightly pointed, ventral margin of P-4 protruding in two fine tips near the insertions of the ventral hairs, sword seta slightly curved.

Females

Paralectotype and one specimen from MMB

genital field: pregen thickened, genital plates with straight medial margin, Ac in triangular arrangement palp: as in males, but more slender

idiosoma L/W 650/430; glandularia 30

coxal field L 293; Cx-3 W 333; Cx-1 + 2 mL 103, IL 198, W 243

I-L-5 dL 138, vL 110, dL/vL 1.25, HA-HC 33, 39, 46, dL/HB 3.54

S-1 L 70, L/W 10.0, S-2 L 64, L/W 8.0, interspace 6; L S-1/2 1.09

I-L-6 L 99, HA-HC 26, 23, 25, dL/HB 4.30; L I-L-5/6 1.39

genital field L/W 189/175, Ac-1–3 L 48, 43, 56

gnathosoma vL 112; chelicera L 208, L/H 5.20, bS/claw 2.30

palp	P-1	P-2	P-3	P-4	P-5
L/W	27/20	67/43	78/38	99/27	34/10
(ratio)	1.35	1.56	2.05	3.67	3.40
rel.L	9	22	26	32	11
total L:	P-2/4 0.68				
	305				

In the lectotype, one prefr asymmetrically fused to postoc, and secondary sclerite border of Cx-4 very large; genital field with a strong pregen, sausage-shaped due to secondary sclerotization, with a maximum W of 112 µm, palp more slender than in males, hair cover of P-4 less dense, and tips near insertions of ventral hairs less pronounced.

Discussion: The original description (Piersig, 1898a) based mainly on the females, concentrates on colouration, dimensions and general characters of the genus. The smaller size of the males and the general shape of their genital field are mentioned briefly. A comparison of the lectotype with the original description and four figures published by the author later on (1896–99) shows that he based his diagnosis on taxonomically nonhomogeneous material: the I-L-5/6 dL ratio resulting from the measurements in the original description is 1.6, that in the figure published in 1896–99 is 1.3. The only specimen with collecting site identification was, unavoidably, designated the lectotype, a decision favoured also by the weak sclerotization and poor state of conservation of the juvenile specimen mounted on the other slide. However, the consequences for nomenclature are unfortunate.

The first records of *A. loricatus* after the original description (Walter, 1922b) were at least partially based on erroneous determinations (see above). The first figure of the dorsal plates characteristic of *A. loricatus*-like mites was provided by Motaş & Angelier (1927) but the sclerotized excretory pore in their figure 1 demonstrates that their specimen from the Massif Central represents a species different from *A. loricatus*. Motaş (1928) described the variability of the dorsal plates, but it remains unclear whether he was examining *A. loricatus* or a medley of various species. All subsequent authors considered the presence of a sclerotized excretory pore as diagnostic for *A. loricatus*, with the consequence that two new names were introduced for *loricatus*-like mites with smooth excretory pore (*A. barsiensis*, *A. macrolaminatus*). In old specimens of *loricatus*-like mites, the whole integument becomes leathery and thickened, reaching a maximum thickness of about 12 µm. As a result glandular and muscle attachment plates become very much less visible and sometimes appear as clear areas surrounded by darker integument. This is also the case in the lectotype of *A. loricatus*, while in the second specimen in the Piersig collection the idiosomal sclerites are slightly sclerotized. Bader (1994) overlooked the presence of larger sclerites in *A. loricatus*, and introduced a new name *A. placocallosus* (see below) for all sclerite-bearing populations formerly attributed to *A. loricatus*.

Habitat: Rhithrobiont.

Distribution: Due to taxonomic confusion, all extant records of *A. lorricatus* need revision. Most probably only records under the name of *A. barsiensis* refer to the true *A. lorricatus*. It is documented with certainty only from the Tatras, the Alps and the Dinaric mountains (5, 10, 11).

ATTRACTIDES GIBBERIPALPIS PIERSIG, 1898
(FIG. 17A–F)

Type series: Lectotype, here designated ♂ NHMB *Megapus gibberipalpis* Piersig coll. Piersig P.S. on two slides, idiosoma 458, gnathosoma (undissected) and 1. I-L 458a. Paralectotype: ♀ NHMB labelled and mounted as lectotype, prep. nrs idiosoma 472, gnathosoma (dissected) 472a. Both preps missing collecting site labels and completely desiccated, but subjects covered by a film of mounting medium and obviously not crushed. **Locus typicus:** kleine Mittweida bei Nitzschhammer unweit Scheibenberg (mittleres Erzgebirge) in untergetauchtem, die Steine des Flußbettes überziehendem kurzrasigem Moos an reißenden Stellen; 6 ♂, 2 ♀, 2 Dn.

Material examined: SMF K. Viets: 2115, Oelkassen, Wabach, Kühne 5.10.1911 ♂; 2760, Vogler, Kohlhai, 20.7.1920 ♀; 5020, Gospić; 23.8.1934 ♂; 4948, Split, Jadro, 9.8.1934 ♀; SMF K. O. Viets: 1522, Harz, kleines Spitzental, 13.7.1955 ♂, ♀; 1571, Harz, mittleres Rabental, 17.7.1955 ♂, ♀.

Description:

General features

dorsal integument: striated (7–11/10); muscle attachments: unsclerotized
I-L: I-L-6 relatively short and basally thickened
excretory pore: smooth; Vgl-1: not fused to Vgl-2
palp: strong sexual dimorphism

Male

Lectotype, measurements SMF 2115

genital field: anterior margin straight or weakly concave, margin indented between Ac-2 and Ac-3 both laterally and medially, Ac-3 elongated and anteriorly pointed

palp: P-2 and P-3 each with a strong lamellar protrusion more or less distinctly set up from the ventral segment margin, P-4 ventral margin 3 : 2 : 1, sword seta on, or slightly distal to level of proximoventral seta

idiosoma L/W 580/450; glandularia 22

coxal field L 338; Cx-3 W 374; Cx-1 + 2 mL 126, IL 243, W 306

I-L-5 dL 215, vL 161, dL/vL 1.34, HA-HC 54, 65, 74, dL/HB 3.31

S-1 L 99, L/W 12.4, S-2 L 85, L/W 7.7, interspace 2; L S-1/2 1.18

I-L-6 L 134, HA-HC 32, 21, 23, dL/HB 6.38; L I-L-5/6 1.60

genital field L/W 166/121, Ac-1–3 L 42, 45, 58

gnathosoma vL 144; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/31	83/72	81/61	94/40	36/12
(ratio)	0.94	1.15	1.33	2.35	3.00

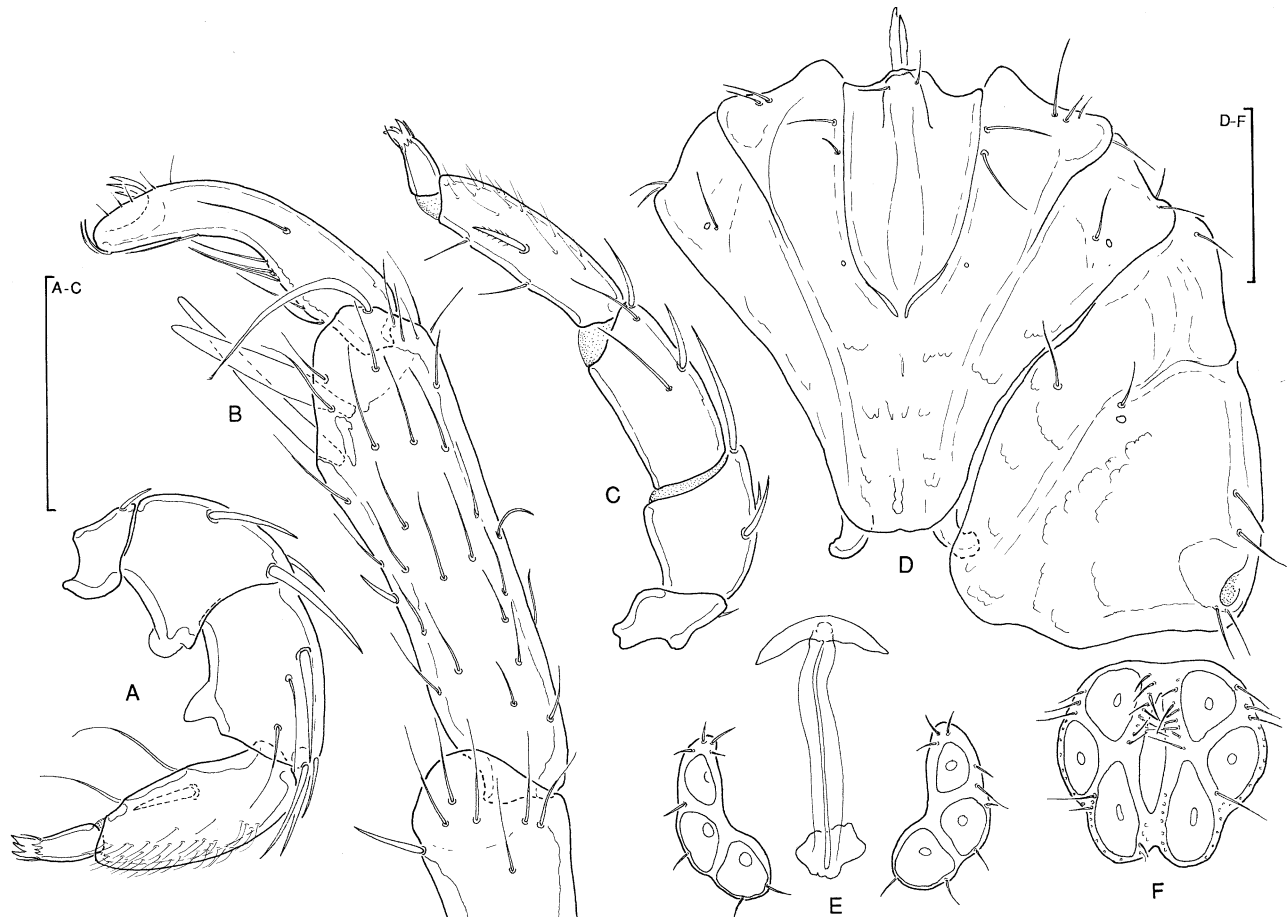


Figure 17. *Atractides gibberipalpis*. A, B; D; F, ♂ SMF 2115; C, E, ♀ SMF KOViets 1522. A, ♂ palp, lateral view; B, ♂ I-L-5 and -6; C, ♀ palp, medial view; D, ♂ coxal field, E, ♀ genital field; F, ♂ genital field. Scale bars = 100 µm.

rel.L	9	26	25	29	11
total L:	P-2/4 0.88				
323					

Posteromedial margin Cx-1 + 2 truncate, of Cx-4 undulate due to two protruding muscle attachments alternating with medial and lateral concave sections; I-L-6 strongly thickened basally, and slightly swollen distally; leg claws ventrally with lamella and clawlet; the facing tips of the Ac medially at nearly the same distance from each other; the contour line of the ventral protrusions on P-2 and P-3 always smooth, rarely the surface near the insertion of the protrusion slightly thickened, producing the impression of a double hump ('Doppelhöcker', K. Viets, 1936).

Female

Paralectotype, measurements SMF 1522

genital field: Ac in an obtuse angle

palp: ventral margins P-2-4 straight, P-4 2:2:1, sword seta halfway between ventral hairs

idiosoma L/W 670/500; glandularia 22

coxal field L 314; Cx-3 W 400; Cx-1 + 2 mL 117, IL 211, W 280

I-L-5 dL 208, vL 156, dL/vL 1.32, HA-HC 47, 61, 69, dL/HB 3.38

S-1 L 98, L/W 12.3 S-2 L 87, L/W 8.7, interspace 20; L S-1/2 1.13

I-L-6 L 130, HA-HC 30, 23, 24, dL/HB 5.65; L I-L-5/6 1.58

genital field L/W 157/180, Ac-1-3 L 29, 34, 34

gnathosoma vL 126; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/H	26/28	70/48	81/38	95/28	32/14
(ratio)	0.93	1.46	2.13	3.39	2.29
rel.L	9	23	27	31	11
total L:	P-2/4 0.74				
304					

Cx-4 with a well developed caudal margin of secondary chitinization, genital plates with a narrow sclerotized margin, palp slender, without ventral protrusions on P-2 and P-3.

Discussion: Until now this species remained easily recognizable on the basis of the diagnostic features provided here. In Europe there is only one further species with protruding ventral margin of P-3 in males, *A. inflatus* Walter, 1925.

Habitat: Rhithrobiont; low order streams, often in mosses.

Distribution: Palaearctic, except Scandinavia (1-18, 24).

ATTRACTIDES TENER THOR, 1899 (FIG. 18A-H)

Syn. *A. palpalis* (Lundblad, 1956): K. O. Viets, 1957; *A. pilosus* Schwoerbel, 1961: syn. nov.

Type series: Lost. Neotype designated here: SMF 1515 Cotype *Atractides tener* (Thor) ♀ Norwegen Ljans-elv 5.10.1901 Thor coll. This specimen was authorized by Thor, but was clearly not a part of the type series (collected after publication, original description based on a male, type localities Isi-elv i Baerum). State of conservation: idiosoma slightly crushed, mounting fluid with many crystallizations, both chelicerae missing claws.

Material examined: SMF: K. Viets 2805, Rügen, sub nom. *A. spinipes*, 2 ♂ (mounted together with *A. nodipalpis*, 1 ♀, *A. sp.*, 1 Dn); Germany, Schönbusch (TÜ) Goldersbach near Teufelsbrücke, from a 12-month investigation, 1996, 1 ♂, 6 ♀; Germany, Black Forest, from a saprobiological investigation, 1984 in the Breg and Brigach catchments (Gerecke & Schwoerbel, 1991) 5 ♂, 2 ♀.

Description:

General features

dorsal integument: striated (9-12/10 µm); muscle attachments: unsclerotized I-L: I-L-5 slender, S-1 and -2 nearly equal in length and little modified, I-L-6 robust, weakly curved, distally thickened
excretory pore: sclerite ring; Vgl-1: not fused to Vgl-2
palp: without ventral projections on P-2

Males

SMF 2805

genital field: anterior margin equally convex, with a narrow border of secondary sclerotization (occasionally slightly incised medially), posterior margin deeply indented, often with a fine medial tip palp: ventral margin of P-2 convex, P-4 thickened, ventral margin 1:1:2, sword seta long, near distoventral hair

idiosoma L/W 670/500; glandularia 30

coxal field L 336; Cx-3 W 383; Cx-1 + 2 mL 130, IL 234, W 297

I-L-5 dL 172, vL 134, dL/vL 1.28, HA-HC 31, 43, 49, dL/HB 4.00

S-1 L 78, L/W 13.0, S-2 L 76, L/W 10.9, interspace 7, L S-1/2 1.03

I-L-6 L 125, HA-HC 30, 25, 29, dL/HB 5.0; L I-L-5/6 1.38

genital field L/W 112/121, Ac-1-3 L 30, 36, 34

gnathosoma -; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	28/25	62/46	76/39	99/35	35/13
(ratio)	1.12	1.35	1.95	2.83	2.69
rel.L	9	21	25	33	12
total L:	P-2/4 0.63				
300					

Integument striation often recognizable in tangential view only; Dgl equally round, mediocaudal margin Cx-1 + 2 broadly convex (truncate) with a pointed tip more or less protruding below the integument surface, apodemes of Cx-2 curved forming a 45-90° angle with the median line; a narrow margin of undulate secondary sclerite bordering the posterior and lateral coxal margins.

Females

Neotype

genital field: Ac in a triangle, pregen strongly curved, thick

palp: P-2 ventral margin straight, P-4 ventral margin 1:1:1, sword seta between ventral hairs, nearer to distoventral hair

idiosoma L/W 780/640; glandularia 30

coxal field L 370; Cx-3 W 515; Cx-1 + 2 mL 126, IL 290, W 350

I-L-5 dL 222, vL 163 dL/vL 1.36, HA-HC 40, 49, 65, dL/HB 4.53

S-1 L 94, L/W 13.4, S-2 L 90, L/W 10.0, interspace 17, L S-1/2 1.04

I-L-6 L 161, HA-HC 32, 29, 35, dL/HB 5.55; L I-L-5/6 1.38

genital field L/W 157/189, Ac-1-3 L 42, 48, 45

gnathosoma -; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/27	78/54	103/43	123/31	38/16
(ratio)	1.07	1.44	2.40	3.97	2.38
rel.L	8	21	28	33	10
total L:	P-2/4 0.63				
371					

S-1 with rounded, S-2 with pointed tips (but with considerable variability in shape of S-1 and -2 in southern

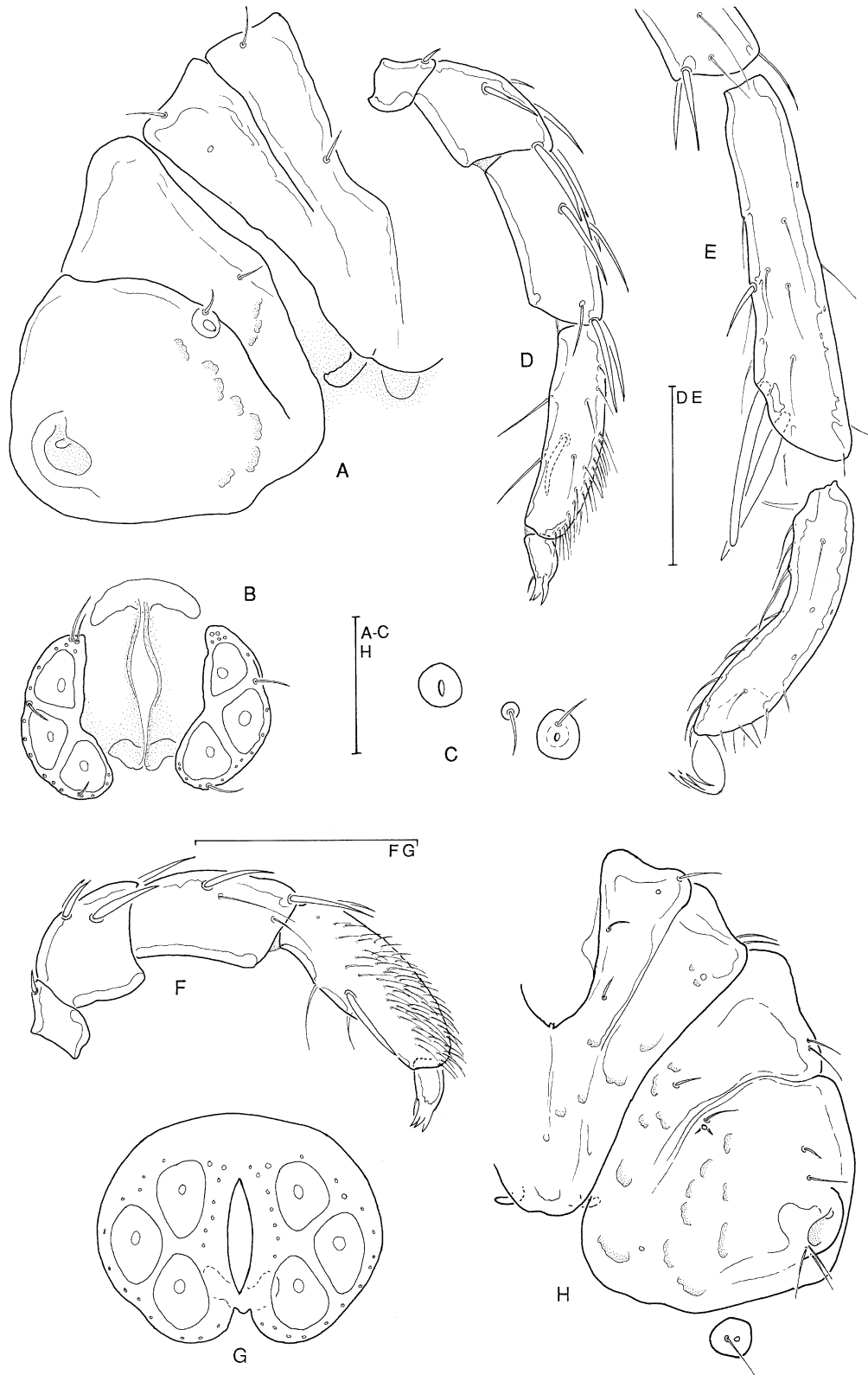


Figure 18. *Atractides tener*. A–E, ♀, Norway, SMF 1515; F; G, ♂ N Germany, Rügen SMF 2805; H, ♂ Goldersbach. A, ♀ coxal field; B, ♀ genital field; C, ♀ excretory pore and Vgl-1/2; D, ♀ palp, lateral view; E, ♀ I-L-5 and -6; F, ♂ palp, medial view; G, ♂ genital field; H, ♂ coxal field. Scale bars = 100 µm.

German populations); genital plates with a fine border of secondary sclerite, Ac arranged in an obtuse triangle, gonopore anteriorly exceeding only slightly the anterior margin of genital plates.

Discussion: *A. tener* was the first *Atractides* described with a sclerite ring surrounding the An. This character proves to be very stable within species of the genus, and completely independent from general idiosoma sclerotization (e.g. sclerotization of idiosoma muscle attachments, fusion of Vgl-1 and Vgl-2).

Habitat: Rhithrobiont.

Distribution: Europe (1, 4, 5, 6–11, 13–18, 20–23) (Pešić, in press f).

ATRACTIDES NODIPALPIS THOR, 1899
(FIGS 4F, 5C, 7A–D, 9A–C, 10A, C, E, F,
11B–F, H, 12, 13A–H, 19A–L, 43I)

Syn. *A. tenuitarsus* (Komárek, 1921): K. Viets, 1956; *A. tividae* (Sokolow, 1926): syn. nov.; *A. parviporus* (Besseling, 1933): Lundblad, 1962; *A. semidistans* (Husiatinschi, 1937): syn. nov.; *A. moravicus* Láska, 1952: syn. nov.; *A. limnicola* Schwoerbel, 1959: syn. nov.; *A. microcavaticus* Schwoerbel, 1961: syn. nov.; *A. schlienzi* Schwoerbel, 1961: syn. nov.

Type series: Lost with the destruction of the Thor collection. Neotype ♂ (here designated) SMF 1518 Cotype ♂ Norwegen, Gudbrandsdalen, Grotbek, Sel. 24.7.1899 S. Thor leg; Cx-I, chelicerae and gnathosoma damaged by crushing, right I/II-L separate; state of conservation good. Paraneotypes ♀ SMF 1516, 1517, labelled like neotype, with several insignificant damages, state of conservation good. These specimens are surely not syntypes: (1) the original description provides no *locus typicus*; Gudbrandsdalen is not included in the introductory collecting site list; (2) all the material published in the original description was collected in 1898.

Material examined: NHMB Sefve leg. Schweden Alo 22.11.1914; VII/25-gnathosoma *in situ*, both palps and left I-L missing (on a separate, lost slide?); Germany, Schönbuch (TÜ) Goldersbach at Teufelsbrücke, from a 12-month study, 1996/1997, 47 ♂, 54 ♀, two intersexes.

Description:

General features

dorsal integument: striated (10/10 µm); muscle attachments: unsclerotized
I-L: S-1 longish, blunt, S-2 basally enlarged, pointed; I-L-6 curved, basally thickened

excretory pore: unsclerotized; Vgl-1: not fused to Vgl-2
palp: strong sexual dimorphism P-2, P-4

Male

Neotype, in parentheses variability of ♂ from SW Germany
genital field: both anterior and posterior margins deeply indented, often with small medial protrusions in the centre of indentations

palp: P-2 with strong ventrodial protrusion consisting of a bluntly pointed medial hump and an equally convex lateral thickening, P-3 ventral margin slightly concave; P-4 maximum H near proximoventral hair, ventral margin 2 : 1 : 2, sword seta near proximoventral hair

idiosoma L/W 700/550; glandularia 35
coxal field L 360; Cx-3 W (329–437); Cx-1 + 2 mL (108–135), IL (189–258), W (252–320)

I-L-5 dL 206, vL 152, dL/vL 1.36, HA-HC 45, 61, 72, dL/HB 3.38

S-1 L 107, L/W 13.4, S-2 L 83, L/W 6.9, interspace 21, L S-1/2 1.29
I-L-6 L 137, HA-HC 31, 23, 25, dL/HB 5.96; L I-L-5/6 1.50
genital field L/W 130/166, Ac-1–3 L 41, 53, 65
gnathosoma –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	31/30	74/66	83/50	100/43	38/15
(ratio)	1.03	1.12	1.66	2.33	2.53
rel.L	10	23	25	31	12
total L:	P-2/4 0.74				
	326				

Integument in the neotype locally with fine granulation (diameter of granulae about 2 µm) – a mounting artefact not found in other specimens; coxal field with an extremely narrow border of secondary sclerotization, posteromedial margin of Cx-1 + 2 equally convex, with a protruding medial tip, apodemes of Cx-2 only slightly curved, forming an acute angle with the median line; I-L-5 S-1 slightly thickened and truncate distally, S-2 enlarged in the basal third, distally pointed, I-L-6 moderately curved; genital field with large Ac surrounded by a narrow strip of genital plate sclerite, anterolateral margin with a border of secondary sclerotization, gonopore large, with roundish anterior and posterior edges; P-4 insertion of sword seta near the proximoventral hair (but occasionally shifted anteriorly to the vicinity of the distoventral hair, or, more rarely, proximal to the proximoventral hair).

Females

Paraneotype, in parentheses variability of ♀ from SW Germany

genital field: Ac in an obtuse angle, Ac-3 strongly enlarged

palp: P-2 ventrodial edge rounded, P-4 ventral margin 2 : 3 : 2, sword seta between ventral hairs

idiosoma L/W 900/730; glandularia 35

coxal field L 401; Cx-3 W 526 (338–538); Cx-1 + 2 mL (90–135), IL (180–275), W (252–383)

I-L-5 dL 238, vL 175, dL/vL 1.36, HA-HC 56, 65, 78, dL/HB 3.66

S-1 L 121, L/W 15.1, S-2 L 100, L/W 10.0, interspace 23, L S-1/2 1.21

I-L-6 L 152, HA-HC 29, 21, 28, dL/HB 7.24; L I-L-5/6 1.57

genital field L/W 144/206, Ac-1–3 L 48, 45, 58

gnathosoma –; chelicera L 241, L/H 5.36, bS/claw 2.49

palp	P-1	P-2	P-3	P-4	P-5
L/W	33/31	79/53	100/41	121/29	43/15
(ratio)	1.06	1.49	2.44	4.17	2.87
rel.L	9	21	27	32	11
total L:	P-2/4 0.65				
	376				

I-L-6 more slender and curved than in males. Genital field with narrow pregen and gonopore only slightly extending over the anterior margin of the genital plates, genital plates with a small anterolateral border of secondary sclerotization, in most cases (but not in the rather old paraneotype of Fig. 19K) slightly incised between the Ac; Ac-3 clearly larger than Ac-1 and Ac-2, with a straight anterolateral edge facing Ac-2; ventral margin of P-2 straight, without projections, with a rounded ventrodial edge; sword seta of P-4 inserted exactly between the two ventral hairs or approaching the distoventral hair.

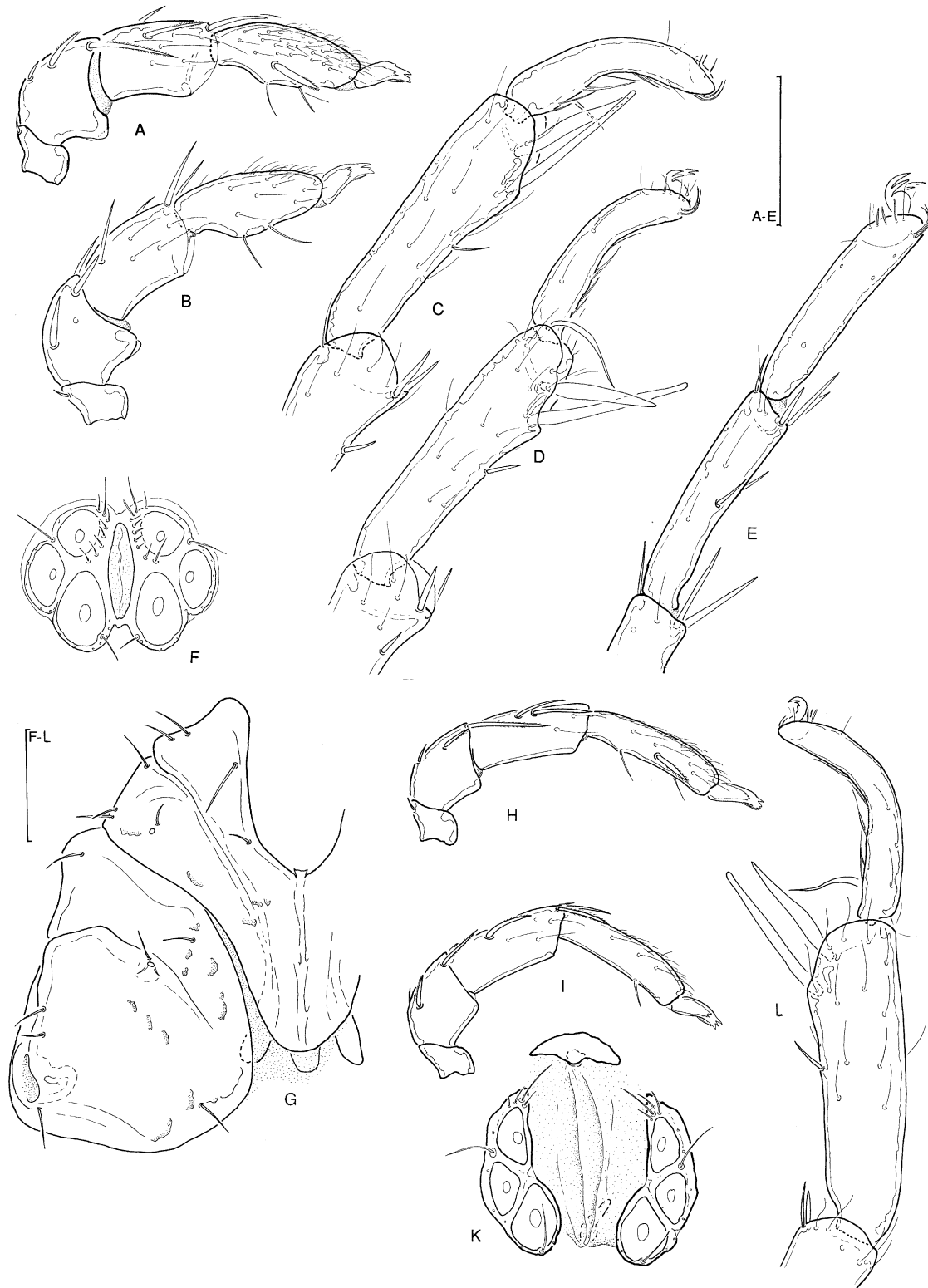


Figure 19. *Atractides nodipalpis*. A–F, neotype ♂ SMF 1518; G, ♂ (Goldersbach); H, I, paraneotype ♀ 1517; K, L, paraneotype ♀ SMF 1516. A, ♂ palp, medial view; B, ♂ palp, lateral view; C, ♂ I-L-5 and -6 posterior view; D, dito, anterior view; E, ♂ II-L-5 and -6 posterior view; F, ♂ genital field; G, ♂ coxal field; H, ♀ palp, medial view; I, ♀ palp, lateral view; K, ♀ genital field; L, ♀ I-L-5 and -6. Scale bars = 100 μ m.

Discussion: This was the first species discovered with notable sexual dimorphism in the shape of the palp. Since then, 25 subspecies have been described, mainly on the basis of differences in the shape of the male P-2 and I-L. Analysis of morphological variability allows establishment of the systematic status of most of these taxa (see below). The shape of the ventral margin of P-2 is very diverse within the genus, and species with ventral protuberances on the male P-2 do not form a monophyletic unit. With regard to nearly all measurements, the neotype male lies within the range established for a population of *A. nodipalpis* from southern Germany, only the S-1 (L/W 13.4) is slightly more slender than the maximum of 12.9. More differences are found in the paraneotype female, where many absolute measurements lie below the minima established in Germany (in parentheses): palp total L 376 (392), setal interspace 23 (25), I-L-6 L 152 (167) μm . Most proportions are in agreement, with the exception of the very slender sword setae of I-L-5, with a L/W ratio of 15.1 (11.7) for S-1 and 10.0 (8.0) for S-2. It is not surprising that the range of morphological variability increases when a more extended geographical area is considered.

Remarks: This is the *Atractides* species currently most frequently found in Central Europe, and the only one for which we have detailed information on life cycle and parasitic behaviour of the larva (Martin, 1998). In northern Germany, parasitic larvae are found at maximum density at the end of April, obviously due to hatching from overwintering eggs. In May, large numbers of deutonymphs and juvenile adults are found, with ovigerous females found from May to September. Only a few specimens hatch from egg clusters within the same year, while the larval stage remains enclosed in the cluster envelope until the spring of the following year. Hosts include chironomids of the families Orthoclaadiinae and Chironominae (genera *Rheocricotopus*, *Polypedilum* and *Orthoclaadius*). The statement of Wainstein (1980) that *A. spinipes* and *A. nodipalpis* are two closely related species, distinguished by their life cycles (with and without parasitic larvae, respectively) is surely erroneous; his definition of *A. spinipes* is unclear, and there are new data on the parasitism of *A. nodipalpis*. However, the possibility of skipping the parasitic stage indicated by Wainstein is an interesting life cycle trait worth studying in detail (Smith, 1998).

Descriptions of larvae: Efford (1963, 1966); Ullrich (1978); Wainstein (1980); Martin (1998).

Habitat: Rhithrobiont. Probably the species most resistant to anthropogenic organic pollution (Gerecke & Schwoerbel, 1991). It may owe its extended distri-

bution and high frequency in Central Europe to this factor.

Distribution: Palaearctic. At present, the high number of partly uncertain subspecies of *A. nodipalpis* described during the past 100 years complicates the analysis of its geographical distribution (1–18, 20, 22–24).

ATRACTIDES GABRETAE THON, 1901

Species dubia

Type series: Probably lost; contrary to the information provided by K. Viets (1956) the Thon collection remained at the Zoological Institute, Prague until the 1950s (Komárek in litt. to Viets, SMF). Since then, the slides have been lost.

Description: Female (original description, male unknown): idiosoma L 1450 μm , integument smooth, coxal area L 500 μm , genital area far from the caudal margin of Cx-4, near to the posterior idiosoma margin, gonopore L, 180 μm , genital plates L, 180 μm ; mouthparts 'as in *A. spinipes*', palp L 450 μm , P-2 L 102, P-3 120 μm .

Discussion: The description of this species based on a single female specimen was induced by the presence of only two pairs of Ac, the position of the sword seta of P-4 near the proximoventral hair, and a large body size with relatively short coxae. Thon himself discussed (but rejected) the possibility that the number of acetabula could be the result of a malformation. Following the description of *A. gabretae*, further examples of specimens with only two pairs have been detected; another species with this characteristic was described by Koenike (1915) and K. Viets (1926) erected a separate subgenus *Tetramegapus* with *A. gabretae* as *typus generis*. Since then, misshaped specimens with reduced numbers have come to light in populations of various species, demonstrating that this is a character not suitable for taxonomic ranking (see 'Subgenera', above). The original description is too scanty to allow any interpretation of the taxonomic state of its subject. *A. gabretae* is therefore a *species dubia*.

ATRACTIDES SUBASPER KOENIKE, 1902 (FIG. 20A–H)

Type series: Lectotype, designated here, NHUB 588, *Megapus subasper* Koen. ♂ Type; Lüneburger Heide, Böhme, in einem Sturzbahe. H.Müller coll. VII, 1902. State of conservation: good, dorsal shield with several cracks, left I-L-5 and -6 missing. Paralectotypes: NHUB 589 ♂, NHUB 590 ♀, one slide with nine specimens (2/4/3) desiccated, re-prepared and mounted on two slides (1/2/2 in Euparal, 1/2/1 on the original slide in Hoyer's fluid); all labelled like lectotype. SMNH 587, labelled like lectotype, ♂. State of conservation: good, but mounting medium has partially retreated from the subjects. SMNH 591, Sturzbach der Böhme im Allergeb., Juli, 1901 ♀, State of conservation: good, mounting medium perfect.

Material examined: Sicily, I 485, Trapani, Fiume Fittasi near ponte Fittasi TB 95 99, 7.9.1986 Gerecke, 4/3/1

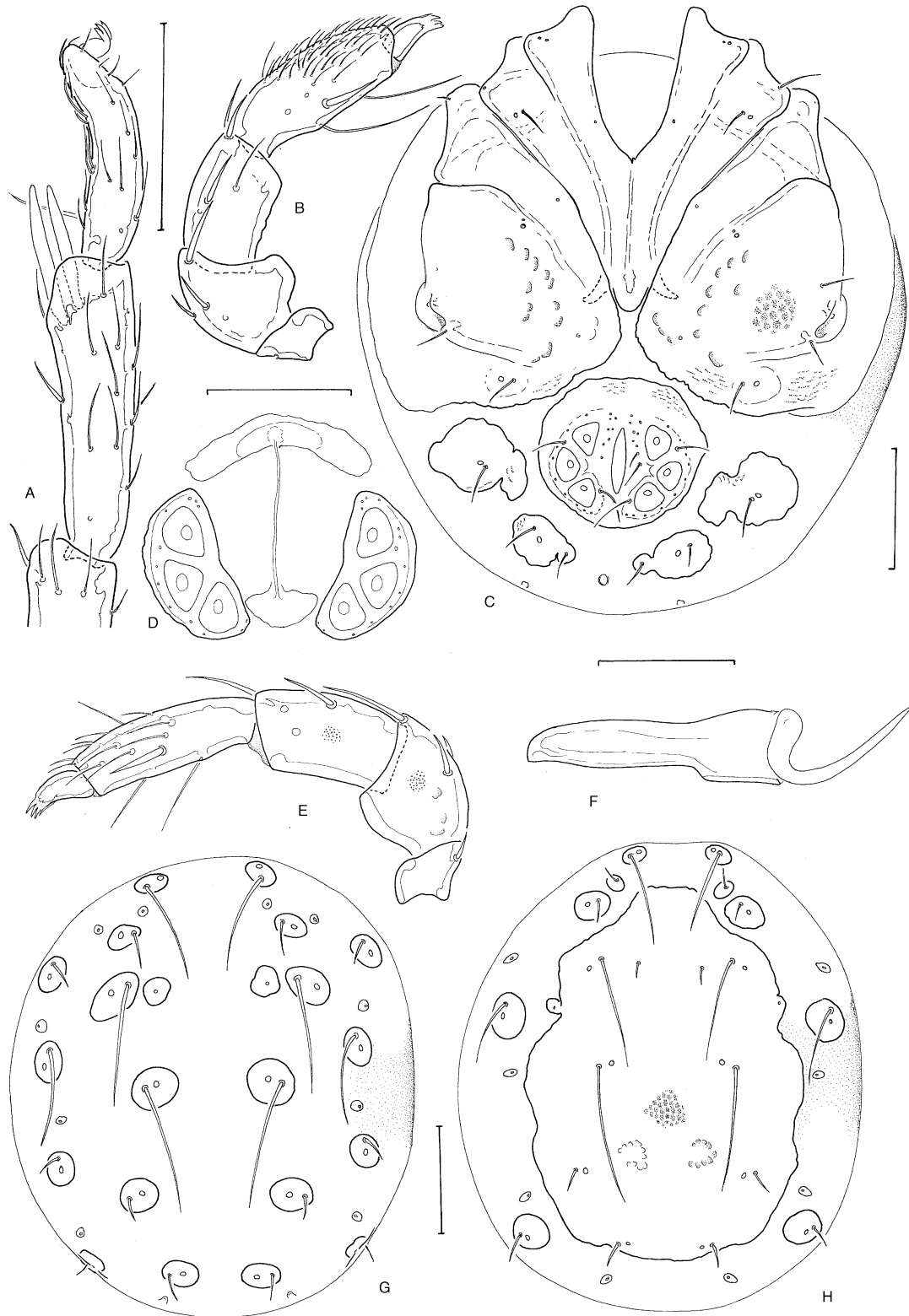


Figure 20. *Atractides subasper*. A, B, lectotype ♂ NHUB 588; C, paralectotype ♂ NHUB 589; D, E paralectotype ♀ NHUB 590; F, ♂ paralectotype SMNH 587; G, ♀ Sicily I485; H, ♂ Sicily I485. A, ♂ I-L-5 and -6; B, ♂ palp, medial view; C, ♂ idiosoma, ventral view; D, ♀ genital field, E, ♀ palp, medial view; F, ♂ chelicera; G, ♀ dorsum; H, ♂ dorsum. Scale bars = 100 μ m.

*Description:**General features*

dorsal integument: striated (6–9/10 µm); muscle attachments: sexual dimorphism (dorsal shield in males), glandularia enlarged
 I-L: I-L-5 S-1 and -2 close together, similar in shape, strong and short with rounded tips; I-L-6 weakly curved, only slightly narrowed distally
 excretory pore: smooth; Vgl-1: in females not fused to Vgl-2, in males age-dependent (fused to Vgl-2 only in older, strongly sclerotized specimens)
 gnathosoma with pointed, protruding rostrum
 chelicera with long, needle-like claw
 palp: sexual dimorphism, P-5 thickened and short

*Males**Lectotype*

dorsum: dorsal shield including frontalia and Dgl-3–6
 coxal field: extended secondary sclerotization including Vgl-1
 genital field: transversely oval, convex anterior and posterior margins of secondary sclerotization, sometimes fused to posterior margin of coxal field; Ac rather small, subtriangular
 palp: P-2 with a truncate ventrodorsal hump, P-3 ventral margin concave, P-4 ventral margin 2 : 2 : 1, sword seta between ventral setae, nearer to proximoventral hair
 idiosoma 450/–; glandularia 45
 coxal field L 302; Cx-3 W 338; Cx-1 + 2 mL 135, IL 229, W 247
 I-L-5 dL 152, vL 114, dL/vL 1.33, HA-HC 35, 44, 49, dL/HB 3.45
 S-1 L 68, L/W 9.7, S-2 L 62, L/W 8.9, interspace 8, L S-1/2 1.10
 I-L-6 L 105, HA-HC 25, 22, 23, dL/HB 4.77; L I-L-5/6 1.45
 genital field L/W 94/126, Ac-1–3 L 30, 24, 25
 gnathosoma vL 130; chelicera L 219, L/H 4.87, bS/claw 1.64

palp	P-1	P-2	P-3	P-4	P-5
L/W	25/25	61/58	67/39	90/35	30/12
(ratio)	1.00	1.05	1.72	2.57	2.50
rel.L	9	22	25	33	11
total L:	P-2/4 0.68				
	273				

Occasionally, integument striation visible only laterally in tangential view; large dorsal shield with irregular undulating margin including at least prefr, postoc, Dgl-3–6, and the slit organ caudolaterally from Dgl-3 (further slit organs and also the Lgl can be fused to the lateral margin of the shield); Cx-1 + 2 with tongue-like protruding mediocaudal margin, Cx-4 with extended caudal and lateral border of secondary sclerotization completely including Vgl-3; occasionally, this sclerotization can meld caudal margin of Cx-1 + 2, medial margins of Cx-4, and also anterior margin of the genital field into a continuous coxogenital shield; genital field and Vgl-1/2 surrounded by extended secondary sclerotization; Vgl-1 free or fused to the medial margin of Vgl-2 (in some cases asymmetrically fused only on one side, but free on the other); gnathosoma as illustrated in Figure 21C for *A. octoporus*; ventral hairs of P-4 very long.

*Females**Paralectotype* SMNH 591:

dorsum: neither dorsal shield, nor sclerotized muscle attachments
 genital field: pregen very strong and large due to secondary sclerotization, Ac in an obtuse angle, genital plates crescent-shaped, medial margin only weakly concave on the level of Ac-2
 palp: P-2 ventral margin convexly protruding distally, P-3 ventral margin straight, P-4 ventral margin 1 : 1 : 1, sword seta between ventral hairs
 idiosoma L/W 750/570; glandularia 45
 coxal field L 350; Cx-3 W 439; Cx-1 + 2 mL 140, IL 263, W 292

I-L-5 dL 180, vL 143, dL/vL 1.26, HA-HC 42, 50, 58, dL/HB 3.62
 S-1 L 83, L/W 9.5, S-2 L 76, L/W 7.4, interspace 10, L S-1/2 1.10
 I-L-6 L 123, HA-HC 29, 25, 26, dL/HB 4.94; L I-L-5/6 1.46
 genital field L/W 169/210, Ac-1–3 L 35, 33, 33
 gnathosoma vL 135; chelicera L 298, L/H 5.67, bS/claw 1.68

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/29	70/53	91/55	105/32	35/18
(ratio)	1.00	1.33	1.63	3.27	2.00
rel.L	9	21	27	32	11
total L:	P-2/4 0.67				
	330				

Dorsum without shield and muscle attachments unsclerotized, but glandularia platelets rather large; tips of apodemes of Cx-2 extending far above the level of the mediocaudal margin of Cx-1 + 2, which is less protruding than in males, sometimes nearly truncate; secondary sclerotization forming only a narrow border surrounding posterior and lateral margins of coxae, never including the Vgl-3; genital field variable, with gonopore sometimes rather short (see Fig. 20D) in other specimens extending far beyond the anterior margin of the genital plates, pregen narrow in juveniles, but strongly extended laterally by accretion of secondary sclerotization in older specimens; genital plates with a fine lateral border of secondary sclerotization; chelicerae with basal segment/claw ratio 1.4–1.7; P-4 more slender than in males, with nearly straight ventral margin.

Discussion: Within the genus, *A. subasper*, *A. octoporus*, *A. digitatus*, and *A. heversi* form a phylogenetic unit, the ‘*subasper* species group’. It is characterized by a pointed, protruding gnathosomal rostrum and chelicerae with a long, needle-like claw (basal segment/claw ratio low, 1.4–1.7).

Habitat: Rhithrobiont, as indicated by the characteristics of the Sicilian locality, resistant to warming in summer and capable of living in streams with a high percentage of fine substrata.

Distribution: Central and southern Europe, the Caucasus (1–3, 8, 9, 13–15, 24).

ATTRACTIDES OCTOPORUS PIERSIG, 1904
(FIGS 11A, 21A–F)

Type series: Missing, probably lost. *Locus typicus:* Bäche bei Mauth, Böhmerwald. No neotype is designated due to the clear characters of this species and the lack of specimens within the vicinity of the *locus typicus*.

Material examined: Germany, Schönbusch (TÜ) Goldersbach at Teufelsbrücke from a 12-month investigation, 1996–7 16/51/2

*Description:**General features*

dorsal integument: striated (9/10 µm); muscle attachments: unsclerotized
 I-L: I-L-5 short and thick, S-1 strongly thickened basally, curved, S-2 shortened, both blunt, I-L-6 weakly curved, slightly narrowed distally

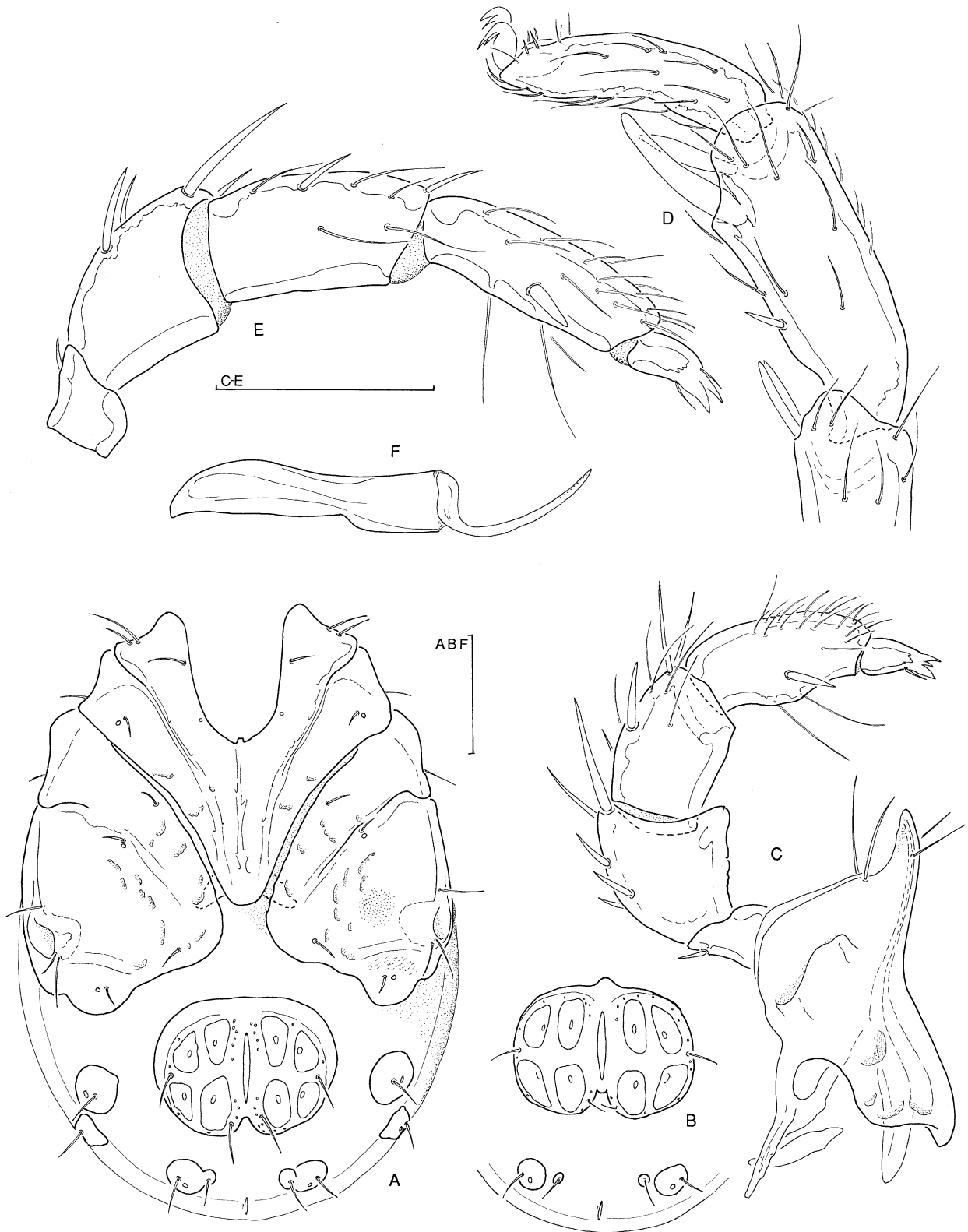


Figure 21. *Atractides octoporus*, specimens from Goldersbach. A, ♂ idiosoma, ventral view; B, juvenile ♂, genital field and excretory pore area; C, ♂ gnathosoma and left palp, medial view; D, ♂ I-L-5 and -6; E, ♀ palp, medial view; F, ♀ chelicera. Scale bars = 100 µm.

genital field with four pairs of Ac in rectangular arrangement
 excretory pore: smooth
 Vgl-1: fused to Vgl-2 in old males only
 gnathosoma: ventrally protruding, pointed rostrum, chelicera: needle-like,
 long claw
 palp: sexual dimorphism, P-5 thickened

Males

Goldersbach, S Germany, prep. Nr. D453/9
 coxal field: extended secondary sclerotization
 genital field: anterior margin with a medial projection in juveniles, with
 extended convex margin of secondary sclerotization in older specimens,
 posterior margin deeply indented
 palp: robust and thickened, P-2 ventral margin bumpy, distally forming a
 nose-like edge, P-3 ventral margin straight, P-4 ventral margin strongly
 protruding on the level between the ventral hairs, 2 : 1 : 2, sword seta
 strong, nearer to distoventral hair
 idiosoma L/W 490/400; glandularia 40
 coxal field L 284; Cx-3 W 342; Cx-1 + 2 mL 139, IL 210, W 252
 I-L-5 dL 143, vL 101, dL/vL 1.42, HA-HC 52, 61, 66, dL/HB 2.34
 S-1 L 70, L/W 5.4, S-2 L 48, L/W 6.0, interspace 21, L-S-1/2 1.46
 I-L-6 L 119, HA-HC 29, 26, 27, dL/HB 4.58; L I-L-5/6 1.20
 genital field L/W 117/171, Ac-1-4 L 36, 29, 27, 34
 gnathosoma vL 150; chelicera L 288, L/H 7.20, bS/claw 1.62

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/27	67/56	63/41	81/36	34/15
(ratio)	1.07	1.20	1.54	2.25	2.27
rel.L	11	24	23	30	12
total L:	P-2/4 0.83				
	274				

Glandularia enlarged, with undulate margins, medio-caudal margin Cx-1 + 2 convex, apodemes of Cx-2 forming a 45° angle, width of the borders of secondary sclerotization at Cx-1 + 2 caudally and Cx-4 medio-caudally various, from very narrow to quite extended (and then including the anterior half of Vgl-3); I-L-5 bearing numerous fine hairs, anterior margin of genital field in juveniles with a narrow border of secondary sclerotization and a mediodistal protrusion, in older males with an enlarged, anteriorly straight border; the medial Ac subrectangular, the lateral ones subtriangular in shape; Gsk rather short, total L 85–95 µm; ventral hairs of P-4 long.

Females

Goldersbach, Germany D453/1
 genital field: pregen boomerang-shaped, in older specimens enlarged and
 thick, genital plates crescent-shaped, with straight medial margin
 palp: P-2-4 with straight ventral margins, P-4 1 : 1 : 1, sword seta stronger
 than in males
 idiosoma L/W 870/670; glandularia 40
 coxal field L 370; Cx-3 W 500; Cx-1 + 2 mL 144, IL 270, W 356
 I-L-5 dL 198, vL 135 dL/vL 1.47, HA-HC 49, 56, 72, dL/HB 3.54
 S-1 L 85, L/W 6.5, S-2 L 56, L/W 5.6, interspace 23, L S-1/2 1.52
 I-L-6 L 157, HA-HC 33, 31, 35, dL/HB 5.06; L I-L-5/6 1.26
 genital field L/W 193/216, Ac-1-4 L 49, 38, 36, 47
 gnathosoma vL 198; chelicera L 413, L/H 6.16, bS/claw 1.63

palp	P-1	P-2	P-3	P-4	P-5
L/W	34/34	92/63	101/54	108/36	45/20
(ratio)	1.00	1.46	1.87	3.00	2.25
rel.L	9	24	27	28	12
total L:	P-2/4 0.85				
	380				

Secondary sclerotization modest, forming at most a small undulate border surrounding the posterior margin of coxae and the anterolateral margins of genital plates; pregen in mature specimens sometimes nearly semicircular, due to accretion of secondary sclerotization; gonopore relatively short, misshaped specimens with 3 or 5 Ac; Vgl-1 never fused to Vgl-2, not even in old specimens.

Discussion: K. Viets (1926) introduced the subgenus *Octomegapus* for *Atractides* species bearing four pairs of Ac in the genital field, with *A. octoporus* as *typus subgeneris*. As explained earlier, there is no reason for maintaining this taxon; *A. octoporus* is obviously closely related to the triacetabulate *A. digitatus* from Spain and also to *A. subasper*. The presence of a pointed ventral protrusion of the gnathosomal rostrum and a needle-like, elongated chelicera are good arguments for a close phylogenetic relationship between these species. Further common characters are: frequent extended secondary sclerotization in males, relatively short and thick S-1 and -2, and long ventral hairs on P-4.

Habitat: Rhithrobiont.

Distribution: Central Europe (4, 8–10, 18).

ATRACTIDES VAGINALIS (KOENIKE, 1905) (FIG. 22A–F)

Megapus vaginalis Koenike, 1905

Syn. *A. tatrensis* Szalay, 1953: syn. nov.; *A. oviformis* Szalay, 1953: syn. nov.

Type series: Holotype ♀ NHUB 802 *Megapus vaginalis* Koen. ♀; Tirol Bach u. Sulzfluh Prof Zschokke leg., 1892. State of conservation: good, mounting medium slightly darkened and torbid, idiosoma slightly crushed, gnathosoma separate, dorsally, one chelicera, both palps and all I-III-L isolated, legs partly dismembered. This is the single specimen on which the original description was based; incorrectly, a male in NHMB is labelled as *Typus*, containing a dried specimen from the Piersig collection (without indication of collecting locality, on two slides with numbers IX/44, IX/45).

Material examined: NHMB XIX/06 ♂, Zufluß des Partnunersees 1870 m, 28.7.11; SMNH 6376 ♀, same collecting site and date (both determinations authorized by Koenike); Germany, Nationalpark Berchtesgaden, Dsar 13, Sittersbachquelle 2, 2.6.1994, 22/33/9

Description:

General features

dorsal integument: striated (10/10); muscle attachments: unsclerotized
 glandularia: small, knob-shaped
 I-L: I-L-5 rather long, S-1 and -2 similar in dimensions, stocky, blunt, close together, S-1 slightly narrowed subapically, S-2 thicker than S-1; I-L-6 short, strongly curved, basally thickened and distally continuously narrowed
 genital field: Ac large, in a nearly right triangle
 excretory pore: smooth; Vgl-1: not fused to Vgl-2
 palp: weak sexual dimorphism

Males

Berchtesgaden BGL Dsar 13e

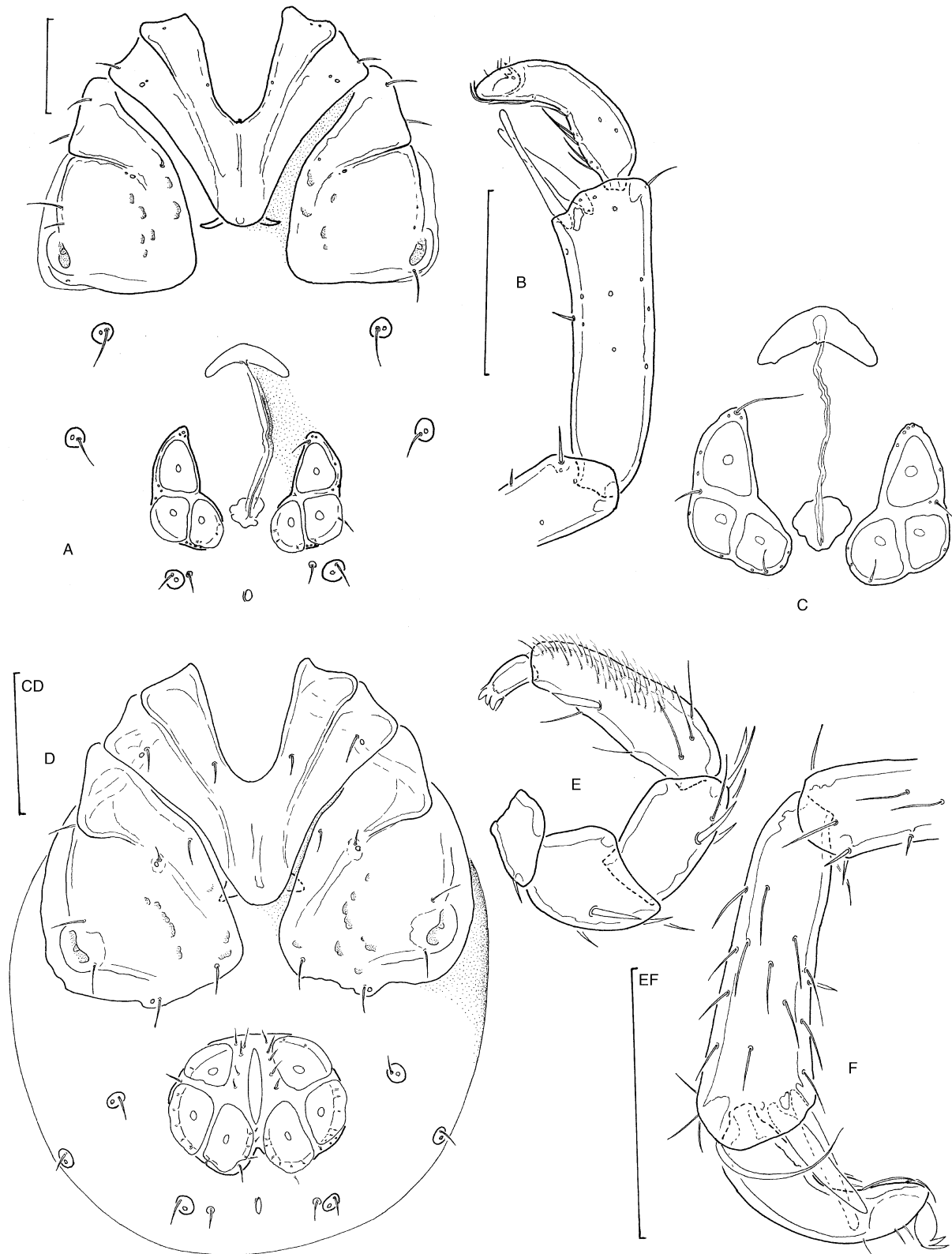


Figure 22. *Atractides vaginalis*. A, B, holotype ♀ NHUB 802; C, ♀ SMNH 6376, D–F, ♂ Berchtesgaden. A, ♀ ventrum; B, ♀ I-L-5 and -6; C, ♀ genital field; D, ♂ ventrum; E, ♂ palp, medial view; F, ♀ I-L-5 and -6. Scale bar = 100 µm.

coxal field: extended secondary sclerotization, in mature specimens forming a continuous coxal shield, including Vgl-3
 genital field: anterior margin convex, posterior margin deeply indented, Ac relatively large
 palp: P-2 ventral margin straight, with rounded ventrodistal edge, P-3 and P-4 ventral margin straight, 1 : 1 : 1, sword seta near distoventral hair
 idiosoma L/W 410/330; glandularia 18
 coxal field L 243; Cx-3 W 252; Cx-1 + 2 mL 85, IL 157, W 210
 I-L-5 dL 121, vL 100, dL/vL 1.21, HA-HC 29, 39, 40, dL/HB 3.10
 S-1 L 54, L/W 7.7, S-2 L 53, L/W 6.6, interspace 3, L S-1/2 1.02
 I-L-6 L 78, HA-HC 24, 20, 19, dL/HB 3.9; L I-L-5/6 1.55
 genital field L/W 96/128, Ac-1-3 L 48, 48, 53
 gnathosoma vL 85; chelicera L 150, L/H 5.17, bS/claw 2.33

palp	P-1	P-2	P-3	P-4	P-5
L/W	26/20	49/35	49/28	80/25	26/9
(ratio)	1.30	1.40	1.75	3.20	2.89
rel.L	11	21	21	35	11
total L:	P-2/4 0.61				
	230				

Integument: striation often nearly invisible, appearing completely smooth; glandularia small, equally rounded knobs; Cx-1 + 2 with weakly convex or truncate mediocaudal tip, apodemes of Cx-2 blunt, forming an obtuse angle, nearly perpendicular to the median line, Cx-3 + 4 with an undulating border of secondary sclerotization, in some juveniles not including Vgl-3 or asymmetrically fused only on one side; in older mature specimens, secondary sclerotization covering the whole area between medial margins of Cx-3 + 4 and caudal margin of Cx-1 + 2, producing a unique, continuous coxal shield.

Females

SMNH 6376
 coxal field: without, or with very narrow secondary sclerotization, Vgl-3 never fused to Cx-4
 genital field: gonopore extending far over the anterior margin of the genital plates, pregen strongly curved, genital plates triangle-shaped, medial margin forming an obtuse angle between Ac-1 and Ac-3
 palp: ventral margin P-2-4 straight, P-4 1 : 1 : 1, sword seta between ventral hairs
 idiosoma L/W 570/440; glandularia 18
 coxal field L 292; Cx-3 W 306; Cx-1 + 2 mL 105, IL 204, W 254
 I-L-5 dL 165, vL 134, dL/vL 1.23, HA-HC 42, 51, 53, dL/HB 3.23
 S-1 L 67, L/W 9.2, S-2 L 67, L/W 7.7, interspace 7, L S-1/2 1.00
 I-L-6 L 95, HA-HC 29, 23, 22, dL/HB 4.06; L I-L-5/6 1.74
 genital field L/W 181/178, Ac-1-3 L 49, 39, 42
 gnathosoma vL -; chelicera L 184, L/H 4.85, bS/claw 2.32

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/25	61/44	64/35	92/26	31/12
(ratio)	1.18	1.40	1.83	3.50	2.63
rel.L	11	12	23	33	11
total L:	P-2/4 0.67				
	277				

In contrast to Figure 2 in the original description, anterior margin of Cx-1 normal in shape, not distally protruding and enlarged, and Cx-2/3 not separated from each other by membranous integument near the lateral idiosoma margin; the holotype with five eggs (not two, as illustrated in Koenike's figure); palp with curved ventrodistal tip of P-2 less pronounced, and fewer dorsal setae on P-4 than in males, these setae

extending also to the proximal part of the segment (in agreement with Koenike's figure, but in contrast to his statement in the text: 'nur auf die distale Gliedhälfte beschränkt').

Discussion: Due to the fact that *A. vaginalis* was described only from a female, understanding of the characteristics of this species was incomplete for a long time. Only Lundblad (1956) was aware that there is a further similar taxon, that he described under the name of '*var. adnatus*'. As stated correctly by Bader, it represents a well-defined, separate species.

Habitat: Crenobiont, with a preference for montane and alpine rheocrenes and rheohelocrenes.

Distribution: Alps, Tatras; former records of *A. vaginalis* require revision for a better understanding of its geographical distribution (4, 9, 10).

ATTRACTIDES CURVISETUS (KOENIKE, 1911)

Megapus curvisetus Koenike, 1911

Species dubia

Type series: Holotype, SMNH 1144 *Megapus curvisetus* Koen. ♀ Type; Westf., in der Henne Dr Thienemann coll., 18.8.1908. State of conservation: good, left I-L and right IV-L missing.

Description: Female (holotype, male unknown) integument striated (7/10 µm), glandularia with slightly irregular contour line, but without secondary sclerotization, maximum diameter 36 µm; mediocaudal margin of Cx-1 + 2 truncate, apodemes of Cx-2 in a right angle to the median line. I-L-5 thickened with doubled ventral seta, S-1 curved and truncate, probably misshaped (internally with a curious transverse partition line) I-L-6 relatively short (L ratio I-L-5/6 1.53); pregen crescent-shaped, large, genital plates compact, contour without incisions, Ac in an obtuse angle, Ac-1-3 L 46, 46, 60 µm; excretory pore smooth, Vgl-1 not fused to Vgl-2; palp inconspicuous, with nearly straight ventral margins of P-2 to -4, insertions of ventral hairs of P-4 dividing the ventral margin 1 : 1 : 1, sword seta halfway between the two hairs, not extremely elongated (as stated by K. Viets, 1936).

Discussion: The original description was provided without any discussion of diagnostic characters, mainly dealing with measurement data and morphological details generally found in all *Attractides* species. Obviously, Koenike interpreted the shape of S-1, on which he based the name, to be an important feature of this taxon. The strange internal structure of this seta suggests that its shape is caused by developmental disturbance (an interpretation corroborated also by the unusual doubling of the ventral seta in the centre of the segment). Of the species known at that time, *A. curvisetus* is most similar to *A. nodipalpis*. In

the latter, a wide range of variation of the shape of the pregen can be observed, from a rather short, transverse rod to a sickle-shaped sclerite as in *A. curvisetus*. *A. curvisetus* differs from *A. nodipalpis* only in the truncate posteromedial margin of Cx-1 + 2 with apodemes in right-angled position. Due to the damage and individually aberrant features of the single specimen on which *A. curvisetus* is based, the species must be designed a *species dubia*.

ATTRACTIDES MONTANUS (HALBERT, 1911)
(FIG. 23A–D)

Megapus spinipes nov. var. *montanus* Halbert, 1911

[syn. to *A. distans* (K. Viets, 1914): Besseling, 1954, rejected synonymy]

Species dubia

Type series: Lectotype, here designated, NHMB *Megapus spinipes* vs. *montanus* ♀ Irland coll. Halbert; leg. Halbert Irland, on two slides numbered XXI/35, 599 (idiosoma) and XXI/36, 599a (gnathosoma and two legs). State of conservation: perfect. It is highly likely that this specimen is a syntype: no further record of this taxon was published after the original description, and the author himself excluded it later from his list of Irish freshwater mites (Halbert, 1944); *loci typici*: Stream on Croaghpatrick; Bunowen stream at Louisburgh.

Description. Female (lectotype, male unknown?): integument striated (5/10 µm); caudal margins of coxae with extended margins of secondary sclerotization; I-L-5 rather thick, with nearly parallel dorsal and ventral margins, both S-1 and -2 slightly nar-

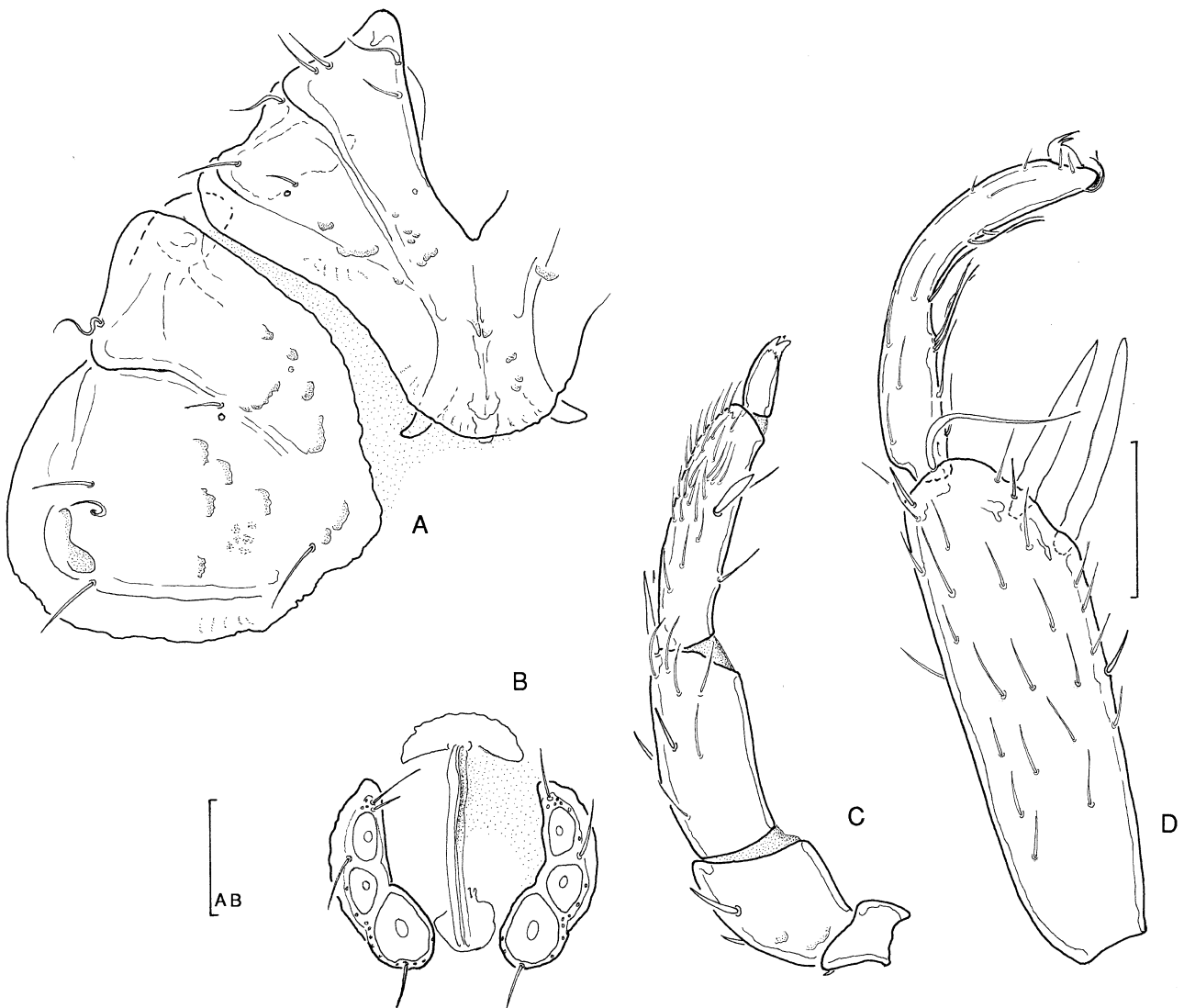


Figure 23. *Atractides montanus*, ♀ lectotype (NHMB). A, coxal field; B, genital field; C, palp, medial view; D, I-L-5 and -6. Scale bars = 100 µm.

rowed near their base, interspace 26 µm, S-1 more blunt, S-2 pointed; I-L-6 slender, strongly curved, ratio dL I-L-5/6 1.43; genital plates with distinct anterolateral border of secondary sclerotization; Ac in a weakly curved line, Ac-1 and -2 rather small, Ac-3 considerably larger, Ac-1–3 L 39, 43, 61 µm; excretory pore smooth, Vgl-1 separate from Vgl-2; palp slender, P-4 with insertions of ventral setae dividing the ventral margin 1 : 2 : 1, sword seta arranged near the distoventral hair.

Discussion: In the original description Halbert considered *A. spinipes* to be a swimming hair-bearing species and decided to establish the taxon *montanus* for ‘stenothermal’ hair-free populations from other points of view similar to what he defined as *A. spinipes*. His observations of *montanus* – more strongly developed claws, I-L-6 more strongly bent, palps more robust, with longer sword seta – confirm that he allocated to *spinipes* specimens that other authors would have called *ovalis*. From several points of view, the only conserved specimen of *montanus* is quite similar to *A. nodipalpis* (morphology and measurements of I-L and palp) but it differs in the extended secondary sclerotization of coxae and the thickened I-L-5. Therefore the possibility that the name of *montanus* referred to a taxon genuinely new to science when it was described cannot be excluded. Besseling (1954) and Lundblad (1956) proposed synonymizing *A. spinipes montanus* with *A. distans* K. Viets, 1914. Even if there were morphological conformity, to conform with the rule of priority *A. distans* would have become a synonym of *A. montanus*. However, in *A. montanus*, setal interspace is much narrower, S-1 is not enlarged and truncated distally, and I-L-6 is relatively short. From Halbert’s statement ‘is no doubt widely distributed’, one cannot deduce that he has really seen numerous specimens, and in the original description there is no indication concerning the sex of the specimens he examined. His observation of an idiosomal length of 1000–1400 µm suggests that he saw only females. In view of the fact that *A. montanus* was introduced against a background of incorrect information on the other *Atractides* species known at that time, and that there is no information on important morphological features of the male, I consider it a *species dubia*. However, it has, notwithstanding this, been illustrated.

ATRACTIDES DISTANS (K. VIETS, 1914) (FIG. 24A–G)
Megapus distans K. Viets, 1914

Type series: Holotype ♀ SMF K. Viets 1545 *Megapus distans* Viets ♀ Type Prov. Brandenburg, Neuenburger Fl. b. Hoppegarten VIII.1899 Protz leg., state good, Cx-1 + 2 medially damaged. Paratype ♂, SMF K. Viets 1539; labelled like holotype. State of conservation: good, but Cx-1 + 2 broken medially, Gsk missing. The original description does not contain type designations, but in a later paper K. Viets (1959) declared that he considered the male specimen to be a paratype.

Material examined. GERMANY: SMF KOViets 1347, Kossau-Bach nördl. Rantzau, Holstein (108/49) 29.7.1949, 1 ♂, 1 ♀; SMF KOViets 951, Erlangen, Lachgraben an der Nürnberger Chaussee, H.-J. Stammer leg. 11.10.1949 1 ♂, 1 ♀; Germany, Baden-Württemberg, surroundings of Freiburg/Br. 1979 Meyer, 1 ♀; Brandenburg, Lausitz, Wudritz near Willmersdorf-Stöbritz, 23.06.1996, Pusch, 1 ♀; The Netherlands, coll. Besseling: Rosep, Haaren 729 04.47, 11 ♂, 21 ♀; ditto 725 09.46 6 ♂, 4 ♀ Gr.Wetering, Naathozarn, 726 10.46, 1 ♂, 1 ♀; Neersop, Westerhaven, 822 04.49 1 ♂.

Refused determinations: Germany, SMF KOViets 1796 and, 1809, Mölle, linker Zufluß von Hals z. westl. Straße; südl. Möllenbeck bei Rinteln (16/53) 22.7.1953, 2 ♂, 1 ♀ (= *A. allgaier* nov. sp.); the Netherlands, coll. Besseling, Geest Teograat [...] 07.49 (= *A. nodipalpis*).

Description:

General features

dorsal integument: striated (8/10); muscle attachments: unsclerotized
I-L: I-L-5 with S-1 and -2 wide interspace, S-1 near to the ventral seta, long and slender, slightly curved and with truncate, enlarged tip, S-2 pointed, basally enlarged; I-L-6 very long and slender excretory pore: smooth; Vgl-1: not fused (but occasionally closely nearer) to Vgl-2
palp: no sexual dimorphism, ventral margin P-2 straight, with slightly curved distal edge, P-3 and P-4 straight, P-4 with slight elevation near insertion of proximoventral hair, 1 : 1 : 1, sword seta on the level of distoventral hair

Males

Paratype, in parentheses variability of I-L in specimens from The Netherlands, Besseling 725, 726, 729, 822, *n* = 12
genital field: anterior margin truncated or slightly convex, caudal margin weakly indented
idiosoma L/W 560/450; glandularia 28
coxal field L 306; Cx-3 W 416; Cx-1 + 2 mL 100, IL 200, W 315
I-L-5 dL 183 (175–210), vL 108 (105–130), dL/vL 1.69 (1.40–1.76), HA-HC 47, 52 (50–63), 82, dL/HS 3.52 (3.20–3.70)
S-1 L 134 (123–150), L/W 16.8, S-2 L 89 (80–100), L/W 8.9, interspace 39 (30–48), L S-1/2 1.51 (1.40–1.58)
I-L-6 L 170 (165–208), HA-HC 21, 16 (15–18), 16, dL/HS 10.63 (10.0–12.2); I-L-5/6 1.08 (1.00–1.06)
genital field L/W 94/110, Ac-1–3 L 20, 25, 32
gnathosoma vL –; chelicera L 168, L/H 5.25, bs/claw 2.57

palp	P-1	P-2	P-3	P-4	P-5
L/W	25/25	63/40	76/35	91/35	32/12
(ratio)	1.00	1.58	2.17	2.60	2.67
rel.L	9	22	26	32	11
total L:	P-2/4 0.69				
	287				

Integument: striation visible mainly on idiosomal flanks; glandularia small, circular, maximum diameter Dgl-4 21, Vgl-3 28 µm; posterior margins of Cx-4 forming an obtuse angle, with the lateral part perpendicular to the median line, and the medial part oblique, converging towards the median edges of Cx-3; I-L-6 continuously narrowed from the base to the tip; ventral margin P-2 slightly convex (a fine longitudinal lamella on this segment probably an artefact), P-4 with a fine denticle near the insertion of the proximoventral hair, sword seta short and slightly curved.

Females

Holotype, Cx-1 + 2 specimen from Lausitz, in parentheses variability of specimens from The Netherlands, coll. Besseling 725, 726, 729, *n* = 6
genital field: Ac in slightly curved line
palp: P-2 ventrally straight, P-4 slightly more slender than in male
idiosoma L/W 710/620; glandularia 28
coxal field L 380; Cx-3 W 505; Cx-1 + 2 mL 100, IL 192, W 300

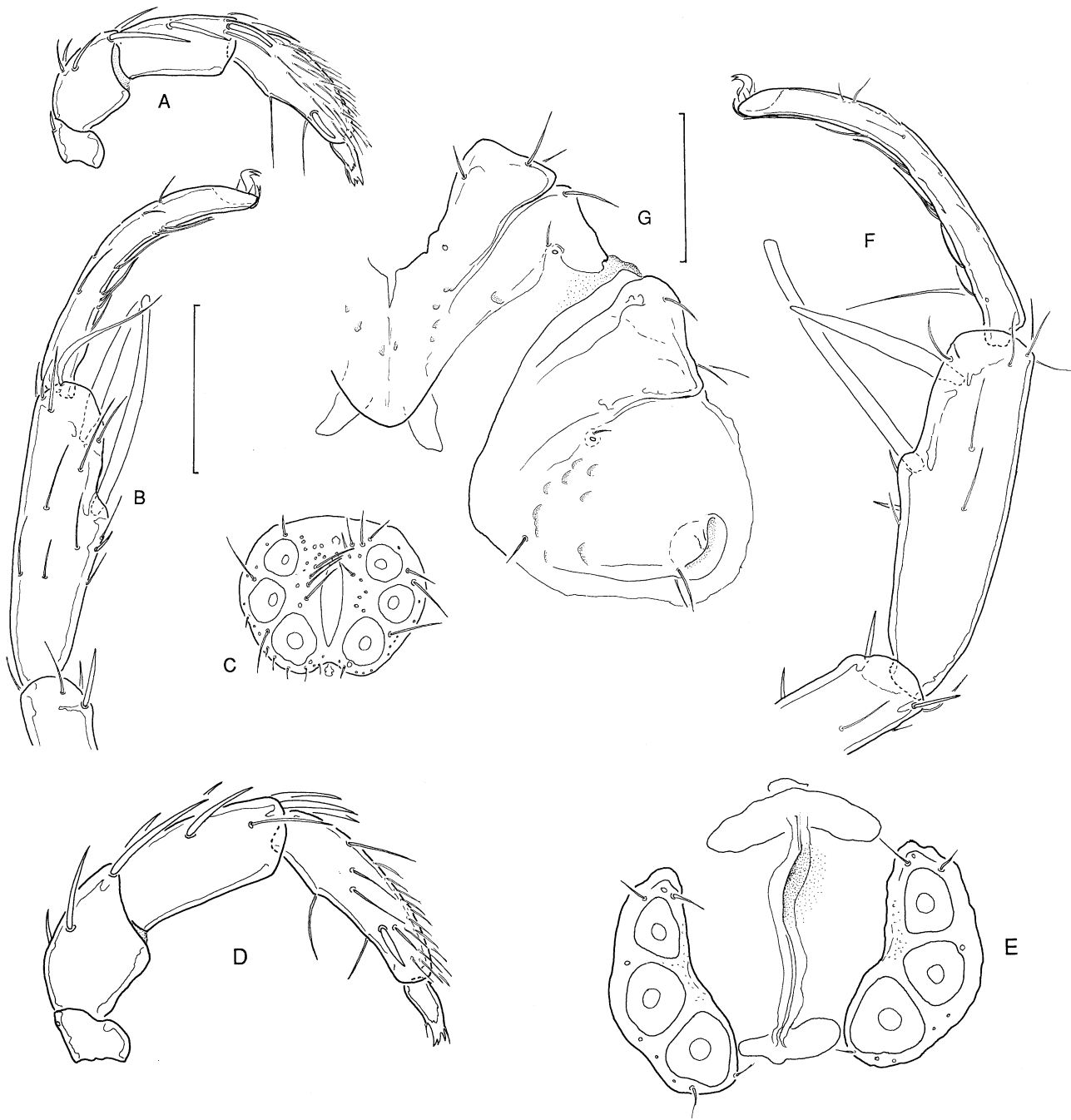


Figure 24. *Atractides distans*. A–C, lectotype ♂, D–F, paralectotype ♀ G, ♂ Germany, Lausitz. A, ♂ palp, medial view; B, ♂ I-L-5 and -6; C, ♂ genital field; D, ♀ palp, medial view; E, ♀ genital field; F, ♀ I-L-5 and -6; G, ♂ coxal field. Scale bars = 100 µm.

I-L-5 dL 220 (195–235), vL 121 (125–140), dL/vL 1.82 (1.56–1.77), HA-HC 63, 70 (55–70), 103, dL/HB 3.14 (3.28–3.55)
 S-1 L 161 (135–175), L/W 16.1, S-2 L 109 (85–105), L/W 9.9, interspace 51 (40–58), L S-1/2 1.48 (1.44–1.67)
 I-L-6 L 213 (185–230), HA-HC 24, 17 (17–19), 17, dL/HB 12.53 (10.6–13.6); L I-L-5/6 1.03 (1.00–1.05)
 genital field L/W 153/189, Ac-1–3 L 34, 34, 41
 gnathosoma vL –; chelicera L 202, L/H 5.05, bS/claw 2.74

palp	P-1	P-2	P-3	P-4	P-5
L/W	33/30	79/49	94/43	111/32	36/13
(ratio)	1.10	1.61	2.19	3.47	2.77
rel.L	9	22	27	31	10
total L:	P-2/4 0.71				
	353				

Integument striation more distinct than in male; mediocaudal margin of Cx-1 + 2 tongue-shaped, apodemes of Cx-2 in an acute angle with the median line, posterior margin of Cx-2 indistinct; Cx-3 + 4 with undulate margin of secondary sclerotization; pregen sausage-shaped (only slightly narrowed laterally) W 90 µm, postgen W 58 µm.

Discussion: Due to the distant position of S-1 and -2 on I-L-5 and the particular shape of S-1 (distally enlarged and with a truncated tip), *A. distans* is distinguished from all species known at that time. Due, however, to this easily recognizable characteristic, little attention has been paid to other characters. Integumental striae are arranged as in lineated species (*Hygrobatas caliger*-like) and in larger specimens they appear to be far apart, although the distance between them is not significantly larger than their diameter.

Besseling (1954) reported considerable variation in the ratio dL/vL of segment I-L-5, and a clear tendency of seta S-1 to shift more proximally in females than in males. He considered the far distal insertion of the sword seta on P-4 to be a diagnostic feature and proposed synonymizing *A. gassowskii* (Sokolow, 1934), *A. gracilis* (Sokolow, 1934) and *A. diastema* (Szalay, 1935) with *A. distans*, and placing *A. cultellatus* (K. Viets, 1930) and *A. odarkensis* (Sokolow, 1934) as subspecies within *A. distans*. The three species described by Sokolow (1934) from the eastern Palaearctic region are not treated here; the proposals for taxonomic placement of the other two species are not acceptable, as Besseling did not consider important differences; he sometimes attributed *A. nodipalpis* females to *A. distans*, and this led to his assumption of a wide range of variability, as mentioned above. Re-examination of his material indicates that his vial 844 exclusively contained *A. nodipalpis*. Analysis of the correctly determined part of the specimens from the Netherlands permits deduction of the range of variation of the important I-L measurements from large populations collected in autumn and spring.

K. Viets (1959) himself observed considerable variation in material from the Weser catchment area but gave measurement details for one specimen from the Harz only, with slight differences to the paratype. Re-examination of material in the Viets collections from Weser and elsewhere in Germany, together with the study of material newly collected in southern Germany, indicates that *A. distans* as defined by the previous authors includes two separate taxa. A new species *A. allgaier* sp. nov. (see below) is introduced for specimens with character states clearly differing from the type series of *A. distans*, and the diagnosis for the latter is accordingly restricted.

Habitat: Rhithrobiont; preferably in high order lowland streams, eurythermic.

Distribution: western Palaearctic; most records will require re-confirmation in view of the split of the two species proposed here, and further taxa might be hidden in other geographical areas (1, 6, 8–15).

ATTRACTIDES ARCUATUS (THOR, 1914) (FIG. 25A,B)

Megapus arcuatus Thor, 1914

Syn. *A. dubius* (Sokolow, 1940): syn. nov.

Type series: Lost with the destruction of the Thor collection. *Locus typicus:* small mountain brook near Ordubat, at the Russian-Persian frontier, 10.6.1913 1 ♂, 17.6.1913 1 ♀.

Material examined: *A. dubius* Sokolow, 1940, Holotype; NHMB *Megapus piersigi* Walter ♂ coll. Piersig; Typus; P.S. = *arcuatus*? pasted over with a label *Megapus piersigi* Walter = *arcuatus*. . . Two slides: IX/01, 457, idiosoma; IX/02, 457a gnathosoma, both completely desiccated. Walter probably planned to describe this specimen from the Piersig collection under the name of *A. piersigi*, but convinced himself that it was identical to *A. arcuatus* before publishing the name. Both due to the lack of label indicating collecting site and poor state of conservation, it does not merit further attention.

Description:

General features

dorsal integument: lineated?; muscle attachments: unsclerotized
coxal field: sexual dimorphism?

I-L: I-L-5 S-1 and -2 interspaced, similar in shape and dimensions, I-L-6 not particularly long, curved

genital field: Ac elliptical-roundish, in a weakly curved line, Ac-2 not shifted laterally

excretory pore: unsclerotized?; Vgl-1: not fused to Vgl-2

palp: sexual dimorphism, P-4 sword seta near distoventral hair

Males

Translation of the original description, with additions deduced from Thor's figures:

coxal field: Cx-1 + 2 and Cx-3 + 4 fused to an unique coxal shield (?)

genital field: anterior and posterior margins with very shallow indentations, the caudal indentation filled with secondary sclerite, numerous hairs flanking the gonopore; genital setae: 60

palp: P-2 ventrally convexly swollen, with a nearly spherical aspect, P-3 ventral margin slightly concave; P-4 ventrally thickened with maximum H near proximoventral hair, ventral margin 1 : 1, sword seta long

idiosoma L/W 590/430; glandularia –
coxal field L 300; Cx-3 W –; Cx-1 + 2 –

I-L-5, I-L-6 –; L I-L-5/6 1.31

genital field L/W 100/100, Ac-1–3 L 30, 30, 30

gnathosoma vL 112, chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	–	54	60	80	–
(ratio)	–	1.08	–	–	–
rel.L	–	–	–	–	–
total L:	P-2/4 0.68				
230?					

Integument 'soft, covered with particularly dense, fine stripes', space between eyes 100 µm; coxal field relatively extended, L 300 µm, W 360 µm; mediocaudal margin of Cx-1 + 2 strongly extended caudally, reaching the mediocaudal angle of Cx-3; Cx-2 and -3 completely fused, without a membranous suture line between the two plates; caudal margin Cx-4 nearly straight, only near the mediocaudal edge slightly curved; I-L-6 'similar to *A. nodipalpis* but more delicate', S-1 and -2 similar in length, wide

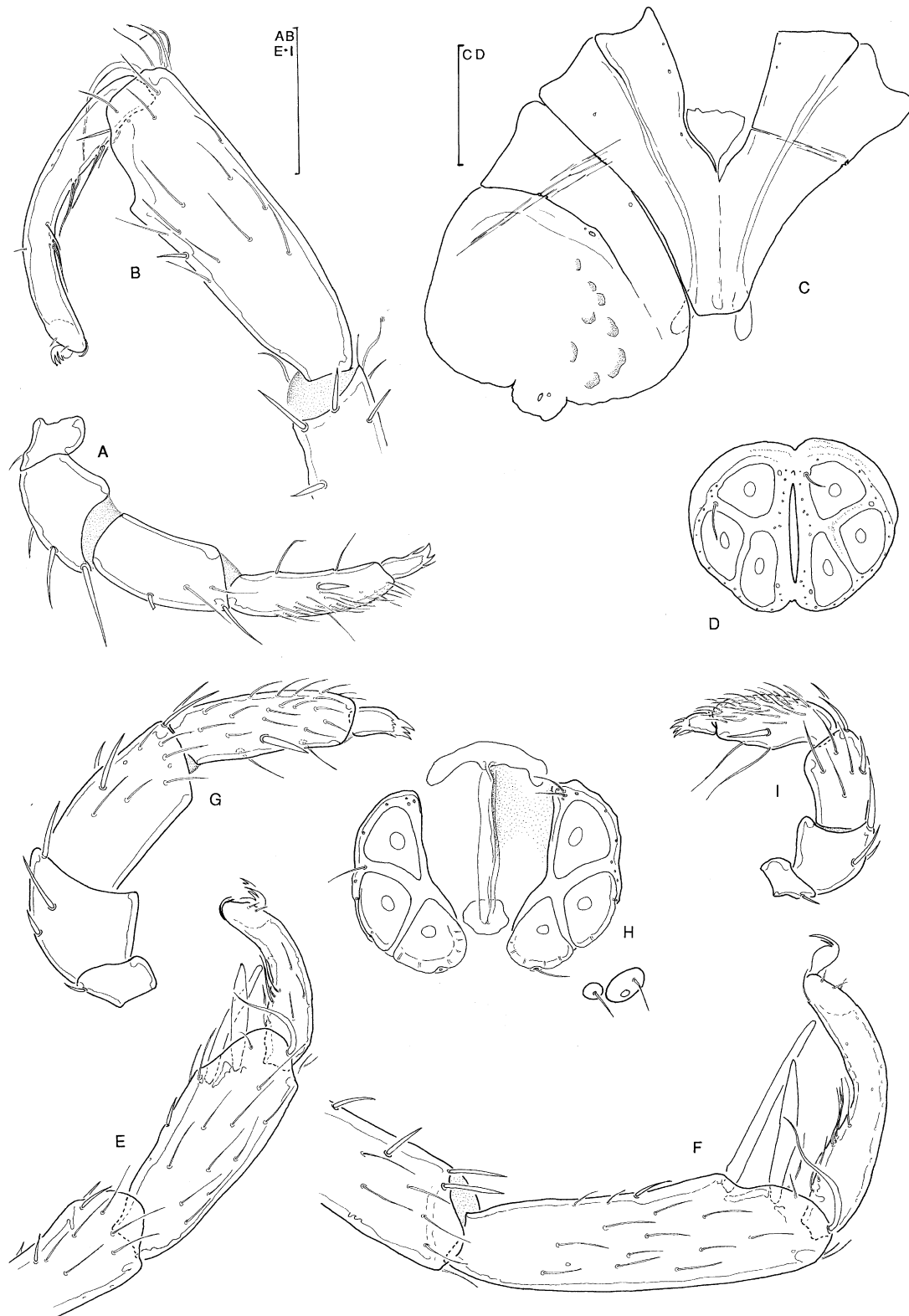


Figure 25. A, B, *Atractides arcuatus* (*A. dubius*, holotype = syn. to *A. arcuatus*); A, ♀ palp; B, ♀ I-L-5 and -6 (S-1 and -2 lacking). C-I, *Atractides glandulosus*. C-E, holotype ♂ NHMB; F-H, paratype ♀ NHMB, I ♂, black forest SMNH 4882, C ♂ coxal field; D, ♂ genital field, E, ♂ I-L-5 and -6; F, ♀ I-L-5 and -6; G, ♀ palp, medial view; H, ♀ genital field and Vgl-1 + 2; I ♂ palp, medial view. Scale bars = 100 μm.

interspace; genital field far caudally from coxae, roundish, not narrowed caudally; 9–12 fine hairs each on the medial margins flanking the gonopore, similar hair pores but in higher numbers (about 16) on the lateral margin, and 3–4 caudally; Gsk clearly visible in the preparation, normal in shape; excretory pore weakly sclerotized (probably without a defined sclerite ring) at a distance of 30 µm from the genital field, and 40 µm from the posterior idiosoma margin, Vgl-1 not fused to Vgl-2; gnathosoma W 72 µm, anteriorly protruding in a weak, narrowed rostrum; palp L 230 µm (P-1–5: 30, 54, 60, 80, 30 µm; as Thor explained, he measured the maximum L, not the dorsal, L); P-4 densely covered with curved fine hairs, especially dorsally, sword seta inserted 'more distally than in *A. nodipalpis*, distinctly in the anterior part of the segment', P-5 slender.

Females

Translation of the original description, with additions deduced from Thor's figures; in parentheses values taken from the holotype of *A. dubius*:

coxal field: Cx-1 + 2 and Cx-3 + 4 separated by a stripe of membranous integument

genital field: –;

palp: more slender than in male, P-2 ventral margin not convexly swollen, with an irregular, slightly coarse surface, P-3 ventral margin straight, P-4 ventral margin 1 : 2 : 1

idiosoma L/W 760/520 (950/–); glandularia (20)

coxal field L (383); Cx-3 W (504); Cx-1 + 2 mL (139), IL (270), W (360)

I-L-5 dL (252), vL (166), dL/vL (1.52), HA-HC (76, 83, 103), dL/HB 3.04

S-1 L (161), L/W (10.1), S-2 L (116), L/W (10.6), interspace (45), L S-1/2 (1.39)

I-L-6 L (193), HA-HC (29, 20, 22), dL/HB (9.65); L I-L-5/6 (1.31)

genital field L/W 155/155 (202/210), Ac-1–3 L 37, 37, 28 (37, 37, 29)

gnathosoma –; chelicera L (252), L/H (5.04), bS/claw (2.50)

palp	P-1	P-2	P-3	P-4	P-5
L/W	(34/34)	70 (85/56)	90 (103/45)	100 (112/29)	(36/13)
(ratio)	(1.00)	(1.52)	(2.29)	(3.86)	(2.77)
rel.L	(9)	(23)	(28)	(30)	(10)

total L: P-2/4 0.70 (0.76)

300
(370)

Coxal field with a separation line between Cx-2 and -3, Cx-1 shortened, Cx-3 relatively elongated, caudal margin of Cx-4 slightly more curved; genital plates L 113 µm, Ac-1 and -2 elliptical, Ac-3 round; 'four small, hair-bearing pores at the anterior edge of the genital plate, furthermore a low number of such hairs restricted to the outer margins of the plate'; palp differing from the other sex in being longer, more slender and without swollen segments, total L 300, segments P-1–5 30, 70, 90, 100 34 µm (maximum L, see above), P-2 ventrally with an irregular, slightly coarse surface.

Female (holotype of *A. dubius*): integument lineated (3/10 µm), mediocaudal margin of Cx-1 + 2 truncate, apodemes of Cx-2 strong, forming an acute angle, Cx-3 + 4 surrounded by extended, finely radially fissured secondary sclerite; this sclerotization completely filling the interspace between Cx-2 and Cx-3 and considerably extending over the laterocaudal margin of Cx-2; genital plates with triangular Ac-1–3

arranged in a weakly curved line, excretory pore smooth; palp P-2 with ventrodistal edge very slightly protruding, sword seta of P-4 rather short, inserted near the distoventral hair.

Discussion: Thor compared *A. arcuatus* with *A. nodipalpis* and worked out several differential characteristics: fusion of all coxae in males, I-L-5 with S-1 and -2 similar in shape and dimensions, I-L-6 more slender, lower dimensions and shape of genital field, arrangement and shape of Ac, shape of male P-2, position of sword seta P-4 in both sexes. Since the original description, no further contribution has been made to our knowledge of the morphology of this species, and it has been almost completely ignored in western Europe. The known morphological characteristics testify that *A. arcuatus* is a clearly distinct species, not confusable with any other taxon known at that time. However, for a better understanding of taxa described below, a revision is highly desirable. For example, it remains unclear whether the integument is lineated or striated (even though the fact that Thor made particular mention of 'striae' suggests that he observed what is here called a lineated integument) and whether or not there is sclerotization of the excretory pore (according to Thor, it is 'weakly sclerotized', but his figures do not show a defined sclerite ring). The position of the excretory pore and genital opening close to the posterior idiosoma margin suggest that Thor's male was a juvenile. This would explain his observation of a 'fusion' of anterior and posterior coxal plates. In juveniles, these plates are closely adpressed so that no membranous integument remains visible – this character is probably not of diagnostic value for *A. arcuatus* males.

Habitat: Rhithrobiont.

Distribution: Eastern Europe, Asia (Caucasus, Armenia, Crimea, Uzbekistan, Tashkent: Sokolow, 1940; Czech Republic: Láska, 1955a; Hungary: Szalay, 1941). The records from outside the former USSR are doubtful due to incomplete knowledge of the species. A record from Algeria (Walter, 1928b) based on a single, misshaped female is here considered as not justified (10, 12, 24). While this manuscript was in press, the species has been recorded from Iran (with redescription of the female: Asadi & Pešić, in press).

ATRACTIDES KAUKASIENSIS (THOR, 1914)

Megapus nodipalpis kaukasiensis Thor, 1914

[syn. to *A. nodipalpis* Thor, 1899: Sokolow, 1940]

Species dubia

Type series: Lost with the destruction of the Thor collection. The description was based on 1 male and 1 nymph. *Locus typicus:* Mingrelia, brook near Cageri [Georgia], 25.06.1913, Komárek.

Description. Male (female unknown): original description extremely scanty, with the following details only: coxae more fused, genital field quite distant [from coxal field], sword seta of P-4 strong, inserted proximally. In the same paper, in his discussion of *A. arcuatus*, Thor figured I-L-5 and -6 and genital field of *A. nodipalpis*. Probably, these figures refer to the stem species and not to *A. nodipalpis kaukasiensis* (as suggested by K. Viets (1956). Otherwise, the author would have made reference to these figures in the caption for his new taxon, as he did in the caption for *A. arcuatus*.

Discussion: When Sokolow proposed the synonymization of *A. nodipalpis kaukasiensis* with the stem species, most probably he based his judgement on the original description only. More correctly, *A. kaukasiensis* should be considered a *species dubia*.

ATRACTIDES QUADRUPORUS (KOENIKE, 1915)

Megapus quadrupora Koenike, 1915

Species dubia

Type series: Following the type catalogue written by Koenike's wife (in NHUB) the type preparation was numbered 1770. This slide could not be found neither in NHUB nor in SMNH (where another part of his collection is kept). *Locus typicus:* Aue bei Leuchtenberg (Prov. Hannover) unweit Bremen Koenike coll. 27.7.1915.

Description. Male (original description, female unknown): idiosoma nearly round (L 600, W 585 µm, integument lineated (?-'deutlich fein gerippt'); gnathosoma with short rostrum (25 µm); P-4 with interspace between ventral hairs, the proximal one on a protuberance; sword seta near the distoventral hair; distance between Cx-1 + 2 and Cx-3 + 4 larger than in *A. ovalis* and *A. spinipes*, apodemes of Cx-2 in an acute angle with the median line, strongly protruding over the (truncate) posteromedial margin of Cx-1 + 2; I-L-5 and -6 similar in dL (I-L-5 200, I-L-6, 195 µm); legs without swimming hairs; genital field about 100 µm from the coxae, L 115, W 130 µm, anteriorly with a median protrusion, caudally with a median incision, with two pairs of Ac, surrounded by numerous hairs.

Discussion: Koenike did not provide any diagnostic feature that could allow separation from *A. gabretae*, at that time the only other species with Ac reduced to two pairs (known only from females). According to our present knowledge, in numerous species of the genus a reduced number indicates that an individual is simply misshaped: it cannot serve as a taxonomic character. The original description is based mainly on features common to many, if not all, species of the genus, but the low ratio dL I-L-5/6, and the possibly lineated integument could be a character combination not found in any of the species known at that time. Due to the loss of the type specimen, and also in view of the

fact that *A. quadruporus* was based on a single misshaped individual, it remains a *species dubia*.

ATRACTIDES GLANDULOSUS (WALTER, 1918)

(FIG. 25C–K)

Megapus glandulosus Walter, 1918

Type series: Holotype ♂ NHMB *Megapus glandulosus* Walter ♂ Aare/Aarau, 7.3.1917 coll. Steinmann; Typus; IX/23 (470) idiosoma, state of conservation good, coxae with crash line extending from lateral edge Cx-3/4 to the proximal margin of the gnathosomal bay, left II-L-4–6, III-L-6 missing; ditto IX/24 (470a) gnathosoma, right I-L, both palps separate, desiccated and crushed.

Material examined: NHMB ♀, labelled as holotype, but not part of the type series, with addition Wöschnau; IX/64 (493) idiosoma, mounting medium largely desiccated, but subject still surrounded by a corona of fluid; IX/65 (493a) gnathosoma, palps (both separate) right I-L, IV-L, left III-L, mounting medium desiccated, subjects surrounded by coronae of fluid. SMF 7998 ♂ Cascade à Tech s/Tech (Pyr.-or.) 15.VI.1950 [ex coll. Angelier]; 7999 ♀, labelled like 7998. SMNH 4885 ♀ Schwarzwald, Schönwald, 29.6.1938; 4882 ♂ Schwarzwald, Obersimonswald 30.6.1938.

Refused determination: NHMB [without collecting site identification] *Megapus glandulosus*; XXVIII/43 idiosoma, IX/37 (478a) P.S. [collection Piersig] gnathosoma. In view of the different numbers, it is highly doubtful that both preparations refer to the same specimen. Integument structure, as well as shape of mouthparts and I-L differ clearly from *A. glandulosus*.

Description:

General features

dorsal integument: striated (11/10); muscle attachments: unsclerotized glandularia: enlarged by secondary sclerotization
I-L: I-L-5 thickened; I-L-5 S-1 and -2 interspaced, S-1 slender, slightly curved, blunt, S-2 thicker and shorter, pointed, I-L-6 basally thick, distally equally narrowed
genital field: Ac in an obtuse triangle
excretory pore: smooth; Vgl-1 not fused (in older males closely attached) to Vgl-2
palp: sexual dimorphism

Male

Holotype
coxal field: extended secondary sclerotization, including Vgl-3
genital field: anterior margin convex or indented medially, posterior margin indented, Ac-3 longish;
genital setae: 50
palp: P-2 slightly protruding ventrodistal protrusion, P-4 2 : 1 : 1, long ventral hairs, sword seta near the proximoventral hair
idiosoma L/W 440/-; glandularia 40
coxal field L 342; Cx-3 W 405; Cx-1 + 2 mL 121, IL 238, W 306
I-L-5 dL 170, vL 128, dL/vL 1.33, HA-HC 65, 69, 72, dL/HB 2.46
S-1 L 92, L/W 10.2, S-2 L 74, L/W 6.2, interspace 19, L S-1/2 1.24
I-L-6 L 125, HA-HC 32, 22, 22, dL/HB 5.68; L I-L-5/6 1.36
genital field L/W 117/139, Ac-1–3 L 50, 55, 64
gnathosoma vL 140; chelicera L 211, L/H 5.28, bS/claw 2.35

palp	P-1	P-2	P-3	P-4	P-5
L/W	40/34	72/67	76/54	92/47	22/16
(ratio)	1.18	1.07	1.41	1.96	1.38
rel.L	13	24	25	30	7
total L:	P-2/4 0.78				
	302				

Integument 7 µm thick; dorsal glandularia with irregular contour line due to secondary sclerotization; posteromedial margin of Cx-1 + 2 truncate, apodemes of Cx-2 short, nearly parallel to the median line, Vgl-3

fused to the posterior margin of Cx-4; I-L-5 relatively short and thick, dorsal margin slightly convex, anterior sheaths covering the insertion of I-L-6 strongly protruding; genital field with large anterior border of secondary sclerotization (the W date of 50 µm in the original description surely erroneous) anterior tips of Ac-3 close to the posterior margin of Ac-1; both P-2 and P-4 ventrally protruding.

Females

Black Forest, SMNH 4885:

genital field: genital plates crescent-shaped, with concave medial margin, Ac-3 protruding over the caudal margin
palp: ventral margin P-2 weakly convex, P-3 weakly concave, P-4 nearly straight, 2 : 3 : 2, sword seta nearer to the distoventral hair
idiosoma L/W 630/500; glandularia 40
coxal field L 342, Cx-3 W 432; Cx-1 + 2 mL 157, IL 243 W 333
I-L-5 dL 233, vL 165, dL/vL 1.41, HA-HC 63, 72, 78, dL/HB 3.24
S-1 L 105, L/W 10.5, S-2 L 83, L/W 6.9, interspace 25, L S-1/2 1.27
I-L-6 L 150, HA-HC 32, 35, 24, dL/HB 6.0; L I-L-5/6 1.55
genital field L/W 157/184, Ac-1-3 L 58, 58, 53
gnathosoma vL 144; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	35/31	81/58	98/45	115/31	37/15
(ratio)	1.13	1.40	2.18	3.71	2.47
rel.L	10	22	27	31	10
total L:	P-2/4 0.70				
	366				

Mediocaudal margin of Cx-1 + 2 with a pointed subcutaneous tip, apodemes of Cx-2 forming an acute angle with the median line, Vgl-3 not fused to the posterior margin of Cx-4; I-L-5 and -6 more slender and with less extended articulation sheath compared to that of males; anterior tip of Ac-3 close to posterior margin of Ac-1; ventral margin P-2 only slightly protruding distally.

Discussion: The original description is very brief, without figures and based on a single male, with a few comparative remarks concerning differences to *A. nodipalpis* only. Also, in his more detailed description (Walter, 1944; obviously including figures of the holotype) he neglected to define the diagnostic characters. Among the species known at that time, *A. glandulosus* is most similar to *A. vaginalis* due to the Vgl-3 fused to posterior margin of Cx-4 in males, and I-L-6 distally narrowed. *A. vaginalis* differs in both sexes in having smaller dorsal glandularia, apodemes of Cx-2 forming an obtuse angle, thinner I-L-5 (dL/HB 3.1–3.2) S-1 and -2 similar in length (S-1/2 0.92–1.02) with narrow interspace (3–9 µm), relatively short I-L-6 (dL I-L-5/6 > 1.5) and less thickened P-4, with the sword seta in males located near the distoventral hair.

The first description of a female provided by Walter (1944) is probably based on specimens from Austria. A specimen from the *locus typicus* in Switzerland (erroneously labelled as 'type', NHMB IX/64–65) agrees in shape of I-L-6 and some features of minor importance,

but differs from the description in having a relatively long and slender S-1 on I-L-5 (L/W 14.9), the genital field with Ac arranged in a slightly curved line, the anterior tip of Ac-3 distanced from the posterior margin of Ac-1, and the sword seta on P-4 rather thick, approaching the proximoventral hair. From general experience with *Atractides* species, one would expect that sexes agree tendentially in extension of glandularia, general arrangement of sclerites and Ac, and shape of the first leg. More information on morphological variation in *A. glandulosus* is required before it can be decided whether this female from the *locus typicus* is conspecific (but morphologically aberrant) or represents another species. For the time being, the definition of the female sex is here restricted to specimens from the Black Forest and the Pyrenees, which agrees with the figures provided by Walter (1944). *A. glandulosus* females differ from *A. nodipalpis* in having larger glandularia (maximum diameter 30 µm), a more triangular arrangement of Ac, a thicker I-L-6 (L/HB > 6.5) with HC < HB (HC > HB).

Habitat: Crenobiont?

Distribution: Unclear: southern, western and Central Europe? (1, 3, 4, 9, 13). (Di Sabatino & Cicolani, 2001).

ATRACTIDES TUBEROSUS (K. VIETS, 1919)

Megapus tuberosus K. Viets, 1919

Species dubia

Type series: Holotype ♀ SMF 2116 *Atractides tuberosus* (Viets) ♀ Type Oelkassen a. Vogler Wabach 4.9.1911. Viets coll. 2116. State of conservation: mounting medium with numerous precipitations covering the subjects; dorsum/ventrum lying separate, both I-L and both palps separate, in lateral view.

Material examined: NHMB ♂ without collecting site indication, ex coll. Pier-sig *Megapus tuberosus* Walter; Typus; = *walteri* IIX/38–39, Pr.479–479a idiosoma and gnathosoma on separate slides. Walter planned to describe this specimen under the preoccupied name of *tuberosus*; some years later it became the type of *A. walteri* (K. Viets, 1925).

Description. Female (original description and holotype): idiosoma total L 660, W 420 µm; integument finely lineated (8/10 µm) 15 µm thick, Dgl diameter 27 µm; coxae rather slender, W on the level of Cx-4360 µm, gnathosomal bay L 100, central W 55 µm, Cx-3 L 215 µm; legs, mainly I-L, with numerous nodule-like formations; I-L-5 dL 150, HB 40, I-L-6 dL 115 µm distally little enlarged; genital field L 165, W 150 µm, gonopore L 150, genital plates L 90, Ac-3 L 30 µm, Ac arranged in a curved line, pregen rather large; chelicera total L, 195, claw L 50 µm palp measurements (L/H, P-1–5): 25/22, 61/47, 78/43, 96/31, 29/11 µm; P-4 ventrally straight, dorsally equally convex, ventral hair insertions dividing the segment into three equal parts, sword seta in the centre of the segment; numerous, more or less hemispheric swellings at or near the insertions of the numerous fine hairs (as in *A.*

tuberipalpis (K. Viets, 1913) from Cameroon) a few such nodules also at the terminal segment of the palp.

Discussion: The field of densely arranged dorsal setae on P-4 in *Atractides* is possibly associated with glandular activity. Specimens with droplets accumulated in that area are found frequently in several species. It is clearly visible in the holotype that the nodules after which it is named are not projections from the sclerotized integument of the segment; they vary in size and are more or less detached from the integumental surface.

Since the first description, only a few finds of *A. tuberosus* have been published (Schwoerbel, 1959; Bader, 1975) and K. Viets & K. O. Viets (1960) designated it *species incerta*. From the drawings published by Bader (1975) who gave the first description of a male, one can deduce that he examined specimens of *A. vaginalis* covered with oil-like droplets. The completely different shape of the genital field of his females confirms that his specimens do not belong to what the Viets called *A. tuberosus*. As the preparation is in a poor state of conservation, and the species description was based on a single female, it makes little sense to discuss it if it represents one of the species described later on. I consider *A. tuberosus* a *species dubia*.

ATTRACTIDES FONTICOLUS (K. VIETS, 1920)
(FIG. 26A–G)

Megapus nodipalpis fonticolus K. Viets, 1920
separate species: Georgiev, 1957

Syn. A. soproniensis (Szalay, 1929): *syn. nov.*; *A. petkovskii* Schwoerbel, 1963: *syn. nov.*

Type series: Lectotype ♂, here designated: SMF 2542 Type; Bremen. Stoteler Wald, 25.7.1919. Nord-Quelle. Viets leg. State of conservation: good, mounting medium with large crystals; the preparation contains two specimens, one entire, and one dissected: idiosoma entire, gnathosoma and one chelicera *in situ*, one chelicera missing, both palps separate, laterally, left I-L- and III-L separate, but not in horizontal position, Gsk separate, in posterior view; the dissected specimen is designated as lectotype. Paralectotypes (further specimens from the *locus typicus*, but collecting date 29.5.1920; as the publication appeared in August 1920, they can be considered as syntypes): SMF 6279, 1 ♂, 1 ♀. *Loci typici* of the original description: springs at the Ratzeburger See and near Bremen.

Material examined: Germany, Bühlertal (TÜ) Hungerbrunnenbach, 22.8.1984, 1 ♂, 1 ♀, Gerecke.

Description:

General features

dorsal integument: lineated (4–5/10); muscle attachments: unsclerotized
I-L: I-L-5 longish, dorsal and ventral margins subparallel, S-1 and -2 closely to each other, S-2 extremely enlarged I-L-6 relatively short, sausage-shaped,
genital field: Ac in an obtuse triangle, subtriangular in shape
excretory pore: smooth; Vgl-1: sexual dimorphism, fused to Vgl-2 in males, separate in females
palp: strong sexual dimorphism

Males

Paralectotype SMF 6279, in parentheses specimen from south-west Germany
genital field: anterior margin convex, posterior margin deeply indented; genital setae: 60

palp: ventral margin P-2 laterally nose-like extended, medially with a more strongly projecting truncate and irregularly rough protrusion, P-3 slightly concave, P-4 maximum H near insertion of the proximoventral hair, 1 : 1 : 1, sword seta curved, on the level of the distoventral hair
idiosoma L/W 660/530; glandularia 28
coxal field L 350; Cx-3 W 405; Cx-1 + 2 mL (105), IL (250), W (305)
I-L-5 dL 192, vL 154, dL/vL 1.25, HA-HC 45, 52, 73, dL/HB 3.69
S-1 L 73, L/W 9.1, S-2 L 55, L/W 3.9, interspace 12, L S-1/2 1.33
I-L-6 L 111, HA-HC 25, 22, 24, dL/HB 5.04; L I-L-5/6 1.73
genital field L/W 121/134, Ac-1–3 L 35, 41, 38
gnathosoma vL 148; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	36/29	70/65	63/46	91/35	29/12
(ratio)	1.24	1.08	1.37	2.60	2.42
rel.L	12	24	22	31	10
total L:	P-2/4 0.77				
289					

Posteromedial margin of Cx-1 + 2 convex, apodemes of Cx-2 walrus moustache-shaped, posterior margin of Cx-4 medially convex, laterally concave, a border of undulated secondary sclerotization only in the lateral part; genital field strongly sclerotized, area of posterior indentation in the holotype not clearly visible due to impurity, with 9–10 anteromedial and 22–24 lateral hair pores.

Females

Paralectotype SMF 6279

genital field: genital plates medial margin with abrupt concavity on the level of Ac-2

palp: ventral margin P-2 with rounded distal protrusion; P-3 surface slightly irregular, often with a fine central incision, P-4 3 : 2 : 3, sword seta between ventral hairs, occasionally nearer to the distal one
idiosoma L/W 950/780; glandularia 35
coxal field L 383; Cx-3 W 508; Cx-1 + 2 mL 112, IL 225, W 293
I-L-5 dL 225, vL 184, dL/vL 1.22, HA-HC 52, 54, 58, dL/HB 4.17
S-1 L 79, L/W 9.9, S-2 L 60, L/W 4.3, interspace 13, L S-1/2 1.32
I-L-6 L 140, HA-HC 26, 23, 26, dL/HB 6.09; L I-L-5/6 1.61
genital field L/W 198/216, Ac-1–3 L 35, 41, 38
gnathosoma vL 180; chelicera L 250, L/H 5.56, bS/claw 2.21

palp	P-1	P-2	P-3	P-4	P-5
L/W	40/34	82/60	87/43	109/31	33/13
(ratio)	1.18	1.37	2.02	3.52	2.54
rel.L	11	23	25	31	9
total L:	P-2/4 0.75				
351					

Apodemes of Cx-2 form an acute angle, posterior margin of Cx-4 laterally straight, medially strongly concave; genital field with boomerang-shaped pregen; Vgl-1 not fused with Vgl-2.

Discussion: A ventral protrusion of the P-2 of males is found in numerous *Atractides* species not closely related to each other. In both sexes, a high number of differences between *A. nodipalpis* and *A. fonticolus* (e.g. integument structure, shape of I-L-5 and -6 and S-1 and -2, genital field) emphasizes that the latter not only cannot be considered a subspecies of the

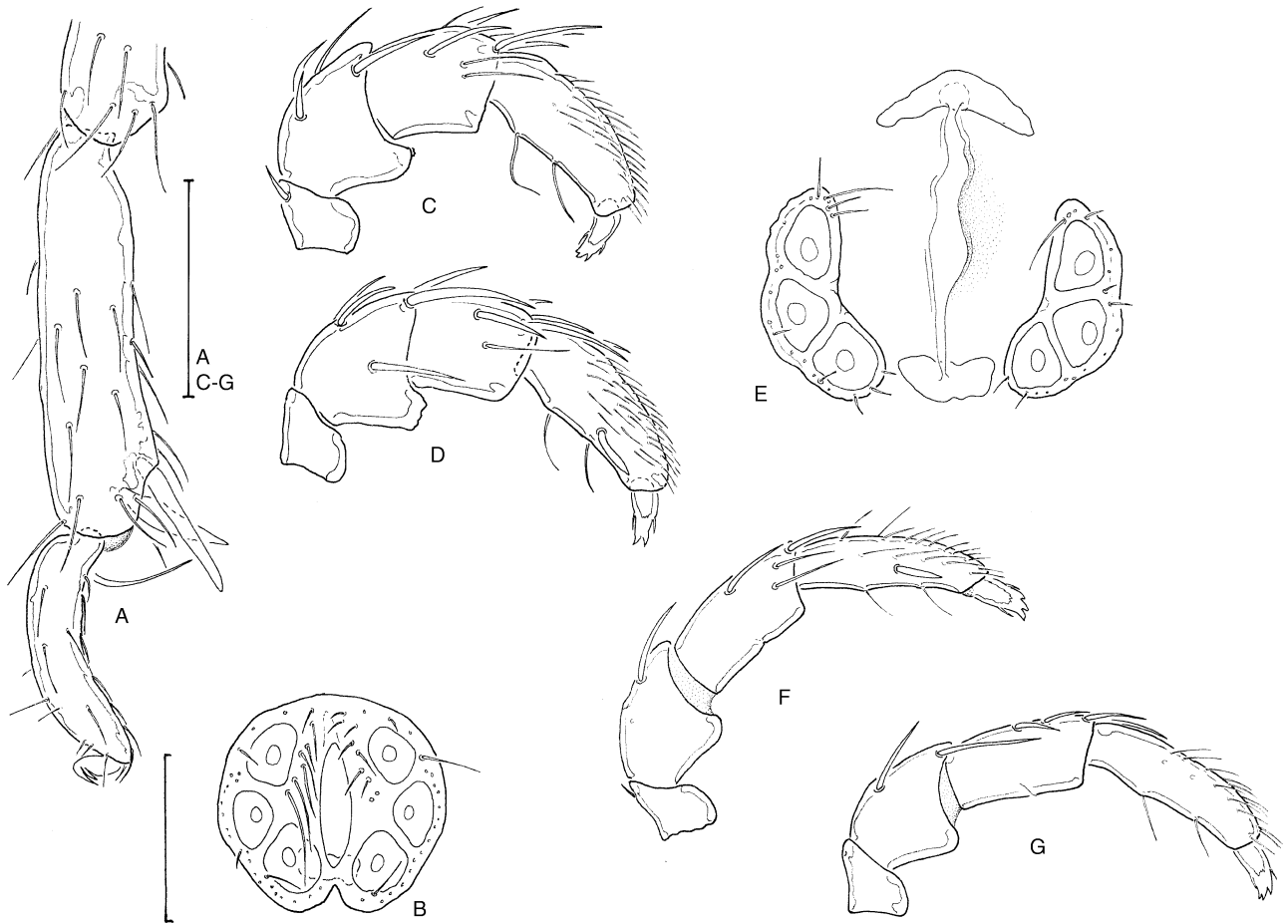


Figure 26. *Atractides fonticolus*. A, paralectotype ♂, B–D, lectotype ♂, E–G paralectotype ♀. A, ♂ I-L-5 and -6; B, ♂ genital field; C, ♂ palp, lateral view; D, ♂ palp, medial view; E, ♀ genital field; F, ♀ palp, medial view; G, ♀ palp, lateral view. Scale bars = 100 µm.

former, but that they are not even closely related taxonomically.

Habitat: Crenobiont or at least crenophilous.

Distribution: western Palaearctic, except British Isles and Sweden (1, 2, 4–15, 24, y).

ATRACTIDES PENNATUS (K. VIETS, 1920)
(FIG. 27A–E)

Megapus nodipalpis pennata K. Viets, 1920

separate species: Motaş & Tanasachi, 1962

Syn. *A. longitibialis* (Walter, 1927): syn. nov.; *A. drakensis* (Kotzias, 1931): K. Viets, 1956

Type series: Holotype ♂ SMF 2648 *Atractides nodipalpis pennata* ♂ Type R.K.2. Ratzeg. Quellsumpf am Küchen-See (östl.) 3.10.1919 Viets leg. State of conservation: good, gnathosoma, one chelicera, left I-L separate, laterally, one chelicera dorsally.

Material examined: SMF 4657, Baumberge, Steuer, 21.10.1927, Beyer, 2 ♂, 1 ♀; D 414 Bayern (MN) Oberrammingen, Klausenbachquelle, 610 m,

08.01.1992 Gerecke 1 ♂, 7 ♀; D 415 Bayern (MN) Unteregg, Quellgebiet Katzbrui, 690 m, 08.01.1992 Gerecke 1 ♂

Description:

General features

dorsal integument: lineated (4/10); muscle attachments: unsclerotized
I-L: I-L-5 dorsal and ventral margins subparallel, S-1 and -2 relatively slender, similar in shape, I-L-6 short, sausage-shaped (only slightly thickened basally);

genital field: Ac in an obtuse triangle

excretory pore: smooth; Vgl-1: not fused to Vgl-2

palp: strong sexual dimorphism, sword seta distally from distoventral hair

Males

Holotype, in parentheses specimens from Bayern

genital field: anterior margin truncate or slightly convex, with a narrow border of secondary sclerotization, posterior margin deeply indented, but filled with fine secondary sclerotization; genital setae: 80

palp: ventral margin P-2 strongly developed, finger-like ventrodistal protrusion, P-3 slightly concave, P-4 strongly thickened, both ventral hairs closely together in the proximal half, 1 : 1 : 5, the proximoventral hair apparently pennate, sword seta distal to ventrodistal hair
idiosoma L/W 830/640; glandularia 29

coxal field L 392; Cx-3 W 460; Cx-1 + 2 mL (108), IL (285), W (410)



Figure 27. *Atractides pennatus*. A–C, holotype ♂ D, E, ♀ SMF 4657, Baumberge. A, ♂ genital field; B, ♂ palp, medial view; C, ♂ I-L-5 and -6; D, ♀ genital field, E, ♀ palp, medial view (P-1 lacking). Scale bars = 100 μ m.

I-L-5 dL 234, vL 189, dL/vL 1.24, HA-HC 54, 61, 67, dL/HB 3.84
 S-1 L 98, L/W 10.9, S-2 L 78, L/W 7.8, interspace 16, L S-1/2 1.26
 I-L-6 L 145, HA-HC 30, 25, 26, dL/HB 5.8; L I-L-5/6 1.61
 genital field L/W 152/175, Ac-1-3 L 48, 51, 64
 gnathosoma vL -; chelicera L 288, L/H 5.88, bS/claw 2.56

palp	P-1	P-2	P-3	P-4	P-5
L/W	38/36	83/74	83/54	112/45	38/13
(ratio)	1.06	1.12	1.54	2.49	2.92
rel.L	11	23	23	32	11
total L:	P-2/4 0.74				
	354				

Glandularia circular, not enlarged by secondary sclerotization, maximum diameter Vgl-3 23 µm; postero-medial margin of Cx-1 + 2 tongue-shaped, with a knob-like protrusion subepidermally extending over the posterior margin, apodemes of Cx-2 strong, in a 45° angle with the medial line; Cx-4 posteriorly with two concave stretches separated by a protruding apodeme; posterior margin of Cx-4 with narrow border of secondary sclerotization; I-L-3/4/5 forming strongly developed distal sheaths each covering the base of the following segment, genital field on each side with 12 larger, medial, and 29–31 finer, lateral hair pores; palp stout.

Females

SMF 4657

genital field: pregen small, genital plates with strongly bent medial margin on level of Ac-2

palp: ventral margin P-2 with nose-shaped distal protrusion, P-3 straight, P-4 nearly straight, 1 : 1 : 2

idiosoma L/W 820/640; glandularia 24

coxal field L 460; Cx-3 W 526; Cx-1 + 2 mL 99, IL 234, W 342

I-L-5 dL 302, vL 237, dL/vL 1.27, HA-HC 49, 67, 78, dL/HB 4.51

S-1 L 105, L/W 11.6, S-2 L 92, L/W 7.1, interspace 20, L S-1/2 1.14

I-L-6 L 176, HA-HC 31, 25, 27, dL/HB 7.04; L I-L-5/6 1.72

genital field L/W 184/211, Ac-1-3 L 63, 81, 65

gnathosoma vL 220; chelicera L 336, L/H 5.51, bS/claw 2.00

palp	P-1	P-2	P-3	P-4	P-5
L/W	45/41	105/78	123/54	134/37	47/16
(ratio)	1.10	1.35	2.28	3.62	2.94
rel.L	10	23	27	30	10
total L:	P-2/4 0.78				
	454				

Diameter of glandularia lower than in males (Vgl-3 14 µm, Vgl-4 24 µm); in general, sclerotization little developed (coxal sclerite surface smooth, margins of genital plates very narrow, with conspicuous medial incision on the level of Ac-2); pregen little extending, not much larger than postgen

Discussion: After a preliminary description (K. Viets, 1920) a thorough discussion of this species was later provided by the same author (K. Viets, 1923) underlining the unique shape and setation of the male palp and examining the three taxa which were considered subspecies of *nodipalpis* at that time: common features of *pennatus* and *nodipalpis* s.s. are elongated Ac-3, their anterior margin approaching the posterior margin of Ac-1; relatively long P-3, thicker P-4 and -5.

Common features of *A. fonticolus* and *A. pennatus* are anterior margin of genital field convex, relatively long P-4. As outlined above, the presence of a ventral protrusion of the P-2 alone cannot substantiate the hypothesis of closer relationships between taxa in *Atractides*. The particular shape of the palp and I-L in both sexes provides sufficient evidence for considering *A. pennatus* a separate species. The lineated dorsal integument, and in males the shape and dense setation of the genital field, indicate a closer relation between *A. pennatus* and *A. fonticolus*. An analysis of this species was provided by Cicolani (1983) based on material from Italy.

Habitat: Crenobiont or at least crenophilous.

Distribution: Europe, except for Fennoscandia and the Caucasus (2–6, 8–10, 13, 14, 18).

ATRACTIDES TENUITARSUS (KOMÁREK, 1921)

Megapus tenuitarsus Komárek, 1921

Syn. to *Atractides nodipalpis* (Thor, 1899): K. Viets, 1956

Type series: Missing, probably lost; type localities: larger forest streams in the Brdy mountains, in the lower reaches of the Cepkoveský, Albrechtický, Černý and other streams, July, August

Description. Male (original description): idiosoma L 830 µm, W 630 µm, integument rather thick and strong, without striation, but covered with fine spines; also, all sclerites covered with spines of this kind; coxal field L 430, W 600 µm, coxae arranged close together (but in the figure membranous suture Cx-2/3 visible); I-L-6 slender; genital field as in *A. nodipalpis*, with anterior and posterior incision, approaching the caudal idiosoma margin; excretory pore smooth, Vgl-1 not fused to Vgl-2; gnathosoma L, 180 µm; palp with P-4 sword seta inserted proximally, far from the centre of the segment. Female (original description): idiosoma L 1200, W 930 µm; coxal field L 500, W 850 µm, medio-caudal margin of Cx-1 + 2 and caudal margins of Cx-4 convex; I-L-5 dL 270–300 µm, distally strongly thickened, I-L-6 dL 210 µm, slender, narrowed centrally and not much thickened on the level of the claw pit, some measurements calculated from Komárek's figure 2b: S-1 L 151, S-2 L 101 µm, interspace 30 µm, I-L-6 HA 33, HB, 19, HC 25 µm; genital field as in *A. nodipalpis*, Ac in triangular arrangement; gnathosoma L 200, W 100 µm; P-2 without evident ventrodistal protuberance; P-4 with ventral margin divided into three equal parts by insertions of the hairs, sword seta in the centre of the segment.

Discussion: Komárek described this species as very close to *A. nodipalpis*, but different in integument structure and shape of I-L-6. The presence of fine spines uniformly covering membranous and sclero-

tized areas of the idiosoma surface is a feature never found in other hygrobatid mites, probably an artefact due to microbial infection or chemical processes during state of conservation of the specimens. The measurements for I-L-6 provided in the original description or calculated from its drawings fall within the variation in *A. nodipalpis*. Unfortunately, it is not clear the I-L of which sex is represented in Komárek (1921: fig. 2b). From the rather slender terminal segment (and also from the text which treats mainly the female) one can deduce that he probably examined a female. He was not aware that there is also a certain degree of sexual dimorphism in *A. nodipalpis*, with I-L-6 more slender in females than in males. Based on present knowledge therefore the lack of type material notwithstanding, I confirm the synonymization of *A. tenuitarsus* with *A. nodipalpis*.

ATRACTIDES ROSSICUS (THOR, 1923)

Megapus rossicus Thor (1923)

Species dubia

Type series: Missing. *Locus typicus* and type: 21.VI.1922 Wolga near Twer (III1): 1 ♀ Prep. 2567

Description: All coxae arranged very closely together, without membranous interspaces, postcoxal idiosoma very short, genital plates with large Ac, surrounded by a very narrow sclerite border, excretory pore and Vgl-2 placed at the posterior idiosoma margin.

Discussion: The original description of *A. rossicus* was based on a single female. All characters considered as diagnostic by Thor are typical features of juveniles. Since the first description, very few additional finds have been published (Sokolow, 1940, 1957; Tuzovskij, 1979) and a male has never been described. Apart from the loss of the type specimen, as a general rule, water mite species defined based on juveniles cannot be recognized; *A. rossicus* is thus a *species dubia*.

ATRACTIDES INFLATUS (WALTER, 1925) (FIG. 28A–H)

Megapus inflatus Walter, 1925

Syn. *A. granulatus* (K. Viets, 1930): Lundblad, 1956

Type series: Holotype ♀ NHMB *Megapus inflatus* ♀ ov. Walter Algerien 3.5.1924 coll. Gauthier; leg. Gauthier. Algérie. Mare près de l'Oued Kerma. 3.5.1924; XIII/16; Typus; Pr.1316 Typ. ♀. State of conservation: good, idiosoma caudally cracked; gnathosoma ruptured; palps, chelicerae and left I-L separate, laterally.

Material examined: *Megapus inflatus* ♂ Walter Algerien 10.5.1925 coll. Gauthier; Typus; leg. Gauthier Algérie Acif Bognif à Bognit 10.V.1925; XIV/04; Pr.1404 Typ ♂ [in reality no type, described by Walter (1928b) together with the following specimen]. State of conservation: good, but idiosoma including genital field longitudinally fractured, and palps damaged by crushing. *Megapus inflatus* ♀ ov. Walter Algerien 28.6.1925 coll. Gauthier Oued Aissi; Pr. 1409 ♀ ov.; Italy I 323, Sicily (EN) Nicosia, Fiumetto di Sperlinga upstr. confluence Torrente Fiumetto, VB 43 77, 550 m, 18.04.1986 Gerecke (3/13/11); Morocco, MAR 3.94 78c Goldschmidt 1/0/0.

Description:

General features

dorsal integument: lineated (3–4/10); muscle attachments: unsclerotized I-L: I-L-5 with S-1 and -2 rather short, blunt, I-L-6 curved, basally and distally thickened, in the centre narrowed
genital field: Ac in a weakly curved line
excretory pore: smooth; Vgl-1: not fused to Vgl-2
palp: strong sexual dimorphism

Males

NHMB 14/04

genital field: anterior margin straight or slightly concave, posterior margin concavely indented; genital setae: 50

palp: ventral margin P-2 with lamellar extension strongly protruding in the distal third, P-3 with similar protuberance distally or in the centre of the segment, P-4 2 : 2 : 1, ventral setae of P-4 long, sword seta curved, distally from the proximoventral hair

idiosoma L/W 600/500; glandularia 20

coxal field L 293; Cx-3 W 369; Cx-1 + 2 mL 85, IL 202, W 279

I-L-5 dL 174, vL 123, dL/vL 1.41, HA-HC 46, 51, 62, dL/HB 3.41

S-1 L 74, L/W 10.6, S-2 L 59, L/W 8.4, interspace 13, L S-1/2 1.25

I-L-6 L 130, HA-HC 31, 25, 29, dL/HB 5.2; L I-L-5/6 1.34

genital field L/W 103/121, Ac-1–3 L 57, 61, 54

gnathosoma –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	24/24	59/54	58/41	76/28	26/10
(ratio)	1.00	1.09	1.41	2.71	2.60
rel.L	10	24	24	31	11
total L:	P-2/4 0.78				
	243				

Glandularia knob-shaped, mediocaudal margin Cx-1 not extending over the truncated margin of secondary sclerotization; I-L-6 stout; genital field with Ac-1 and -2 subtriangular, longer than the roundish Ac-3; protrusions of P-2 and -3 rather variable in shape, in juveniles often little developed and visible as a longitudinal fold only.

Females

Holotype

genital field: Ac-1/2 longish, Ac-3 round

palp: P-2 ventral margin slightly protruding distally, the anterior 3/4 covered with a fine denticulation, ventral margin P-3 with a gentle central thickening covered with fine denticulation, P-4 ventral hairs inserted near pointed elevations, 1 : 1 : 1, sword seta near distoventral hair.

idiosoma L/W 1200/900; glandularia 23

coxal field L 392; Cx-3 W 550; Cx-1 + 2 mL 119, IL 265 W 383

I-L-5 dL 238, vL 171, dL/vL 1.39, HA-HC 52, 61, 81, dL/HB 3.90

S-1 L 100, L/W 11.1, S-2 L 78, L/W 7.8, interspace 17, L S-1/2 1.28

I-L-6 L 176, HA-HC 35, 26, 33, dL/HB 6.77; L I-L-5/6 1.35

genital field L/W 180/189, Ac-1–3 L 37, 37, 37

gnathosoma –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	36/38	103/69	119/61	135/34	43/16
(ratio)	0.95	1.49	1.95	4.03	2.69
rel.L	8	24	27	31	10
total L:	P-2/4 0.76				
	436				

Posterior margin of Cx-1 forming a protruding medial tip in juveniles, but truncated due to secondary sclerotization in older specimens, posterior apodemes of Cx-2 with laterally directed pointed tips; medial margin of Cx-3 elongated in caudal direction, building up nearly the whole medial margin of Cx-3 + 4; holotype

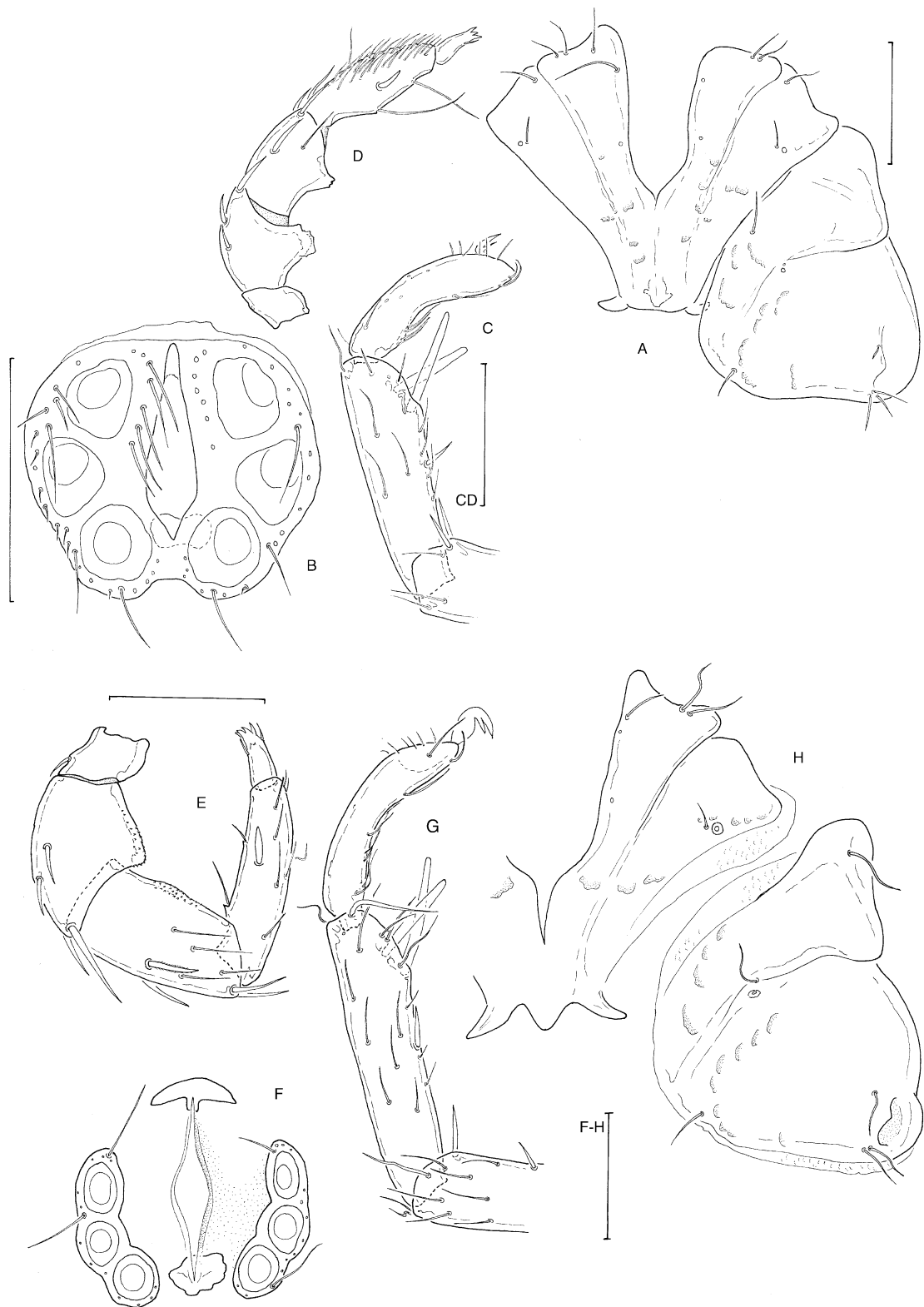


Figure 28. *Atractides inflatus*. A, ♂ SMF 3873 (holotype of *A. inflatus granulatus* = syn. to *A. inflatus*, SMF 3873); B, ♂ Sicily I 323; C, D, ♂ Algeria, coll. Gauthier, NHMB, E–H holotype ♀ NHMB. A, ♂ coxal field; B, ♂ genital field; C, ♂ I-L-5 and -6; D, ♂ palp, medial view; E, ♀ palp, medial view; F, ♀ genital field; G, ♀ I-L-5 and -6; H, ♀ coxal field. Scale bars = 100 μ m.

with 15 eggs. Deutonymph (specimens from I 323): as in females, a gentle central elevation of the ventral margin of P-3 is visible in all specimens.

Discussion: In the original description, based on a single female, Walter (1925) compared *A. inflatus* with *A. arcuatus* (genital field shorter, Ac smaller) and *A. spinipes* (P-3/4 equal in L, Cx longer, legs stronger, I-L-6 distally not thickened). Only after the detection and description of the male (Walter, 1928b) did it become clear that *A. inflatus* is related to *A. gibberipalpis*, at that time the only other species known to bear a ventral protrusion on P-3. The most important distinctive characters of *A. gibberipalpis* are as follows: in both sexes, I-L-5 with S-2 clearly shorter and larger than S-1, I-L-6 relatively short (dorsal L ratio I-L-5/6 1.56–1.58) thickened proximally, but equally narrowed distally; males: Ac-3 much longer than Ac-1 and -2; protrusions of P-2 and -3 more conus-shaped, not laterally flattened; P-4 shorter and thicker, with more convex ventral margin and sword seta inserted on the level of

the proximoventral hair; female: Ac arranged in a more strongly curved line, ventral margins of P-2 and -3 without denticulation, P-3 without central elevation of its ventral margin, P-4 with sword seta of P-4 approaching the distoventral hair.

Habitat: Running water; irregular hydrological conditions with temporary surface flow; probably estivation at nymphal stages in interstitial habitats, rarely in remnant pools (Gerecke, 1991).

Distribution: Mediterranean (x, 1–3, 5, 6, 13) (Pešić, in press f).

ATRACTIDES WALTERI (K. VIETS, 1925)
(FIGS 4D,E,5A,6A–F,10D,29A–G)

Megapus walteri K. Viets, 1925

Syn. *A. coriaceus* (K. Viets, 1925): Lundblad, 1956;
A. borceai (Motaş, 1928): syn. nov.; *A. placocallosus*
Bader, 1994: syn. nov.

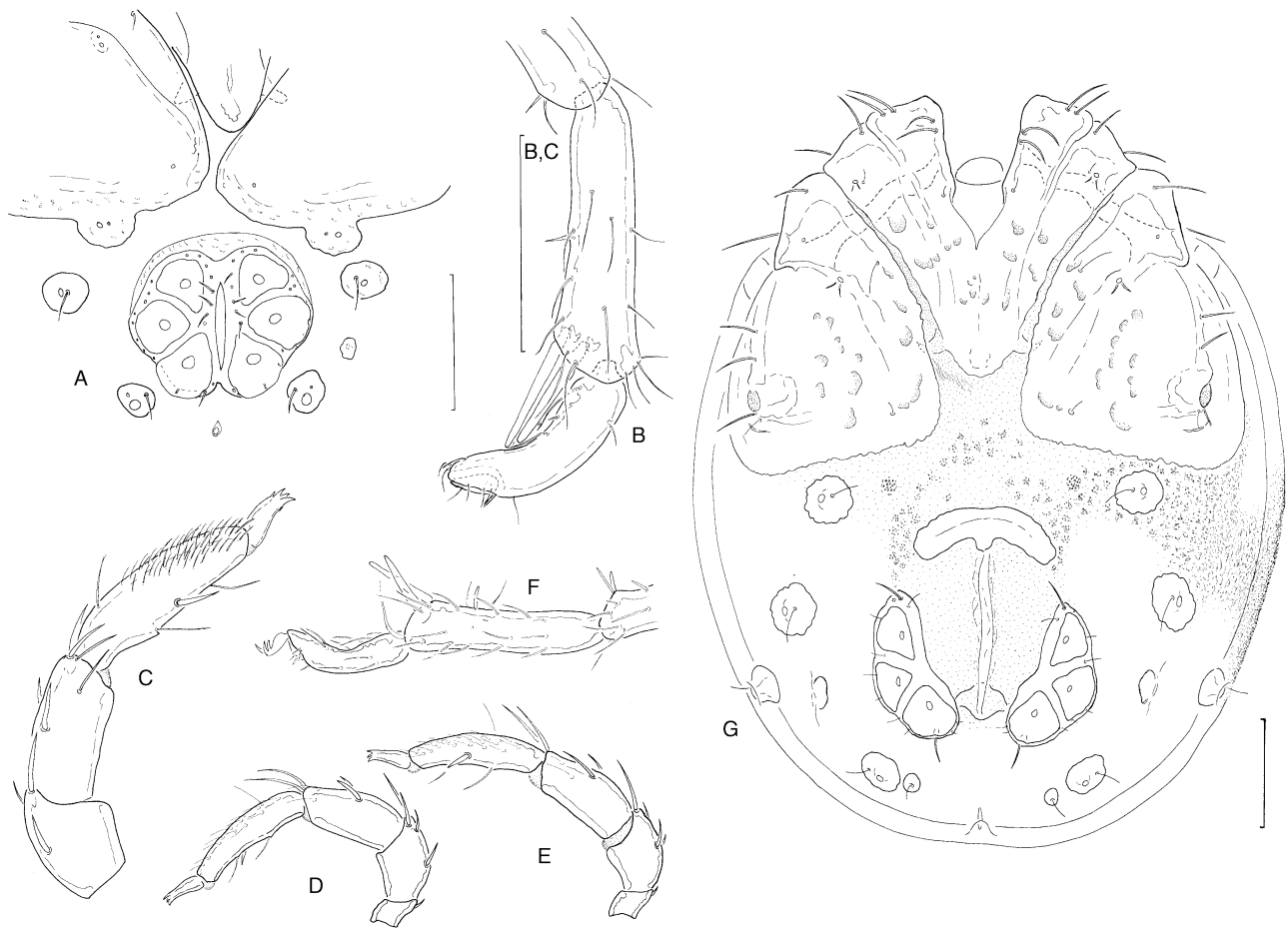


Figure 29. *Atractides walteri*. A, holotype ♂, B, C, ♂ Austria (Tirol), SMF 3276; D–G, ♀ Berchtesgaden. A, ♂, central part of ventral idiosoma. B, ♂ I-L-5 and -6; C, ♂ palp, medial view; D, ♀ palp, lateral view; E, ♀ palp, medial view; F, ♀ I-L-5 and -6; G, ♀ idiosoma, ventral view. Scale bars = 100 µm.

Type series: Holotype ♂ NHMB ex coll. Piersig Pr.479(a); Typus; IX/38–39 on two slides (idiosoma/gnathosoma) *Megapus tuberosus* Walter ♂, with remark added later = *walteri*. State of conservation: desiccated, but numerous details of idiosoma still visible, left Cx-1 + 2 broken, right I-III-IV-L, and left I-II-IV-VI-L missing; gnathosoma preparation containing one I-L and one III-L, measurements or drawings of mouthparts impossible due to desiccation.

Material examined: NHMB *Megapus walteri* Viets Oisans, 19.7.1926 coll. Mota; XIV/75; Typus [no type!]; SMF 3276 Tirol Qu. i. Wattental 27.8.1923 Innsbruck Viets leg.; *Atractides walteri* (Viets) ♂ var. [this specimen not mentioned by K. Viets (1925); Austria, Tirol, Wattental, spring at left border of Wattenbach, 1400 m, 13.01.1998 Hydrachnidia course, University of Innsbruck (1/5/1).

Description:

General features

dorsal integument: papillate; muscle attachments: unsclerotized dorsally, V-2 and V-3 as knob-shaped sclerites at least in older specimens

I-L: dorsal and ventral margins of I-L-5 subparallel basally and centrally, but diverging near the distal edge, S-1 and -2 stout, close together and similar in length; I-L-6 short and curved, only slightly narrowed in the centre of the segment

genital field: Ac in an obtuse triangle

excretory pore: smooth; Vgl-1: sexual dimorphism, fused to Vgl-2 in males, but not in females

palp: no remarkable sexual dimorphism; ventral margins P-2 and P-3 straight, without protrusions, dorsal margin of P-3 not equally convex, but rather straight proximally and distally, and with a stronger curve in the centre of the segment; P-4 with a little dent near proximoventral hair, 1 : 1 : 1, ventral hairs short, sword seta halfway between ventral hairs

Males

SMF 3276, in parentheses: genital field holotype

coxal field: Vgl-3 fused to Cx-4

genital field: anterior margin of primary sclerotization slightly concave, but secondary sclerotization forming a large semicircular border, in older specimens surrounding the whole genital field; posterior margin slightly indented both in primary and secondary sclerotization; genital setae: 40

idiosoma L/W 430/340; glandularia 35

coxal field L 265; Cx-3 W 256; Cx-1 + 2 mL 185, W 218

I-L-5 dL 134, vL 108 dL/vL 1.24, HA-HC 30, 39, 43, dL/HB 3.44

S-1 L 63, L/W 7.9, S-2 L 56, L/W 8.0, interspace 5, L S-1/2 1.13

I-L-6 L 92, HA-HC 24, 22, 22, dL/HB 4.18; L I-L-5/6 1.46

genital field L/W (121/138), Ac-1–3 L (54, 58, 74)

gnathosoma –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	26/22	58/40	67/32	95/29	29/10
(ratio)	1.18	1.45	2.09	3.28	2.90
rel.L	9	21	24	35	11
total L:	P-2/4 0.61				
	275				

Ventral integument finely striated, 10/10 µm, dorsally with densely arranged papillae; extension of papillate area individually variable, covering the whole dorsal idiosoma, restricted to a small interocular field or (rarely) completely reduced; in the latter case, integument often very thick (15–20 µm), coriaceous and with fine porosity arranged in regular circles; margins of glandularia irregular due to extended secondary sclerotization, diameter up to 35 µm (the measurement of 20 µm provided by Viets concerns only primary sclerotization; in the holotype, extension of secondary sclerotization hardly visible due to overvigorous cleaning of the preparation); mediocaudal area of Cx-1 + 2 tongue-shaped, with caudal apodemata of

Cx-2 only slightly protruding over the equally convex lateral margin of the plate; Cx-3 + 4 with large border of secondary sclerotization, Vgl-3 fused to the caudal margin of Cx-4; Ac-1 and -2 subtriangular, wider than long, with pointed median edge directed to the gonopore, Ac-3 strongly bulging out and extending over the posteriolateral margin of the genital field.

Females

Specimen from Wattental

genital field: Ac subtriangular, genital plates with weakly concave medial margin, pregen strongly developed

palp: P-4 slender

idiosoma L/W 660/500; glandularia 40

coxal field L 265; Cx-3 W 315; Cx-1 + 2 mL 103, IL 193, W 234

I-L-5 dL 138, vL 110, dL/vL 1.25, HA-HC 31, 38, 41, dL/HB 3.63

S-1 L 61, L/W 8.7, S-2 L 54, L/W 6.0, interspace 7, L S-1/2 1.13

I-L-6 L 90, HA-HC 22, 17, 17, dL/HB 5.29; L I-L-5/6 1.53

genital field L/W 171/171, Ac-1–3 L 43, 40, 40

gnathosoma vL 115; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	25/20	63/43	76/38	94/23	29/11
(ratio)	1.25	1.47	2.00	4.09	2.64
rel.L	9	22	26	33	10
total L:	P-2/4 0.67				
	287				

Secondary sclerotization generally less extended than in males, but clearly visible (undulate margins of glandularia, coxae and genital sclerites); I-L-6 more slender than in males; Vgl-3 not fused to caudal margin of Cx-4, and Vgl-1 not fused with Vgl-2, V-2/3 forming smaller sclerites than in males; pregen large and strong, with an extended anterior area of secondary sclerotization, Ac forming a flat triangle, Ac-3, and in most cases also Ac-2 bulging out over the margin of the genital sclerite; palps more slender than in males.

Discussion: Walter sent a specimen from the Piersig collection (with an uncertain collection site and date) for further examination to K. Viets, simply declaring that it represented an undescribed species that he wanted to name as *A. tuberosus*, as can be still deduced from its name label. This name being preoccupied, Viets decided to dedicate the new species to his colleague. Due to the small number of specimens at his disposal, Viets was not aware of the range of variability of *A. walteri*, based the diagnosis exclusively on the holotype, and described the specimens of his own collection as a further, separate new species, *A. coriaceus* (see below). Therefore, he considered several features as diagnostic for *A. walteri* which in reality characterize only the holotype as a juvenile specimen, probably damaged by vigorous cleaning. Indeed, the borderlines of secondary sclerotization are not clearly visible, and therefore Viets interpreted porous areas of sclerotization as a part of the membranous integument; he also failed to measure the glandularia diameter and interpret the shape of the genital field. The original description was restricted to the male; a first descrip-

tion of the female was added by Walter & Motaş (1927). With regard to its unique characteristic, the papillate dorsal integument, *A. walteri* is a rather variable species, and the attribution of very juvenile or very old adults can be difficult when the papillae of the dorsal integument are completely invisible (not yet developed or lost when epidermal strata detach). Such specimens, due to their extended secondary sclerotization (including the glandularia) differ from all species known at that time besides *A. glandulosus*. *A. glandulosus* can be distinguished in both sexes due to the ventral and dorsal margins of I-L-5 continuously diverging from the base to the tip of the segment, S-1 and -2 differing in length (L ratio S-1/2 1.27–1.34) and shape (S-2 much more enlarged), more slender, distally narrowed I-L-6 (dL/HB 6.0–7.7), less extended anterior margin of secondary sclerotization of the genital field in mature males, and the smaller pregen in females.

Description of larvae: Martin (in press).

Habitat: Crenobiont.

Distribution: Alps, Carpathians (4, 10).

ATTRACTIDES CORIACEUS (K. VIETS, 1925)

Megapus coriaceus K. Viets, 1925

Syn. to *A. walteri* (K. Viets, 1925): Lundblad, 1956

Type series: Holotype ♂ SMF 3256 *Atractides subasper coriaceus* ♂ Viets Type; Tirol Kasbachtal Quelle 26.8.1923 Viets coll. 3256. State of conservation: mounting fluid densely filled with precipitated material, probably transferred to a second embedding fluid that has produced additional precipitation; both IV-L, one I-L separate, gnathosoma, chelicerae and Gsk missing, both palps lateral.

Discussion: Due to the presence of a large border of secondary sclerotization at the margins of Cx-4, Viets initially planned to describe this taxon as a subspecies of *A. subasper*, a species very different from many points of view. In the discussion of the original description, he underlined the following diagnostic characters in males as compared with *A. walteri*: integument thicker and with reticulation in deeper layers, ventral idiosoma without lineated integument, but with regularly arranged groups of 6–8 pores; diameter of glandularia large (40 µm); anterior margin of genital field not indented, mediocaudal indentation filled with porous chitin, genital field with maximum W (125 µm) on the level of Ac-1. Later, the author himself (with a question mark) transferred the specimen on which the description of the female was based to another new species (*A. separatus*: K. Viets, 1931). As clearly indicated by comparative studies of large populations of *A. walteri* (Lundblad, 1956; pers. observ.) all the above-mentioned characters are not suitable for distinguishing species, but characterize a rather juvenile (holotype of *A. walteri*) and a quite old (holotype of

A. coriaceus) specimen of the same species. As all transitions can be observed between these two character combinations in natural populations, the synonymization of *A. coriaceus* with *A. walteri*, first proposed by Lundblad (1956) is correct.

ATTRACTIDES PANNICULATUS (K. VIETS, 1925)

(FIGS 4B,C,5D–F,6G,H,9D,E,10B,30A–F)

Megapus panniculatus K. Viets, 1925

Syn. *A. mitisi* (Walter, 1944): syn. nov.

Type series: Lectotype ♂, here designated, SMF 3267 *Atractides panniculatus* ♂ ♀ (Viets) Type Tirol Qu. i. Wattental b. Innsbruck 27.8.23 Viets leg. State of conservation: containing 2 ♂, 2 ♀; one of the ♂ with only right I-II-L *in situ*, the remaining legs separate, gnathosoma and chelicerae in dorsal view, both palps separate lateral. This specimen described in K. Viets (1925: fig. 64) and therefore selected as lectotype. Paralectotypes on the same slide, ♂ (with only right II-IV-L *in situ*) and 2 ♀; SMF 3275, labelled like lectotype, 2 ♂, one entire, the other dissected.

Material examined: Germany, Upper Bavaria, and Italy, Trentino-Alto Adige, from a research project on Alpine springs (collecting sites in Crema *et al.*, 1996) 35/18/0.

Description:

General features

dorsal integument: lineated (4/10); muscle attachments: unsclerotized

coxal field: sexual dimorphism

I-L: I-L-5 moderately thickened distally, sword setae distanced, with knife-like lamellar inner margins, S-1 with parallel margins in the distal third and tip obliquely cut off, S-2 enlarged; I-L-6 long and slender, slightly thickened basally, with parallel dorsal and ventral margins from the centre to the claw pit

genital field: Ac in a triangle, large, Ac-3 (often also Ac-2) protruding over the sclerite margin

excretory pore: smooth; Vgl-1: not fused to Vgl-2

palp: weak sexual dimorphism, ventral margin P-2 distally protruding, P-3 straight, P-4 2 : 3 : 1, sword seta near distal hair.

Males

Paralectotype SMF 3267, in parentheses specimens from Berchtesgaden

coxal field: Vgl-3 fused to Cx-4

genital field: anterior margin of primary sclerotization slightly indented, a border of secondary sclerotization truncate, slightly convex, often with a knob-shaped medial projection, posterior margin indented by an acute angle; genital setae: 35

palp: ventral margin P-2 often with irregular rugosity due to fine transverse furrows, distal protrusion rounded, P-4 slightly protruding near proximoventral hair, 2 : 3 : 1, sword seta short and curved.

idiosoma L/W 630/470; glandularia 33

coxal field L 360; Cx-3 W 392; Cx-1 + 2 mL 135, IL 240, W 310

I-L-5 dL 228, vL 156, dL/vL 1.46, HA-HC 58, 65, 85, dL/HB 3.51

S-1 L 121, L/W 12.1, S-2 L 90, L/W 6.0, interspace 32, L S-1/2 1.34

I-L-6 L 165, HA-HC 28, 20, 19, dL/HB 8.25; L I-L-5/6 1.38

genital field L/W 183/196, Ac-1–3 L 64(41–56)–79(47–61)–68(45–62)

gnathosoma vL 156; chelicera L 248, L/H 5.28, bS/claw 2.26

palp	P-1	P-2	P-3	P-4	P-5
L/W	36/30	74/54	81/47	116/43	38/11
(ratio)	1.20	1.37	1.72	2.70	3.45
rel.L	10	21	23	34	11
total L:	P-2/4 0.64				
345					

Occasionally, the lineated dorsal upper integument layer may be peeled off, and finely porous inferior layers become visible; diameter of glandularia 29 µm

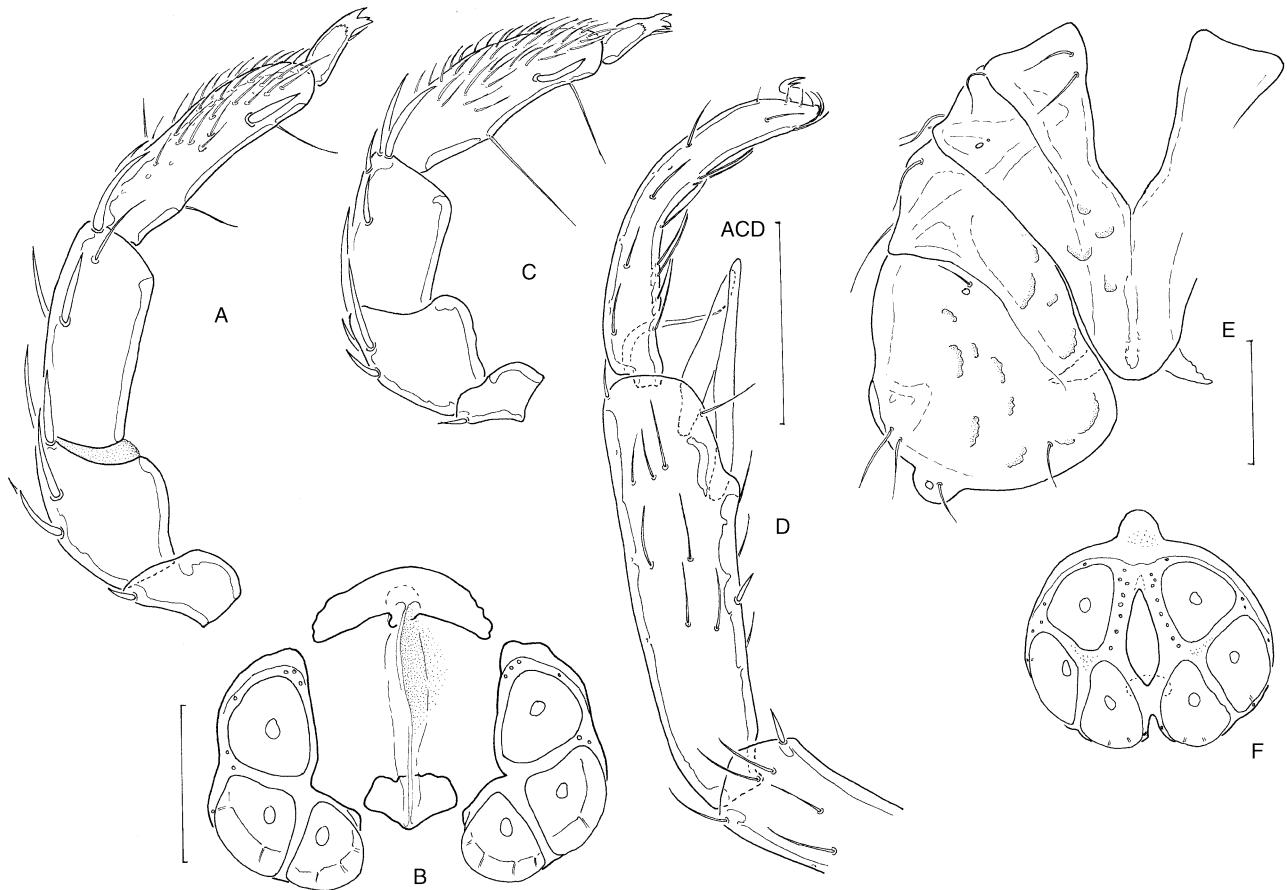


Figure 30. *Atractides panniculatus*. A, paralectotype ♀ SMF 3267; B, ♀ Berchtesgaden; C–F lectotype ♂ SMF 3267. A, ♀ palp, medial view; B, ♀ genital field; C, ♂ palp, medial view; D, ♂ I-L-5 and -6; E, ♂ coxal field; F, ♂ genital field. Scale bars = 100 µm.

(Dgl) to 33 µm (Vgl-2); Cx-1 + 2 with equally convex or truncated posteromedial margin, position of Cx-2 apodemes variable in position and shape, from long and nearly parallel, directed caudally, to short and forming a 90° angle with the median line, directed laterally; Vgl-3 nearly adjacent and lying in a concavity of the coxal margin, only in juveniles completely separate, secondary sclerotization as a narrow, irregularly undulate border, mainly restricted to the area laterally from Vgl-3; genital field with about eight medial setae arranged in a line flanking the gonopore.

Females

Paralectotype, in parentheses specimens from Berchtesgaden

coxal field: Vgl-3 not fused to Cx-4

genital field: frame of primary sclerotization narrow, laterally and caudally overwhelmed by protruding Ac-2/3, anteriorly with a slender border of secondary sclerotization, medial margin indented on the level of Ac-2

palp: P-2 ventrodistal protrusion less developed than in males, P-4 more slender

idiosoma L/W 930/670; glandularia 30

coxal field L 437; Cx-3 W 526; Cx-1 + 2 mL 139, IL 284, W 374

I-L-5 dL 265, vL 184, dL/vL 1.44, HA-HC 67, 72, 94, dL/HB 3.68

S-1 L 130, L/W 10.0, S-2 L 108, L/W 6.0, interspace 38, L S-1/2 1.20

I-L-6 L 198, HA-HC 29, 20, 22, dL/HB 9.90; L I-L-5/6 1.34

genital field L/W 229/261, Ac-1-3 L 67(46-67)-69(46-75)-72(48-72)

gnathosoma -; chelicera L 307, L/H 5.29, bS/claw 2.07

palp	P-1	P-2	P-3	P-4	P-5
L/W	40/31	90/56	108/47	134/34	43/13
(ratio)	1.29	1.61	2.30	3.94	3.31
rel.L	10	22	26	32	10
total L:	P-2/4 0.67				
	415				

Glandularia diameter 22 µm (Dgl) to 30 µm (Vgl-2); anterior coxae with subepidermal medial protrusion extending over the posterior margin of Cx-1 + 2, posterior margin of Cx-4 with two concave areas laterally and medially, separated by a convexly protruding apodeme; genital field with strongly sclerotized pregen.

Discussion: In the original description, Viets discussed the differences between *A. panniculatus* and *A. glandulosus* (thicker I-L-6 and P-4) and *A. tener*

(An. sclerotized, I-L-6 shorter, less curved, sword seta P-4 inserted more proximally). Two features in common with *A. fonticolus* and *A. pennatus* are the lineated dorsal integument, and the distal position of the sword seta on P-4. *A. panniculatus* differs from both species in the wider setal interspace, a more slender I-L-6, and the less strongly projecting ventrodorsal protrusion of P-2 in males.

Description of larvae: Martin (in press).

Habitat: Crenobiont

Distribution: Iberian peninsula, Central Europe, Carpathians (1, 4, 9, 10).

ATRACTIDES TIVDIAE (SOKOLOV, 1926)

Atractides nodipalpis tivdiae Sokolov, 1926

syn. to *A. nodipalpis* Thor, 1899: syn. nov.

Type series: Lectotype male, here designated: ZISP 564 ♀ ♂ *Megapus nodipalpis* Thor var. *tivdiae* n.var. J.Sokolov; 16.7.20.64/4, one male, mounted together with two females (paralectotypes). State of conservation: all specimens damaged by crushing, with broken legs, fractures in coxae; visibility hampered by crystallization of mounting fluid. *Locus typicus:* Karelia, Fluss Tivdia (Sandal-See) in Elodea, 18.VII.1920 [difference between date on slide and date in publ. = error?]

Description and Discussion: Sokolov considered the relatively slender P-4 in both sexes to be a diagnostic feature of his new taxon. However, in *A. nodipalpis*, a considerable variability in shape of P-4 was found, and palp measurements of Sokolov's types lie within the range of variability documented for that species. Moreover, no differences could be found with regard to other characters and measurements; *A. tivdiae* should therefore be considered a synonym of *A. nodipalpis*.

ATRACTIDES LONGITIBIALIS (WALTER, 1927)

Megapus nodipalpis longitibialis Walter, 1927 (in Walters & Motaş, 1927)

Atractides fonticolus longitibialis (Walter, 1927) Bie-siadka & Kowalik, 1978

Syn. to *A. pennatus* (K. Viets, 1920): syn. nov.

Type series: NHMB, Syntypes, ♀ *Megapus nodipalpis longitibialis* Walter Vercors 22.7.26 coll. Motaş 316; XXVIII/90. State of conservation: idiosoma desiccated, air penetrated to the internal part of legs; gnathosoma with palps separate, laterally. ♀ labelled in the same manner, XXVIII/91. State of conservation: palps separate, laterally, gnathosoma missing. *Locus typicus:* Fontaine de Merle, Engenières, au pied du Vercors, 22 juillet, 1926, 11 ♀. Further record in the original description: se trouve aussi en Suisse, without identifying site.

Material examined: [Refused determinations] SMF 3811, ♀ Spanien, Zaragoza, Torre de Medina, 28.5.1918; SMF 7200 ♀ Italien Vomano Fl. Moretti coll. 24.6.1951.

Description. Female (type series, male unknown): idiosoma L 1190–1280 µm, W 980–1100 µm; integument 10 µm thick, with fine ventral striation, but strong dorsal lineation; antenniformia fine, L 125 µm;

glandularia maximum diameter 38 µm; coxae and genital field not clearly visible due to desiccation; dL I-L-5 340, HB 75, setal interspace 15, dL I-L-6, 190 µm; L/W genital field 210/234 µm; Ac-1–3 forming a triangle, maximum L 50, 60, 64; genital plates L 215; excretory pore unsclerotized, Vgl-1 separate from Vgl-2; palp measurements given in the original description: P-1–5 dL/H 44/47, 100/78, 112/54, 132/36, 44/15, total L 432 µm, P-2 with a slight ventrodorsal protrusion, sword seta of P-4 near the distoventral hair in NHMB 28/90, but near the proximoventral hair in NHMB 28/91.

Discussion: Some of the measurements provided in the original description (here in parentheses) diverge considerably from my measurements of the syntype from NHMB: genital field L 211 (270), W 234 (300) µm; I-L-5 dL 280 (340), I-L-6 dL, 197 (214) µm. This observation, as well as differences between the two specimens preserved at NHMB, suggest the presence of different species within the type series. For this reason, and in view of the poor state of conservation of the syntypes in NHMB, I decided not to designate a lectotype, basing the discussion mainly on the drawings in the original publication. From an analysis of Walter's figure 15A, we can deduce the following values: palp: P-2 L/H 1.3; I-L-5: dL/vL 1.2; dL/HB 4.5; HA/HB 0.9; HB/HC 0.9; S-1 L/W 12.0; S-2 L/W 8.4; L S-1/2 1.2. I-L-6: dL/HB 5.6; HA/HB 1.1. dL I-L-5/6 1.7.

In their joint publication, Walter & Motaş considered the assessment of this taxon as a subspecies of *A. nodipalpis* a preliminary solution that would require re-examination after the discovery of the male. Due to the lineation of the dorsal integument, I-L-5 with subparallel ventral and dorsal margins, narrow setal interspace, I-L-6 thick and L ratio I-L-5/6 > 1.6, *A. longitibialis* resembles *A. fonticolus* and *A. pennatus*. Furthermore, females of all three species have a relatively thick P-2 (L/H 1.3–1.4) with roundish ventrodorsal protrusion. Walter's comment concerning the relatively large dimensions of this segment is not confirmed by my measurements. Regarding *A. fonticolus*, the only valuable differences provided in the original description are the longer palp segments 2–5. In view of the larger size of palp and I-L, and also due to the slender S-2 sword seta, *A. longitibialis* agrees with *A. pennatus*. A difference is found only in the shape of I-L-5 which is relatively more expanded distally in *A. pennatus* (HA/HB 0.73) than in *A. longitibialis* (HA/HB 0.90). Some of the measurements published by Walter exceed the dimensions of *A. pennatus* (e.g. dL I-L-5 340 µm, compared with 302 µm in *A. pennatus*) but in the syntype the L of this segment is only 279 µm. All things considered, there is good reason to synonymize *A. longitibialis* with *A. pennatus*. In view of the contradictions between type material and pub-

lication, as well as the poor state of the type material, this decision should be verified based on material from the *locus typicus*.

Since the original description, four additional records have been published, from Spain (K. Viets, 1930) Italy (K. Viets, 1955c) Macedonia (Schwoerbel, 1963) and Poland (without further explanation described as '*A. fonticolus longitibialis*'; Biesiadka & Kowalik, 1978). The specimens from Spain and Italy preserved under this name in SMF obviously do not represent *A. longitibialis* (in both cases the dorsal integument is finely striated, 7/10 µm, glandularia not enlarged). K. Viets (1950) recognized the error, referred the Spanish record to *A. fonticolus*, and ignored the record from Italy in his catalogue (K. Viets, 1956). Schwoerbel's mention from Macedonia contains only a brief remark on the particularly long I-L-5 and does not include measurement data or a discussion of the eventual similarity to other species; the record from Poland is provided within a faunistic table only.

ATTRACTIDES FISSUS (WALTER, 1927) (FIG. 31A–H)
Megapus fissus Walter, 1927 (In Walter & Motaş, 1927)

Type series: Syntypus ♂, NHMB *Megapus fissus* ♂ Walter Geniers-Mort 7.10.1926 coll. Motaş 360 XXVIII/68. State of conservation: poor, probably restored at least once; idiosoma desiccated and crushed, left II-IV-L missing, both I-L separate, desiccated, one has shifted under the cover glass; gnathosoma with chelicerae and one palp separate, lateral, crushed and with many fissures, the other palp missing. As the original description was based on a further, now missing specimen from another locality (avant-dernier ruisseau au dessous de l'Oursière, 19 Septembre 1925, 1 ♂) and the author himself discussed the possibility that the syntype now preserved in NHMB might represent another species, I have decided against designating a lectotype.

Material examined: ♂ SMNH 4713, CH Julierpass, 19.8.1951; ♀ SMNH 4714, Silsersee 20.8.51.

Description:

General features

dorsal integument: lined (3–4/10); muscle attachments: unsclerotized
coxal field: Vgl-3 not fused to Cx-4
I-L: I-L-5 S-1 and -2 pointed, interspaced, S-2 enlarged basally, I-L-6 slender, curved, with nearly parallel dorsal and ventral margins, slightly thickened basally
genital field: Ac large, in triangular arrangement
excretory pore: smooth; Vgl-1: not fused to Vgl-2
palp: sexual dimorphism in P-2, P-3 ventral margin straight, P-4 1 : 1 : 1 sword seta slender, not curved, near to, or distally from, distoventral hair

Males

SMNH 4713
genital field: anterior margin equally convex, posterior margin deeply indented; genital setae: 30
palp: P-2 ventral margin distally protruding, with smooth or irregularly rugose surface; P-3 stout, P-4 slightly protruding near proximoventral hair
idiosoma L/W 620/460; glandularia 25
coxal field L 325; Cx-3 W 403; Cx-1 + 2 mL 108, IL 225, W 324
I-L-5 dL 216, vL 148, dL/vL 1.46, HA-HC 52, 56, 74, dL/HB 3.86
S-1 L 99, L/W 12.4, S-2 L 76, L/W 7.6, interspace 22, L S-1/2 1.30
I-L-6 L 157, HA-HC 29, 22, 21, dL/HB 7.14; L I-L-5/6 1.38

genital field L/W 157/193, Ac-1–3 L 65, 71, 74
gnathosoma vL 135; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	35/30	76/66	70/45	109/38	36/13
(ratio)	1.17	1.15	1.56	2.87	2.77
rel.L	11	23	21	33	11
total L:	P-2/4 0.70				
	326				

Original description: idiosoma L/W 615/450 µm; integument thin (5 µm), dorsally lined as in *A. panniculatus*; coxal field L 345, W 405 µm, Cx-1 L 265, gnathosomal bay L 132 µm; apodemes of Cx-2 strong, arranged in an acute angle and extending over the posteromedial margin of Cx-1 + 2; I-L-5 dL, 195 µm, with distally diverging dorsal and ventral margins, large interspace between sword setae, S-1 longer and more slender than S-2; I-L-6 dL 140 µm (dL ratio I-L-5/6 1.39) of nearly equal thickness from the base to the tip; Vgl-3 not fused to the caudal margin of Cx-4; genital field L/W 145/185 µm, gonopore L 72 µm; anterior margin of Ac-3 close to the posterior margin of Ac-1; gnathosoma L 127, chelicera total L 200 µm, palp measurements L/H P-1 34/–, P-2 72/57, P-3 67/44, P-4 106/44, P-5 34/–, total L 313 µm; P-2 with distoventral margin convexly protruding; P-4 in the figure of the original description inflated (probably as an artefact) with very long ventral hairs (following the text of the description equal in L to the ventral margin, and arranged in the proximal half of the segment, but in Walter's fig. 16 clearly shorter than ventral margin and their insertions dividing the ventral margin in three sectors nearly equal in L) sword seta short, inserted distally from the distoventral hair.

As noted by these authors, considerable differences are found in shape and setation of the palp of the second specimen, now preserved in NHMB. For this reason, it is here described separately, combining my own observations and those of Walter & Motaş (1927):

Syntype: idiosoma L 700 µm; dorsal integument lined (4/10 µm); dorsal glandularia with slightly irregular contour line, diameter 25 µm; Cx-1 + 2 mL 126, IL 265, W 369 µm; posteromedial area of Cx-1 + 2 as described above; I-L-5/6 dL 234/162 µm (ratio 1.44); S-1/2 L 100/61 µm (ratio 1.64), interspace 46 µm, Ac-1–3 maximum diameter 64, 74, 59 µm, Ac-3 anteriorly pointed; palp segments dL P-1–5 36, 80, 72, 109, 36 µm, total L 333 µm, P-2 with a strong ventrodiscal protuberance with irregular surface, ventral hairs of P-4 shorter and further apart, sword seta on the level of the distoventral hair.

As mentioned by Lundblad (1956) the male SMNH 4713 is similar to the second syntype described above, while the same author found in other Swiss collecting sites specimens that resembled the first syntype (P-2

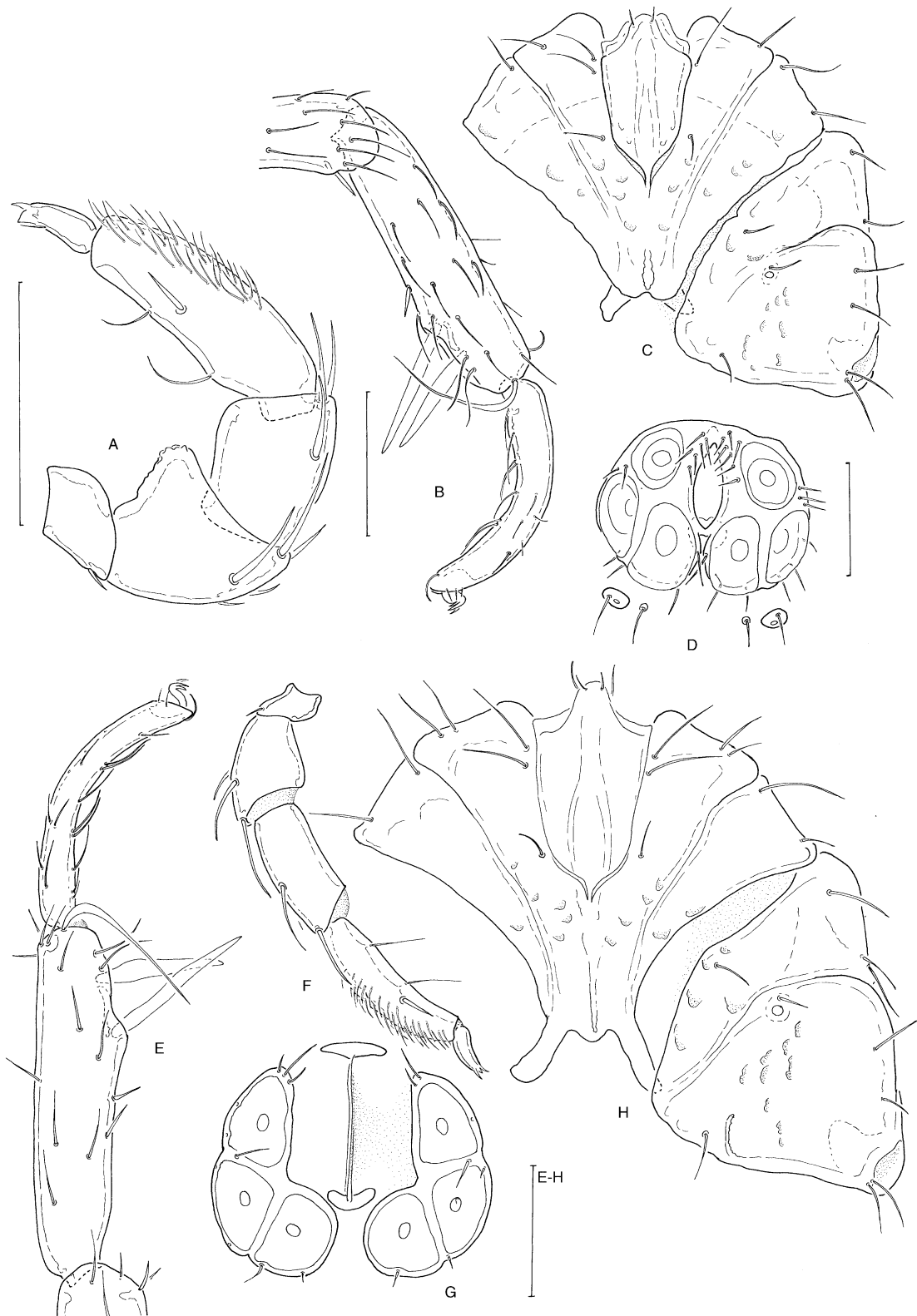


Figure 31. *Atractides fissus*. A–D, ♂ Switzerland, Julierpass SMNH 4713, E–H ♀ Switzerland, Silsersee SMNH 4714. A, ♂ palp, medial view; B, ♂ I–L–5 and –6; C, ♂ coxal field; D, ♂ genital field; E, ♀ I–L–5 and –6; F, ♀ palp, medial view; G, ♀ genital field; H, ♀ coxal field. Scale bars = 100 µm.

with less protruding protuberance, longer ventral hairs on P-4).

Females

SMNH 4714

genital field: small pregen, medial margin of genital plates forming a nearly right angle on the level of Ac-2

palp: ventral margin P-2 slightly convex distally, P-3/4 straight idiosoma L/W 680/500; glandularia 22

coxal field L 365; Cx-3 W 440; Cx-1 + 2 mL 117, IL 238, W 360

I-L-5 dL 265, vL 171, dL/vL 1.55, HA-HC 63, 72, 103, dL/HB 3.68

S-1 L 132, L/W 13.2, S-2 L 100 L/W 6.25, interspace 40, L S-1/2 1.32

I-L-6 L 198, HA-HC 29, 22, 22, dL/HB 9.00; L I-L-5/6 1.34

genital field L/W 189/220, Ac-1-3 L 49, 58, 49

gnathosoma vL 157; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	40/31	90/58	100/45	130/34	38/14
(ratio)	1.29	1.55	2.22	3.82	2.71
rel.L	10	23	25	33	10
total L:	P-2/4 0.69				
	398				

Genital field with short gonopore and small pre- and postgen, Ac-1-3 triangular; gnathosoma L 168 µm; Lundblad's measurements slightly higher (constantly about 5%); P-2 with protruding ventral margin, ventral hairs of P-4 shorter than in male, sword seta inserting distally from the distoventral hair.

Discussion: As Walter & Motaş observed in the original description, *A. fissus* is very similar to *A. panniculatus*. They mention slight differences in the relative and absolute L of P-3 and P-4 (longer in *A. panniculatus*) and the presence of one additional dorsal seta on P-2 in *A. fissus*. The L difference of the palp segments is confirmed by my measurements, but is of low degree (about 10%) and might result from intraspecific variability, as is surely the case for palp setation. All available specimens of *A. fissus* are obviously juveniles. Characters such as fusion of male Vgl-3 with Cx-4, relatively short male genital field with deep caudal indentation, small pregen in the female, caudal position of the excretory pore, and inflation of P-4 change with increasing age or deteriorating preparation quality, and are therefore of low diagnostic value. Also the shape of the Cx-2 apodemes, in *A. fissus* strongly protruding and directed caudally, is found to be variable in *A. panniculatus*. The most important difference between *A. fissus* and *A. panniculatus* concerns P-4: in the latter, ventral hairs insert at a large distance from each other, with the distoventral hair closely approaching the distoventral edge of the segment; also the sword seta, in both species arranged near that hair, is in a more distal position, and is thicker and curved, while it is normal in shape and slender in *A. fissus*. Further differences are found in the male P-2, with a weaker ventrodistal protrusion in *A. panniculatus*, and in the more slender I-L-6: L/HB ♂ 8.05, ♀ 9.90.

Both Walter and Lundblad (1956) mention the variation in the shape of the protrusion on male P-2, as well as the position of the sword seta of P-4 (distally from the distoventral hair in fig. 16 of the original description). However, in large numbers of specimens of *A. panniculatus* from the northern and southern Alps, the above mentioned diagnostic characters were found stable. Together with *A. panniculatus*, *A. fissus* differs from the lineated species *A. fonticolus* and *A. pennatus* in a wide interspace between the sword setae of I-L-5 and the rather long I-L-6 (dL I-L-5/6 1.3-1.4).

Habitat: *A. fissus* should be considered a sister species of *A. panniculatus*, possibly with a tendency to colonize higher order stream sectors, while the latter is crenobiont. This is indicated by records of specimens perhaps representing *A. fissus*, but published under the name of *A. mitisi* Walter, 1944 from Austria and Poland. A sibling species differing in shape and setation of the male palp, *A. longisetus*, has been split off from *A. fissus* while this manuscript was in proof (Pešić, 2002d). As a consequence, the definition of *A. fissus* must be restricted to the character combination here described for the syntypus in NHMB.

Distribution: Alps (France, Switzerland, Austria?) Montenegro (Pešić, 2002d), Poland? (4, 5, 16).

ATTRACTIDES LEGERI (MOTAŞ, 1927) (FIG. 32A-D)

Megapus legeri Motaş, 1927

Syn. *A. taeniolatus* (Maglio, 1928): K. Viets, 1956

Type series: Lectotype ♂, here designated, NHMB *Megapus legeri* ♂ Motaş Oisans, 19.7.1926 Coll. Motaş IXIV/76; Pr.1476; Leg. Motaş, Oisans, R.ons des Trois Dauphins, 19.7.1926. State of conservation: of the idiosoma only sclerites and parts of the shredded dorsal integument remain; several legs separated and more or less dissected in separate segments, left II/III-L-6 and one palp missing, gnathosoma separate, damaged, one palp and chelicerae isolated. *Loci typici:* ruisseau de Pied-Moutet, au-dessous de Bourg-d'Oisans, près de la Rampe des Commères dans les mousses et la vase, 19.7.1926 (4/1/20: female ovigerous); 17.11.1926 (2/18/12: most females ovigerous).

Description:

General features

dorsal integument: lineated (1/10); muscle attachments: unsclerotized
coxal field: sexual dimorphism, in both sexes mediocaudal margin Cx-1 + 2 indented or concave

I-L: I-L-3-5 forming extended distal articulation sheaths; I-L-5 dorsal and ventral margins diverging, S-1 and -2 nearer to each other, S-1 longer than S-2, slightly curved, S-2 basally thickened, narrowed distally, both S-1 and -2 with rounded tip; I-L-6 relatively short and strongly curved, narrowed distally

genital field: Ac in a curved line

excretory pore: smooth; Vgl-1: not fused to Vgl-2

palp: weak sexual dimorphism, P-2 ventrodistally with a longitudinal line separating a medial hump with three fine denticles, from a lateral, smooth elevation; P-4 2 : 3 : 1, sword seta strong, nearer to the distoventral hair

Males

Lectotype

coxal field: Cx-1 + 2 and -3 + 4 fused at their touching edges

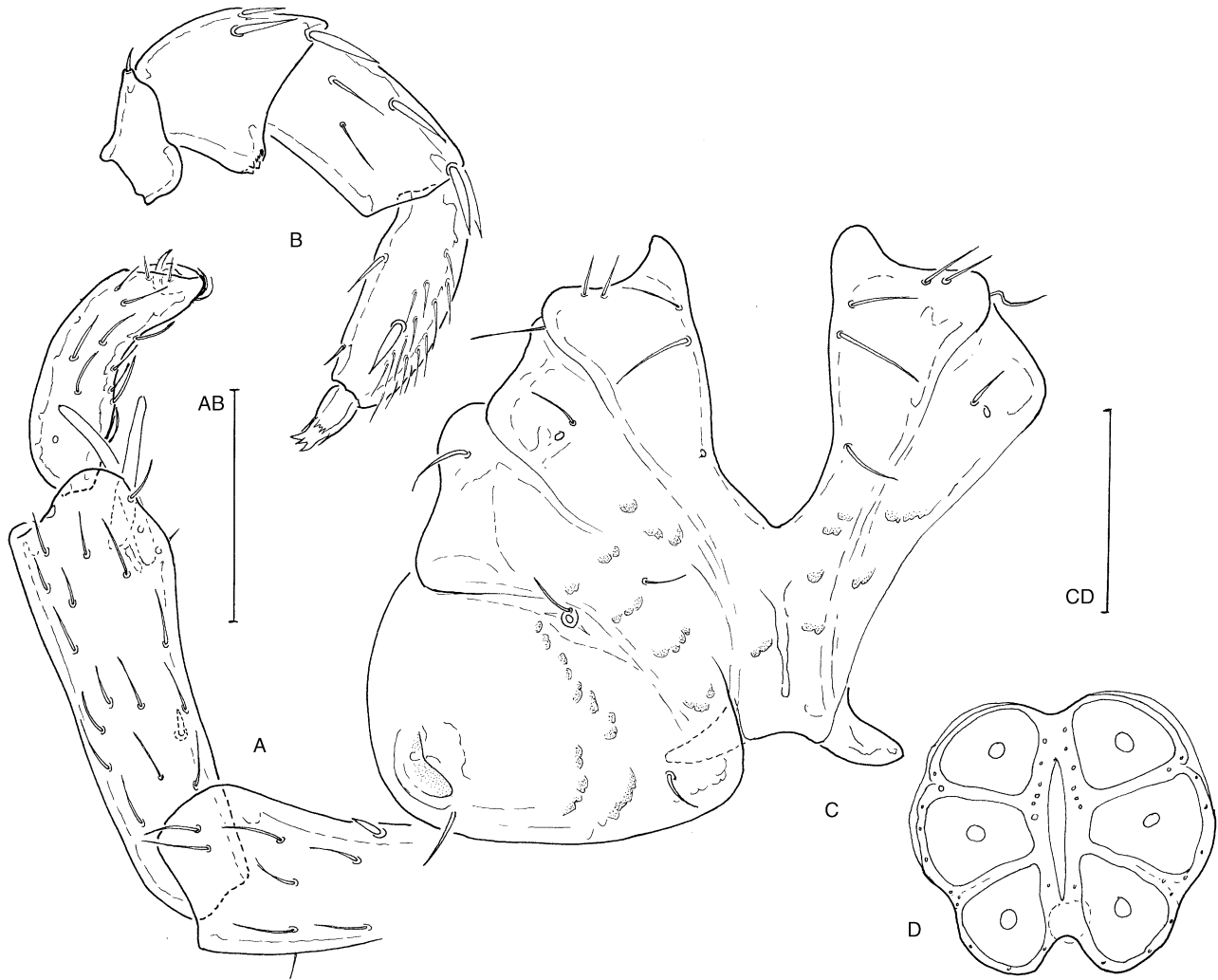


Figure 32. *Atractides legeri*, syntype ♂ NHMB. A, I-L-5 and -6; B palp, medial view; C, coxal field; D, genital field. Scale bars = 100 μ m.

genital field: anterior and posterior margins weakly indented, anteriorly with a narrow border of secondary sclerotization; genital setae: 35
 palp: P-4 ventral hairs very short
 idiosoma L/W 550/360; glandularia 27
 coxal field L 302; Cx-3 W 365; Cx-1 + 2 mL 105, IL 229, W 279
 I-L-5 dL 194, vL 145, dL/vL 1.34, HA-HC 53, 66, 73, dL/HB 2.94
 S-1 L 81, L/W 10.1, S-2 L 70, L/W 7.8, interspace 12, L S-1/2 1.16
 I-L-6 L 111, HA-HC 35, 26, 26, dL/HB 4.27; L I-L-5/6 1.75
 genital field L/W 139/153, Ac-1-3 L 49, 49, 57
 gnathosoma vL 136; chelicera L 221, L/H 4.70, bS/claw 2.40

palp	P-1	P-2	P-3	P-4	P-5
L/W	40/34	85/74	87/52	103/36	34/13
(ratio)	1.18	1.15	1.67	2.86	2.62
rel.L	11	24	25	30	10
total L:	P-2/4 0.83				
	349				

Integument lineated as in *Hygrobatas calliger*, with very prominent lines giving the integument a squamose appearance in tangential view; these lines in the

preserved pieces of dorsal integument of the lectotype very short, L mostly 10–20 μ m, at maximum 80 μ m and clearly distinct; glandularia diameter following Motaş 16 μ m, but in the lectotype up to 27 μ m. Cx-1 + 2 with concave mediocaudal margin; total L of I-IV-L: 677, 520, 610, 916 μ m; I-L-3–5 forming strongly developed distal sheaths covering the articulations of the following segments; I-L-5 in the lectotype deformed by crushing; genital field with facing borders of Ac-1 and -2 and Ac-2 and -3 straight, Ac-1 and -3 subtriangular, Ac-2 trapezoidal; palp measurements provided by Motaş are 15% lower than those established by the lectotype (P-1–5 dL/H 31/–, 73/68, 68/49, 94/42, 29/–, total L 295 μ m) P-2 following Motaş forming a single conus covered by some obtuse denticles, but in the lectotype a weak longitudinal line visible, separating a medial hump with denticles from a

lateral, smooth elevation; P-4 sword seta strong, inserted between the levels of the ventral hairs, but nearer the distal one.

Females

Original description

coxal field: Cx-1 + 2 and -3 + 4 not fused along their touching edges

genital field: pregen slender, genital plate medial margin forming an obtuse angle on the level of Ac-2 (intermediate between linear and triangular arrangement of Ac)

palp: slightly more slender than in males, but well developed protrusion on P-2

idiosoma L/W 760/580 glandularia –

coxal field L 363; Cx-3 W –; Cx-1 + 2 –

I-L-5 dL 255, vL –, dL/vL –, HA-HC –, 62, –, dL/HB 4.11

S-1/2 –

I-L-6 L 125, HA-HC –, dL/HB –; L I-L-5/6 2.04

genital field L/W 230/255, Ac-1–3 L 73, 52, 52

gnathosoma vL 178; chelicera L 250, L/H 4.39, bS/claw 3.03

palp	P-1	P-2	P-3	P-4	P-5
L/W	36/–	83/68	81/47	99/36	31/–
(ratio)	–	1.22	1.72	2.75	–
rel.L	11	25	25	30	9
total L:	P-2/4 0.84				
	330				

Coxal field maximum W 478 µm, total L Cx-1 + 2 280 µm, posteromedial margin incised by an obtuse angle; Cx-1 + 2 and Cx-3 + 4 approaching each other, but in Motaş' figure 24B separated by a narrow membranous line; total L I-IV-L: 825, 635, 751, 1197 µm; genital plates L 113.

Discussion: Since the first description, attention has been paid only once to this species, when K. Viets (1956) synonymized *A. taeniolatus* Maglio, 1928 with *A. legeri* (see below). No further records have since been published. Interpretation of the diagnostic features is hampered by there being only a single, heavily damaged type specimen. Motaş discussed the relationships of *A. legeri* to *A. nodipalpis* (similar shape of palp) and to *A. spinipes*, *A. arcuatus*, and *A. inflatus* (Ac arranged in a weakly curved line). At that time, *A. spinipes* was a dumping ground for unresolved taxonomic problems, and *A. inflatus* was known from the female only. After discovery of the male, there was no doubt that the latter species is taxonomically rather distant from *A. legeri* (presence of a strong ventral protrusion on P-3 in males, females with a denticulated ventral swelling on this segment, longer I-L-6 in both sexes). For the other two species, Motaş described the following differences: *A. nodipalpis* has Ac in a triangular arrangement, males with a double ventral protrusion on P-2 missing denticulation, P-4 less densely covered with dorsal hairs and longer ventral hairs. *A. arcuatus* has a much shorter and rounder genital field (L in males 100 µm, in females 155 µm) with shorter Ac (Ac-1–3 L 37, 37, 28 µm). Further differences of *A. arcuatus* (not mentioned in the original description of *A. legeri*) are: in both sexes, ratio dL I-L-

5/6 1.3; in males, genital field without caudal incision, P-2 without denticulation on the ventral protrusion. Among the species so far compared, only *A. arcuatus* has a lineated integument. Among the other species with lineated integument known at that time, *A. paniculatus* differs in numerous characters, such as the increased setal interspace on I-L-5, a (relatively and absolutely) longer I-L-6, and the ventral protrusion of P-2 developed only weakly in males, and absent in females. Due to the presence of strongly developed sheaths at distal margins of I-L-3–5, *A. legeri* is similar to *A. pennatus*. The latter differs from the former in the more slender I-L-6, the tongue-shaped medio-caudal edge of Cx-1 + 2, the genital field with Ac more reduced in size, and, in males, with a higher number of setae flanking the gonopore, in both sexes the P-4 sword seta further away from the level of the distoventral hair, the P-2 without ventral denticles, in males bearing a finger-like protrusion, but in females only slightly protruding at the ventrodistal edge.

Habitat: Rhithrobiont.

Distribution: Alps (France, Italy) (4).

ATTRACTIDES BORCEAI (MOTAŞ, 1928)

Megapus borceai Motaş, 1928

Syn. to *A. walteri* (K. Viets, 1925): syn. nov.

Type series: Missing. *Locus typicus*: torrent du Bruyant (massif du Vercors, 8 juillet, 1927, T. 7°5; dans les *Oxyrrhynchium rusciforme*, 1 ♂. Altitude environ 900 m.

Description. Male (original description, female unknown): idiosoma total L 462, W 330 mm, oval in shape, but with protruding anterolateral edges; integument relatively thick (13 mm) with finely striated surface, but reticulated in the inferior strata; glandularia diameter 36 mm; coxal field total L 264, W 314, Cx-1 L, 192 mm, Cx-4 with a border of secondary sclerotization, Vgl-3 not fused to Cx-4; I-IV-L total L: 447, 364, 390, 624 mm; I-L-5 dL 114, HB 39, S-1 L 60, S-2 L 55 mm; I-L-6 dL 86, HC 26 mm; a small unpaired sclerite anterior from the genital field, genital field L 104, W 130 mm, surrounded by a narrow border of secondary sclerotization, anterior margin convex, posterior margin incised, gonopore L 68 mm; Ac subtriangular, each forming a pointed tip directed towards the centre of the gonopore; distance Ac-1–3 large, distance Cx-4 to genital field 99 mm; Vgl-1 fused to Vgl-2, excretory pore unsclerotized; gnathosoma with short rostrum, L 104, W 52 mm; chelicera total L 177, H max. (error in original description 'longeur maxima') 36, claw L 49 mm. Palp segments L/H P-1–5 21/–, 52/39, 62/34, 91/31, 26/– mm; ventral margin of P-2 straight, without ventrodistal protuberance, P-4 1 : 1 : 1, sword seta inserted between the levels of the ventral hairs, nearer the distoventral hair.

Discussion: *A. borceai* has not been reported since the original description. Probably in view of the small overall dimensions and the similar integument structure, Motaş compared *A. borceai* with *A. coriaceus*, and mentioned only two differences: in *A. coriaceus*, dimensions are larger, and the border of secondary sclerotization of Cx-4 is more extended, including Vgl-3. In the meantime, *A. coriaceus* has been recognized as a synonym of *A. walteri*, a rather small species with age-dependent variation in integument structure and extension of secondary sclerotization. From a comparison of the measurements published for *A. borceai* and my data from *A. walteri*, there is conformity in dimensions and shape of idiosoma and appendages. Comparison of the detailed figures by Motaş with the morphology of *A. walteri* provides no clue that might contradict the taxonomic identity of these two species. Obviously, *A. borceai* was based on a specimen with reduced integumental papillosity, as they are found regularly in populations of *A. walteri*. Thus *A. borceai* is a synonym of the latter species.

ATRACTIDES TAENIOLATUS (MAGLIO, 1928)

Megapus taeniolatus Maglio, 1928

Syn. to *A. legeri* (Motaş, 1927): K. Viets, 1956

Type series: Missing (not preserved in the Maglio collection, Verbania-Palanza, Benfatti pers. comm.). *Locus typicus:* torrente in Val Malenco (Alpi Retiche) versante destro presso Chiesa (1000 m asl.) fra i muschi, 27 ottobre, 1927, 1 ovigerous female.

Description. Female (original description, male unknown): idiosoma L 745, W 560 µm (specimen measured after a long time in conservation liquid; treated with KOH and distilled water); integument dorsally lineated, ventrally striated, L of dorsal lines very variable, 5–100 µm; coxal area L 370, W 535 µm; posterior margin of Cx-4 straight, locally slightly concave; I-L-5 with S-1/2 L 90/70 µm, I-L-6 dL 145 µm, distally curved, with about 10 ventral hairs; genital plates L, 180 µm, with relatively large Ac arranged in a curved line; 13 eggs 120 µm in diameter; gnathosoma vL 162 µm, chelicera L 262 µm, claw L 80 µm; no indications on dL of palp segments; P-2 with a cupuliform ventrodorsal protuberance bearing 6–7 very fine denticles; P-4 with dense cover of dorsal hairs, insertions of ventral hairs dividing the ventral margin into three equal sectors, sword seta of P-4 near the distoventral hair.

Discussion: When he described this species, Maglio was not aware that there were several other *Atractides* species with a lineated dorsal integument. Assuming that he had found a taxon different from all hitherto known *Atractides* species he proposed a separate subgenus: *Taeniomegapus*. In a note added in proof, he referred to *A. legeri*, the description of which had

appeared in the meantime; he found no differences to *A. taeniolatus*, but underlined the necessity of comparing the specimens of both species to define their relative taxonomic status, a procedure no longer possible due to the loss of both types. The original description does not contain any feature of diagnostic value for separating the two species. Presence of a denticulated ventral protrusion on P-2 in the female is not described from any other species with a lineated dorsal integument. No useful information is available about the shape of I-L-5 and -6 in *A. taeniolatus*, but from Maglio's note one may deduce that he did not find differences comparable to those found by Motaş. There is thus sufficient reason to agree with the synonymization of the two species first proposed by K. Viets (1956).

ATRACTIDES FLUVIATILIS (SZALAY, 1929)

(FIG. 33A–F)

Megapus nodipalpis fluviatilis Szalay, 1929

Separate species: Angelier *et al.*, 1963

Type series: Missing. *Locus typicus:* Fluss Garam bei Lekér, 23.VI.1927, 1 ♂. Collecting site of females (Szalay, 1935b): Garamrudnó (Kom. Bars) aus dem Fluß Garam leg. Dr E. Dudich am 18.VI.1932, 1 ♂, 3 ♀.

Material examined: SMF 4974, Jugoslav. Stobrec 17.8.1934 Viets leg. 1 ♂, 2 ♀. State of conservation: perfect; all mouthparts and I-L separate, male Gsk missing; SMF KOViets 7071 ♀, 7072 ♂ Israel IES 1375 26.11.1979.

Description:

General features

SMF 4974

dorsal integument: striated (7/10); muscle attachments: not sclerotized
I-L: I-L-5 S-1 and -2 distanced, with fine, but obtuse tips, I-L-6 slender, curved, basally slightly thickened, with parallel dorsal and ventral margins
genital field: Ac in an obtuse triangle
excretory pore: smooth; Vgl-1: close (fused?) to Vgl-2
palp: weak sexual dimorphism, P-4 1 : 1 : 1, sword seta near distoventral hair

Males

SMF 4974

genital field: anterior margin slightly concave, posterior margin indented, slender, external genital plate border narrow, Ac margins facing neighbouring Ac nearly straight; genital setae: 80
palp: ventrodorsal margin of P-2 convexly protruding, with traces of a pair of parallel extensions near distal edge; P-4 1 : 1 : 1, sword seta strong
idiosoma L/W 710/550; glandularia 20
coxal field L 360; Cx-3 W 405; Cx-1 + 2 –
I-L-5 dL 222, vL 152, dL/vL 1.46, HA-HC 54, 63, 79, dL/HB 3.52
S-1 L 116, L/W 11.6, S-2 L 93, L/W 9.3, interspace 39, L S-1/2 1.25
I-L-6 L 163, HA-HC 25, 21, 23, dL/HB 7.76; L I-L-5/6 1.36
genital field L/W 128/145, Ac-1–3 L 42, 42, 42
gnathosoma –; chelicera L 257, L/H 5.71, bS/claw 2.47

palp	P-1	P-2	P-3	P-4	P-5
L/W	32/32	80/68	88/49	107/38	37/13
(ratio)	1.00	1.18	1.80	2.82	2.85
rel.L	9	23	26	31	11
total L:	P-2/4 0.75				
	344				

Posteromedial margin Cx-1 not protruding, apodemes of Cx-2 elongated, forming an acute angle; leg claws

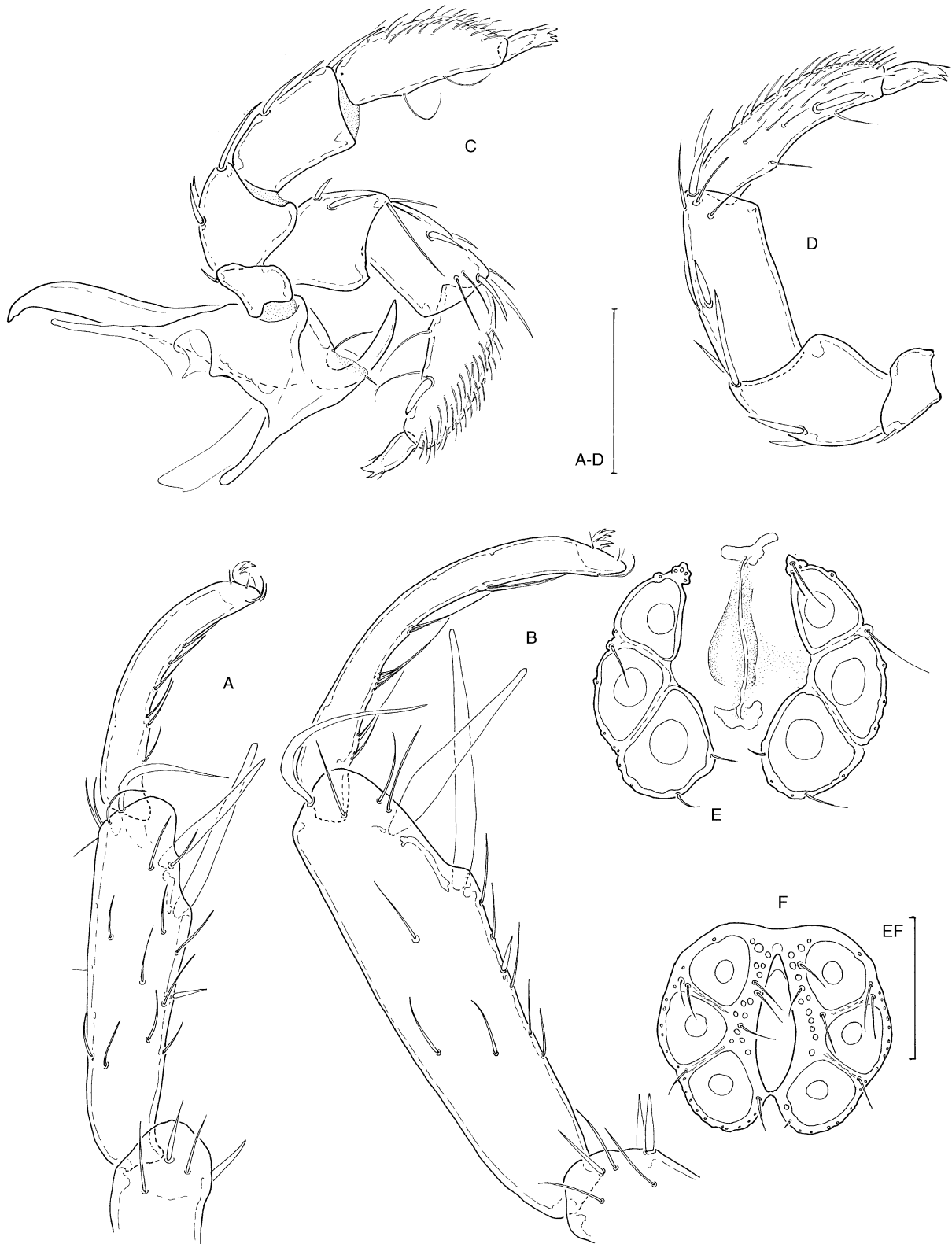


Figure 33. *Atractides fluviatilis*, Croatia, SMF 4974. A, ♂ I-L-5 and -6; B, ♀ I-L-5 and -6; C, ♂ gnathosoma and palps lateral view; D, ♀ palp, medial view; E, ♀ genital field; F, ♂ genital field. Scale bars = 100 µm.

(also on I-L) with strongly developed dorsal clawlet; I-L-5 with S-1 and -2 both relatively slender, tip of S-1 obtuse, of S-2 more pointed; P-4 rather thick and stout.

Measurements from the original description: idiosoma L 560, W 500 mm, coxal field L 333, maximum W 417 mm, I-L-5 dL, 183, HB 50 mm, S-1 L 100, S-2 67 mm, I-L-6 dL 133 mm; genital field L/W 120/114 mm: palp L/H P-1 33/33, P-2 67/50, P-3 58/50, P-4 90/45, P-5 33/10, total L 281 mm.

Females

SMF 4974

genital field: pregen small, Ac-1 and -3 subtriangular, Ac-2 trapezoidal; palp: P-2 ventral margin slightly convex distally, P-3 ventral margin straight, slightly thickened centrally, P-4 sword seta strong, but weaker than in males

idiosoma L/W 660/470; glandularia 20

coxal field L 401; Cx-3 W 441; Cx-1 + 2 –

I-L-5 dL 306, vL 193, dL/vL 1.59, HA-HC 81, 92, 123, dL/HB 3.33

S-1 L 168, L/W 15.3, S-2 L 132, L/W 6.6, interspace 52, L S-1/2 1.27

I-L-6 L 244, HA-HC 34, 18, 20, dL/HB 13.55; L I-L-5/6 1.25

genital field L/W 153/184, Ac-1-3 L 56, 72, 72

gnathosoma vL –; chelicera L 318, L/H 5.30, bS/claw 2.38

palp	P-1	P-2	P-3	P-4	P-5
L/W	47/39	105/68	125/54	138/35	44/15
(ratio)	1.21	1.54	2.31	3.94	2.93
rel.L	10	23	27	30	10
total L:	P-2/4 0.76				
	459				

The specimens in SMF 4974 are juveniles (very weakly sclerotized, pre- and postgen nearly invisible, genital plates composed of three separate Ac bases). I-L-5 with S-2 basally thickened, I-L-6 longer and more slender than in males; ventrodiscal margin of P-2 less protruding than in male, ventral margin P-4 slightly protruding near proximoventral hair.

Measurements from the first description of the female (Szalay, 1935b): idiosoma L/W 750–900/670–770; coxal field L 390, maximum W 550; I-L-5/6 dL 233/183 (1.27) S-1/2 L 117/83 (1.41) genital field L, 192, both genital plates and gonopore L 117; gnathosoma L 150, H 117, chelicera total L 241; palp L/H P-1 33/33, P-2 75/50, P-3 100/40, P-4 117/30, P-5 33/–, total L 358 µm.

Discussion: In the original description (considering males only) Szalay compared this taxon with *A. nodipalpis*, listing the following differences: glandularia smaller, genital field longer than wide, palp more robust, but with ventral margin of P-2 roundish and much less protruding. Furthermore, he stated that *A. fluviatilis* was similar to *A. gibberipalpis* due to the bipartite ventrodiscal protuberance of P-2. However, *A. nodipalpis* also has a rounded protuberance flanked by a more pointed protrusion at the distoventral edge of P-2. *A. fluviatilis* is rather different from *A. nodipalpis* not only due to the arrangement of the Ac and

the weakly developed ventral protuberance of P-2 in males, but also due to the sword seta of P-4 nearer the distoventral hair in both sexes, and the presence of a slight protrusion of the ventrodiscal margin of P-2 in females. *A. fluviatilis* cannot be considered a subspecies of *A. nodipalpis*. Among the species with striated dorsal integument known in 1929, *A. fluviatilis* is unique due to the combination of diagnostic features mentioned above. (Note, however, that the integument structure can be deduced only from SMF 4974; Szalay gave no information.) *A. distans*, a species having a similarly slender I-L-6 and distal position of the sword seta on P-4, differs in the relatively small Ac, shape and setation of I-L-5, and a straight ventral margin of P-2 in both sexes.

As compared with the original description, the male from Croatia on which this redescription is based differs in the relatively larger genital field, higher total L of palp, with completely different proportions of single segments. However, Szalay's measurements are often in strong contrast to his descriptions and figures and merit little confidence. A male from Israel (SMF) agrees in most measurements with my redescription, but differs in having a genital field strongly reduced in size (L/W 69/83 µm) a shorter palp (total L 285 µm) a relatively thick P-2 (L/H 1.38) and a lower I-L-5/6 ratio (1.25).

The first description of the female (Szalay, 1935b) was based on three females collected together with one male in the same river basin to which the *locus typicus* belongs. As in males, measurement values are considerably lower, but difficult to value. In Szalay's figure, the Ac are arranged in a curved line rather than in an obtuse triangle. With regard to this character, *A. fluviatilis* is probably a species with transitional variability.

Moreover, the female from Israel differs from the specimen from Croatia in minor measurement values: genital field L/W 126/135, palp total L 375 µm, I-L-5/6 L 238/189. Some further differences are found in the more slender S-1 (L/W 11.8) the shorter S-2 (L 85, L S-1/2 1.53) and the more slender I-L-5 (L/H 3.78) and P-4 (L/H 4.25). Apart from absolute values, there appear to be no congruent tendencies of proportional differences in both sexes that would indicate that the populations from Israel and Croatia represent different species. *A. fluviatilis* is a species in need of further revision, due to the geographical variability in the dimensions of idiosoma and appendages.

Habitat: Rhithrobiont

Distribution: The Balkans, Central Europe, Iberian peninsula and Israel; requires revision (1?, 5, 6, 9, 13?, y?).

ATRACTIDES SOPRONIENSIS (SZALAY, 1929)*Megapus soproniensis* Szalay, 1929*Atractides (Megapus) nodipalpis soproniensis* (Szalay, 1929): Szalay, 1956*Atractides fonticolus soproniensis* (Szalay, 1929): Biesiadka, 1979aSyn. to *A. fonticolus* (K. Viets, 1920): syn. nov.

Type series: Missing. *Locus typicus*: Sopron, Bach des Tatscher Grabens, 25.VII.1927, 1 ♀. Collecting site of the male attributed to *A. soproniensis* by Szalay (1956): Aszófő, Abfluss der Rom-Quelle (32) 11.VII.1932, 1 ♂ (type) 1 ♀ und Csopak, Bach (24) 14.VII.1932, 1 ♀ [D].

Description. Female (original description): idiosoma L/W 984/850 µm, distance between Dgl-1 233 µm; coxal field L 400, maximum W 650 µm, Cx-1 L 300 µm, with broadly rounded posteromedial margin, apodemes of Cx-2 in an obtuse angle; I-L-5 dL 241, HB 58, with subparallel dorsal and ventral margins, narrow setal interspace, L S-1 67, S-2 50 µm, S-2 clearly more enlarged than S-1; I-L-6 dL 133 µm, weakly curved, not narrowed distally, I-L-5/6 dL ratio 1.81; genital field L/W 217/250, gonopore L 158 µm, Ac arranged in a triangle; excretory pore unsclerotized, Vgl-1 probably fused to Vgl-2; gnathosoma with short rostrum, palp measurements, P-1–5, L/H 33/40, 83/67, 91/50, 117/33, 33/12, total L 357 µm, P-2 with a blunt ventrodistal protrusion, sword seta of P-4 approaching distoventral hair.

Male (Szalay, 1956): idiosoma L/W 745/639 µm; coxal field L 327, maximum W 491, Cx-1 L 245 µm; I-L-5 dL 178, HB 47, S-1 L 65, S-2 L 57 µm, I-L-6 weakly curved, dL 100 µm (dL I-L-5/6 1.78); genital field with slightly convex, nearly straight anterior, and incised posterior margins, L/W 115/128, gonopore L/W 82/36 µm, excretory pore unsclerotized, Vgl-1 fused to Vgl-2; gnathosoma with short rostrum, chelicera L 208, claw 73 µm; palp measurements P-1–5 L/H 32/33, 65/58, 57/40, 84/34, 28/12, total L 266 µm, P-2 with a relatively strong ventrodistal protrusion, ventrodistal edge of P-3 slightly protruding, P-4 with ventral hairs dividing its ventral margin into three sectors equal in L, medial sword seta inserted halfway between the ventral hairs.

Discussion: In the original description, Szalay stated that *A. soproniensis* was close to *A. vaginalis* without providing any diagnostic characters that could separate the two species. There is in fact some similarity to *A. vaginalis* in the triangular arrangement of the Ac, and I-L-5 with subparallel dorsal and ventral margins. However, the dimensions provided by Szalay surpass much the measurement data of the type of *A. vaginalis*, the I-L-6 of that species is strongly narrowed distally, and the ventral margin of P-2 in females is straight. In terms of the shape of the I-L-6, *A. soproniensis* is more similar to *A. adnatus* (Lundblad, 1956); however, the latter has a straight ventral

margin of P-2 in both sexes. Later, when he described the male, Szalay (1956) was aware that *A. soproniensis* is similar to *A. fonticolus*. As the latter taxon at that time was considered by most authors to be a subspecies of *A. nodipalpis*, he reduced *A. soproniensis* to subspecies level as well. Most differences he found between the two taxa concern measurement values only: both sexes of *A. fonticolus* were found to be smaller than *A. soproniensis*. Furthermore, the I-L of that species has a relatively shortened terminal segment (I-L-5/6 dL ratio 1.74).

The interpretation of *A. soproniensis* is hampered due to loss of types and the incomplete description (e.g. no information on integument structure and dimensions of dorsal glandularia). There is full agreement concerning the shape of the genital field in both sexes, and in both taxa the Vgl-1 is fused to Vgl-2 in males. Furthermore, a slightly protruding distoventral edge of P-3 is also found in *A. fonticolus*, and the medial sword seta of P-4 can be inserted proximal to the distoventral hair. In this case, there is no reason for interpreting weak differences in measurement values as indicators of taxonomic separation, not even at the subspecies level (as proposed by Biesiadka, 1979a). Therefore *A. soproniensis* is here synonymized with *A. fonticolus*.

ATRACTIDES BARSIIENSIS (SZALAY, 1929)*Megapus barsiensis* Szalay, 1929Syn. to *A. loricatus* (Piersig, 1896): Lundblad, 1956, Schwoerbel, 1957

Type series: Missing. *Locus typicus*: Szklenőfürdő, Wilkensäbach, 15.VI.27, 1 ♂; collecting site of the first female described (Szalay, 1935b): stream of the Goldbrunner Tal near Körmöcbánya (Kom. Bars) coll. E. Dudich 12.VIII.1933.

Material examined: SMF 4996 *Atractides barsiensis* (Szalay) ♂ ♀; Jugoslawien Gospić 29.8.1934 Quelle Viets leg. 4996. State of conservation: good, dorsal skin damaged, ♂ Gsk and chelicerae missing, ♀ left I-L damaged, III/IV-L missing.

Description. Male (original description): idiosoma L/W 475/375 µm, integument striated; dorsalia and ventralia well developed as sclerite plates, glandularia surrounded by extended sclerite rings with irregular margin, Dgl-3 fused laterally to the platelet formed by postoc and D-1, Dgl-4 embedded in the plate of D-4; coxal field total L 267, maximum W of Cx-4 333, Cx-4 caudally, and particularly laterally with extended secondary sclerotization; I-L-5 dL 108, HB 41, S-1 67, S-2 50, I-L-6 dL 83 µm, dL ratio I-L-5/6 1.30; genital field L/W 112/125 µm, anterior margin straight, posterior margin slightly incised; excretory pore unsclerotized, Vgl-1 fused to Vgl-2; palp measurements, P-1–5, L/H 17/25, 50/33, 50/33, 83/28, 33/12, total L 233 µm, ventral margin of P-4 divided by the insertion

of ventral hairs in three sectors equal in L, sword seta inserted in the middle between these two hairs.

Male (SMF 4996): idiosoma L/W 410/290 µm, integument striated (11/10 µm) coxal field L 220, Cx-3 W 238 µm, slender, mediocaudal margin Cx-1 tongue-shaped, apodemes of C-2 strong, forming an obtuse angle; I-L-5 ventral and dorsal margins diverging, dL 103, ventral L 84, HA-C 32, 35, 37 µm (low difference HA/B due to ventral seta inserted far distally) S-1/2 L 48/42, I-L-6 L 77, HA-C 22, 21, 21 µm, ratio dL I-L-5/6 1.34; ventralia small but clearly visible as sclerotized dots; genital field L 94, W 103 µm, with anterior incision filled with secondary sclerotization, anterior margin of secondary sclerite straight, Ac-3 caudally extending far over the level of the postgen, external margin of genital field between Ac-2 and Ac-3 slightly concave, excretory pore unsclerotized, Vgl-1 fused to Vgl-2; palp measurements, P-1-5 L/H 23/19, 51/37, 52/30, 79/24, 25/10, total L 230 µm, with slightly protruding ventrodiscal edge of P-2.

Female (Szalay, 1935b): idiosoma dL (without tips of Cx-1) 567, W 433 µm; integument finely granulated, glandularia and sclerites as in males; coxal field L 283, maximum W 367 µm; I-L-5 dL 142, HB 45, S-1/2 L 67/58, I-L-6 L 100, HB 25 µm, dL ratio I-L-5/6 1.42; genital field L 175, W 167, gonopore L 117, genital plates L 100 µm; genital plates with a narrow border of secondary sclerotization, pregenitale with strongly sclerotized posterior margin, but thin sclerotization anteriorly; gnathosoma L 100, chelicera total L 142, claw 58 µm, palp measurements P-1-5, L/H 25/-, 67/50, 75/42, 100/28, 33/-, total L 300 µm

Female (SMF 4996): similar to male, but sclerites generally smaller, partly not fused, only narrow borders of secondary sclerotization; idiosoma L/W 383/256, coxal field 220, Cx-3 W 243 µm, Cx-1 + 2 mL 81, IL 157, W 144 µm; I-L-5 dL 113, vL 92, HA-C 33, 36, 37, S-1/2 L 55/52, I-L-6 L 83, HA-C 24, 22, 22 µm, ratio dL I-L-5/6 1.36; genital field L 126, W 144 µm; palp measurements P-1-5 L/H 23/20, 56/37, 63/31, 81/23, 29/9, total L 252 µm, ventrodiscal edge of P-2 not protruding, P-4 with lower density of dorsal hairs.

Discussion: In the original description, Szalay discussed only diagnostic differences between *A. barsiensis* and *A. lacustris*, a species with dorsal sclerotization at that time known only from a preliminary description. *A. lacustris* is extremely different, e.g. in shape of mouthparts and legs, and belongs to the subgenus *Tympanomegapus*. Only when he described the female did Szalay (1935b) become aware that *A. barsiensis* is similar to *A. loricatus*; he noted differences in the general shape of the idiosoma (roundish in *A. loricatus*, more elliptical in *A. barsiensis*) the terminal segment of I-L, and the genital organ (without explicating the character of differences he

enumerated). From a comparison with Piersig's table 46 (to which Szalay refers) one may deduce that he referred to the narrower pregenitale (surely due to the juvenile state of the specimen depicted by Piersig) but no morphological differences of I-L-6 become evident. With good reason, Szalay asked for a revisional redescription of *A. loricatus*. Lundblad (1956), who discussed the *loricatus*-like water mites without having seen Piersig's types, proposed the concept of an *A. loricatus* very variable with regard to the extension of idiosoma sclerotization (including an excretory pore with or without sclerite ring); he treated *A. barsiensis* as a variety of *A. loricatus*, differing only in a slightly longer I-L-6. Schwoerbel (1957) came to the conclusion that *A. barsiensis* is probably a synonym of *A. loricatus*, a concept finally accepted also by Szalay (1970).

On the other hand, Láska (1960) proposed the following diagnostic characters, as compared with *A. loricatus*: Prefr not fused to the anterior platelets (made up by postoc, D-1 and Dgl-3); all sclerite platelets smaller; male genital field more slender, caudally deeply indented and with oval, not subtriangular Ac; in both sexes, excretory pore without sclerite ring. Numerous other authors followed this proposal and continued to use both names separately (for a complete list, see K. O. Viets (1987). Further detailed discussions of *loricatus*-like water mites were published by Bader (1975, 1994). His observations are however, devalued by the fact that his interpretation of the types of *A. loricatus* was wrong (for a discussion see under *A. loricatus* and *A. placocollosus* Bader, 1994).

My observations of the types of *A. loricatus* and numerous additional preparations of *loricatus*-like mites suggest that they cannot be considered conspecific. That conclusion notwithstanding, *A. barsiensis* is really a synonym of *A. loricatus*. The differentiation proposed by Láska was based on taxonomically useful characters, but what he interpreted as *A. barsiensis* is actually *A. loricatus*, while the specimens attributed by him to *A. loricatus* represent another taxon, discussed below (see *A. brendle* sp. nov.).

The specimens from the Tatra mountains ex coll. Láska used here for the redescription of *A. loricatus* agree closely with the original description of *A. barsiensis*. The specimens from Croatia (SMF 4996) are notably smaller, but do not differ in proportions and general idiosoma and gnathosoma morphology.

ATRACTIDES GRANULATUS (K. VIETS, 1930)

Megapus inflatus granulatus K. Viets, 1930
Syn. to *A. inflatus* (Walter, 1925); Lundblad, 1956

Type series: Lectotype, here designated: SMF 3873 *Atractides inflatus granulatus* ♂ ♀ (Viets) Type; Spanien Madrid Rio Manzanares 4.5.1919 3873;

containing 2 ♂, 2 ♀, one of the ♂ obviously representing a different species (mediocaudal margin Cx-1 + 2 concave, anterior margin of genital field medially incavated, P-3 without ventral protrusion, P-4 thicker, I-L not visible laterally, evtl. = *A. nodipalpis*); the other male designated as lectotype. State of conservation: good.

Discussion: When Viets described this taxon, he clearly did not have to hand Walter's description of the male of *A. inflatus* and restricted the comparison between the two taxa to the female. He stated the following arguments for introducing a new subspecies (characters of *A. inflatus* s.s. in parentheses): ventral margin of P-2 and -3 granulated (smooth); P-4 relatively long (shorter); mediocaudal margin Cx-1 + 2 nearly truncate (tongue-shaped); suture Cx-3/4 equally curved (forming an obtuse angle near Cxg1); I-L-6 more (less) curved.

As Lundblad (1956) pointed out, the granulation is found also in the type of *A. inflatus*; the mediocaudal margin of Cx-1 + 2 is tongue-shaped in young specimens, but becomes more flattened with increasing age,

and also the curvation of I-L-6 is variable in *A. inflatus*. My measurements provide no evidence for any noteworthy difference in relative L of P-4 (*A. inflatus*: 31%, *A. granulatus*: 32%). In Figure 28A, the palp of the lectotype male of *A. granulatus* is depicted. Its description by Viets agrees well with *A. inflatus* (Walter, 1928b). *A. granulatus* is a synonym of *A. inflatus*.

ATRACTIDES VALENCIANUS (K. VIETS, 1930)
(FIG. 34A–G)

Megapus valencianus K. Viets, 1930

Type series: Lectotype ♂, here designated SMF 2733 *Atractides valencianus* Viets ♂; Spanien Zaragoza Balsa salada 8.7.1918 2733 containing two ♂, one of them dissected (lectotype) the other undissected (paralectotype). State of conservation: good, both palps separate laterally, of the chelicerae only one basal segment remaining, Gsk missing. Paralectotype: SMF 3845 ♀, labelled like lectotype. State of conservation: good, idiosoma irregularly dissected, with genital field longitudinally ruptured, both palps, both I-L lateral, only one chelicera preserved, with broken claw tip.

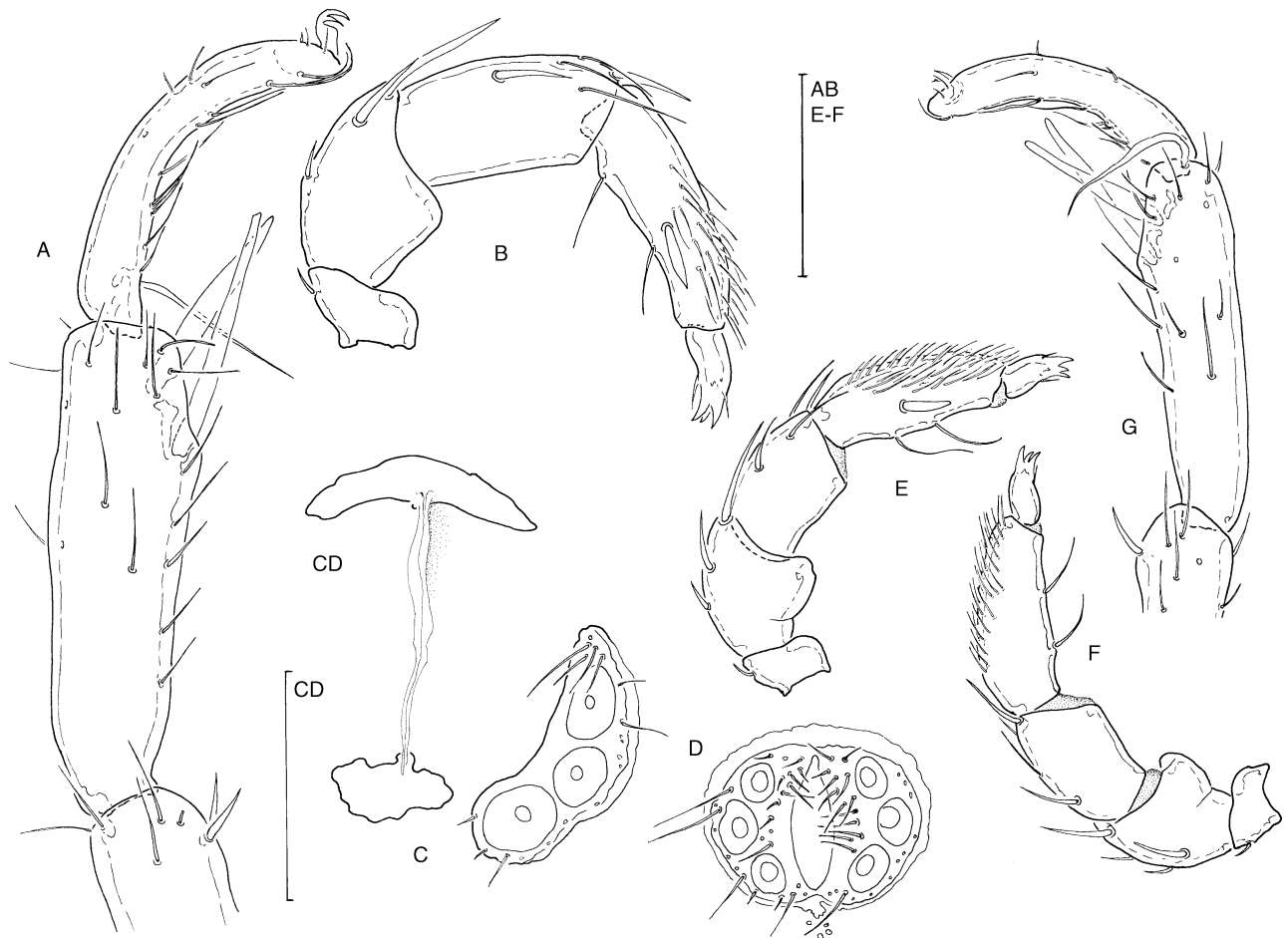


Figure 34. *Atractides valencianus*, type series. A–C, paralectotype ♀, D–G, lectotype ♂. A, ♀ I-L-5 and -6; B, ♀ palp, medial view; C, ♀ genital field without right genital plate; D, ♂ genital field, E, ♂ palp, medial view; F, ♂ palp, lateral view; G, ♂ I-L-5 and -6. Scale bars = 100 µm.

Description:**General features**

dorsal integument: lineated (5/10); muscle attachments: unsclerotized
 I-L: I-L-5 S-1 and -2 wide interspace and rather slender, S-2 distally truncated, S-2 pointed, slightly thicker; I-L-6 basally and distally slightly thickened, curved
 genital field: Ac small and roundish, in an obtuse triangle
 excretory pore: smooth; Vgl-1: not fused to Vgl-2
 palp: sexual dimorphism

Males**Lectotype**

genital field: anterior margin primary and secondary sclerotization irregularly convex, posterior margin primary sclerotization slightly indented, secondary sclerotization irregular; genital setae: 50
 palp: P-2 convex extension protruding at the distoventral edge, with a fine longitudinal line separating a lateral lamellar part that continues into the laterodistal margin of the segment, from the more strongly sclerotized protrusion proper; ventral margin P-3 slightly concave, P-4 1 : 1 : 1 or 2 : 1 : 2, sword seta strong, between ventral hairs
 idiosoma L/W 590/480; glandularia 25
 coxal field L 306; Cx-3 W 378; Cx-1 + 2 mL 85, IL 163, W 224
 I-L-5 dL 180, vL 128, dL/vL 1.41, HA-HC 40, 47, 58, dL/HB 3.83
 S-1 L 87, L/W 12.4, S-2 L 78, L/W 7.8, interspace 16, L S-1/2 1.12
 I-L-6 L 132, HA-HC 25, 20, 20, dL/HB 6.60; L I-L-5/6 1.37
 genital field L/W 76/92, Ac-1-3 L 17, 19, 20
 gnathosoma vL 134; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/30	73/55	70/44	99/35	35/13
(ratio)	0.97	1.33	1.59	2.83	2.69
rel.L	9	24	23	32	11
total L:	P-2/4 0.74				
	306				

Coxae with narrow borders of secondary sclerotization, mediocaudal margin of Cx-1 + 2 tongue-shaped, apodemes of Cx-2 in an obtuse angle, curved; secondary sclerotization surrounding the whole genital field as a narrow strip, anteriorly convex, posteriorly irregular due to small muscle insertion dots asymmetrically fused to the medial margin, medial genital hairs arranged in paired rows flanking the gonopore; P-2 with a fine line extending in the basal third from the lateral to the medial surface, in lateral view visible as an obtuse angle in the ventral margin of the segment, P-4 relatively short and thick, laterally widened to 45 µm, with ventral setae relatively short.

Females**Paralectotype**

genital field: pregen large, genital plate with small border of secondary sclerotization, Ac-2 smaller than Ac-1 and -3, Ac-1 longish, Ac-3 round
 palp: P-2 ventrodorsal edge slightly protruding and rounded, P-3 ventral margin straight, P-4 1 : 2 : 2, sword seta nearer to the distoventral hair
 idiosoma L/W 750/600; glandularia 30
 coxal field L 392; Cx-3 W 526; Cx-1 + 2 mL 90, IL 220, W 306
 I-L-5 dL 238, vL 157, dL/vL 1.55, HA-HC 67, 72, 86, dL/HB 3.31
 S-1 L 123, L/W 12.3, S-2 L 103, L/W 7.9, interspace 29, L S-1/2 2.94
 I-L-6 L 174, HA-HC 30, 22, 25, dL/HB 7.91; L I-L-5/6 1.37
 genital field L/W 180/216, Ac-1-3 L 29, 27, 31
 gnathosoma vL 180; chelicera L 314, L/H 5.41, bS/claw 2.49

palp	P-1	P-2	P-3	P-4	P-5
L/W	42/38	103/72	112/58	130/41	47/16
(ratio)	1.11	1.43	1.93	3.17	2.94

rel.L	10	24	26	30	11
total L:	P-2/4 0.79				
	434				

Genital plates L 129 µm; two eggs (diameter 125 µm); palp rather robust.

Discussion: Viets compared the male of *A. valencianus* with *A. ovalis* and *A. spinipes*, two species which have little or no protruding ventrodorsal margins of P-2, and elaborated the following differences: *A. ovalis* has a more slender palp, a relatively less large P-4 and a sword seta inserted more distally, larger Cx-4, a shorter I-L-6 and shorter S-1 and -2 on I-L-5. In *A. spinipes*, the P-4 would be laterally enlarged 'and the genital plate not incised anteriorly and posteriorly'. The latter statement is obviously erroneous; what Viets was attempting to convey was that the plate is incised in what he called *A. spinipes* (see K. Viets, 1936: fig. 279). Further important characters that separate *A. valencianus* from *A. ovalis* are the wider setal interspace on I-L-5, and the absence of swimming hairs from III/IV-L. *A. spinipes* was at that time, and has henceforth remained, a species of doubtful characters. *A. valencianus* differs from *A. spinipes* as redefined in this paper in the lineated dorsal integument, a more slender I-L-6, the sword setae of I-L-5 further apart, the Vgl-1 not fused to Vgl-2, the ventrodorsal edge of P-2 with more strongly developed protrusion in males, but completely devoid of thickening or rounding in females, and the ventral margin of P-3 in males not convex in the distal part.

Since the original description, no further records have been published, and only Lundblad made brief reference to its morphology: In 1956 he published two photographs of the ventral idiosoma of a female and a male from Viets' type series, but without making any mention in the text, and in 1962 he mentioned the shape of its P-2 when he described *A. neumani*.

From the other species with lineated dorsal integument and weakly developed protrusion of P-2 in males known at that time (*A. arcuatus*, *A. panniculatus*, *A. fissus*, *A. legeri*) *A. valencianus* is most similar to *A. arcuatus* due to roundish Ac in both sexes arranged in an obtuse triangle or in a weakly curved line, the absence of denticulation or rugosity on the protrusion of male P-2, and the posterior margin of the male genital field not deeply indented. For a clear separation of *A. valencianus* from *A. arcuatus*, a redescription of the latter species is necessary. From the available information, *A. arcuatus* has larger Ac (and consequently a more narrow surrounding border of genital plate sclerite) more equal in size in females, and a smaller palp (total L ♂ 230, ♀ 353 µm).

Habitat: Rhithrobiont, from a stream near a spring laden with saltpetre.

Distribution: Spain, known only from the *locus typicus* (1).

ATRACTIDES CULTELLATUS (K. VIETS, 1930)
(FIG. 35A–C)

Megapus cultellatus K. Viets (1930)

Atractides distans cultellatus (K. Viets, 1930): Besseling, 1954

Type series: Lectotype ♀, here designated, SMF 3881 *Megapus cultellatus* Viets ♀ Type; Spanien, Madrid, Rio Manzanares, 14.5.1919 3881. State of conservation: good, containing two specimens; lectotype: the left specimen (three eggs, gnathosoma separate with palps not detached, genital field in oblique position). Paralectotype: the right specimen (no eggs, gnathosoma separate in dorsal position, both palps separate laterally, genital field plain).

Description:

General features

Male unknown

dorsal integument: lined (4–5/10); muscle attachments: unsclerotized

I-L: I-L-5 wide setal interspace and different in size, both equally narrowed distally and with blunt tips, S-1 slender, S-2 thickened in its basal third; I-L-6 slender.

genital field: Ac in a weakly curved line
excretory pore: smooth; Vgl-1: not fused to Vgl-2
palp: see below

Female

Lectotype

genital field: Ac-1/2 slender, Ac-3 roundish, with straight margin facing Ac-2
palp: P-2 ventrodorsal margin convexly protruding, P-3 ventral margin straight, P-4 1 : 2 : 1, sword seta close to the distoventral hair
idiosoma L/W 680/620; glandularia 29
coxal field L 370; Cx-3 W 450; Cx-1 + 2 mL 90, IL 171, W 247
I-L-5 dL 215, vL 125, dL/vL 1.72, HA-HC 56, 63, 96, dL/HB 3.41
S-1 L 114, L/W 12.7, S-2 L 85, L/W 5.7, interspace 44, L S-1/2 1.34
I-L-6 L 174, HA-HC 26, 17, 22, dL/HB 10.2; L I-L-5/6 1.24
genital field L/W 156/170, Ac-1–3 L 30, 30, 30
gnathosoma vL 148; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	33/31	72/49	92/37	105/28	40/12
(ratio)	1.06	1.47	2.49	3.75	3.33
rel.L	10	21	27	31	12
total L:	P-2/4 0.69				
342					

Glandularia regularly round, diameter 22 (dorsally) to 29 µm (ventrally); both gonopore and genital plate L 124 µm, 3 eggs (diameter 103 µm); P-4 sword seta

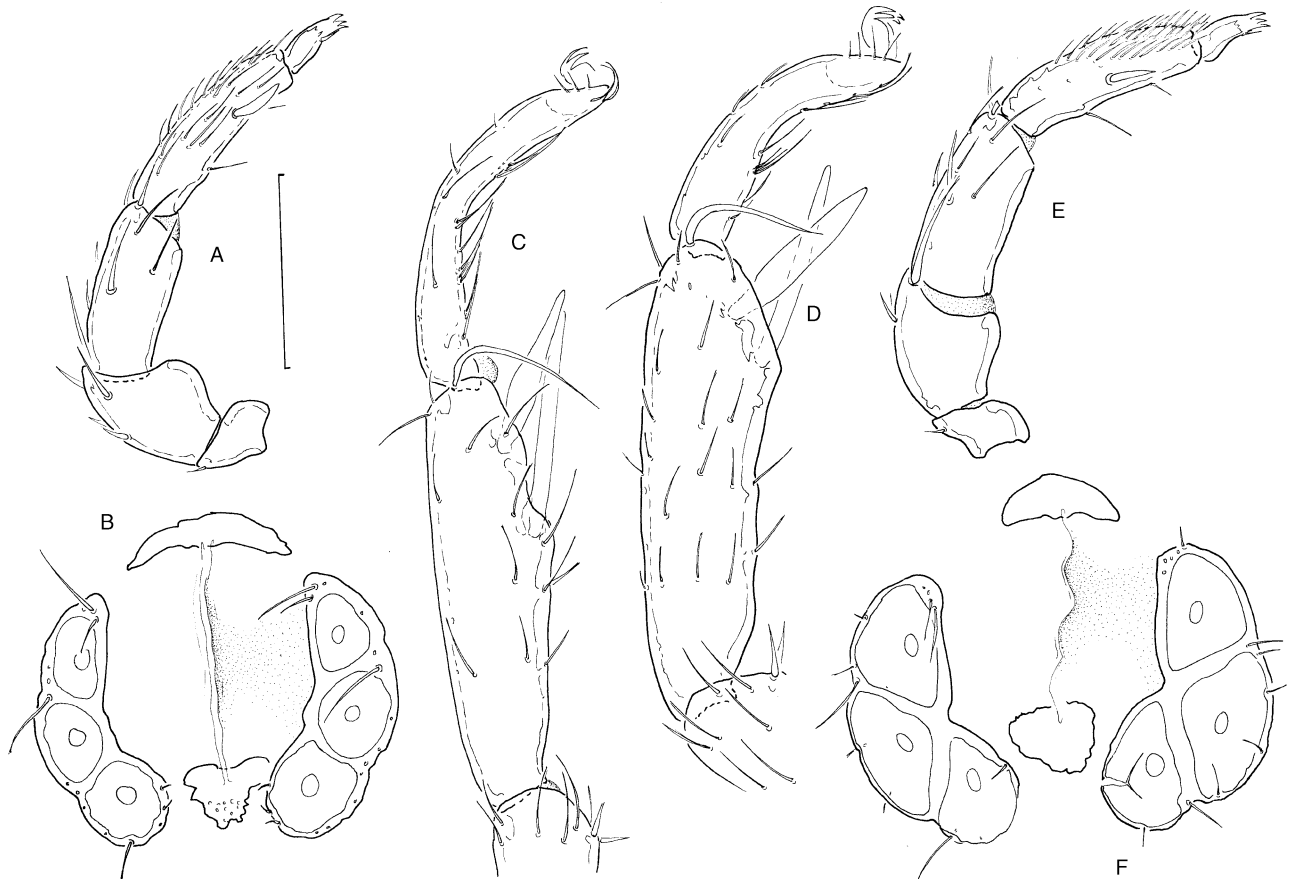


Figure 35. A–C, *Atractides cultellatus*, holotype ♀ SMF 3881. A, palp, medial view; B, genital field; C, I-L-5 and -6. D–F, *Atractides angustiporus*, holotype ♀ SMF 3943. D, I-L-5 and -6; E, palp, medial view; F, genital field. Scale bars = 100 µm.

knife like enlarged, distally sloped, inserted near the ventral margin close to the distoventral hair.

Discussion: In the original description, Viets stated that due to the shape of P-2 and position of S-1 and -2 on I-L-5, among the European species *A. cultellatus* were most similar to *A. fissus*. This species has generally larger dimensions of idiosomal sclerites and all appendages, and differs also in the more extended ventrodistal furrow of I-L-5 (ratio dL/vL 1.55, *A. cultellatus* 1.72), a relatively short I-L-6 (ratio dL I-L-5/6 1.34, in *A. cultellatus* 1.24) less strongly narrowed in the centre of the segment (ratio HA/HB 1.32, in *A. cultellatus* 1.53), the larger Ac arranged in a triangle, and the less protruding ventral margin of P-2.

Besseling (1954) noted a similarity to *A. distans* and proposed ranking *A. cultellatus* as a subspecies of it. The two species agree in a series of idiosoma and appendage measurement values, but, apart from the presence of a lineated dorsal integument, the following characters separate *A. cultellatus* from *A. distans* (in parentheses): P-2 more robust, L/H 1.47 (1.61); P-3 and P-4 more slender, L/H 2.49, 3.75 (2.19, 3.47); S-1 shorter, 114 (161) μm and distally not enlarged, S-2 much thicker, L/W 5.67 (9.91) I-L-6 relatively short, dL ratio I-L-5/6 1.24 (1.03).

Viets paid attention to a small membranous vesicle near the insertion of I-L-6 of the specimen on which his description was based (and the presence of this vesicle influenced his choice of lectotype). This is clearly an artefact that can be observed occasionally when the membranous integument in the 'armpit' of I-L-5 and -6 is inflated (Fig. 9F). *A. cultellatus* is a well-defined species that cannot be confused with any of the taxa known at the time of its description. A better definition of the range of variability of females and the description of the still unknown male is necessary for a better understanding of its taxonomic position.

Habitat: Rhithrobiont.

Distribution: Spain, known only from the *locus typicus* (1).

ATRACTIDES ANGUSTIPORUS (K. VIETS, 1930)
(FIG. 35D–F)

Megapus angustiporus K. Viets, 1930

Type series: Holotype ♀, SMF 3943, Spanien, Huesca, Rio Ara, 16.7.1919. State of conservation: good, dorsum/ventrum separated, gnathosoma, both palps, one I-L separate in lateral position.

Description:

General features

Male unknown

dorsal integument: striated (7/10); muscle attachments: not sclerotized

I-L: I-L-5 long and distally thickened, S-1 and -2 wide interspace; S-1 slender, S-2 sword-like enlarged; both with blunt tips, I-L-6 short and slender, curved, basally thickened.

genital field: Ac in a triangle

excretory pore: smooth; Vgl-1: not fused to Vgl-2

palp: see below

Females

Holotype

genital field: pregen narrow, Ac large, closely adpressed to each other, surrounded by a narrow border of genital plate sclerite

palp: P-2 ventral margin weakly S-shaped, convex in the distal part, P-3 ventrally straight, P-4 2 : 3 : 1, sword seta between ventral hairs

idiosoma

L/W

650/550;

glandularia

25

coxal field

L

365;

Cx-3

W

515;

Cx-1 + 2

mL

94,

IL

180,

W

279

I-L-5

dL

232,

vL

171,

dL/vL

1.36,

HA-HC

59,

70,

79,

dL/HB

3.31

S-1

L

94,

L/W

10.4,

S-2

L

103,

L/W

6.4,

interspace

22,

L

S-1/2

0.91

I-L-6

L

144,

HA-HC

31,

23,

23,

dL/HB

6.26;

L

I-L-5/6

1.61

genital field

L/W

184/211,

Ac-1-3

L

49,

61,

52

gnathosoma

vL

139;

chelicera

-

palp	P-1	P-2	P-3	P-4	P-5
L/W	31/31	81/53	96/44	106/30	34/14
(ratio)	1.00	1.53	2.18	3.53	2.43
rel.L	9	23	28	30	10
total L:	P-2/4 0.76				
348					

Upper integument layer striated, lower layer thickened and leathery, strengthened around muscle insertions; glandularia round, length both of gonopore and genital plate 149 μm .

Discussion: Without going into detail, Viets found in the morphology of *A. angustiporus* 'reminiscences' of *A. vaginalis*, but listed the following differences in the latter species: integument without striation, narrow setal interspace on I-L-5, I-L-6 shorter, and ventral margin of P-2 straight. In comparison with *A. panniculatus*, he found in *A. angustiporus* a thicker I-L-6 and the sword seta P-4 inserted more proximally. Viets was in error when he identified the integumental striation of *A. angustiporus* with the lineation as found in *A. panniculatus*. *A. angustiporus* differs from *panniculatus*-like 'truly lineated' species (with interspaces between lines much larger than the width of the lines) in the dense arrangement of the striae. *A. fluvialtilis* has smaller Ac arranged in a weakly curved line, and a much longer I-L-6 (L I-L-5/6 1.2–1.4). *A. nodipalpis* (in parentheses) differs from *A. angustiporus* in the relatively long I-L-5 (I-L-5/6 dL ratio 1.32–1.56) and the less slender I-L-6 (dL/HB > 6.5).

Since the first description, only one find of *A. angustiporus* has been published, concerning three females and one deutonymph from the Massif de Néouvielle (French Pyrenees) but without giving any morphological details (C. Angelier, 1950). Szalay (1935a) described *A. angustiporus lobatus*, an uncertain subspecies from Hungary. *A. angustiporus* has remained defined by a minor character combination and should be redefined based on a variability study of populations from the *locus typicus* area.

Habitat: Rhithrobiont.

Distribution: Pyrenees (Spain, France) (2).

ATRACTIDES ADENOPHORUS (K. VIETS, 1930)
(FIG. 36A–E)

Megapus adenophorus K. Viets, 1930

[Syn. to *A. loricatus* Piersig, 1896: Lundblad, 1956, rejected synonymy]

Type series: Holotype ♀ SMF 3973 *Atractides adenophorus* Viets ♀ Type; Spanien Huesca Rio Ara 16.7.1919. State of conservation: good, idiosoma in toto, genital field oblique, gnathosoma separate with appendages *in situ*, both I-L separated, lateral.

Description:

General features

Male unknown

dorsal integument: striated (8/10); muscle attachments: sclerotized as typical for *loricatus*-like species, pref. not fused to postoc

I-L: I-L-5 distally enlarged, S-1 and -2 closely together, with blunt tips, S-1 slender, S-2 thickened; I-L-6 short, curved, with distally slightly converging dorsal and ventral margins

genital field: Ac in an obtuse triangle

excretory pore: weak semicircular sclerite embracing the caudal edge;

Vgl-1: fused to Vgl-2

palp: see below

Females

Holotype

genital field: pregen large, with anterior border of secondary sclerotization; genital plates triangular, with weakly concave medial margin, Ac strongly protruding caudally

palp: ventral margin P-2 weakly S-shaped, P-3 and P-4 straight, P-4 2 : 2 : 1, sword seta between the ventral hairs

idiosoma L/W 660/540; glandularia 30

coxal field L 238; Cx-3 W 297; Cx-1 + 2 mL 90, IL 171, W 247

I-L-5 dL 123, vL 99, dL/vL 1.22, HA-HC 30, 37, 39, dL/HB 3.32

S-1 L 60, L/W 10.0, S-2 L 54, L/W 6.8, interspace 5, L S-1/2 1.11

I-L-6 L 83, HA-HC 24, 22, 21, dL/HB 3.77; L I-L-5/6 1.48

genital field L/W 175/184, Ac-1-3 L 49, 61, 52

gnathosoma vL 96; chelicera L 177, L/H 3.05, bS/claw 2.28

palp	P-1	P-2	P-3	P-4	P-5
L/W	24/21	63/38	70/33	89/24	30/10
(ratio)	1.14	1.66	2.12	3.71	3.00
rel.L	9	23	25	32	11
total L:	P-2/4 0.71				
	276				

Upper integument layer striated, a further, interior striated integument layer with striae in perpendicular arrangement; glandularia surrounded by circular sclerites; dorsal and ventral muscle insertions well sclerotized, forming the typical pattern of dorsalia and ventralia, partly fused with neighbouring glandularia and seta-bearing platelets as described for *A. loricatus*; Cx-1 + 2 with weakly convex mediocaudal margin and apodemes of Cx-2 directed laterally, caudal margin of Cx-4 with a border of well-developed secondary sclerotization; total L I-IV-L: 488, 389, 365, 700 µm; gonopore L 133, genital plates L 125 µm, strongly sclerotized, with a fine lateral border of secondary sclero-

tization. Male: Unknown. the description provided by E. Angelier (1949a,b) has to be referred to a species different from *A. adenophorus*.

Discussion: Viets dispensed completely with a discussion of diagnostic features, as did Angelier (1949b) in the first description of a male attributed to this species. In his discussion of the variation in *A. loricatus*, Lundblad (1956) considered *A. adenophorus* a weakly sclerotized specimen of *A. loricatus* and proposed its synonymization. Indeed, there is agreement between the types of both species with regard to nearly all idiosoma and gnathosoma measurements. However, two clear differences argue for retaining *A. adenophorus* as a separate species: the shape of I-L-6 (relatively short, dL ratio I-L-5/6 1.52, in *A. loricatus* 1.30–1.39, and distally equally narrowed, HB > HC, in *A. loricatus* HB < HC) and the presence of a sclerite halfring at the excretory pore (completely smooth in *A. loricatus*). The description of males and females attributed to this species by E. Angelier (1949a,b) must be referred to *A. loricatus* or another *loricatus*-like species: they have a smooth An, and the dL ratio I-L-5/6 in females is 1.39.

Habitat: Rhithrobiont.

Distribution: Spain, known only from the *locus typicus* (1).

ATRACTIDES SEPARATUS (K. VIETS, 1931)
(FIG. 37A–H)

Megapus coriaceus K. Viets, 1925 *partim*

Megapus separatus K. Viets, 1931

Syn. *Atractides franciscanus* Bader & Gerecke, 1996: syn. nov.

Type series: Holotype ♀, SMF 3276 *Atractides separatus* ♀ (Viets) Type; Oesterreich. Innsbruck, Quelle i. Wattental, 27.8.23. Viets leg. 3276. State of conservation: good, idiosoma *in toto*, gnathosoma separate, with one palp and chelicerae lateral, one palp and both I-L separate, lateral.

Material examined: *A. franciscanus*, type series and further 2 ♂, 11 ♀ from springs in the Schapbach and Herrenroint area, Berchtesgaden National Park, coll. Gerecke, Schrankel & Martin, 1996–2000. A specimen preserved under this name in NHMB (Schwendebach 3.8.1945 coll. Walter) and not previously published is of uncertain taxonomic identity, but is very unlikely to represent *A. separatus*.

Description:

General features

dorsal integument: striated (7/10); muscle attachments: unsclerotized

coxal field: sexual dimorphism

I-L: I-L-5 narrow setal interspace, S-1 and -2 similar in shape, blunt, I-L-6 short and curved, with distally diverging dorsal and ventral margins

genital field: Ac in an obtuse triangle

excretory pore: sclerotized (slight sexual dimorphism!); Vgl-1: not fused to Vgl-2

palp: no sexual dimorphism; ventral margins P-2–4 straight, P-4 2 : 3 : 1, sword seta between ventral hairs

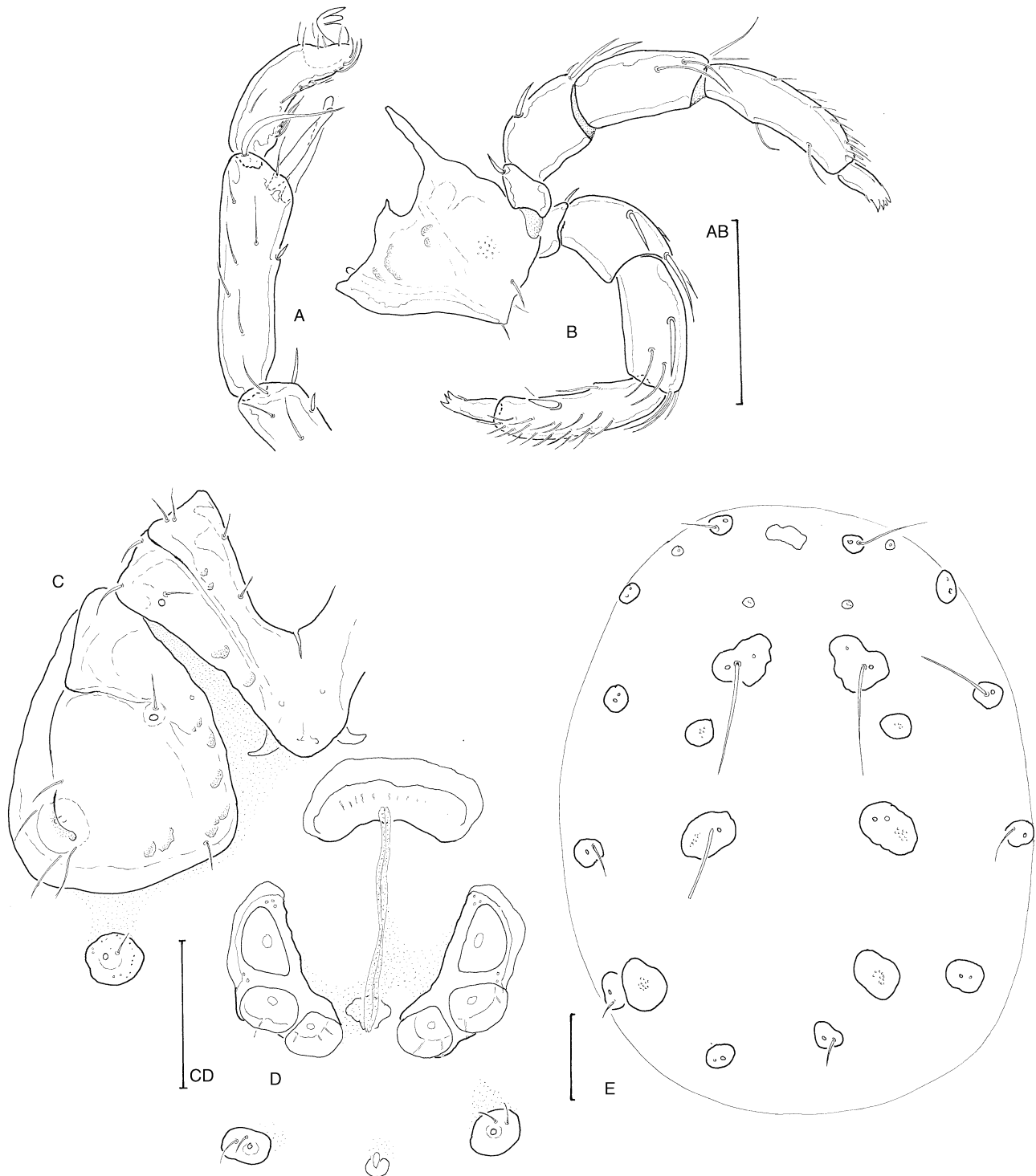


Figure 36. *Atractides adenophorus*, holotype ♀ SMF 3973. A, I-L-5 and -6; B, gnathosoma and palps lateral view; C, coxal field; D, genital and postgenital field, E, dorsal idiosoma. Scale bars = 100 µm.

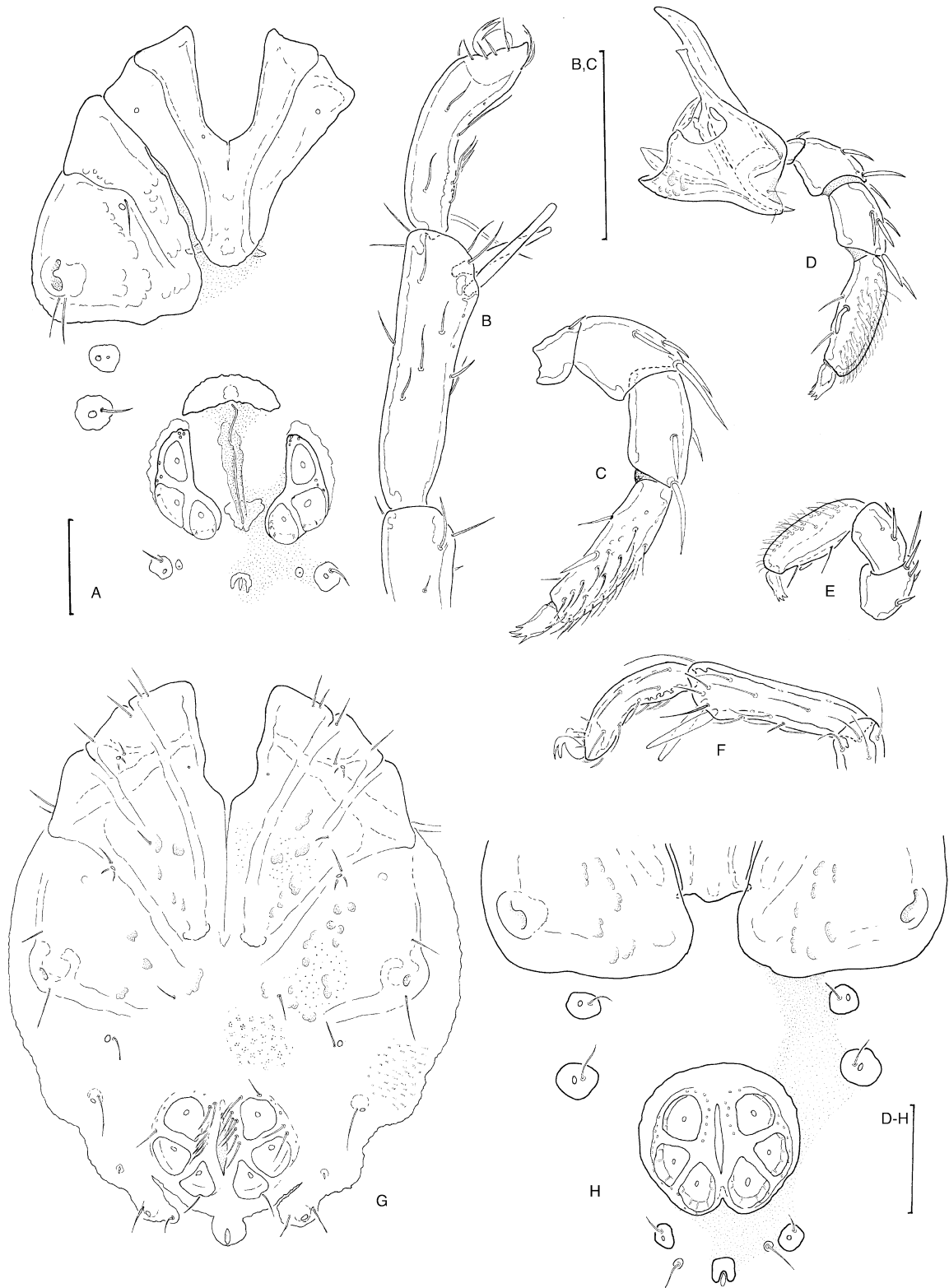


Figure 37. *Atractides separatus*, A–C, holotype ♀ (from Totschnig *et al.*, 1999), D–G *A. franciscanus* Bader & Gerecke, type series (= syn. to *A. separatus*); H, misshapened ♂ from Berchtesgaden. A, ♀ idiosoma, ventral view; B, ♀ I-L-5 and -6; C, ♀ palp, medial view; D, ♂ gnathosoma and left palp, medial view; E, ♂ left palp, lateral view; F, ♂ I-L-5 and -6; G, ♂ ventral idiosoma; H, ♂ ventrocaudal idiosoma with reduced sclerotization. Scale bars = 100 µm.

Males

Paratype of *A. franciscanus*

coxal field: ventral surface covered by an extended shield including coxae, Vgl-3/4, genital field, and occasionally also excretory pore and Vgl-1 + 2; if exceptionally this shield is not formed, the excretory pore is anteriorly embraced by a horseshoe-shaped sclerite

genital field: (if exceptionally not enclosed into the ventral sclerotization), with equally convex anterior, and deeply indented posterior margin; genital setae: 50

palp: P-4 slightly thicker than in females, occasionally inflated

idiosoma L/W 570/450; glandularia 30

coxal field L 315; Cx-3 W 330; Cx-1 + 2 mL 128, IL 222, W 275

I-L-5 dL 150, vL 121, dL/vL 1.24, HA-HC 31, 41, 47, dL/HB 3.66

S-1 L 65, L/W 7.22, S-2 L 60, L/W 6.00, interspace 8, L S-1/2 1.08

I-L-6 L 112, HA-HC 27, 25, 27, dL/HB 4.48; L I-L-5/6 1.34

genital field L/W 100/140, Ac-1-3 L 40, 35, 37

gnathosoma -; chelicera L 207, L/H 5.75, bS/claw 2.91

palp	P-1	P-2	P-3	P-4	P-5
L/W	30/23	57/45	62/37	96/35	27/12
(ratio)	1.30	1.27	1.68	2.74	2.25
rel.L	11	21	23	35	10
total L:	P-2/4 0.59				
272					

Measurements of the ventral shield: L/W 495–515/380–405 µm; in all specimens, the excretory pore sclerite ring not equal in thickness but anteriorly enlarged and posteriorly rather thin.

Females

Holotype, variability of selected measurements for specimens for Berchtesgaden in parentheses

coxal field: in mature specimens, coxae with an extended border of secondary sclerite, but never fused to a unique coxal shield

genital field: pregen large, genital plates medial margin with a kink on the level of Ac-2, Ac-3 caudally protruding

excretory pore: sclerite ring incomplete in most specimens, caudally open, in juveniles restricted to the anterior edge

idiosoma L/W 640/460 (650–900/450/600); glandularia 35

coxal field L 290 (320–360); Cx-3 W 336 (350–450); Cx-1 + 2 mL 130 (128–160), IL 216 (215–260), W 256 (265–330)

I-L-5 dL 152 (148–180), vL 114 (115–135), dL/vL 1.33, HA-HC 34, 40, 49, dL/HB 3.80

S-1 L 69 (78), L/W 11.5, S-2 L 61 (75), L/W 6.8, interspace 9, L S-1/2 1.13

I-L-6 L 114 (115–135), HA-HC 26, 23, 29, dL/HB 4.96; L I-L-5/6 1.33

genital field L/W 171/193 (200–230/200–235), Ac-1-3 L 41, 48, 43

gnathosoma -; chelicera L 206, L/H 7.10, bS/claw 2.38

palp	P-1	P-2	P-3	P-4	P-5
L/W	27/22	54/40	67/30	87/25	27/11
(ratio)	1.23	1.35	2.23	3.48	2.45
rel.L	10	21	26	33	10
total L:	P-2/4 0.62				
262					
(283–320)					

Glandularia with irregular margin, medial and caudal margins of Cx-4 with a thick, slightly irregular border of secondary sclerotization; genital plates with well developed anterolateral border of secondary sclerotization, Ac relatively small, Ac-2 and -3 protruding over the caudal margin of the plates, pregen strong and large; ventral margin of P-2 without protrusion.

Discussion: Viets introduced this taxon without any description or evaluation, in a single sentence: ‘Das

von mir, 1925 [...] provisorisch zu *Megapus coriaceus* Viets, 1925 ♂ gestellte ♀ ist spezifisch andersartig; es möge *Megapus separatus* n.nom. benannt werden’. The paper in question contains three figures of I-L-5 and -6, palp, and the ventral idiosoma of the female (Viets, 1925: 59, 61, 62) but has no explaining text. We thus have no idea about the reasons underlying his decision to introduce *A. separatus*. Since then, the name has appeared only occasionally in species catalogues until Totschnig *et al.* (1999) gave a redescription. A tentative collection of additional specimens in the *locus typicus* was not successful: in order to compensate ecologically (‘Ausgleichsmaßnahme’) for the asphaltting of the area, the spring that probably represents the *locus typicus* has been transformed into a pond (signposted ‘Biotop’).

The gap in measurement values between *A. separatus* and the recently described *A. franciscanus*, with the former appearing to be a very similar, albeit distinctly smaller species, has in the meantime been filled by variability studies on additional material from the springs surrounding the *locus typicus* of *A. franciscanus* in Berchtesgaden. *A. separatus* appears now to be a rather variable species, with the type representing the lower limit of the range in female size.

Males of *A. separatus* are unique among the *Atractides* species known at that time in the extended ventral sclerotization typically including coxae, genital field and Vgl-3 + 4, in some cases also the excretory pore and Vgl-1 + 2, combined with a complete absence of sclerotized dorsal muscle attachments.

Due to the excretory pore with an inconspicuous sclerite restricted to the anterior edge or embracing it like a horseshoe, females of *A. separatus* are also not easily confused with any other *Atractides* species. In the Berchtesgaden populations one male appeared to be without secondary sclerotization, with coxal plates separated from each other by membranous strips. This specimen is obviously not juvenile, with dark sclerite margins; it can be recognized as belonging to *A. separatus* only by the combination of Vgl-1 + 2 not fused, and the excretory pore bearing a posteriorly open, horseshoe-shaped sclerite as described for females.

Habitat: Crenobiont; mostly taken in helocrenes.

Distribution: Alps (Austria, south-east Germany) (4).

ATRACRIDES DRAMENSIS (KOTZIAS, 1931)

Megapus dramensis Kotzias, 1931

Syn. to *A. pennatus* (K. Viets, 1920): K. Viets, 1956

Type series: Missing. **Locus typicus:** Kaltstenotherme Quellen des Gutes Kempeczowitz, sogenanntes 5-Quellen-Loch, 100 m westlich vom Gut [no date], Drama valley (PL).

Discussion: Kotzias compared his species mainly to *A. vaginalis*, from which it differs in the lineated integument (4/10 µm) the palp bearing a ventrodistal protrusion in both sexes, the shape of genital field and acetabula, and the relatively long I-L-6. All these characters, and also additional features such as extended sheaths at the distal margins of I-L-3/4, setation of P-4, and the shape of the male genital field, are found also in *A. pennatus*. Kotzias was aware of this similarity and mentions as distinctive characters of *A. dramensis* the truncate (not slightly convex) anterior margin of the genital field, and a more extended field of dorsal hairs on P-4. Both characters are now known to be variable in *A. pennatus* and cannot be used to distinguish species. The fact that most measurements in the original description lie constantly 5–10% above the values here provided for *A. pennatus* could be due to a technical error, or interpreted as an example of individual variability without taxonomic importance. The similarity in shape and setation between male and female palps mentioned by Kotzias is surprising. In *A. pennatus*, one may observe that the female P-2 is similar to the male one, but it consistently appears to have a weaker ventral protrusion. In view of the similarity between the two taxa in all other regards, it is likely that Kotzias simply expressed his observations imprecisely. As proposed by K. Viets (1956), *A. dramensis* should be considered a synonym of *A. pennatus*.

ATRACTIDES SUBTERRANEUS (K. VIETS, 1932)
(FIG. 38A–D)

Megapus subterraneus K. Viets, 1932
Syn. *A. obovalis* (Szalay, 1946): syn. nov.

Type series: Holotype ♂, SMF 4535 *Atractides subterraneus* (Viets) ♂; Jugoslavien Skoplje 4535. State of conservation: mounting medium turbid, dorsal integument damaged, left Cx-1 + 2 broken, gnathosoma and both I-L separate, chelicerae *in situ*, one palp separate.

Material examined: [all the following material not part of the type series; all indications on the labels pertinent to eventual types not correct, including the designation of paratypes published in the catalogue of K. Viets (1956: 344)]. SMF 4587 ♂ *Atractides subterraneus* (Viets) ♂ Cotype; Jugoslavien Skoplje August 1932 5487; SMF 4708 ♀ SMF 4783 Dn, both labelled like 4587; SMF 5481 Dez. 1936 Karaman, Cotype, 2♂, 2♀ badly damaged, many precipitations in mounting fluid; Skoplje 1936 Karaman coll., tube material from coll. K. Viets, 4♂, 2♀, partly dissected and slide-mounted (Gerecke).

Description:

General features

dorsal integument: smooth; muscle attachments: unsclerotized; eyes reduced coxal field: external edges of coxae little protruding; generally weak sclerotization

I-L: I-L-5 basally narrow, distally moderately thickened, S-1 and -2 similar in shape, with pointed tips, close to each other; I-L-6 nearly straight, dorsal and ventral margins slightly diverging distally, claw strong

genital field: Ac very small

excretory pore: smooth; Vgl-1: not fused to Vgl-2

palp: no sexual dimorphism; dorsal setae enlarged and hyaline, P-2 ventrodistally convexly swollen, but without distinct protrusion, ventral margin P-4 1 : 1 : 1, slightly thickened near insertion of proximoventral hair, sword seta strong, near distoventral hair

Male

SMF 4587

genital field: nearly circular, only mediocaudally incised, anterior edges of gonopore and Ac-1 considerably distant from anterior margin of genital field; hairs in the area flanking the gonopore arranged in double rows, Ac oval; genital setae: 50

idiosoma L/W 430/315; glandularia 17

coxal field L 185; Cx-3 W 243; Cx-1 + 2 mL 69, IL 152, W 174

I-L-5 dL 96, vL 79, dL/vL 1.22, HA-HC 22, 25, 29, dL/HB 3.84

S-1 L 39, L/W 9.8, S-2 L 35, L/W 8.8, interspace 3, L S-1/2 1.11

I-L-6 L 100, HA-HC 20, 19, 21, dL/HB 5.26; L I-L-5/6 0.96

genital field L/W 78/83, Ac-1-3 L 15, 15, 20

gnathosoma vL 78; chelicera L 168, L/H 6.22, bS/claw 2.23

palp	P-1	P-2	P-3	P-4	P-5
L/W	17/16	40/33	38/25	71/21	24/9
(ratio)	1.06	1.21	1.52	3.38	2.67
rel.L	9	21	20	37	13
total L:	P-2/4 0.56				
	190				

Integument completely smooth, without striation, no eyes visible; glandularia small, round, maximum diameter 17 µm, sometimes with '8'-shaped contour line (glandular hair and glandular porus appearing on a separate platelet each, fused only in the area where the two platelets touch); all sclerites of idiosoma and appendages weakly sclerotized, often hyaline, but coxae with (very fine) porosity; the anterior and lateral margins of coxae together forming a continuous semi-circular line interrupted only medially by the gnathosomal bay; mediocaudal margin of Cx-1 + 2 convexly rounded, Cx-4 subtriangular in shape.

Female

SMF, coll. Karaman 1936

genital field: gonopore very long, genital plates short; Ac in a nearly straight line

idiosoma L/W 450/360; glandularia 11

coxal field L 210; Cx-3 W 256; Cx-1 + 2 mL 81, IL 168, W 256

I-L-5 dL 116, vL 90, dL/vL 1.29, HA-HC 19, 24, 36, dL/HB 4.83

S-1 L 46, L/W 7.7, S-2 L 51, L/W 8.5, interspace 7, L S-1/2 0.9

I-L-6 L 112, HA-HC 20, 19, 22, dL/HB 5.89; L I-L-5/6 1.04

genital field L/W 130/125, Ac-1-3 L 14, 12, 14

gnathosoma -, chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	21/19	47/38	47/26	78/21	24/9
(ratio)	1.11	1.24	1.81	3.71	2.67
rel.L	10	22	22	36	11
total L:	P-2/4 0.60				
	217				

Gonopore long, but genital plates short, with medial margin nearly straight or bearing fine incisions between the Ac; Ac in a nearly straight line, pregen strongly curved, slender, with pointed lateral tips, postgen compact, subrectangular; one specimen bearing one very large egg (L/W 145/115 µm). Deutonymph: a brief description of the genital field is provided by K. Viets (1934).

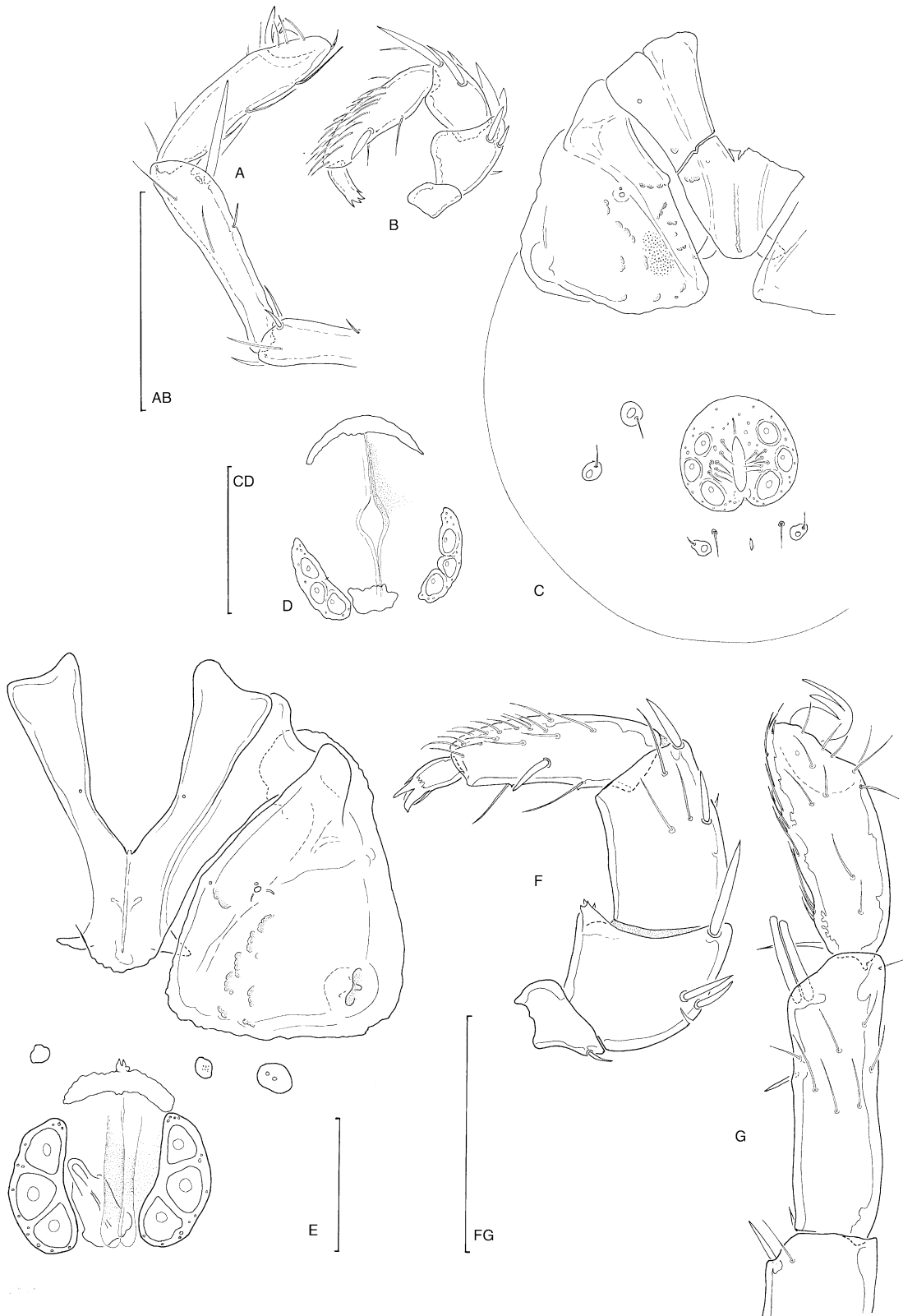


Figure 38. A–D, *Atractides subterraneus*. A–C, holotype ♂ D, ♀ Skoplje 1936, Karaman; A, ♂ I-L-5 and -6; B, ♂ palp, medial view; C, ♂ idiosoma, ventral view; D, ♀ genital field. E–G, *Atractides dentipalpis* ♀ SMF 7182 Algeria, coll. Vaillant. E, coxal and genital field; F, palp, medial view; G, I-L-5 and -6. Scale bars = 100 μm .

Discussion: *A. subterraneus* was one of the first true groundwater mites detected. Its small size, weak sclerotization, and the particular shape of genital field and I-L meant that both sexes differed from all species known at the time of its description. The only record after those by K. Viets from Macedonia was provided by E. Angelier (1953) from the French Pyrenees. Szalay (1946) described *A. obovalis* as a subspecies of *A. subterraneus* from Romania (here synonymized with the stem species). From Japan, a further subspecies *A. s. japonensis* has been described by Imamura (1958).

Habitat: ground-water, interstitial water.

Distribution: Macedonia, Romania, France (2, 6, 10).

ATRACTIDES PARVIPORUS (BESSELING, 1933)

Megapus parviporus Besseling, 1933

Syn. to *A. nodipalpis* Thor, 1899: Lundblad, 1962

Type series: Lectotype ♂, here designated, Coll. Besseling 543 b.42 Leigraaf Heesewyk *Atract. nod. parv.*, undissected in a separate vial. Paralectotypes: same label as lectotype, 2/2/0 slide-mounted in Hoyer's fluid, 20/13/1 in vial.

Material examined: coll. Besseling, 617 b. 43 Gr. Wetering Knathoven several specimens labelled as *A. nod. parviporus*, preserved together with *A. nodipalpis* and other water mite species.

Discussion: In his paper on the variation in *A. nodipalpis*, Besseling separated his material into groups of specimens with larger acetabula (e.g. ♂ Ac-1: 55–42, Ac-2: 61–44, Ac-3: 83–61 µm) and smaller acetabula (♂ Ac-1: 42–31, Ac-2: 42–30, Ac-3: 61–47 µm). It is noticeable that these values obviously grade into each other. As this character is not correlated with any other morphological peculiarity, it probably represents only an extended range of variability within one single species. Lundblad (1962) was obviously right when he proposed (but without any discussion) the synonymization of *A. nodipalpis parvipora* with *A. nodipalpis nodipalpis*.

ATRACTIDES DENTIPALPIS (WALTER, 1935)

(FIG. 38E–G)

Megapus dentipalpis Walter, 1935

Type series: Missing (not preserved at NHMB); *locus typicus:* Algeria Tlemcen (Department Oran) großer Wasserfall, Ende April, 1929, 2 ♀.

Material examined: SMF 7182 ♀, Algérie, Tala Guilef 3.5.51 Vaillant coll.

Description:

General features

Male unknown

dorsal integument: striated (6/10); muscle attachments: unsclerotized

I-L: I-L-5 with nearly parallel dorsal and ventral margins, S-1 and -2 rod-shaped, short, with blunt tips,

closely together, I-L-6 short and stout, equally thickened from the base to the claw furrow, claw strong

genital field: Ac in a weakly curved line

excretory pore: smooth; Vgl-1: not fused to Vgl-2

palp: see below

Females

SMF 7182

genital field: genital plates bean-shaped, with slightly convex medial margin, Ac subtriangular

palp: P-2 ventrodistally with a small, medial extension bearing 4–5 pointed denticles, separated by a short longitudinal pit from the rounded lateral edge of the segment; P-4 2 : 3 : 2, ventral margin nearly straight, small protruding denticles near hair insertions, sword seta between ventral hairs

idiosoma L/W 560/450; glandularia 30

coxal field L 285; Cx-3 W 350; Cx-1 + 2 mL 94, IL 224, W 275

I-L-5 dL 123, vL 100, dL/vL 1.23, HA-HC 36, 40, 45 dL/HA 3.08

S-1 L 39, L/W 7.8, S-2 L 37, L/W 7.4, interspace 1, L S-1/2 1.05

I-L-6 L 105, HA-HC 31, 33, 37, dL/HA 3.18; L I-L-5/6 1.17

genital field L/W 135/153, Ac-1–3 L 29–34–34

gnathosoma–; chelicera L 240, L/H 4.62, bs/claw 2.24

palp	P-1	P-2	P-3	P-4	P-5
L/W	31/29	76/65	83/49	90/31	31/13
(ratio)	1.07	1.17	1.69	2.90	2.38
rel.L	10	24	27	29	10
total L:	P-2/4 0.84				
311					

Glandularia with undulating margins, mediocaudal edge of Cx-1 + 2 convex, posterior margins of Cx-1 + 2 and Cx-3 + 4 undulating; a pair of sclerotized muscle attachments (in fig. 56 of the original description one unpaired sclerite) between Cx-4 and genital field; pregen large, strong, with an anteromedial extension, postgen large, protruding as a conically narrowed sclerite facing towards the centre of the idiosoma.

Discussion: *A. dentipalpis* is not easily confused with any of the species known at that time due to the I-L-5 with short, equally rod-shaped sword setae, the thick, slightly modified I-L-6, and the indented protrusion of P-2 after which the species is named. There is a striking difference between the absolute measurement values provided in the original description (e.g. idiosoma L/W 825/660, I-L-5 dL 160, chelicera L 310, palp total L 425 µm) and the (relatively smaller) dimensions established for the specimen from SMF. Measurements of the types of several species published by Walter in 1947 (*A. denticulatus*, *primitivus*, *firmus*, *longus*) indicate that his measurement table was mistaken, with a general deviation of +20%. Due to the loss of the types, at present there is no possibility of checking the hypothesis that the original description of *A. dentipalpis* was also affected by this error. With regard to proportion and setation, the specimen from SMF agrees with the original description, with the exception of the more strongly developed pregen and the presence of paired (in the type, unpaired) muscle attachments between Cx-4 and the genital field.

Habitat: Rhithrobiont, possibly with a preference for hygropetric habitats.

Distribution: Algeria (x).

ATTRACTIDES DIASTEMA (SZALAY, 1935) (FIG. 39A–C)
Megapus diastema Szalay, 1935a
 [syn. to *A. distans* (K. Viets, 1914): Besseling, 1954,
 rejected synonymy]

Type series: Missing. *Locus typicus*: Hungary, Garamveszele (Kom. Bars) aus dem Fluß Garam; leg. Dr. E. Dudich am 29.V.1933

Description:

General features

Males unknown

dorsal integument: fine striation; muscle attachments: unsclerotized

genital field: Ac in a weakly curved line

I-L: I-L-5 setae S-1, S-2 not enlarged distally, S-2 strongly thickened in the basal third, wide setal interspace ($>50\ \mu\text{m}$); I-L-6 curved, maximum H basally, strongly narrowed in the centre (HB), slightly thickened distally

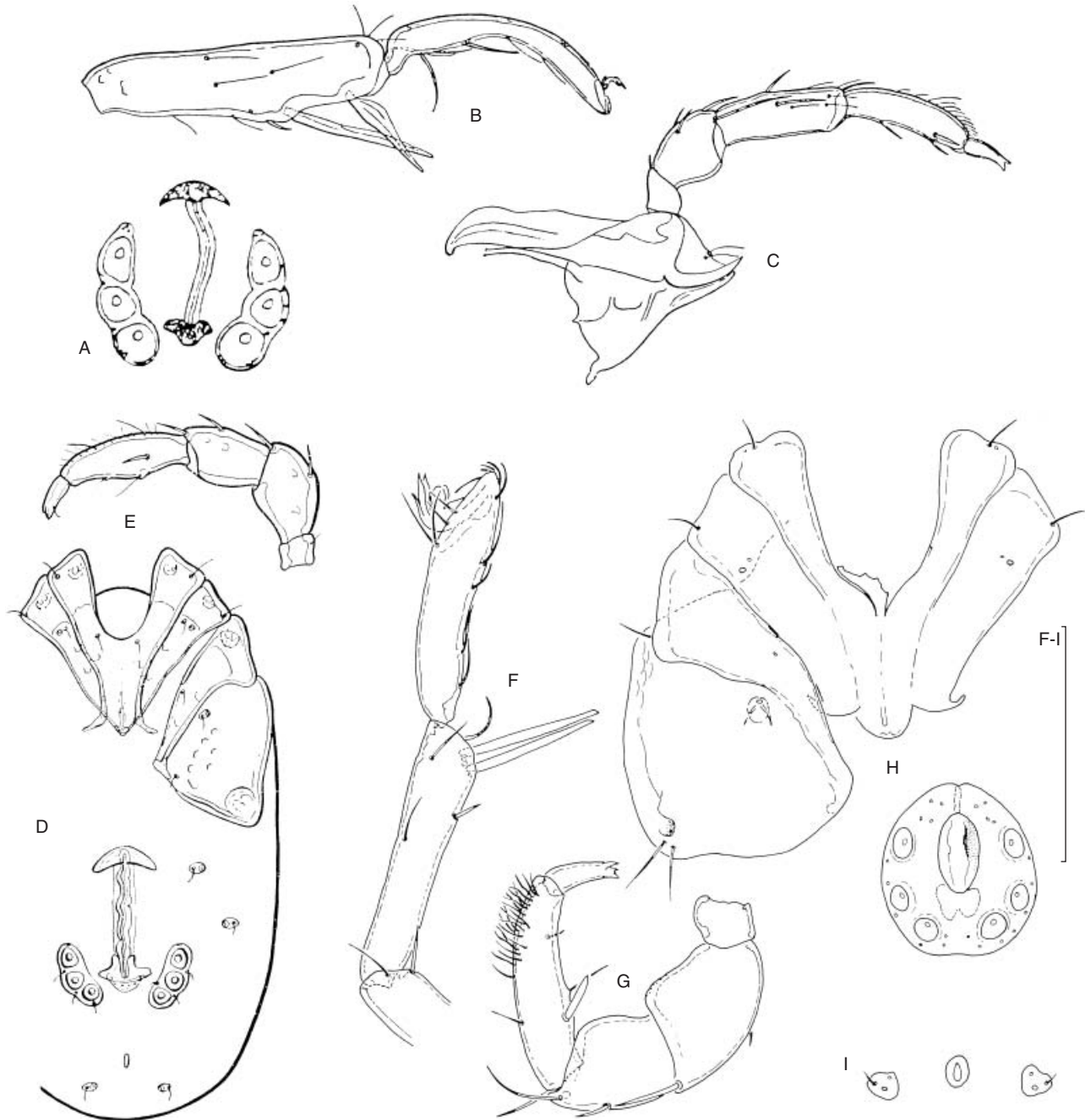


Figure 39. A–C, *Atractides diastema*, ♀ (from Szalay, 1935). A, genital field; B, I-L-5 and -6; C, gnathosoma with chelicera and left palp, medial view; D–I, *Atractides cisternarum*; D, E, ♀ from Motaş *et al.* (1947), F–I, holotype ♂ SMF 4895. D, idiosoma, ventral view, partial view; E, palp, medial view; F, I-L-5 and -6; G, palp, medial view; H, coxal field; I, genital and postgenital field. For A–E, no magnification scale bars published, Scale bar for F–I = 100 mm.

excretory pore: smooth; Vgl-1: not fused to Vgl-2
palp: see below

Female

Original description

genital field: genital plates with weak indentations at borders Ac-1/2 and Ac-2/3

palp: P-2 ventral margin of P-2 slightly protruding; P-4 2 : 2 : 1, sword seta anteriorly from distoventral hair

idiosoma L/W 617/583; glandularia small

coxal field L 367

I-L-5 dL 233, HB 58, dL/HB 4.02

S-1 L 125, S-2 L 100, interspace > 50, L S-1/2 1.25

I-L-6 L 183, HB 17, dL/HB 10.76; L I-L-5/6 1.27

genital field L/W 167/158

gnathosoma vL 133; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/H	33/33	67/50	100/40	108/33	38/–

(ratio not calculated because Szalay gives distal instead of maximum H)

rel.L	10	19	29	31	11
total L:	P-2/4 0.62				

346

Caudal apodemes of Cx-2 long, forming an acute angle; gonopore L 117, genital plate L 125 µm; chelicera basal segment/claw 87/67 µm [?], P-2 ventral margin weakly S-shaped, P-3 with a slight ventral thickening (not visible in Szalay's fig. 2), P-4 sword seta inserted distally from ventrodistal hair; Szalay's measurements and figure strongly contradictory: L/H ratio calculated from measurements (ratio taken from the figure in parentheses): P-3 2.50 (2.77) P-4 3.27 (4.20).

Discussion: Szalay saw in this species intermediate characters between *A. nodipalpis* (palp shape and setation) and *A. distans* (wide setal interspace) and considered the name '*diastema*' to be temporary until the male was found. Since then, only a few further females have been recorded from Poland (Biesiadka, 1973). Besseling (1954) proposed the synonymization of *A. diastema* with *A. distans* and was followed by K. O. Viets (1978), but Biesiadka lists three arguments against this synonymization: in *A. distans*, genital plates are not longish, S-1 is strongly enlarged distally, and the ventral margin of P-2 is straight. *A. diastema* differs from *A. nodipalpis* in the distal position of the sword seta on P-4, the weakly curved line of the Ac, and wide setal interspace. However, if the attribution of Biesiadka's specimens from Poland is correct, the first character is variable and the sword seta may also be inserted proximal to the distoventral hair. *A. diastema* is weakly defined, but cannot be placed in synonymy with any species known at that time. A redescription based on both sexes is necessary.

ATTRACTIDES LOBATUS (SZALAY, 1935)

Megapus angustiporus lobatus Szalay, 1935a
species dubia

Type series: Missing. *Locus typicus:* Körmöcbánya (Kom. Bars) aus dem Bache Bisztrica von Dr. E. Dudich am 26.V.1933 gesammelt.

Description. Female (male unknown, original description): idiosoma L/W 667/583 µm, contour line undulate due to symmetrically arranged indentations; integument finely striated [?], glandularia diameter about 20 µm; coxal field L 358 µm; I-L-5 dL 217, HB 82, S-1 L 100, S-2 L 83, setal interspace 38 (calculated from drawing), ratio dL/HB 3.5, ratio L S-1/2 1.20; I-L-6 dL 130, HB 17 µm, ratio dL/HB 7.65, ratio dL I-L-5/6 1.67; genital field L/W 175/191 µm, gonopore L 133, genital plates L 117 µm; excretory pore smooth, Vgl-1 separate from Vgl-2; gnathosoma vL 133, chelicera basal segment 175, claw 75 µm, ratio 2.33; palp segments L/H P-1 25/25, P-2 75/50, P-3 91/40, P-4 104/33, P-5 30/– (H taken at distal end of segment), total L 325 µm; P-2 with ventral margin slightly protruding in its anterior part, sword seta of P-4 inserted halfway between proximal and distal ventral hairs.

Discussion: *A. lobatus* differs from the generally similar *A. nodipalpis* in the high total L of the palp and the relatively long I-L-5 (in *A. nodipalpis* maximum I-L-5/6 ratio 1.56). From Szalay's figure 8 one can also deduce that the terminal segment of the first leg is more strongly thickened and narrowed distally than in the compared species. With regard to these characters, *A. lobatus* is similar to *A. fonticolus*, from which it differs in the integument structure and a less slender P-4. The reason for making this taxon a subspecies of *A. angustiporus* was probably the agreement in measurements of palps and I-L-5 and -6; Szalay does not discuss this. The only difference between *A. lobatus* and *A. angustiporus* mentioned in the original description is the name-giving undulate contour line of the idiosoma. Such a modification of the body shape is regularly found as an individual aberration and is of no taxonomic value. Thus, *A. lobatus* could be considered to be a synonym of *A. angustiporus*. However, the latter species is little known, and it would be impossible to provide a faunistic record of *A. angustiporus* based on a single female. By the loss of the type, *A. lobatus* became a *species dubia* of uncertain identity. Records of this taxon published since the original description (Hungary: Szalay, 1941, 1946, 1949; Czech Republic: Láska, 1955b) do not include discussion of morphological features, and possibly refer to 'lobate' individuals from various species.

ATTRACTIDES CISTERNARUM (K. VIETS, 1935)

(FIG. 39D–I)

Megapus cisternarum K. Viets, 1935a

Type series: Holotype ♂, SMF 4895 *Atractides cisternarum* ♂ (Viets) Type Jugoslawien Skoplje Brunnen 1934. State of conservation: good, idiosoma partly fractured, some details difficult to identify due to weak sclerotization and precipitations in the mounting medium; right I-L-4–6 separate, lateral, proximal apodemes of gnathosoma damaged; right palp separate, both palps and chelicerae clearly visible laterally, Gsk *in situ*.

Description:**General features**

dorsal integument: smooth; muscle attachments: un sclerotized; eyes: reduced coxal field: transparent, without porosity, low number of setae

I-L: I-L-5/6 little modified; I-L-5 with subparallel dorsal and ventral margins, S-1 and -2 similar in shape, slender, with obtusely truncate distal tip, narrow setal interspace; I-L-6 dL nearly straight, with dorsal and ventral margins equally diverging distally, maximum H at the claw furrow, claws strong

genital field: Ac very small, oval

excretory pore: sclerite ring; Vgl-1: fused to Vgl-2

palp: weak sexual dimorphism; all setae fine, neither flattened, nor enlarged,

P-1 relatively short, ventrodorsal margin P-2 convexly protruding, P-3 convex, P-4 3 : 2 : 2, proximoventral hair near a pointed denticle, distoventral hair shifted to the lateral surface, sword seta strong, proximally from the proximoventral hair

Male**Holotype**

genital field: oviform, anterior margin slightly indented, posterior margin nearly straight, setae restricted to the external margin of the plate; gonopore short and enlarged, restricted to the anterior 2/3 of the plate, Ac near the external margin of the plate; genital setae: 21

idiosoma L/W 430/290; glandularia 17

coxal field L 178; Cx-3 W 187; Cx-1 + 2 mL 54, IL 119, W 157

I-L-5 dL 116, vL 99, dL/vL 1.17, HA-HC 24, 26, 30, dL/HB 4.46

S-1 L 58, L/W 14.5, S-2 L 62, L/W 15.5, interspace 4, L S-1/2 0.94

I-L-6 L 105, HA-HC 20, 19, 23, dL/HB 5.53; L I-L-5/6 1.10

genital field L/W 73/67, Ac-1-3 L 13-11-13

gnathosoma -, chelicera L 175, L/H 4.86, bS/claw 1.78

palp	P-1	P-2	P-3	P-4	P-5
L/W	17/24	74/46	58/39	91/23	33/10
(radio)	0.71	1.61	1.49	3.96	3.30
rel.L	6	27	21	33	12
total L:	P-2/4 0.81				
	273				

Idiosoma elongated; no integumental structure visible in either membranous or sclerotized parts; in the area of the (reduced) lateral eyes, a pair of long, flagellar setae of unclear identity (anterior dorsal area damaged), shape of Dgl-1 unknown; anterior tips of Cx-1 flanking the gnathosomal bay slightly protruding, a low number of setae on coxal surface; shape of medio-caudal margin of Cx-1 and -2 poorly visible, apodemes of Cx-2 directed laterally; a long hair near S-1 and -2 on I-L-5, also visible in the figure provided by Viets, probably an artefact; leg claws strong, with abruptly narrowed tip, dorsal clawlet and claw blade; genital field without setae visible between Ac-2 and -3 (in Viets' figure probably inserted erroneously); pregen longish, rod-shaped, postgen dumb-bell-shaped; P-2 ventrodorsal margin eventually bearing a fine denticulation (not clearly visible due to precipitations), P-3 ventral margin S-shaped, distally convex, extension of the field of fine dorsal hairs on P-4 not clearly recognizable.

Females

Following Motaş *et al.* 1947

genital field: gonopore long, genital plates small, flanking the postgenital sclerite, pregen large, sickle-shaped

idiosoma L/W 405/230

coxal field L 214, W 225

I-L-5 dL 120, HB 25, dL/HB 4.80

S-1 L 50, S-2 L 50, L S-1/2 1.00

I-L-6 L 112, HC 20; L I-L-5/6 1.07

gnathosoma vL 77; chelicera L 115, L/H (see discussion)

palp	P-1	P-2	P-3	P-4	P-5
L/W	15/15	60/36	50/32	72/24	20/12
(ratio)	1.00	1.67	1.56	3.00	1.67
rel.L	7	28	23	33	9
total L:	P-2/4 0.83				
	217				

No preparations are available for re-examination. Coxal field more slender than in males, gonopore L 94, genital plates L/W 54/22 µm, flanking the postgenital sclerite and bearing three small, roundish Ac and four setae each. Palp more slender than in male.

Discussion: After the first description from former Yugoslavia, *A. cisternarum* has been found in numerous sites in Romania (Motaş *et al.*, 1947; Motaş & Tanasachi, 1948). The description of the male provided by Motaş *et al.* agrees with the holotype, apart from some minor differences which could be attributed to individual variability as well as imprecise observation: P-4 relatively long (L 120 µm) chelicera more slender (L/H 6.3) Ac larger (e.g. diameter of Ac-2 > 2× distance Ac-1-2, in the holotype < 1×); in the description of the female there are some doubtful measurements, e.g. the indications on the (very short and slender) chelicera are very slight; deducing from the figure provided by the authors, 'longeur totale' probably indicated L of basal segment, and H has been measured in oblique position. Motaş *et al.* found clearly visible suture lines between Cx-1 and -2 and Cx-3 and -4. This suggests that the weak sclerotization of the holotype is due to juvenile age and not a species-specific feature.

A. cisternarum is easily distinguished from any species known at that time due to the shape of the genital field, I-L-5 and -6, and palps. It is similar to *A. subterraneus* in reduced size of eyes, structureless integumental surface of idiosoma and appendages (probably characters achieved with adaptation to sub-surface waters) and the shape of I-L-5 and -6 (possibly indicating a closer phylogenetic relation between the two species). However, *A. subterraneus* differs in palp setation (dorsal setae of P-2 and -3 enlarged and flattened, sword seta P-4 placed near distoventral hair) and arrangement of elements in the genital field (higher numbers of setae, in males also on the medial part, male gonopore opening in the caudal two-thirds of the genital plate); furthermore, in both sexes the excretory pore is smooth and the Vgl-1 not fused to Vgl-2. Since then, the only record was provided by Rensburg (1971) in a checklist of the phreatic fauna of Switzerland, but without specifying sites. As this record is not documented by deposited material, *A. cisternarum* should be considered restricted to south-east Europe.

Habitat: Ground-water (hyporheic interstitial as well as deeper layers).

Distribution: Croatia, Romania (5, 10).

ATRACTIDES LATIPES (SZALAY, 1935) (FIG. 40A–G)

Megapus latipes Szalay, 1935b

Syn. *A. remyi* E. Angelier, 1951: E. Angelier, 1954

Type series: Missing. *Locus typicus:* Hungary, Garamrudnó (Kom. Bars) aus dem Rudnóer Bache; leg. Dr. E. Dudich am 18.VI.1932.

Material examined: Germany, D 448, Bayern (GAP) Uffing, Ach downstr. Staffelsee, 1 km SE Heimgarten, 680 m, PT 5989 16.05.1993 Gerecke 1/1/0; Italy, I 1078a, Sicily, T. Saracena at Chiusitta 20.06.1989 Ferrito 0/2/0; I 1079a, same site, 19.07.89 0/3/0; Luxembourg, 30 B 6, Ösling, bassin de la Sûre, Schlénnerbaach, Frühjahr 1996 1 ♀; Int4c, Ösling, bassin de la Sûre, Schlénnerbaach u. Chapelle St. Michel, Interstitial 3, 300 m, 72.5/113.2, 7.8.1998 Gerecke & Schrankel 1 ♂.

Description:

General features

dorsal integument: striated; muscle attachments: unsclerotized

I-L: I-L-5 strongly thickened, S-1 and -2 different in size and shape, both with blunt tips, wide setal interspace, S-2 strongly enlarged; I-L-6 curved and thin, distally narrowed

genital field: Ac in a weakly curved line

excretory pore: sclerite ring; Vgl-1: fused to Vgl-2

palp: weak sexual dimorphism; ventral margin P-2 straight, P-3 straight or slightly concave; one of the two dorsodistal setae of P-2 enlarged, flattened and plumose, P-4 1 : 1 : 1, sword seta near distoventral hair

Male

Bayern, D 448

genital field: anterior margin equally convex, extended by a large, medially protruding border of secondary sclerotization, posterior margin with a deep and large indentation somewhat narrowed on the level of medial margins of Ac-3, gonopore short; genital setae: 30

idiosoma L/W 400/300; glandularia 45

coxal field L 200; Cx-3 W 234; Cx-1 + 2 mL 72, IL 130, W 171

I-L-5 dL 118, vL 77, dL/vL 1.53, HA-HC 48, 51, 59, dL/HB 2.31

S-1 L 70, L/W 7.8, S-2 L 48, L/W 4.8, interspace 21, L S-1/2 1.46

I-L-6 L 94, HA-HC 17, 12, 11, dL/HB 7.83; L I-L-5/6 1.26

genital field L/W 72/81, Ac-1-3 L 17-21-22

gnathosoma -, chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	19/16	43/32	45/28	62/26	23/7
(ratio)	1.19	1.34	1.61	2.38	3.29
rel.L	10	22	23	32	12
total L:	P-2/4 0.69				
	192				

Integument with little visible striation, mediocaudal margin of Cx-1 + 2 equally convex, apodemes of Cx-2

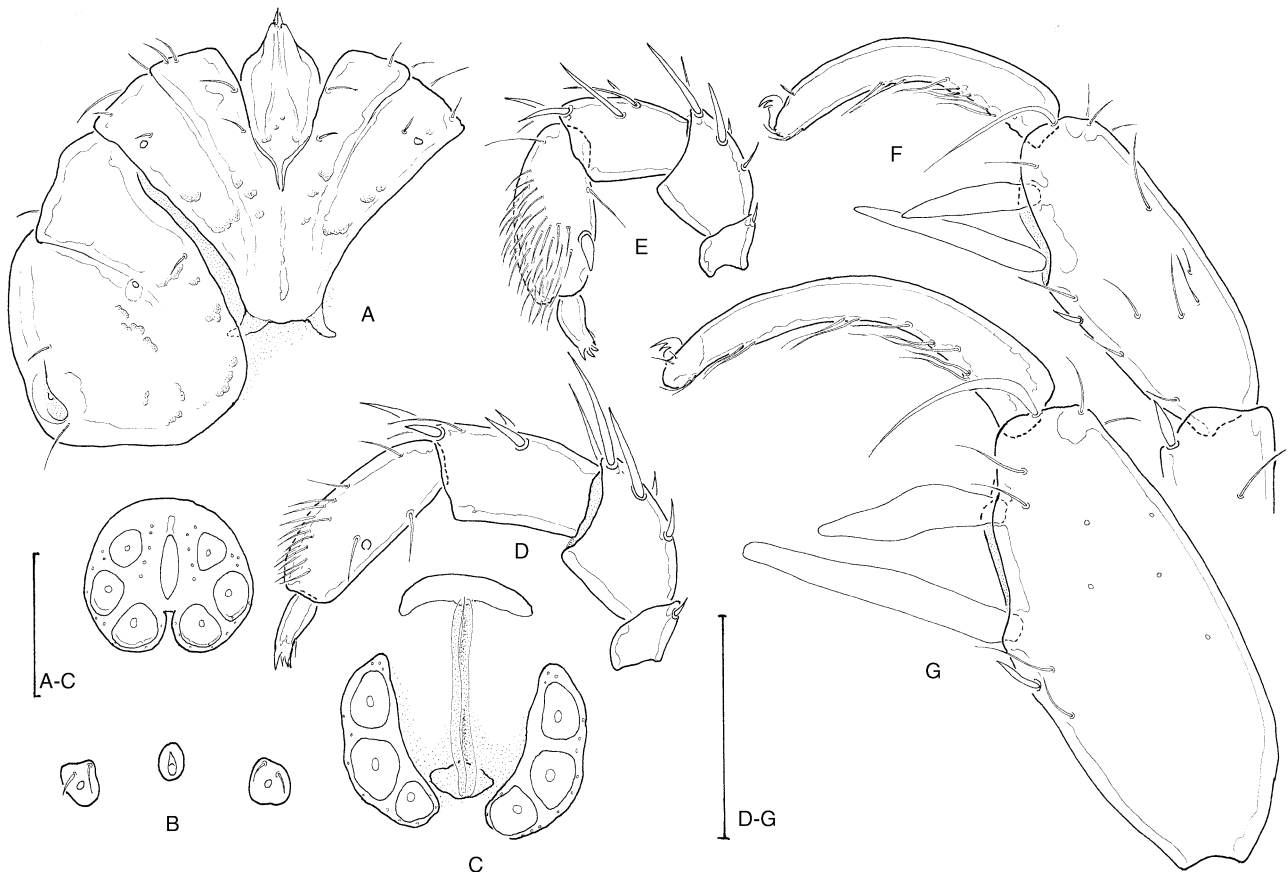


Figure 40. *Atractides latipes*, specimens from Bavaria (D 448). A, B, E, F, ♂ C, D, G, ♀. A, ♂ coxal field; B, ♂ genital and postgenital field; C, ♀ genital field; D, ♀ palp, medial view (with sword seta P-4 lacking); E, ♂ palp, medial view; F, ♂ I-L-5 and -6 (with S-1 slightly dislocated); G, ♀ I-L-5 and -6. Scale bars = 100 µm.

well developed, directed caudolaterally. I-L-5 with ventral seta inserted close to S-1. Gonopore short, flanked by five pairs of hairs; a further ten on each side at the lateral and posterior border of the genital plate; P-4 strongly inflated probably as a preparation artefact (H artificially increased).

Females

Sicily, I 1078a

genital field: pregen large, boomerang-shaped or equally rounded, genital plates with c. 15 setae each, Ac-1 longish, Ac-2/3 round with their facing margins straight

palp: slightly more slender than in males

idiosoma L/W 600/450; glandularia 47

coxal field L 252; Cx-3 W 288; Cx-1 + 2 mL 90, IL 157, W 205

I-L-5 dL 156, vL 92, dL/vL 1.70. HA-HC 65, 64, 81, dL/HB 2.44

S-1 L 92, L/W 7.7, S-2 L 67, L/W 5.2, interspace 40, L S-1/2 1.37

I-L-6 L 121, HA-HC 19, 12, 13, dL/HB 10.08; L I-L-5/6 1.29

genital field L/w 123/114, Ac-1-3 L 19-17-22

gnathosoma vL 87; chelicera L 157, L/H 5.81, bS/claw 2.49

palp	P-1	P-2	P-3	P-4	P-5
L/W	23/20	48/32	56/29	71/20	24/8
(ratio)	1.15	1.50	1.93	3.55	3.00
rel.L	10	22	25	32	11
total L:	P-2/4 0.68				
	222				

Integument leathery and up to 16 µm thick, superficially with fine striation, in deeper layers a stratum with fine porosity; muscle attachments unsclerotized but in older specimens clearly visible as groups of fine granules; posterior and posteriolateral margins of Cx-1 + 2, and posterior and medial margins of Cx-3 + 4 with a well developed border of secondary sclerotization, mediocaudal margin of Cx-1 between the laterally directed apodemes of Cx-2 truncate; gonopore L 100, genital plates L 91 µm; palp measurements following the original description L/H P-1 25/–, P-2 67/37, P-3 71/33, P-4 83/29, P-5 29/–, total L 275 µm; ventral margin of P-2–4 straight, but irregularly rugose in P-2, P-4 distoventral hair slightly shifted to the lateral surface, dorsal margin of this segment sometimes balloon-like or deflated due to mishaps during preparation, with numerous fine hairs.

Discussion: Szalay compared *A. latipes* with *A. cultelatus* and found in the latter species the following differences: glandularia smaller, I-L-5 longer and more slender, I-L-6 shorter and thicker, ventral margin of P-2 strongly protruding, P-4 with a knife-like enlarged sword seta. He interpreted enlarged glandularia as a feature indicating a closer relationship to *A. subasper*. In reality, due to the particular shape of I-L-5 and -6, *A. latipes* appears isolated and cannot be confused with any other species of the genus. A dL/HB ratio of I-L-5 < 2.7 is found only in males of *A. glandulosus*, a species with S-1 and -2 similar in dimensions, a narrow setal interspace, and with a short, stout I-L-6. Following the measurements provided by Szalay, the female from Sicily is notably smaller than the type

specimen, and differs also in several proportions, e.g. a still stouter I-L-5. However, it is in good agreement with the investigated female from Bayern.

The pair from Luxembourg have larger idiosomal sclerites and appendages: ♂ coxal field L 295, Cx-1 + 2 mL 100, W 230, genital field L/W 94/104, palp L 251, I-L-5 dL/vL 155/98, S-1/2 L 94/64, I-L-6 L 118 µm; ♀ coxal field L 340, Cx-1 + 2 W 300, genital field L/W 170/150, palp L 275, I-L-5 dL/vL 218/112, S-1/2 L 128/84, I-L-6 L, 182 µm. The male differs furthermore from the male from Bayern in the caudal margin of the genital field (not indented, but filled with secondary sclerotization), and in a stouter S-2 (L/W 3.76). With regard to several measurements, the female is more similar to the original description than to the specimens from Bayern and Italy, but agrees well in its proportions.

A revision of additional populations from the whole distribution area, with special regard to specimens from south-east Europe, is necessary for a better understanding of these differences, which might be caused by different measurement techniques (e.g. Szalay obviously gave the distal height of palp segments, while in this study the maximum value is used).

The particular morphology of this species has induced many authors to publish figures (E. Angelier 1954, 1959; Láska, 1955a; Schwoerbel, 1961a, c; Szalay, 1964; Láska, 1971; Biesiadka, 1973), but until now no males have been found. As a result, populations are strongly biased in favour of females.

Habitat: Rhithrobiont, hyporheophilous.

Distribution: Eastern, Southern and Central Europe (2, 3, 8–10).

ATTRACTIDES NONDILATATUS (SOKOLOW, 1936)

Megapus nodipalpis nondilatatus Sokolow, 1936

Species dubia

Type series: May be missing. Not found in ZISP. *Loci typici*: (1) Park des Peterhofer Biologischen Instituts, Fluß Tschornaja (Sapao-joki) 31.VII.1924; (2) Gobzhinka-Bach beim Dorfe Gobzhitza, 08.VIII.1931, 25.VIII.1931; (3) Gobzhinka-Bach Oberlauf, unweit von den Scheunen, 19.VI.1933.

Material examined: SMNH 5317 *Attractides nodipalpis nondilatatus* Sokolow (1936). Södermanland. Lännaån öster om Ekedalek 24.6.1933 Leg. O. Lundblad; probably a specimen fixed in ethanol with dark idiosomal contents and deformed membranous integument.

Description. Male (original description): P-2 ventrally with broadly rounded hump, without protruding tip, similar to *A. fonticolus*; P-3 elongated (ventral L 1.5 times maximum H); P-4 rather slender, not protruding ventrally, insertions of ventral setae dividing ventral margin 1 : 1 : 1, sword seta inserted between the levels of ventral setae; anterior margin Cx-3 medially strongly protruding; Cx-4 large; I-L-5 and -6 as in *A. nodipalpis*, but I-L-6 more slender; anterior mar-

gin of genital field with tongue-shaped medial border.

Male from SMNH: juvenile (weak sclerotization of coxae and genital field, with some genital setae appearing separate from sclerite plate, deformation of P-3) with very large sword seta on P-4, arranged in the middle between insertions of ventral hairs.

Description following Lundblad (1956), based on another specimen (SMNH 4109): integument lineated as in *A. panniculatus*; genital field with plates only weakly fused anteriorly, with anterior and posterior indentation (see discussion of *A. clavipalpis* in Lundblad, 1956); P-2 ventral hump without protruding tip, P-3 ventrally concave, P-4 much less thick than in *A. nodipalpis*, sword seta L 35 µm, in the middle between the insertions of ventral hairs, ventral margin 1 : 1 : 1; palp and I-L-5 and -6 measurements similar to 5317.

Female (original description): P-2 with ventrodistal edge only slightly reinforced, P-3 long, P-4 slender, both ventral setae short and not curved, sword seta between ventral hairs; medial portion of Cx-4 more slender than in male, legs as in male; gonopore long (210 µm) genital plates more slender than in *A. nodipalpis*, L = 145 µm, flanking the posterior half of gonopore.

Discussion: Due to the relatively slender P-4 in both species, Sokolow considered *A. nondilatatus* to be closely related to *A. tivdiae*, a species here synonymized with *A. nodipalpis*. As already mentioned, thickness of P-4 varies considerably in *A. nodipalpis*, and is not suitable for defining separate taxa. The lack of information on important features such as integument surface structure, and shape, dimensions and arrangement of glandularia, does not allow for definitive considerations on the taxonomic state of *A. nondilatatus*. Due to the lack of type material, it must be considered a *species dubia*. Lundblad's assignment of Swedish specimens was tentative, probably based on misshapen specimens of unclear taxonomic status. His further records refer to scattered sites in Germany, France and Spain, where single specimens attributed to *A. nodipalpis nondilatatus* were found mostly in the company of larger numbers of *A. nodipalpis* s.s., or *A. nodipalpis robustus*. This suggests that the specimens in question are best considered representatives of the stem species, somewhat irregular in shape and setation of palps.

However, we should continue paying attention to *Atractides* specimens with tongue-like anteromedial protrusion of male genital field, female genital field with Ac in a curved line, lineated integument (?) rather slender palp with P-2 missing a protruding ventrodistal edge, and P-4 not protruding at the level of the proximoventral hair. The finding of North Euro-

pean populations with a character combination like this could allow for a redescription of this doubtful taxon.

ATRACTIDES SAMSONI (SOKOLOW, 1936) (FIG. 41D–L)

Megapus samsoni Sokolow, 1936

Syn. *A. laetus* Lundblad, 1962: syn. nov.

Type series: Holotype male ZISP 1/831 N422 Type ♂ *Megapus samsoni* n.sp., 1935; Peterhof Hauptkanal (?) 9.VI.24.I.Sokolow. **Locus typicus:** Hauptkanal der Peterhofer Wasserleitung oberhalb des ersten Dammes, in 3–4 km Entfernung von der Eisenbahn, gegenüber dem Dorfe Kostino, 9.VI.1924. State of conservation: idiosoma complete, with Gsk *in situ*, caudal area pleated and gonopore crushed; gnathosoma and chelicerae *in situ*, both palps and right I-L separate, lateral; obviously a juvenile with coxae placed close together and missing secondary sclerotization, caudal area of idiosoma short

Material examined: *Atractides laetus* Lundblad (1962), Holotype ♀, SMNH; 5325.

Description:

General features

dorsal integument: striated; muscle attachments: unsclerotized

I-L: I-L-5 basally slender, slightly thickened near insertion of S-1 and -2; S-1 and -2 homoiomorphic, slender and short, blunt, close to each other; I-L-6 weakly curved, stout, only slightly narrowed in the centre

genital: Ac relatively large

excretory pore: smooth; Vgl-1: not fused to Vgl-2

palp: weak sexual dimorphism, P-2 with ventrodistal protrusion, P-3 with straight ventral margin, P-4 1 : 1 : 1, sword seta between ventral hairs, more or nearer to distoventral hair

Males

Holotype (in parentheses measurements published for *A. laetus* from Biesiadka (1978), or calculated from his figures)

genital field: anterior margin convex, posterior margin truncate, not indented; genital setae: 50, rather long

palp: ventrodistal protrusion of P-2 conus-shaped, P-3 with rough surface distally, P-4 with obtuse angled protrusion near proximal hair

idiosoma L/W 560/410 (540–620/480–575); glandularia 23

coxal field L 293 (250); Cx-3 W 350 (311); Cx-1 + 2 mL 94 (96), IL 229 (182), W 293 (257)

I-L-5 dL 170 (140), vL 130 (110), dL/vL 1.31 (1.27), HA-HC 36 (30), 47 (38), 55 (45), dL/HB 3.62 (3.68)

S-1 L 78 (68), L/W 13.0 (10.0), S-2 L 71 (56), L/W 11.8 (8.5), interspace 14 (7), L S-1/2 1.1 (1.2)

I-L-6 L 145 (121), HA-HC 28 (23), 25 (23), 28 (25), dL/HB 5.80 (5.26); I L-L-5/6 1.17 (1.16)

genital field L/W 112/130 (90/95), Ac-1–3 L 33–32–38 (27–20–34)

gnathosoma vL 138; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/28 (27/28)	68/58 (61/54)	61/43 (61/39)	98/33 (90/34)	37/13 (34/13)
(ratio)	1.04 (0.96)	1.17 (1.13)	1.42 (1.56)	2.97 (2.65)	2.85 (2.62)
rel.L	10 (10)	23 (22)	21 (22)	33 (33)	13 (12)
total L:	P-2/4 0.69 (0.68)				
	293 (273)				

Sokolow provides the following details: glandularia diameter 12–23 µm; apodemata of Cx-2 forming a right angle with the idiosomal longitudinal axis, mediocaudal margin of Cx-1 convex, clearly protruding over the level of the Cx-2–apodemata; total L of legs: I-L 606, II-L 590, III-L 680, IV-L 1050 µm; I-L-5 short, rather narrow basally, thickened only in the

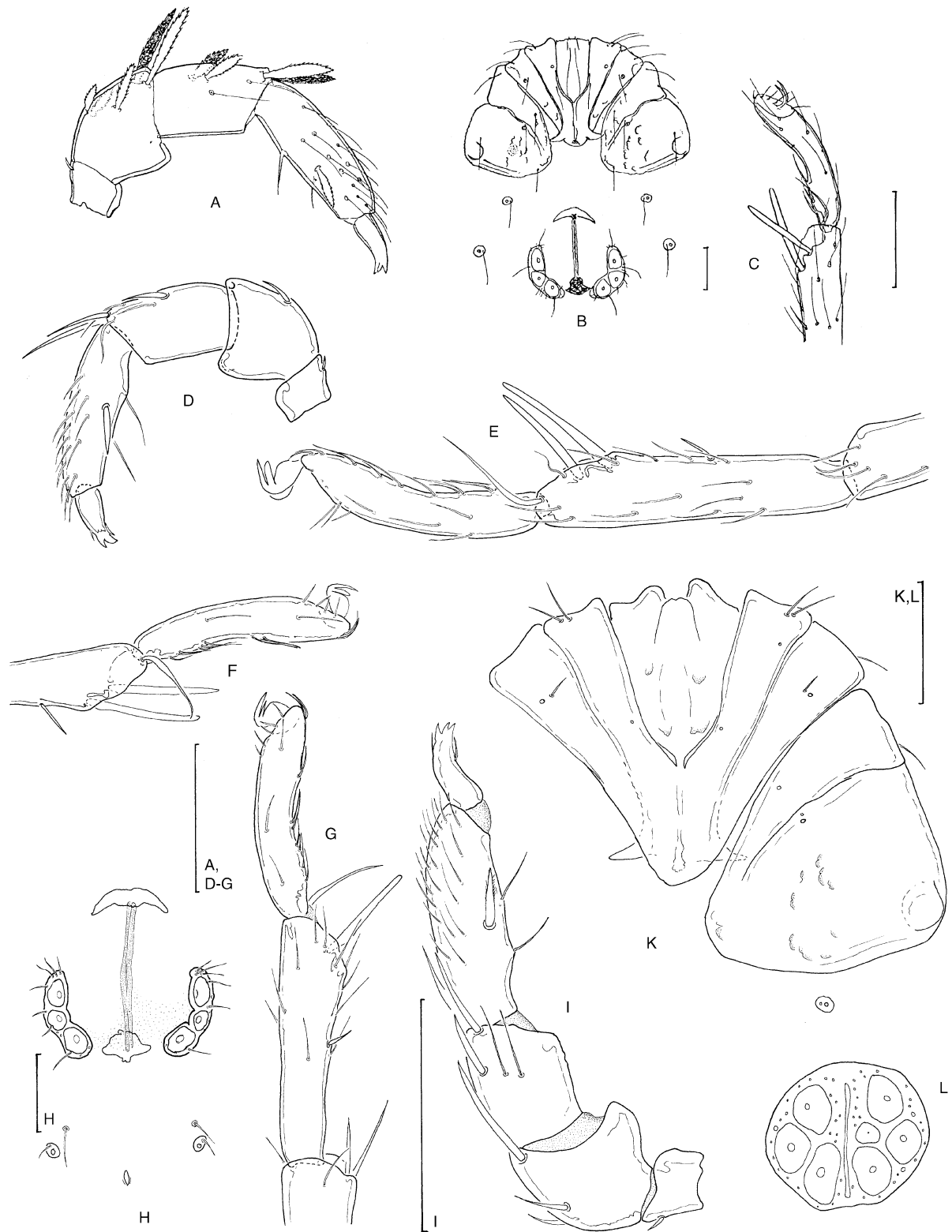


Figure 41. A–C, *Atractides gladisetus* ♀ (from Husiatinschi, 1937). A, palp, medial view; B, coxal and genital field; C, I-L-5 and -6. D–L, *Atractides samsoni*; D, E, H, holotype of *A. laetus* (syn. to *A. samsoni*); F, G, I, K, L holotype ♂. D, ♀ palp, medial view; E, ♀ I-L; F, G, ♂ I-L-5 and -6, anterior and posterior view; H, ♀ genital and postgenital field; I, ♂ palp; K, ♂ coxal field; L, ♂ genital field. Scale bars = 100 μm .

distal half anterior from the ventral seta, S-1 and -2 slender, not remarkably thickened basally and nearly equal in shape, whip-like seta nearly straight; I-L-6 weakly curved, slightly narrowed in the centre and slightly thickened on the level of the claw furrow (ratio HA/HB 1.12); anterior margin of genital field convex, with setae extending also to the medial margins flanking the gonopore between Ac-1 and -2; in the holotype on the left genital plate one supernumerary small Ac medially from Ac-2, gonopore shrunk probably due to misshaping; palp similar in general shape to *A. nodipalpis*, but ventral protrusion of P-2 directed medially, and P-3 relatively short, with 2 fine medial hairs.

Females

Holotype of *A. laetus*

genital field: genital plates with narrow sclerite border, slightly indented between Ac-1/2 and Ac-2/3

palp: ventrodistal protrusion of P-2 distinct, but slightly shorter than in male, P-4 more slender

idiosoma L/W 1035/-; glandularia 25

coxal field L 347; Cx-3 W 450; Cx-1 + 2 mL 112, IL 252, W 330

I-L-5 dL 211, vL 162, dL/vL 1.30, HA-HC 40, 49, 65, dL/HB 4.31

S-1 L 92, L/W 11.5, S-2 L 76, L/W 12.7, interspace 17, L S-1/2 1.21

I-L-6 L 166, HA-HC 32, 28, 32, dL/HB 5.93; L I-L-5/6 1.27

genital field L/W 226/226, Ac-1-3 L 35-30-39

gnathosoma vL 157; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	31/34	78/67	83/47	114/36	40/16
(ratio)	0.91	1.16	1.77	3.17	2.50
rel.L	09	23	24	33	12
total L:	P-2/4 0.68				
	346				

The ventrodistal protrusion of P-2 with two small protruding humps; S-1 blunt, S-2 pointed.

Discussion: Since the original description, this species has not been recorded. The synonymization of *A. laetus* Lundblad (1962) with *A. samsoni* provides better understanding of the variability in males, and the first definition of the diagnostic characters of females. *A. samsoni* is similar to *A. nodipalpis* in the integument surface without lineation and the shape of the palp (also, ventral protrusion of male P-2 sometimes directed medially; in many cases sword seta of P-4 placed between the insertions of the two ventral hairs), but differs clearly in I-L-5 and -6: in *A. nodipalpis*, S-1 and -2 different in shape and length, wider setal interspace and mean L ratio S-1/2 1.29 (1.10–1.42) L/W S-2 5.2–7.8, I-L-6 more slender, more curved and more narrow centrally (HA/HB ratio 1.20–1.67, mean 1.38) but relatively short compared to I-L-5 (L ratio I-L-5/6 1.39–1.59); further differences are found in the genital field (in both sexes of *A. nodipalpis* with larger acetabula, in males with anterior and posterior indentations and lower number of setae, in females with acetabula, in more triangular arrangement). Regarding the male genital field, *A. samsoni* is

similar to *A. fontinalis*, from which it differs in shape of I-L-5 (there, thickened in the basal third, S-2 much shorter and thicker than S-1) and of the male P-4 (sword seta in *A. fontinalis* arranged more distally, on the level of the ventrodistal seta). *A. curvisetus*, a species known only in the female sex and here treated as *species dubia*, differs from *A. samsoni* in larger acetabula, a thicker I-L-5 (L/H 2.85) a larger S-2 (L/W 7.6) and relatively short I-L-6 (ratio I-L-5/6 1.53). A I-L similar in shape is found in *A. tener*, but I-L-6 is stouter (L/HB ♂ 5.00, ♀ 5.6). Both sexes of *A. tener* differ from *A. samsoni* also in larger acetabula, the sclerotized excretory pore, and a more slender palp.

Habitat: Sweden.

Distribution: Northern Russia, Sweden, Poland (14, 15).

ATTRACTIDES GLADISSETUS (HUSIATINSCHI, 1937)

(FIG. 41A–C)

Megapus gladisetus Husiatinschi, 1937a

Megapus nodipalpis var. K. Viets, 1940

Atractides nodipalpis gladisetus (Husiatinschi, 1937)

K. Viets, 1950

Type series: Missing, probably lost; *locus typicus*: Mihodercabach, 415 m ü.d.M., 2.VI.1936. Berhomet am Siret, Bukowina (Rumänien)

Description:

General features

Male unknown

dorsal integument: smooth; muscle attachments: unsclerotized

I-L: I-L-5 dorsal and ventral margins parallel, S-1 and -2 slender, similar in shape, closely together; I-L-6 strong, little curved, only slightly narrowed centrally

genital field: Ac in an obtuse triangle

excretory pore: -; Vgl-1: -

palp: all setae of P-2/3 flattened and enlarged, sword-like, with serrate margin

Female

Original description

genital field: pregen equally rounded

palp: ventral margin P-2 with a nose-like, strongly protruding distal edge, P-3 straight, P-2/3 with flattened, serrate dorsal setae, P-4 sword seta near the distoventral hair

idiosoma L/W 800/600; glandularia small

coxal field L/W 330/545

I-L-5 dL 215, HB 50, dL/HB 4.30

S-1 L 108, S-2 L 84, interspace low, L S-1/2 1.29

I-L-6 L 160, HB 25, dL/HB 6.40; L I-L-5/6 1.34

palp	P-1	P-2	P-3	P-4	P-5
L/W	30/34	90/72	90/52	120/42	42/-
(ratio not calculated, H values taken distally, not as maximum)					
rel.L	8	24	24	32	11
total L:	P-2/4 0.75				
	372				

Apodemes of Cx-2 directed laterally; genital plate L 130, gonopore L 140 µm, no information on sclerotiza-

tion of excretory pore and Vgl-1; P-4 with distoventral hair shifted to the lateral surface.

Discussion: For reasons which are unclear, Husiatinschi considered this species to be related to *A. tuberosus*, which in this revision classes it as a *species dubia*. As a diagnostic feature, he mentioned the sword-like dorsal setae of P-2 and -3 which provided the species name.

With regard to the shape of I-L-5 and -6 and palp, and the arrangement of setae on their segments, *A. gladisetus* is very similar to *A. pennatus*, but the palp setae of the latter species are always round and without serrate margins; *A. pennatus* has a lineated dorsal integument. K. Viets (1950) proposed considering *A. gladisetus* to be a subspecies of *A. nodipalpis* and placing in this taxon a female which he had described in 1940 as an unnamed 'variation' of *A. nodipalpis* from Bulgaria. This placement is surely incorrect: his figs 4–6 show a specimen missing the ventrodiscal protrusion on P-2 and 'gladiform' setae on P-2 and -3, but with enlarged S-2 on I-L-5, and a very slender I-L-6. Strongly enlarged dorsal setae on P-2 and -3 are found in two *Atractides* species from interstitial and groundwater habitats (*A. subterraneus*, *A. latipes*). The presence of this character in a large surface-water species possibly taxonomically related to *A. pennatus* is sufficient to accept *A. gladisetus*, but as a little known species that needs further investigation.

ATRACTIDES SEMIDISTANS (HUSIATINSCHI, 1937)

Megapus nodipalpis semidistans Husiatinschi, 1937b

Syn. to *A. nodipalpis* Thor, 1899: syn. nov.

Type series: Missing. *Locus typicus:* Le petit ruisseau Solonet, qui coule à la lisière de la tourbière de Mihodra, altitude 415 m, 3.VI.1937, Berhomet s. Siret, Bucobine [Roumanie].

Description. Female (male unknown): L/W 1100/950 µm, integument smooth, glandularia small; coxal field L/W 490/780 µm, mediocaudal margin Cx-1 + 2 convex, with a knob shaped subcutaneous tip, apodemes of Cx-2 elongated, in an acute angle; gonopore L 145, genital plate L 150 µm, pregen strongly developed, Ac in an obtuse angle, left genital plate misshaped and missing Ac-2; excretory pore 'very small', probably unsclerotized, no information on Vgl-1; I-L-5 L 292, S-1 L 140, S-2 105, interspace (calculated from fig. 6 of original description) 42 µm; I-L-6 curved, with maximum H basally (HA) L 238, H 75 µm; gnathosoma L 170, chelicera 330, claw 90 µm, palp slender, with straight ventral margins of segments 2–4, P-2 with slightly protruding ventrodiscal edge, P-4 2 : 2 : 1, sword seta between ventral hairs, segment measurements L/distal H: P-1 45/45, P-2 105/64, P-3 130/57, P-4 150/39, P-5 48/–.

Discussion: The description of *A. semidistans* was based on a single female, misshaped in the genital region. Husiatinschi considered it to be similar to *A. distans* in the setal interspace, but close to *A. nodipalpis* with regard to the shape and dimensions of palps and coxae. No further finds of, or comments on, this species have been published since then. My variability study on *A. nodipalpis* indicates that the interspace of *A. semidistans* lies within the range of variability of the stem species. All other available morphological details confirm that *A. semidistans* is a synonym of *A. nodipalpis*.

ATRACTIDES INTERMEDIUS (SOAREC, 1939)

Megapus nodipalpis intermedius Soarec, 1939
separate species, Motaş & Tanasachi, 1962
Species dubia

Type series: Missing. *Locus typicus:* Pârâul Secu. (Leg. J. Soarec 1938) 2 ♂, 1 ♀. Further records published by Soarec (1942), not referring to type material: Carpathes orientales: Bassin du Siret, Bistritza au confluent de Bicaz 550 m, 8 août, 1939; Bassin de la Moldova-Monts de Neamtz, Ruisseau Secu, aff. de l'Ozana, Monastère Secu 500 m, 3 août, 1939; Monts Vrancei et Monts Harghita; Rivière Olt, à Sfântul Gheorghe 500 m 12 juillet, 1939.

Description. Male (detailed description, 1942, female unknown): idiosoma L/W 540/410 µm; coxae with completely fused Cx-1–4 (no separating suture line visible between Cx-2 and -3); I-L-5 dL 174, L/W S-1 75/7, S-2 65/? (Soarec: 75 surely erroneous), setal interspace 22 µm; I-L-6 L 148 µm, strongly curved, L ratio I-L-5/6 1.18; genital field L 171 (Soarec: W = 109 surely erroneous, Fig. 94 shows a genital field wider than long), with equally convex anterior and indented posterior margins; gnathosoma vL 104; palp measurements not usable (strong contradictions between published values, with L P-2 = 74 µm, P-3 = 50 µm, but in Fig. 93 both segments nearly equal in L); P-2 with strongly protruding ventrodiscal edge, P-4 inflated and with dense dorsal hair cover, sword seta arranged distally from the distoventral hair.

Discussion: Soarec's first description was a brief diagnosis, without measurements and drawings, and without specification of the sex of the treated specimens, designating it an intermediate variety between *A. fonticolus* and *A. pennatus*. The description provided in 1942 was based on three males from three different collecting sites, obviously not including the types, without making any reference to females. *A. intermedius* has not been recorded since the original description which leaves many open questions and creates additional problems due to obvious measurement mistakes. The diagnosis is based on a juvenile (excretory pore close to posterior idiosoma margin, inflated P-4). This could be the reason for Cx-2 + 3 appearing fused to each other because in juveniles they can be closely examined without encountering the strip of membra-

nous integument separating the two plates in older specimens. *A. intermedius* is similar to *A. fonticolus* both in the shape of palps and genital field, and in the shape and position of S-1 and -2 (but following Soarec S-2 less thickened than in *A. fonticolus*). Further differences concern the generally lower measurements and differing dimensions of I-L-5 and -6; a low ratio of 1.18 (from this point, Soarec's measurements and drawing agree) is not found in any of the *nodipalpis*-like *Atractides* species.

In view of the numerous obvious errors in the original description, the loss of the types and the fact that *A. intermedius* was probably described from juveniles, this taxon should be considered a *species dubia*. However, the name could be 'reanimated' if in the type region *fonticolus*-like *Atractides* with a low L ratio I-L-5/6 are found.

ATRACTIDES DUBIUS (SOKOLOW, 1940)

Megapus spinipes var.? Sokolow, 1927

Megapus spinipes dubius Sokolow, 1940

Syn. to *A. arcuatus* (Thor, 1914): syn. nov.

Type series: Holotype ♀ ZISP 418 Type ♀ *Megapus* [cancelled: *nodipalpis* Thor var.I] *spinipes* var.*caucasica* n.v. I.Sokolow det.; Kaukas. 8.XI.24 Rugenj. W.Tr.G. 9.1.07 Wlduk. (No.13) Tarnogradskij leg.; comparison with figure 159 in Sokolow (1940) indicates that the description of *A. dubius* was based on this specimen. The name *caucasica* was not published by Sokolow, possibly in view of the already existing name *kaukasiensis* Thor, 1914. State of conservation: idiosoma with separate dorsum, ventrum strapped in two areas, genital field separate from coxal field, all left legs missing or heavily damaged; gnathosoma separate, lateral, with palps and chelicerae *in situ*; two eggs.

Description: see under *A. arcuatus*.

Discussion: At the time when this taxon was described, the morphology of *A. spinipes* was poorly understood. Sokolow characterized it by unfused, paired genital plates in males (thus, a character of misshaped intersexual specimens) and P-3 and P-4 equal in L in females (a character within the range of variability of *A. nodipalpis*). Furthermore, as also done by Halbert (1911), Sokolow attributed to *A. spinipes* the presence of swimming hairs on legs, a character within the subgenus restricted to *A. ovalis*.

Atractides dubius differs from all specimens pooled by various authors at that time under the name of *A. spinipes* due to the lineated integument. From this point of view, it is probably similar to the little known *A. arcuatus*, a species described from the Caucasus as well, of which the type material is lost. If we compare the available information, there is agreement in dimensions and arrangement of Ac, and in shape and setation of palp. Regarding idiosoma and palp measurements, *A. dubius* exceeds the values provided for *A. arcuatus*, but the measurement differences could be examples of normal intraspecific variability. No useful information is available on the morphology of the

female I-L-5 and -6 in *A. arcuatus*. In male *A. arcuatus*, I-L-5 is more slender than in the type of *A. dubius*, but in this regard we observe sexual dimorphism also in other *Atractides* species. The I-L-5/6 L ratio (1.31) is identical in the male *A. arcuatus* and the female *A. dubius*. The available information suggests that *A. dubius* is a synonym of *A. arcuatus*, a species that merits a detailed redescription.

ATRACTIDES ROBUSTUS (SOKOLOW, 1940) (FIGS 42A–H, 43H)

Megapus nodipalpis robustus Sokolow, 1940

Type series: Syntypes ♂, ZISP 1/889 [red] N 392 type ♂ *Megapus nodipalpis* var. *robustus* n.var.; Kuban [...] 15.VIII.32 Tarnogradskij [...] 2 ♂ on one slide. Lectotype: the specimen near the species label. State of conservation: dorsum separate, coxae longitudinally fractured (measurement impossible), gnathosoma and left I-L separate, chelicerae and right palp isolated, P-3 broken, Gsk missing. Paralectotype: the specimen near the collecting site label. State of conservation: idiosoma broken in two parts, genital field missing, gnathosoma and both I-L *in situ*, one palp separate. Paralectotype: ♀, ZISP 2/890 [red] N 397 Type ♀ *Megapus nodipalpis* S.Thor var. *robustus* n.var.; [...] 6.IX.32 Tarnogradskij [...] 1 ♀. State of conservation: dorsum separate, gnathosoma *in situ*, both palps and left I-L separate, right I-L missing. *Locus typicus*: Caucasus, widely distributed in affluents of Kuban river. Further collecting area mentioned in the first description: Kolskij peninsula, Warsuga river (coll. W. I. Schadin).

Material examined: ZISP 393, 398, 400, 410, all labelled *Megapus nodipalpis* S.Thor var. *robustus* nov. var. and Kuban [...] Tarnogradskij, collecting dates VIII/IX 1932; SMF KOViets 1521 'Harz Kellwasser' 1 ♂, 1 ♀.

Description:

General features

dorsal integument: striated (9/10); muscle attachments: unsclerotized
genital field: Ac in triangular arrangement
I-L: I-L-5 with diverging ventral and dorsal margins, S-1–2 with blunt tips, S-1 longish, slender, S-2 thickened in basal third; I-L-6 curved, slender, maximum height basally
genital field: Ac large, in a triangle
excretory pore: smooth; Vgl-1: not fused to Vgl-2
palp: strong sexual dimorphism; P-4 1 : 1 : 1, sword seta long, near proximoventral hair
IV-L-4/5 distally swollen and with pointed sheaths covering the base of the following segment

Males

Lectotype
genital field: anterior margin indented, posterior margin deeply indented, with a small medial extension in the posterior bay, Ac-3 long, distally narrowed; genital setae: 70
palp: ventral margin P-2 with strongly pointed ventrodistal protrusion, separated by a small longitudinal sulcus from a convexly rounded lateral area, P-3 concave, P-4 strongly thickened near proximoventral hair, sword seta proximal to proximoventral hair
idiosoma L/W 1000/730; glandularia 27
coxal field L 450; Cx-3 W –; Cx-1 + 2 mL 139, II 338, W 448
I-L-5 dL 270, vL 193, dL/vL 1.40, HA-HC 67, 81, 92, dl/HB 3.33
S-1 L 132, L/W 14.7, S-2 L 100, L/W 9.1, interspace 29, L S-1/2 1.32
I-L-6 L 193, HA-HC 36, 22, 31, dL/HB 8.77; L I-L-5/6 1.40
genital field L/W 189/224, Ac-1–3 L 55–68–87
gnathosoma vL 224; chelicera L 323, L/H 5.98, bS/claw 2.26

palp	P-1	P-2	P-3	P-4	P-5
L/W	40/42	103/100	103/67	121/47	52/18
(ratio)	0.95	1.03	1.54	2.57	2.89

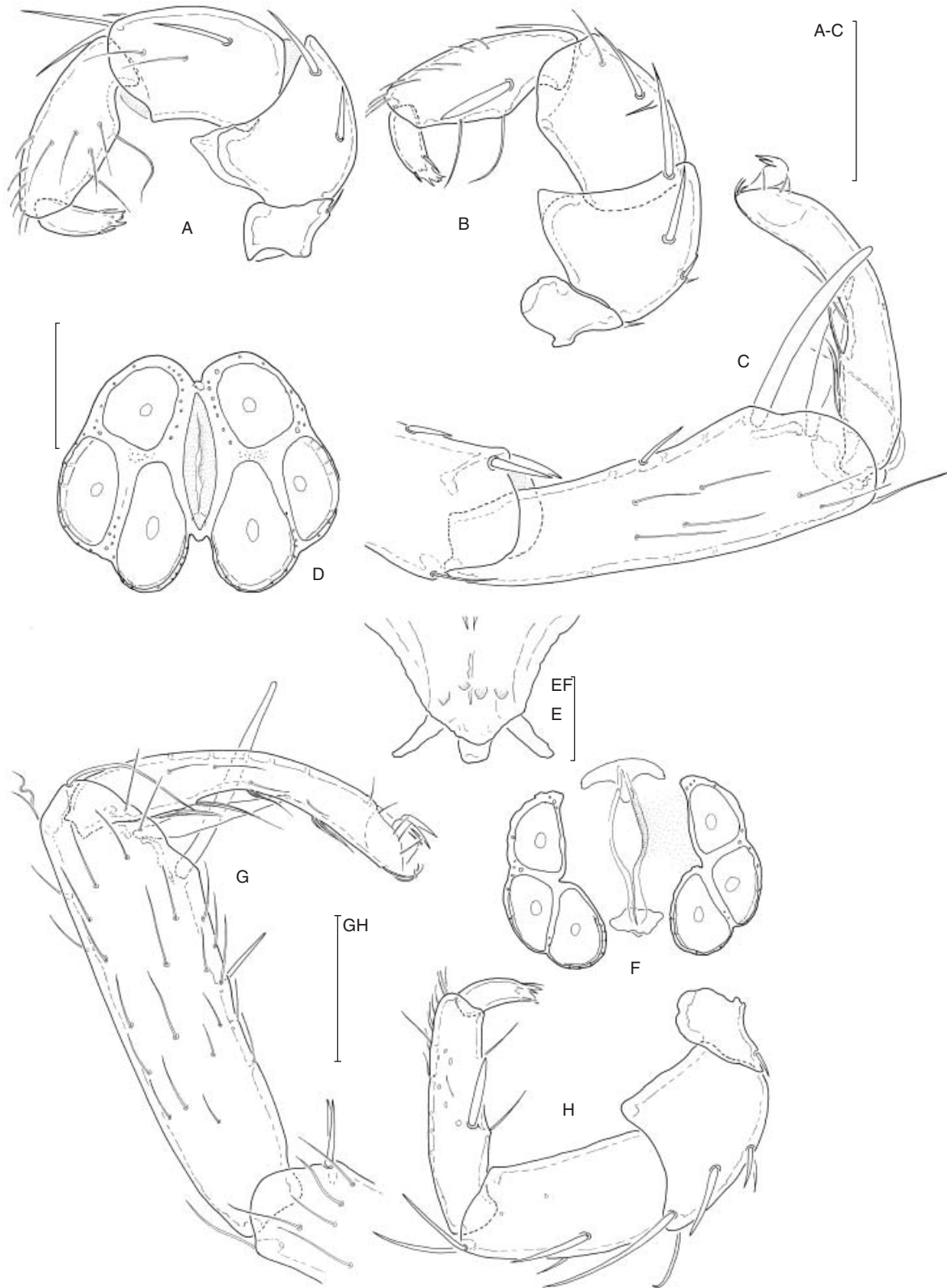


Figure 42. *Atractides robustus*. A–D, lectotype ♂ ZISP 1/889; E–H paralectotype ♀ ZISP 2/840. A, ♂ palp, lateral view; B, ♂ palp, medial view; C, ♂ I-L-5 and -6; D, ♂ genital field; E, ♀ medio-caudal edge of Cx-1 + 2; F, genital field; G, ♀ I-L-5 and -6; H, ♀ palp, medial view; Scale bars = 100 µm.

rel.L	10	25	25	29	12
total L:	P-2/4 0.85				
419					

Mediocaudal margin of Cx-1 + 2 convex, apodemes of Cx-2 in an acute angle with the median line, Cx-4 with narrow border of secondary sclerotization; I-L-4 with strong distal sheaths covering the articulation of I-L-5; genital field with relatively large Ac, leaving narrow reaches of genital plate surface only; Ac-2 and -3 rather longish, nearly in a right angle with Ac-1; P-4 dorsal hair cover not clearly visible due to pollution of the mounting medium.

Females

Paralectotype

genital field: genital plates consisting of a narrow border of sclerite surrounding the Ac, deep indentation of the medial margin between Ac-1 and -2 palp: ventral margin P-2 straight, with a rounded, not protruding distal edge;

P-3 straight, P-4 slender, slightly protruding near proximoventral hair idiosoma L/W 1400/1100; glandularia 30 coxal field L 540; Cx-3 W 795; Cx-1 + 2 mL 175, IL 383, W 500 I-L-5 dL 330, vL 234, dL/vL 1.41, HA-HC 83, 90, 108, dL/HB 3.67 S-1 L 148, L/W 16.4, S-2 L 105, L/W 7.0, interspace 35, L S-1/2 1.41 I-L-6 L 236, HA-HC 40, 25, 32, dL/HB 9.44; L I-L-5/6 1.40 genital field L/W 238/306, Ac-1-3 L 69-76-76 gnathosoma vL 243; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	47/45	123/92	152/74	165/43	58/18
(ratio)	1.04	1.34	2.05	3.84	3.22
rel.L	9	23	28	30	11
total L:	P-2/4 0.75				
545					

Facing edges of Cx-2 and -3 and the posterior margin of Cx-4 bordered by secondary sclerotization; I-L-4 with distal sheaths extending much less far than in males, variation in specimens from Kuban: I-L-5 dL 275–330, setal interspace 19–38, I-L-6 L, 193–236, HB 20–27 µm.

Discussion: In the first description of *A. robustus*, Sokolow gave particular weight to the following characteristics: in both sexes, Ac large, and the insertion of the sword seta P-4 shifted proximally; in males ventrodorsal edge of P-2 strongly protruding, P-4 with long ventral hairs and only a few dorsal hairs.

Comparison with my variability data for *A. nodipalpis* indicates that most of these character states fall within the range of variability of that species. A difference of the southern German population of *A. nodipalpis* is the relatively slender S-1 sword seta, although the type specimens of *A. robustus* are more similar to those of *A. nodipalpis* (♂ 13.4, ♀ 15.1) than to the population used for investigating variation in that species (maximum ♂ 12.9, ♀ 11.7). This character is clearly subject to strong intraspecific variability and not suitable for species definition.

A notable difference between *A. robustus* and *A. nodipalpis* concerns the location of the sword seta of P-4. Females of *A. robustus* are distinct in having the

insertion of this seta closer to the proximal than to the distal ventral hair. In the numerous *A. nodipalpis* females checked for this study, this seta was either found in a central position between the two hairs, or nearer to the distal one. In males of *A. nodipalpis*, the position of this seta is more variable. In most specimens it is located distal to, or on the same level as, the proximoventral hair. However, there are exceptional cases where this seta is in a proximal position, as described in this paper for *A. robustus*. We therefore have the rare situation of an *Atractides* that can be distinguished more clearly in females than in males. Males with sword seta arranged proximal to the proximoventral hair on P-4 can be ascribed to *A. robustus* if they have long S-1 ($L > 130 \mu\text{m}$) and I-L-6 ($L >, 190$).

Lundblad (1956) was the first to observe a characteristic swelling of IV-L-4/5 in *A. robustus*. Indeed, in all specimens of the type series these segments are thickened distally and have pointed lateral sheaths covering the articulation of the following segment. An examination of the whole population from the variability study for *A. nodipalpis* confirms the absence of this character state in the compared species. It is obviously diagnostic for *A. robustus*, and suitable for an unequivocal identification. Often the two taxa *A. nodipalpis nodipalpis* and *A. nodipalpis robustus* were found coexisting in the same collecting site, in contradiction to the phylogenetic subspecies concept. Most previous authors paid particular attention to the more or less strongly protruding edge of the P-2 in males, and attributed specimens in which this secondary sexual character was particularly well developed to *A. n. robustus*.

Habitat: Rhithrobiont.

Distribution: Russia, Caucasus, Central and Southern Europe (1, 4–6, 8–10, 13, 15, 16, 23, 24).

ATRACRIDES MADERENSIS (LUNDBLAD, 1941)

(FIG. 43A–G)

Megapus maderensis Lundblad, 1941a

(*Atractides madericolus* K. Viets, 1949, err.)

Type series: Holotype ♂, SMNH 2918. Typ. *Megapus maderensis* Ldbl. ♂. Madeira. Ribeira da Janella. Risco. Vattenfall., 19.7.1935. Leg. O. Lundblad. Paratype: ♀ SMNH 2919. Allotyp. *Megapus maderensis* Ldbl. ♀. Madeira. Levadan vid 25 Fontes. 22.7.1935. Leg. O. Lundblad. State of conservation: holotype dorsum/ventrum separated, Gsk separate caudal, gnathosoma *in situ*; I-L-5 and -6 (cut off in the centre of I-L-4), chelicerae and palps separate, all in oblique position and poorly visible due to droplet precipitation. Paratype ♀ dorsum missing, gnathosoma with chelicerae *in situ*, I-L-5 and -6 (as in holotype) and palps separate lateral, 1 egg, mounting fluid with little precipitation.

Material examined: two paratypes ♂ ex coll. SMNH (prep. Gerecke) Madeira, Rabaçal, Risco, 19.07.1935, Lundblad, *Atractides maderensis* ♂ Paratypes, two slides.



Figure 43. A–G, *Atractides maderensis*. A–C, paratype ♀ SMNH 2919; D–F, holotype ♂ SMNH 2918; G, paratype ♂ SMNH prep. Gerecke. A, ♀ I-L-5 and -6; B, ♀ palp, medial view; C, ♀ genital field (without right genital plate); D, ♂ genital field, E, ♂ excretory pore and Vgl-1/2; F, ♂ coxal field; G, ♂ palp, medial view. H, *Atractides robustus* lectotype ♂ ZISP 1/889 IV-L-3–5; I (for comparison) *A. nodipalpis*, S Germany; D, 459, IV-L-3–5. Scale bars = 100 µm.

*Description:**General features*

dorsal integument: lineated (4/10); muscle attachments: unsclerotized
 I-L: I-L-5 thickened, both S-1 and -2 short, enlarged, distanced; I-L-6 curved, maximum H at base
 genital field: Ac in a weakly curved line
 excretory pore: oval sclerite ring; Vgl-1: fused to Vgl-2
 palp: in both sexes, ventral margin P-2 with nose-like protruding distal edge, P-3 with a fine, hyaline longitudinal lamella in the anterior half, P-4 1 : 1 : 1, strongly protruding in an obtuse angle near proximoventral hair and the closely positioned, extremely thickened and blunt sword seta

Males

Holotype, in parentheses paratype, for palp only paratype
 genital field: anterior margin equally convex, posterior margin deeply indented; genital setae: 50
 idiosoma L/W 640/470 (530/410); glandularia 29
 coxal field L 315 (290); Cx-3 W 370 (338);
 Cx-1 + 2 mL 117 (103), IL 216 (210), W 275 (265)
 I-L-5 dL 170 (163), vL 121 (116), dL/vL 1.40,
 HA-HC 49, 54, 65, (47, 53, 58) dL/HB 3.15
 S-1 L 76, L/W 7.6, S-2 L 58, L/W 3.9, interspace 18 (13), L S-1/2 1.31
 I-L-6 L 114 (116), HA-HC 25, 21, 20 (24, 17, 19), dL/HB 5.43; L I-L-5/6 1.49
 genital field L/W 100/121, Ac-1-3 L 27, 27, 25
 gnathosoma vL 230; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	30/30	72/66	65/46	87/33	31/13
(ratio)	1.00	1.09	1.41	2.64	2.38
rel.L	11	25	23	31	11
total L:	P-2/4 0.83				
	285				

Lineated epicuticula locally detached and underlying smooth integument visible; very narrow borders of secondary sclerotization at the posterior margin of coxae and anterior margin of genital plate; medio-caudal margin of Cx-1 + 2 equally rounded, apodemes of Cx-2 strongly developed, in an obtuse angle, with their tips not reaching the level of the medio-caudal margin of the coxal plate; genital field with 8–9 setae flanking the gonopore on each side, and further 14–17 setae lined up along the posterior and lateral margins.

Females

Paratype
 genital field: Ac surface increasing Ac-1 < Ac-2 < Ac-3
 palp: as in males, slightly more slender and with shorter setae
 idiosoma L/W 780/620; glandularia 30
 coxal field L 345; Cx-3 W 440; Cx-1 + 2 mL 112, IL 234, W 310
 I-L-5 dL 202, vL 148, dL/vL 1.36, HA-HC 66, 69, 81, dL/HB 2.93
 S-1 L 92, L/W 7.7, S-2 L 69, L/W 4.3, interspace 22, L S-1/2 4.18
 I-L-6 L 135, HA-HC 29, 19, 20, dL/HB 7.11; L I-L-5/6 1.50
 genital field L/W 202/230, Ac-1-3 L 26, 26, 26
 gnathosoma –, chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	36/36	87/78	78/54	96/36	38/16
(ratio)	1.00	1.12	1.44	2.67	2.38
rel.L	11	26	23	29	11
total L:	P-2/4 0.91				
	335				

Pregen large, genital plates anteriorly pointed, posteriorly roundish, Ac in a weakly curved line, 13–14 setae on each plate; Vgl-1 asymmetrically completely

fused with Vgl-2 on one side, but only tangentially attached on the other; palps in shape and setation only weakly different from the male, but dorsal setae on P-2 and P-3 shorter, and P-4 with weaker sword seta and less dense dorsal hair cover.

Discussion: As with the following two species and also *A. (Polymegapus) rutae*, Lundblad (1941b, 1942a) introduced the name with a brief diagnosis in the earlier paper, providing a usable description in the later one. All following remarks concerning the original description refer to the later paper. Due to the character combination of a lineated integument, I-L-5 with short, flattened sword setae, excretory pore surrounded by a sclerite ring, palp with strongly protruding ventrodiscal edge of P-2, a hyaline, longitudinal lamella on ventrodiscal margin of P-3, and a very strong and blunt sword seta on P-4, *A. maderensis* is clearly distinguishable from all species known at the time of its description. Species of subgenus *Atractides* with modified palps in females are *A. gladisetus* and *A. legeri*, both different in shape and setation of I-L-5 and -6 and palp, and *A. dentipalpis*, a species which differs from *A. maderensis*, apart from other features, in the presence of pointed indentations on the ventrodiscal protrusion of P-2.

Habitat: Rhithrobiont.

Distribution: Madeira (1).

ATRACTIDES INSULANUS (LUNDBLAD, 1941)
(FIG. 44A–G)

Megapus insulanus Lundblad, 1941b

Type series: Holotype ♂, SMNH 2915. Typ.; *Megapus insulanus* Ldbl. ♂. Ribeira da Janella. Wattenfall. Risco, 19.7.1935. Leg. O. Lundblad Paratype: ♀ SMNH 2916. Allotyp, labelled like holotype. State of holotype: dorsum separate, Gsk separate, anterior; gnathosoma *in situ*, chelicerae missing, both palps and both I-L-4–6 (with I-L-4 cut off in the centre, I-L-3 and basal part of I-L-4 missing) lateral; together with the dissected holotype, a further undissected male mounted, mounting medium without precipitations. Paratype ♀ like holotype, but with chelicerae preserved, in lateral position isolated, mounting medium with stronger precipitations.

*Description:**General features*

dorsal integument: lineated (2–3/10); muscle attachments: unsclerotized
 I-L: I-L-5 S-1 and -2 far distanced, S-1 obtusely truncate, not thickened distally, S-2 basally enlarged, bluntly pointed; I-L-6 slender, curved, of nearly equal thickness from the base to the claw furrow
 genital field: Ac in a weakly curved line
 excretory pore: sexual dimorphism, smooth in ♂, with a horseshoe-shaped sclerite embracing posterior edge in ♀; Vgl-1: sexual dimorphism, fused to Vgl-2 in ♂, separate in ♀
 palp: weak sexual dimorphism; ventral margin P-3 in the proximal half concave, in the distal half with a longitudinal hyaline lamella, P-4 2 : 1 : 1, sword seta short, stout, near distoventral hair

Males

Holotype
 genital field: anterior margin straight or slightly concave, posterior margin weakly indented; genital setae: 40

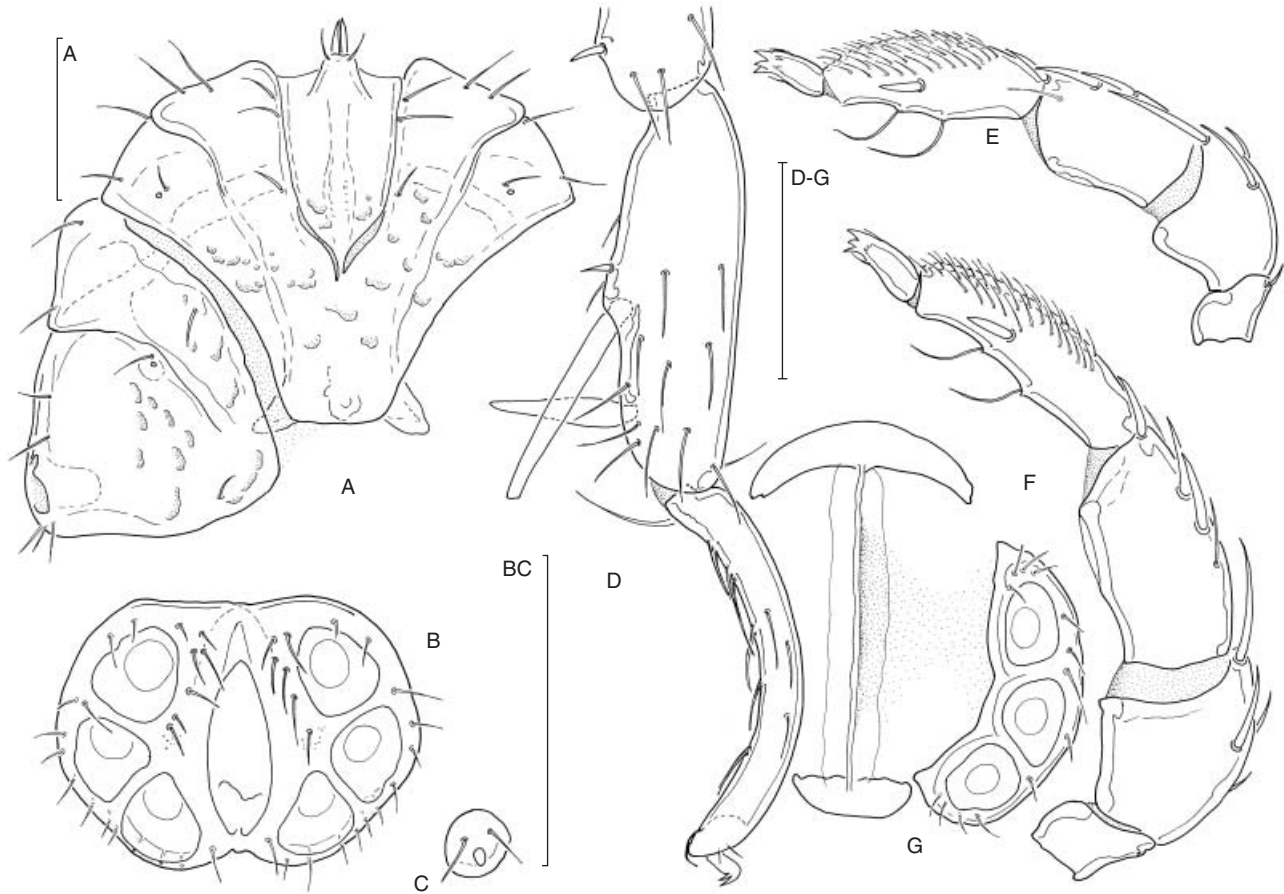


Figure 44. *Atractides insulanus*. A–E, holotype ♂ SMNH 2915; F, G, paratype ♀ SMNH 2916. A, ♂ coxal field; B, ♂ genital field; C, ♂ Vgl-1/2; D, ♂ I-L-5 and -6; E, ♂ palp, medial view; F, ♀ palp, medial view; G, ♀ genital field (without right genital plate). Scale bars = 100 µm.

palp: ventral margin P-2 weakly S-shaped, slightly protruding distally
 idiosoma L/W 560/390; glandularia 25
 coxal field L 293; Cx-3 W 350; Cx-1 + 2 mL 94, IL 198, W 288
 I-L-5 dL 190, vL 110, dL/vL 1.73, HA-HC 61, 65, 99, dL/HB 2.92
 S-1 L 108, L/W 9.0, S-2 L 67, L/W 5.6, interspace 49, L S-1/2 1.61
 I-L-6 L 172, HA-HC 23, 21, 21, dL/HB 8.19; L I-L-5/6 1.10
 genital field L/W 81/114, Ac-1-3 L 29, 31, 26
 gnathosoma vL 130; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	34/29	76/55	78/47	100/36	34/11
(ratio)	1.17	1.38	1.66	2.78	3.09
rel.L	11	24	24	31	11
total L:	P-2/4 0.76				
	322				

Cx-1 + 2 without borders of secondary sclerotization, mediocaudal margin truncate, apodemes of Cx-2 on the level of this margin, directed laterally; S-1 arranged approximately in the centre of the segment; Ac triangular in shape; Gsk L/W 120/31 µm; P-4 with both ventral hair insertions accompanied by a well developed denticle.

Females

Paratype
 genital field: genital plates slender, anteriorly pointed
 palp: ventral margin P-2 with a pointed distal edge, P-4 more slender than in ♂
 idiosoma L/W 840/590; glandularia 22
 coxal field L 387; Cx-3 W 490; Cx-1 + 2 mL 103, IL 365, W 383
 I-L-5 dL 265, vL 117, dL/vL 2.26, HA-HC 85, 90, 148, dL/HB 2.94
 S-1 L 156, L/W 9.8, S-2 L 90, L/W 5.6, interspace 74, L S-1/2 1.73
 I-L-6 L 238, HA-HC 29, 20, 25, dL/HB 11.9; L I-L-5/6 1.11
 genital field L/W 180/211, Ac-1-3 L 31, 31, 29
 gnathosoma vL 162; chelicera L 261, L/H 4.83, bS/claw 2.22

palp	P-1	P-2	P-3	P-4	P-5
L/W	45/34	100/69	112/58	125/38	40/11
(ratio)	1.32	1.45	1.93	3.29	3.64
rel.L	11	24	27	30	9
total L:	P-2/4 0.80				
	422				

Genital field with large, curved pregen, genital plate with a narrow border of anterior and lateral secondary sclerotization, bearing 13 setae arranged along the

anterior, lateral, and posterior margins, Ac nearly equal in size; palp differing from male in a nearly straight ventral margin of P-2 (with a minute, acute-angled ventrodiscal extension) and a more slender P-4 with less dense dorsal hair cover.

Discussion: *A. insulanus* is similar to *A. maderensis* in the lineated integument, the presence of a hyaline longitudinal lamella at the ventral margin of P-3, and the shape and setation of the male genital field. *A. maderensis* differs in the rounded posteromedial margin of Cx-1 + 2, the sword setae of I-L-5 placed more closely together, I-L-6 shorter and stockier, the excretory pore with sclerite ring, the palp with strong ventrodiscal protrusion of P-2 in both sexes, P-4 particularly thickened on the insertion level of the proximoventral hair and bearing a very strong sword seta arranged near this hair. In the large distance between sword setae of I-L-5, *A. insulanus* resembles *A. distans* and *A. latipes*. It differs from both species in the lineated integument, a relatively thicker, distally

obliquely truncate S-1, and thicker palp segments. Furthermore, *A. latipes* is a species considerably smaller in size. For a discussion of possible phylogenetic relationships between *A. insulanus* and *A. maderensis* see the Discussion under *A. macaronensis*.

Habitat: Rhithrobiont, mainly in hygropetric streams (Stauder, 1991).

Distribution: Madeira (1).

ATTRACTIDES MACARONENSIS (LUNDBLAD, 1941)
(FIGS 45A–G, 46I)

Megapus macaronensis Lundblad, 1941b

Type series: Holotype ♂, SMNH 2902. Typ.; *Megapus macaronensis* Ldbl. ♂. Madeira. Levadan vid 25 Fontes 22.7.1935. Leg. O. Lundblad. Paratype: ♀ SMNH 2903. Allotyp (labelled as holotype). State of conservation: holotype dorsum lost, Gsk separate, posterior, both I-L-5 and -6 separate, lateral (with I-L-4 cut off in the centre); gnathosoma and chelicerae *in situ*, palps both lateral, mounting medium with many precipitations; paratype in all details as holotype.

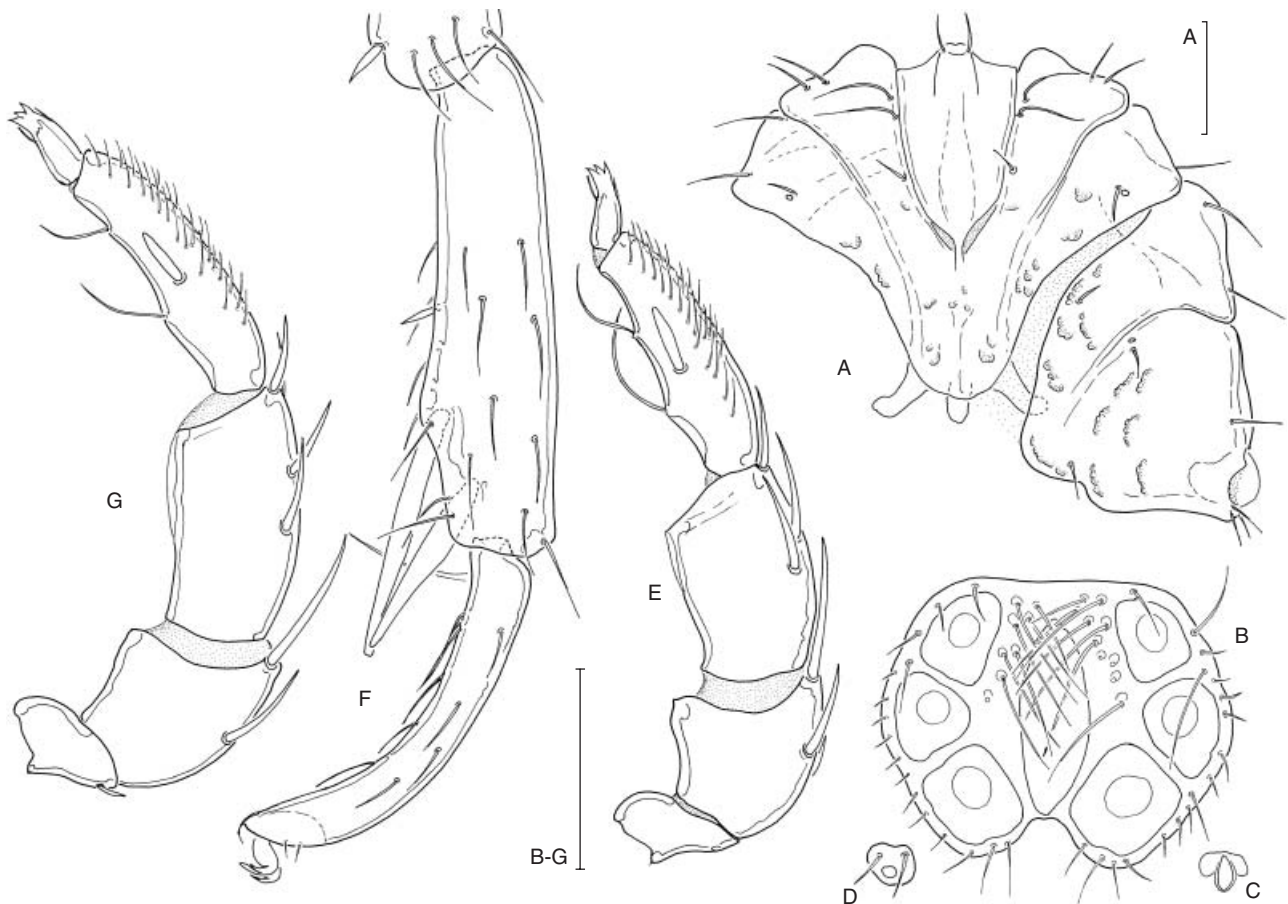


Figure 45. *Atractides macaronensis*. A–F, holotype ♂ SMNH 2902; G, paratype ♀ SMNH 2903. A, ♂ coxal field; B, ♂ genital field; C, ♂ excretory pore; D, ♂ Vgl-1/2; E, ♂ palp, medial view; F, ♂ I-L-5 and -6; G, ♀ palp, medial view. Scale bars = 100 μ m.

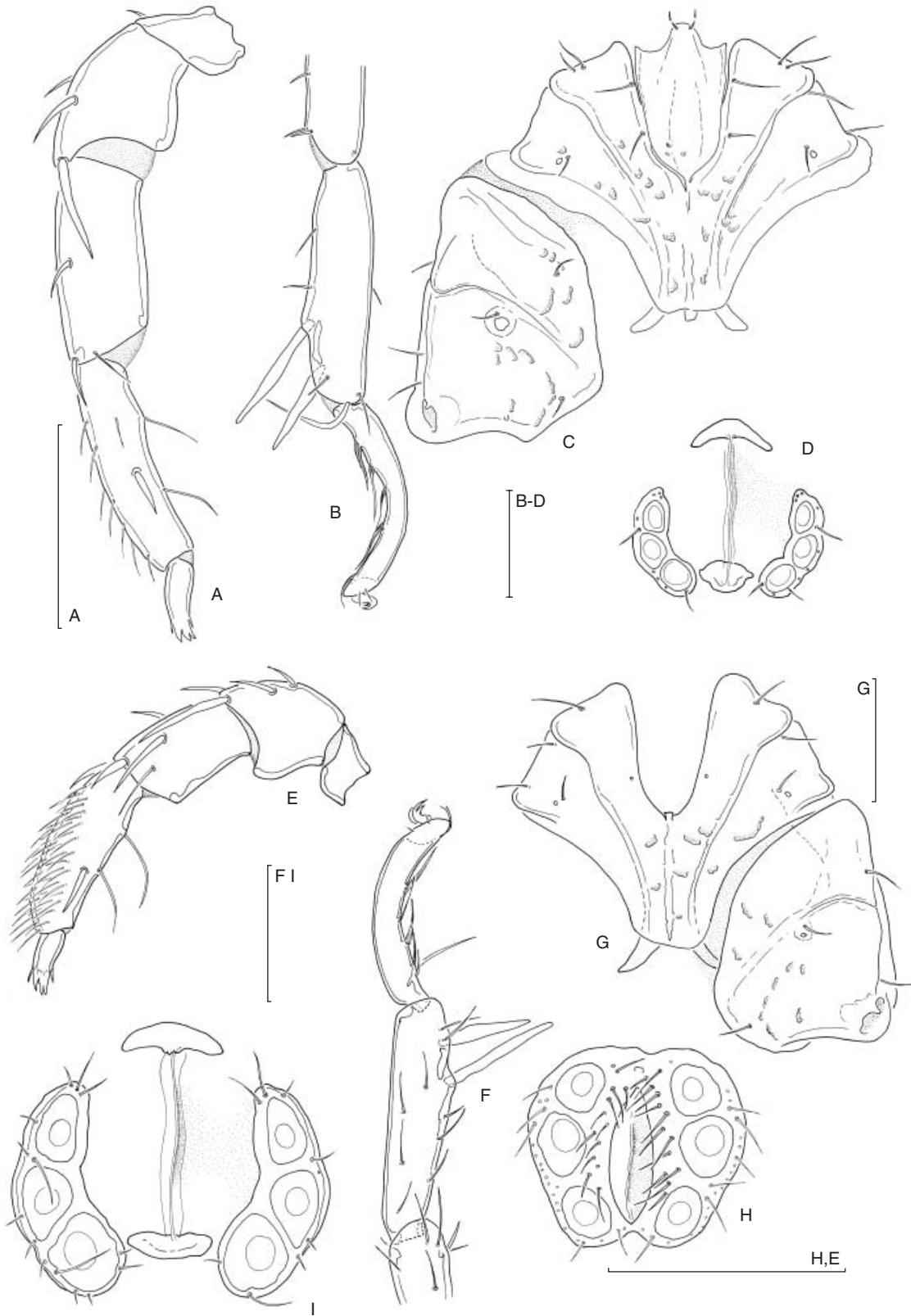


Figure 46. A–H *Atractides algeriensis*. A–D, paratype ♀ E–H, holotype ♂ A, ♀ palp, medial view; B, ♀ I-L-5 and -6; C, ♀ coxal field; D, ♀ genital field, E, ♂ palp, medial view; F, ♂ I-L-5 and -6; G, ♂ coxal field; H, ♂ genital field; I *Atractides macaronensis* paratype ♀ SMNH 2903, genital field. Scale bars = 100 µm.

*Description:**General features*

dorsal integument: lineated (4–5/10); muscle attachments: unsclerotized
 coxal field: posterior margin of Cx-4 indented
 I-L: I-L-5 not particularly thickened, S-1 and -2 distanced, distally narrowed
 and with rounded tips, S-1 more slender and longer than S-2; I-L-6 curved,
 slender, with parallel dorsal and ventral margins
 genital field: Ac in a weakly curved line, increasing in dimensions from Ac-1
 to Ac-3
 excretory pore: with a small sclerite embracing anterior edge; Vgl-1: sexual
 dimorphism, fused with Vgl-2 in ♂, separate in ♀
 palp: no sexual dimorphism; ventral margin P-2 without protrusion, ventro-
 distally forming a pointed angle, P-3 in the proximal half slightly convex, in
 the distal half with a hyaline longitudinal lamella, P-4 1 : 1 : 1 or 2 : 2 : 1,
 slender, sword seta between ventral hairs

Males

Holotype
 genital field: anterior margin straight, posterior margin weakly indented;
 genital setae: 50
 idiosoma L/W 730/540; glandularia 22
 coxal field L 405; Cx-3 W 470; Cx-1 + 2 mL 126, IL 265, W 387
 I-L-5 dL 252, vL 171, dL/vL 1.47, HA-HC 61, 72, 96, dL/HB 3.50
 S-1 L 130, L/W 13.0, S-2 L 99, L/W 7.1, interspace 36, L S-1/2 1.31
 I-L-6 L 193, HA-HC 30, 25, 26, dL/HB 7.72; L I-L-5/6 1.31
 genital field L/W 132/161, Ac-1–3 L 47, 45, 52
 gnathosoma vL 171; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	43/36	100/74	112/65	134/40	43/16
(ratio)	1.19	1.35	1.72	3.35	2.69
rel.L	10	23	26	31	10
total L:	P-2/4 0.75				
432					

Mediocaudal margin of Cx-1 + 2 slightly convex with a protruding subcutaneous knob, apodemes of Cx-2 in an obtuse angle, mediocaudal margin of Cx-4 with a strong indentation. On each side about 10 long setae flanking the large gonopore, and 15 setae posteriorly decreasing in L at the lateral margins; Ac-1/2 subtriangular, Ac-3 larger and subquadratic in shape.

Females

Paratype
 genital field: Ac increasing in diameter Ac-1–3
 idiosoma L/W 1010/780; glandularia 27
 coxal field L 437; Cx-3 W 590; Cx-1 + 2 mL 157, IL 284, W 419
 I-L-5 dL 288, vL 198, dL/vL 1.45, HA-HC 63, 76, 108, dL/HB 3.79
 S-1 L 141, L/W 14.1, S-2 L 110, L/W 6.5, interspace 38, L S-1/2 1.28
 I-L-6 L 216, HA-HC 30, 22, 29, dL/HB 9.82; L I-L-5/6 1.33
 genital field L/W 193/220, Ac-1–3 L 40, 43, 45
 gnathosoma vL 189; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	49/40	110/78	134/65	148/38	49/16
(ratio)	1.23	1.41	2.06	3.89	3.06
rel.L	10	22	27	30	10
total L:	P-2/4 0.74				
490					

Mediocaudal indentation of Cx-4 less developed than in males; genital field with relatively small pregen, excretory pore as in male, but Vgl-1 separate from Vgl-2. Palp more slender than in male.

Discussion: Both sexes are very similar to those of *A. insulanus* in the lineated integument, and the shape of genital field and palp. In general, *A. macaronensis* has larger dimensions than *A. insulanus* (e.g. palp total L ♂ 432, *A. insulanus* 322 µm). The most conspicuous differences of *A. insulanus* concern I-L-5 and -6: wider setal interspace (♂ 49, ♀ 74 µm) lower ratio dL/vL (1.73–2.26) and dL/HB (2.9). S-1 stouter (L/W 9.0–9.8) but relatively long (L ratio S-1/2 1.61–1.73), I-L-6 relatively long (L ratio I-L-5/6 1.10–1.11). Furthermore, *A. insulanus* differs from *A. macaronensis* in having an undented caudal margin of Cx-4, an unsclerotized anterior edge of the excretory pore and a less slender P-4 (L/H ♂ 2.78, ♀ 3.29). Bearing in mind the range of variability established for *A. nodipalpis*, we might expect that this list of differences would be reduced markedly after a statistical analysis of higher numbers of specimens. However, several of the listed characters (e.g. relative L and shape of sword setae on I-L-5, proportions of I-L-5, and L ratio I-L-5/6) have proved to be rather stable in other *Atractides* species, and *A. macaronensis* is without doubt separate from *A. insulanus*. Following Lundblad, this species differs from all other *Atractides* known at that time in having the sword seta of P-4 inserted proximally. However, similar conditions are found also in *A. panniculatus*, a species differing from *A. insulanus* in the longer Cx-1 + 2 medial suture (>120 µm), larger Ac (diameter >50 µm), Vgl-1/2 not fused, and ratio I-L-5/6 > 1.2.

Notwithstanding the considerable number of differences between *A. macaronensis* and *A. insulanus* on the one hand, and *A. maderensis* on the other, the similar shape of the male genital field, and in particular the presence of a hyaline longitudinal lamella on the ventral margin of P-3 suggest a close relationship between these three species. We may be looking at a group of sister species that originated by adaptive radiation on Madeira itself. Attention should be paid to eventual outgroup candidates in the fauna of south-west Europe and north-west Africa.

Habitat: Rhithrobiont, with a preference for hygropetric habitats and stony habitats with middle to high stream velocity (Stauder, 1991).

Distribution: Madeira (1).

ATRACTIDES ALGERIENSIS (LUNDBLAD, 1942)
(FIG. 46A–H)

Megapus algeriensis Lundblad, 1942c
(*Atractides africanus* K. Viets, 1949, err.)

Type series: Holotype ♂, SMNH 3139. Typ.; *Megapus algeriensis* Ldbl. ♂ Algeriet, El Kantara 4.4.1931 leg. G. Notini. State of conservation: dorsum lost, both I-L-5 and -6 separate, lateral (with I-L-4 cut off in the centre); gnathosoma separate, all appendages isolated, lateral; poor visibility due to many precipitations. Paratype: ♀ SMNH 3140. Allotyp. site label and state as holotype, but gnathosoma incl. chelicerae *in situ*, only palps separate, lateral.

*Description:**General features*

dorsal integument: striated (6/10); muscle attachments: unsclerotized
 I-L: I-L-5 S-1 and -2 distanced, S-1 slender, blunt, S-2 basally thickened, more pointed; I-L-6 slender, curved, with maximum H proximally
 genital field: Ac small, in a curved line
 excretory pore: smooth; Vgl-1: not fused to Vgl-2
 palp: sexual dimorphism, ventral margin P-3 and P-4 straight

Males

Holotype

genital field: anterior margin straight, posterior margin weakly indented, Ac-2 nearer to Ac-1; genital setae: 70
 palp: ventral margin P-2 strongly S-shaped, distally convex, but without protrusion, P-4 1 : 1 : 1, sword seta distal to distoventral hair
 idiosoma L/W 550/440; glandularia 20
 coxal field L 297; Cx-3 W 330; Cx-1 + 2 mL 94, IL 174, W 256
 I-L-5 dL 170, vL 112, dL/vL 1.52, HA-HC 43, 47, 67, dL/HB 3.62
 S-1 L 87, L/W 12.4, S-2 L 67, L/W 8.4, interspace 22, L S-1/2 1.30
 I-L-6 L 138, HA-HC 22, 18, 20, dL/HB 7.67; L I-L-5/6 1.23
 genital field L/W 83/90, Ac-1-3 L 19, 21, 19
 gnathosoma vL 112

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/25	62/49	66/39	87/31	30/12
(ratio)	1.16	1.27	1.69	2.81	2.50
rel.L	11	23	24	23	11
total L:	P-2/4 0.71				
	274				

Upper cuticula striated, deeper integument layers with a coarse lineation perpendicular to the upper strata; Cx-1 + 2 mediocaudal margin truncate, apodemes of Cx-2 strongly developed, in rectangular position to each other, slightly curved; posterior margin of Cx-4 laterally concave, suture Cx-3/4 slightly curved and Cxgl-2 not protruding anteriorly over this line; I-L-5 S-1 with irregular narrowing (following Lundblad, slightly S-shaped) and apically rounded, S-2 strongly enlarged in the basal half; I-L-6 strongly curved, with nearly parallel dorsal and ventral margins; left Vgl-1 asymmetrically reduced; genital field maximum W in the anterior half, on the level of the anterior margin of Ac-2; W Ac-2 more closely resembles that of Ac-1 than Ac-3; 15 pairs of setae flanking the gonopore.

Females

Paratype

genital field: genital plates with narrowed anterior tip, medial concave, slightly indented between Ac
 palp: ventral margin P-2 slightly protruding distally; P-4 2 : 3 : 3, sword seta between ventral hairs
 idiosoma L/W 810/620; glandularia 22
 coxal field L 378; Cx-3 W 470; Cx-1 + 2 mL 135, IL 234, W 333
 I-L-5 dL 230, vL 140, dL/vL 1.64, HA-HC 58, 63, 96, dL/HB 3.65
 S-1 L 121, L/W 12.1, S-2 L 94, L/W 6.7, interspace 38, L S-1/2 1.29
 I-L-6 L 183, HA-HC 29, 16, 22, dL/HB 11.44; L I-L-5/6 1.26
 genital field L/W 166/175, Ac-1-3 L 27, 29, 27
 gnathosoma vL 148; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	32/31	81/53	98/43	104/29	38/14
(ratio)	1.03	1.53	2.28	3.59	2.71
rel.L	9	23	27	30	11
total L:	P-2/4 0.78				
	353				

Mediocaudal margin Cx-1 + 2 concave, with slightly protruding knob-shaped subcuticular tip; pregen rather small. Palp, especially P-4, more slender than in males.

Discussion: Among the species with relatively small Ac, smooth excretory pore and slender I-L-5 and -6, *A. algeriensis* is most similar to *A. arcuatus*, *A. valencianus*, and *A. cultellatus* due to absence of muscle attachment sclerites and Vgl-1 not being fused to Vgl-2. *A. arcuatus* is still a little-known species, probably with lineated integument and with larger Ac in both sexes. If the synonymization of *A. dubius* proposed here proves to be correct, *A. arcuatus* differs also in having a stouter I-L-5, at least in females. *A. valencianus* is similar in many measurements, but with lineated integument, a stouter and relatively short I-L-6 (L/HB ♂ 6.6, ♀ 7.9, ratio I-L-5/6 1.36–1.37) and in males with a larger genital field bearing lower numbers of setae. From *A. cultellatus*, a species known only in the female sex, *A. algeriensis* differs in a longer median suture Cx-1 (in *A. cultellatus* L = 90 µm) the dimensions of P-3 and P-4 (more slender in *A. cultellatus*) and the sword seta on P-4 not particularly thickened. In the original description, Lundblad compared *A. algeriensis* also to *A. tivdiae*, *A. diastema*, *A. fluviatilis* and *A. nondilatatus* from Eastern Europe. The holotype of *A. tivdiae*, a species known only from a male and here considered synonym to *A. nodipalpis*, has a larger genital field. *A. diastema*, known only from females, differs from *A. algeriensis* in a wider setal interspace (>50 µm) and more slender palp segments (L/H P-3 2.77, P-4 4.20); *A. fluviatilis* and *A. nondilatatus* have considerably larger Ac and genital fields. *A. algeriensis* has not been found again since its first description.

Habitat: Rhithrobiont.

Distribution: Algeria (x).

ATRACRIDES MITISI (WALTER, 1944)

Megapus mitisi Walter, 1944

Syn. to *A. panniculatus* (K. Viets, 1925): syn. nov.

Type series: Missing. *Locus typicus:* Austria, Mittellauf Ybbs Gsadt Ufersteine 28.9.37 2 ♀

Material examined: SMNH 4978 *Atractides mitisi* (Walt.) ♀ Österrrike Lunz. Bäck. 24.5.1955. Leg. O. Lundblad.

Description. Female (original description, male unknown): idiosoma L/W 960/800 mm, integument lineated; coxal field L/W 420/600 mm, mediocaudal margin of Cx-1 + 2 convex, with a slightly protruding subepidermal medial tip and apodemes of Cx-2 strongly protruding forming an acute angle; caudal margin Cx-4 straight, obviously with strong border of

secondary sclerotization; dL I-L-4 270, I-L-5 265, HA 68, HB 65, I-L-6 200 mm, I-L-5 with nearly parallel dorsal and ventral margins, dL/HB 4.08; S-1 slender, slightly enlarged in its distal half, nearly straight, S-2 basally strongly thickened (maximum W 15 mm) setal interspace 43 mm, L ratio I-L-5/6 1.33, I-L-6 proximally nearly straight, from the centre to the tip strongly curved; genital field L 220, gonopore L 160, genital plate L 150 mm, Ac in an obtuse angle, excretory pore smooth, Vgl-1 not fused to Vgl-2; gnathosoma L 140, chelicera total L 245, palp segments (L/H calculated from Walter's fig. 59) L P-1 38, P-2 90 (L/H 1.50), P-3 115 (L/H 2.50), P-4 135 (L/H 3.84), P-5 45, total L 378 mm, L ratio P-2/4 0.67, ventral margin of P-2 distally strongly inflated and rounded, with maximum H of 60 mm, ventral margin P-4 1 : 2 : 1, sword seta inserted slightly proximal to the distoventral hair.

Female from SMNH: idiosoma L/W 1200/900 μm , integument lineation 3/10 μm , with lines rather short (30–80 μm) glandularia diameter 27 μm , coxal field L 470, Cx-3 W 650, Cx-1 + 2 mL 153, IL 297, W 423 μm , coxae with extended secondary sclerotization, subcutaneous medial tip of Cx-1 + 2 not protruding over the convex posterior margin of Cx-1 + 2, apodemes of Cx-2 nearly parallel, in extremely acute angle; I-L-5 dL 297, vL, 189, HA–HC 69, 76, 112, S-1 L 145 (L/W 12.0), S-2 105 (L/W 8.8) interspace 47 μm ; I-L-6 L 216, HA–HC 29, 20, 22 μm , L/HB 10.8, L ratio I-L-5/6 1.38; genital field with borders of secondary sclerotization anteriorly on pregen and anterolaterally on genital plates, Ac-1–3 L 65, 69, 67 μm ; palp total L 445 μm , L (L/H) P-1 43 (1.19), P-2 100 (1.49), P-3 116 (2.37), P-4 148 (3.89), P-5 38 (3.45).

Discussion: The female from SMNH agrees closely with the information available from the original description. The only difference is found in generally larger measurements (a difference which might be still more considerable as Walter's measurement data have a general error of +20%). Due to the wide setal interspace, Walter compared *A. mitisi* with *A. distans* and the three Asiatic species *A. gassowskii* (Sokolow), *A. odarkensis* (Sokolow) and *A. gracilis* (Sokolow) and found a different arrangement of the Ac (in the compared species, arranged in a weakly curved line). In reality, *A. mitisi* is more similar to *A. panniculatus* and *A. fissus*, and in view of the distal position of the distoventral hair of P-4 and the slender I-L-6 it should be considered a synonym of *A. panniculatus*. The specimen from SMNH is larger than the Alpine populations of *A. panniculatus* investigated here both with regard to absolute dimensions, and in the relative setal interspace, a rather variable character in *A. panniculatus*. As to the shape (L/H ratio) of palp segments, the values for *A. mitisi* lie between those of

A. panniculatus and *A. fissus*, indicating that this character is of little taxonomic significance.

Apart from Lundblad (1956) three further authors recorded *A. mitisi*. The females from Wienerwald (K. O. Viets, 1958) and from the Polish Carpathians (Biesiadka, 1973) both differ from the type of *A. mitisi* in the distance of the distoventral seta of P-4 from the edge of the segment; they probably represent *A. fissus*. Bader (1975) attributed a single male from his collection in the Swiss National Park to this species, without giving any evidence about diagnostic differences between *A. mitisi* and *A. panniculatus*, a species widely distributed in the same area. With a setal interspace of 30 μm and the distoventral hair inserting closely to the distal edge of P-4, it falls within the range of variation in *A. panniculatus*.

ATRACTIDES OBLONGUS (WALTER, 1944) (FIG. 47A–G)

Megapus oblongus Walter, 1944

Syn. *A. longus* (Walter, 1947): syn. nov.; *A. szalayii* Motaş & Tanasachi, 1948: syn. nov.; *A. nitraensis* Láska, 1959: syn. nov.; *A. cerberus* Schwoerbel, 1961: syn. nov.; *A. psammophilus* Schwoerbel, 1965: syn. nov.

Type series: Holotype ♀, NHMB, *Megapus oblongus* ♀ Walter Ybbs 22.9.1937 Coll. v. Mitis Typus; leg. v. Mitis. Ybbs. Daglesbach 22.9.1937; XIV/79 pasted over: *Megapus oblongus* Walter Pr.14 79 Type ♀. State of conservation: perfect, gnathosoma incl. chelicerae isolated, in oblique position, both palps separate, lateral; right I-L separate, lateral.

Material examined: *A. longus* (Walter, 1947) type series, see under *A. longus*; MMB *A. longus*; 962–1 Studený p. u Zverovky. Liptovské Hote. 10.9.1954 Leg. Láska 1 ♀, 1269–1 Javorinka-Bělske Tatry 22.6.1958 1 ♀; type series and material examined of *A. nitraensis*; 8 slides from coll. CSM (7/1/0) labelled *A. szalayii* from collecting sites in Germany (Black Forest: Krummenbach, Schwarza, Zastler) and from Austria (Vorarlberg: Egg).

Description:

General features

dorsal integument: striated (8–9/10) muscle attachments: unsclerotized
coxal field: anterior edges of individual Cx slightly extending
I-L: I-L-5 sword setae similar in shape, slender, close to each other, with obtuse tips; I-L-6 stout, curved with nearly parallel dorsal and ventral margins, claws well developed
genital field: Ac in an obtuse triangle
excretory pore: smooth; Vgl-1: fused to Vgl-2
palp: no sexual dimorphism, slender; ventral margins P-2–4 straight, P-4 1 : 1 : 1, sword seta slender, between ventral hairs

Males

Lecto- and paralectotype of *A. longus*
genital field: anterior margin straight, posterior margin weakly indented, gonopore short, with anterior edge on the level of the posterior part of Ac-1, flanked by four pairs of hairs and in its posterior third by Ac-3; genital setae: 40
Idiosoma L/W 350–450/230–325 glandularia 20
coxal field L 190–247, Cx-3 W 204–224, Cx-1 + 2 mL 78–100, IL 128–161, W 172–190 μm
I-L-5 dL 96–121, vL 72–94 dL/vL 1.29–1.33, HA–HC 35, 40, 41 (23, 27, 31), dL/HB 3.03–3.56

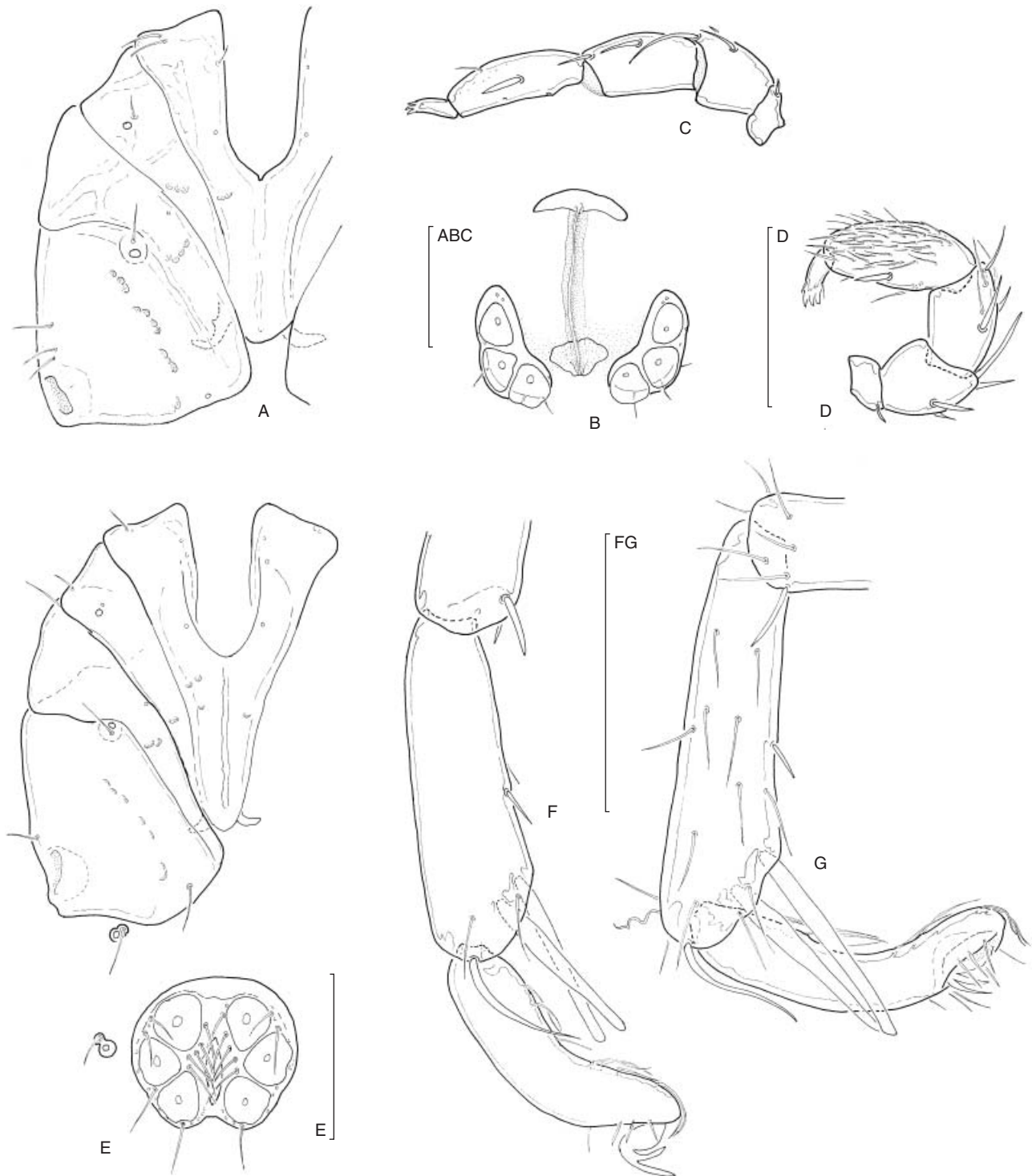


Figure 47. *Atractides oblongus*. A, C, holotype ♀ B, ♀ from type series of *A. longus*; D–F, ♂ from type series of *A. longus* (= syn. to *A. oblongus*), NHMB. A, ♀ coxal field; B, ♀ genital field; C, ♀ palp, medial view; D, ♂ palp, medial view; E, ♂ coxal and genital field; F, ♂ I-L-5 and -6; G, ♀ I-L-5 and -6. Scale bars = 100 μm.

S-1 L 52–68 (L/W 10.4–11.3), S-2 48–63 (L/W 6.9–9.0), interspace 7–8, S-1/S-2 1.08

I-L-6 L 76–96, HA-HC 26, 22, 22 (19, 16, 17), L/HB 4.36–4.75, L I-L-5/6 1.26
genital field L/W 68–90/72–96, Ac-1–3 L 21, 23, 23
gnathosoma vL 67–94 chelicera L 123–166, L/H 5.35, bS/claw 2.51–2.53

palp	P-1	P-2	P-3	P-4	P-5
L/W	15–20/ 15–20	37–49/ 28–38	44–54/ 24–36	62–81/ 23–31	21–23/ 7–9
(ratio)	(1.0)	(1.29–1.32)	(1.50–1.83)	(2.61–2.88)	(2.56–3.00)
rel.L	8–9	21–22	24–25	35–36	11–12
total L:	P-2/4 0.60				
	179–207				

Dgl-1–3 and Lgl-2 with long setae; mediocaudal margin of Cx-1 + 2 convex, apodemes of Cx-2 weakly developed and little protruding, borders of sclerites barely visible due to general weak sclerotization, no secondary sclerite; medial edges of all Ac forming angles directed to the centre; P-2 ventral margin with rounded distal edge, ventral margin of P-4 slightly concave proximal to insertion of the proximoventral hair, but straight between this point and the distal edge, dorsal margin slightly bowed and with dense hair cover along its length.

Female

Lectotype

genital field: genital plates flanking the postgen; Ac-3 triangular
idiosoma L/W 450/315 glandularia 22
coxal field L 243, Cx-3 W 265, Cx-1 + 2 mL 100, IL 176, W 211
I-L-5 dL 143, vL 108, dL/vL 1.32, HA-HC 40, 43, 47, dL/HB 3.33
S-1 L 81 (L/W 13.5), S-2 71 (L/W 10.1), interspace 12, S-1/2 1.09–1.13
I-L-6 L 108, HA-HC 28, 22, 23, L/HB 4.91, L I-L-5/6 1.32
genital field L/W 130–121
gnathosoma –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	24/21	55/43	70/37	85/21	29/9
(ratio)	(1.14)	(1.28)	(1.89)	(4.05)	(3.22)
rel.L	9	21	27	32	11
total L:	P-2/4 0.65				
	263				

Females

Paralectotypes of *A. longus*

idiosoma L/W 470–655/340–470
coxal field L 243–279, Cx-3 W 279–306, Cx-1 + 2 mL 90–112, IL 156–184, W 192–238
I-L-5 dL 125–154, vL 92–99, dL/vL 1.36–1.56, HA-HC 31, 40, 47 (28, 31, 39), dL/HB 3.85–4.03
S-1 L 63–81 (L/W 10.5–11.6), S-2 58–72 (L/W 8.0–8.3), interspace 9–12
I-L-6 L 92–110, HA-HC 25, 20, 21 (20, 16, 18), L/HB 5.50–5.75, L I-L-5/6 1.36–1.40
Genital field L/W 157/135, genital plate L 110, Ac-1–3 L 30, 27, 25

palp	P-1	P-2	P-3	P-4	P-5
L/W	22/16	46/31	60/26	77/20	23/8
(ratio)	(1.38)	(1.48)	(2.31)	(3.85)	(2.88)
rel.L	10	20	26	34	10
total L:	P-2/4 0.60				
	228				

Coxal field without traces of secondary sclerotization; genital field with Ac surrounded by a narrow sclerite border, pregen as a narrow stripe; P-4 distoventral hair insertion not accompanied by particular forma-

tions of the segment margin (palp measurements following original description, based on another specimen from the type series: L P-1 35, P-2 70, P-3 85, P-4 112, P-5 35, total L 337 µm).

Discussion: Following Walter, this species resembles *A. vaginalis* in the relatively large Ac arranged in a triangle, the sword setae of I-L arranged close together, and the relatively stout I-L-6. Walter was incorrect in considering the integument structure as a diagnostic difference: moreover, in *A. vaginalis*, the integument has a fine striation, although it is sometimes nearly invisible. *A. oblongus* differs from *A. vaginalis* (in parentheses) in the relative dimensions of I-L-5 and -6, with L ratio I-L-5/6 1.26–1.40 (1.74) and L/HB ratio I-L-6 4.36–4.75 (3.90) in males and 4.91–5.75 (4.13) in females, the Vgl-1 fused to Vgl-2, and the palp with dL P-3 > P-2 (P-2/3 nearly equal in L). In view of these differences, there is no reason to consider *A. oblongus* a 'variety' of *A. vaginalis* as proposed by Lundblad (1956). Several measurements of the coxal field discussed by Walter are surely of minor importance as the type specimen is a juvenile, and proportions would have changed with ageing. The fusion of Vgl-1 and Vgl-2, a feature occasionally not yet realized in juveniles of other species representing this character, merits particular attention. At the time of the description of *A. oblongus*, the only known *Atractides* species combining this character with the absence of sclerotized muscle attachments were *A. spinipes* (following my definition) *A. fonticolus* and *A. latipes*. *A. oblongus* is rather similar to *A. spinipes* in many dimensions and proportions, but has a genital plate different in shape: in *A. spinipes*, the Ac are arranged in a weakly curved line, and in males, the posterior fifth of the gonopore only is flanked by Ac-3. *A. fonticolus* (in parentheses) differs from *A. oblongus* in the integument structure (lineated), dimensions (taller) and enlarged setae on I-L-5; *A. latipes*, besides other features, differs in the unique shape of the I-L-5 and -6. *A. oblongus* is a well-defined species, but has not been recorded since the first description. All specimens from CSM labelled '*A. szalayii*' are difficult to interpret due to crushed mouthparts and I-L. However, the descriptions of both sexes agree with that of *A. oblongus* in the shape of the genital field, and in the L ratio I-L-5/6 (males: 1.21–1.26, female: 1.30).

Habitat: Hyporheobiont.

Distribution: Alps, Central Europe, Carpathians (4, 8–10).

ATRACTIDES LATIPALPIS MOTAS & TANASACHI, 1946
(FIG. 48A–D)

Megapus latipalpis Motaş & Tanasachi, 1946

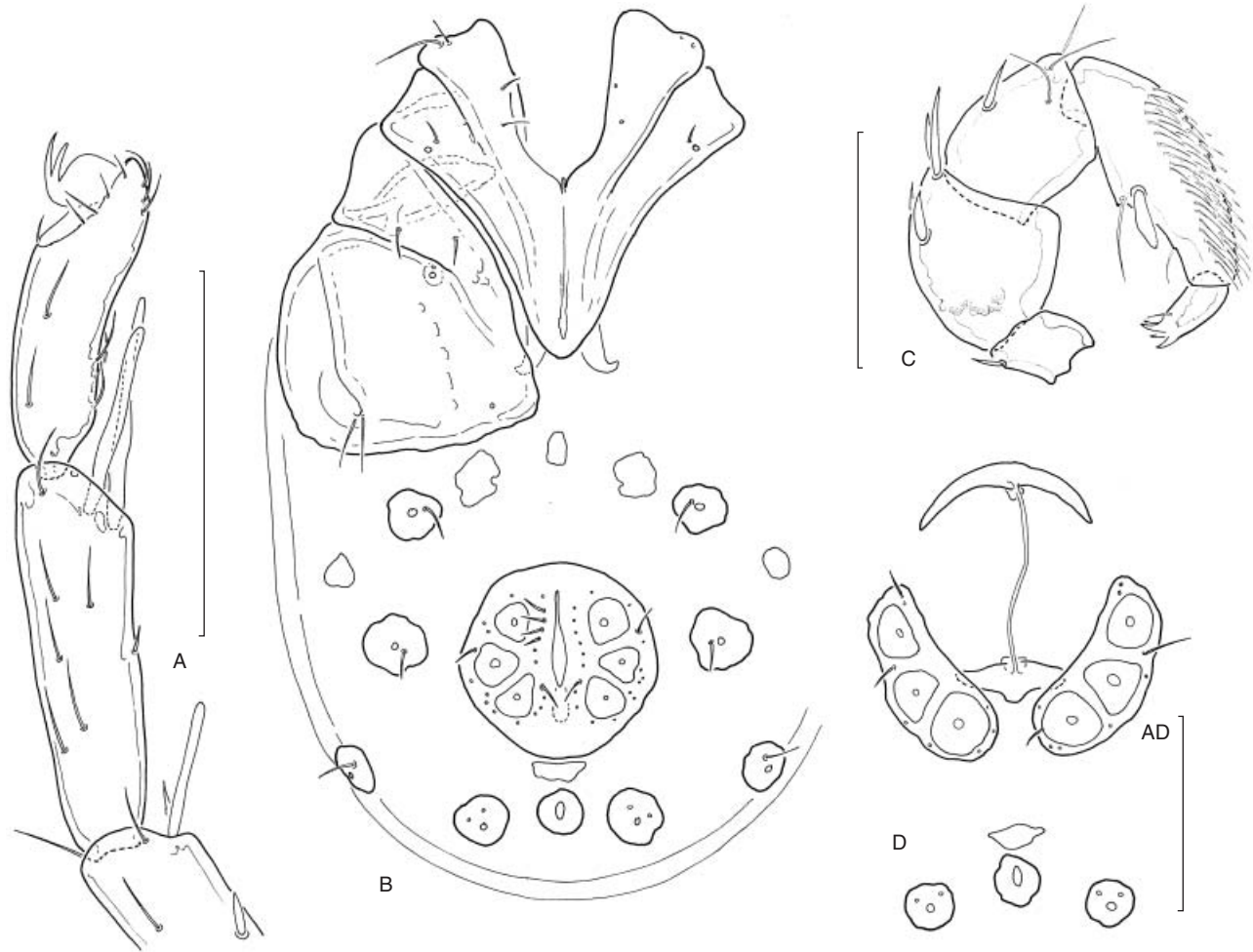


Figure 48. *Atractides latipalpis*. A, B, syntype ♂ from type series of *A. dentiferus* (= syn. to *A. latipalpis*); C, ♂ from Luxembourg; D, syntype ♀ from type series of *A. dentiferus*. A, ♂ I-L-5 and -6; B, ♂ idiosoma, ventral view; C, ♂ palp, medial view; D, ♀ genital field. Scale bars = 100 µm.

Syn. *A. dragonensis* (K. Viets, 1949) = *A. affinis* (Szalay, 1946 nec Lundblad, 1927b): K. O. Viets (1987); *A. dentiferus* K. Viets, 1949 = *A. rectipes* (Walter, 1947 nec Sokolow, 1934): Schwoerbel, 1959c.

Type series: Missing. *Locus typicus*: Romania, Vallée du Dragan, affluent du Crişul-Răpide.

Material examined: LUX int4c, Ösling, Hoscheid, Schlännerbaach at St. Michael, interstitial dig 7.8.1998 Gerecke & Schrankel, 3/1/0; type series of *A. dentiferus*.

Description:

General features

dorsal integument: smooth or with extremely fine striation; muscle attachments: 4 pairs of sclerotized dorsal plates, D-1 separate from Dgl-3, D-2 fused with Dgl-4

I-L: I-L-5/6 slightly modified; S-1 and -2 slender and similar in shape, closely together; I-L-6 stout, weakly curved, not narrowed in the centre

excretory pore: sclerotized; Vgl-1: fused with Vgl-2

palp: P-2 ventral margin straight, P-4 enlarged, ventral margin 3 : 2 : 1, with dentiform protrusion near insertion of proximoventral hair, with dense dorsal hair cover, enlarged, sword seta strong, on the level of proximoventral hair

Males

Specimen from Luxembourg, in parentheses original description
genital field: anterior margin straight, posterior margin convex or medially protruding; genital setae: 40

palp: P-4 extremely enlarged

idiosoma L/W 450/300 (485/294); glandularia 30

coxal field L 220 (240); Cx-3 W 252; Cx-1 + 2 mL 99, IL 156, W 187

I-L-5 dL 109, vL 91, dL/vL 1.20 (1.16), HA-HC 23, 29, 30, dL/HB 3.76 (3.18)

S-1 L 58, L/W 11.6, S-2 L 63, L/W 8.3, interspace 4, L S-1/2 0.92

I-L-6 L 88, HA-HC 19, 17, 19, dL/HB 5.18 (4.23); L I-L-5/6 1.24 (1.07)

genital field L/W 87/103 (97/125), Ac-1-3 L 23, 30, 28

gnathosoma vL 50 (125 [!]); chelicera L 157, L/H 5.41, bS/claw 2.02

palp	P-1	P-2	P-3	P-4	P-5
L/H	22/22 (37/27)	67/47 (104/64)	58/39 (71/53)	89/36 (133/43)	31/10 42/14

(ratio)	1.00 (1.37)	1.43 (1.63)	1.49 (1.34)	2.47 (3.09)	3.10 (3.00)
rel.L	08 (10)	25 (27)	22 (18)	33 (34)	12 (11)
total L:	P-2/4 0.75 (0.78)				
	267 (387)				

Male (original description): Setae Dgl-1 short and willow leaf-shaped, Dgl-2–4 and Lgl-2 long and slender, D-2 the smallest, like D-4 not fused with neighbouring glandularia; two further, knob-shaped, sclerotized muscle attachments visible laterally from D-1 and caudolaterally from D-4; gonopore extending between the levels of Ac-1 and Ac-3, L/W 51/17 mm, flanked by eight pairs of hairs arranged at regular distances.

Male (specimen from Luxembourg): genital field with irregular margin of secondary sclerotization, but without extension of the caudal margin; unpaired postgenital sclerite rather distant from genital field, enlarged, further three pairs of knob shaped muscle insertion sclerites (V-1–3) staggered with the Vgl; ventral margin of P-2 slightly convex, forming an obtuse ventrodistal angle, ventral margin of P-3 straight, as well with an obtuse distal angle, hair field on P-4 restricted to the distal 2/3 of the dorsal surface, sword seta flattened, with maximum W in the distal third.

Females

Original description, supplemented with dates from Luxembourg
genital field: genital plates far caudally, in oblique position on the level of the postgenital
palp: P-4 less thickened than in males
idiosoma L/W 360/225; glandularia –
coxal field L 208
I-L-5 dL 94, HB 29, dL/HB 3.24
I-L-6 L 90, HB 21, dL/HB 4.29; L I-L-5/6 1.04
gnathosoma –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	23/21	56/51	52/41	92/26	33/11
(ratio)	1.10	1.10	1.27	3.54	3.00
rel.L	09	22	20	36	13
total L:	P-2/4 0.61				
	256				

Shape and arrangement of dorsal idiosomal sclerites as in the male; genital field 88/98 µm, gonopore L 64 µm, with arc-shaped pregen and postgen, Ac in a weakly curved line.

Discussion: The authors of the original description compared *A. latipalpis* only to *A. distans* (similar in the enlarged P-4, but completely different in the shape of I-L-5 and -6, and without muscle attachment sclerites), *A. dentipalpis* (with a stout, small curved I-L-6, but completely different in the shape and setation of I-L-5 and palp) and *A. acutirostris*, a species belonging to the subgenus *Tympanomegapus* due to the outstanding characters of the mouthparts. *A. latipalpis* differs from the few species with sclerotized muscle attachments known at that time in the following char-

acter combination: D-1 not fused to Dgl-3, I-L-5 and -6 slightly modified, with long, slender and pointed S-1 and -2 similar in shape and placed close together, I-L-5/6 L ratio 1.04 (including Central European specimens 1.04–1.24), male genital field with straight anterior margin, female genital field with genital plates arranged caudally in oblique position, on the level of postgen; excretory pore sclerotized; palp with straight ventral margin of P-2 and P-4 strongly enlarged, with dentiform protrusion of ventral margin near the proximoventral hair, sword seta inserted near proximoventral hair.

There are major differences in measurement and proportion between the specimen from Luxembourg and the original description, but it appears to agree closely with the figures provided by Motaş & Tanasachi. The palp measurements in the first description suggest an error occurred if they are considered in proportion with the accompanying idiosoma measurements: the values would result in palp L = 79% that of the idiosoma, extreme proportions never found in *Atractides* specimens. If we compare the measurements from the Luxembourg specimen with those published for *A. latipalpis* by Schwoerbel (1961a) and Gledhill (1967) we find a good agreement regarding a relatively low total L (234–269 µm) of the palp and the shape of its segments. The specimens from Germany, Great Britain and Luxembourg differ from the original description also in a higher ratio L I-L-5/6 (1.14–1.24). The specimens from Germany have a much larger genital field (W 115–131 µm) than those from Luxembourg and Great Britain, and are in agreement with the original description. The low genital field L/W ratio of the type specimen (0.78, specimens from Central Europe 0.84–0.90) is possibly caused by the oblique position of the organ in the original description, as suggested by the transverse shape of the acetabula. In any case, not only is a redescription of both sexes based on material from south-east Europe desirable, but also the morphological differentiation of geographically separate populations of *A. latipalpis* in other parts of its distribution area merits particular attention in future faunistic inventories.

Habitat: Hyporheobiont.

Distribution: South-east and Central Europe, UK (2, 4, 8–11, 13, 18).

ATRACTIDES OBOVALIS (SZALAY, 1946)

Megapus subterraneus obovalis Szalay, 1946

Syn. to *A. subterraneus* (K. Viets, 1932): syn. nov.

Type series: Missing. *Locus typicus:* Romania Barátka-Bratcuta (Kom. Bihar) Quelle beim Zusammenfluss des Flusses Sebes-Körös (Crisul-Repede) mit

dem Bach Barátka (Bratcuta) 16.08.1942, 1 ♀ von Dr. A. Chappuis gesammelt.

Discussion: The name '*obovalis*' was introduced for a specimen that differs from the original description nearly exclusively in slightly larger idiosomal dimensions. From Szalay's palp measurements, P-2 seems to be distinctly shorter than P-3 (L ratio 40/49 µm) but in his figure they are nearly equal. The lower number of dorsal setae on P-2 and -3 is probably an artefact. The long, pen-like palp setae are easily lost in these fragile subterranean mites. I-L-5/6 (dL 135/123, ratio 1.10) are slightly longer than in the specimens of *A. subterraneus* from Macedonia (116/112, ratio 1.04) but such differences in size can be expected within the limits of intraspecific variability, and the L ratio of the two segments is rather similar in both specimens. The slightly concave shape of the ventral margin of I-L-6 is found equally in *A. subterraneus*. Since the first description, *A. subterraneus obovalis* has been recorded once by Motaş & Tanasachi (1948: numerous males and females from the area of Brasov, Romania) who regarded the distinctive features of this taxon to be of very low importance, and did not bother with a description and discussion of the unknown male morphology. Since then, the name has appeared only in comprehensive lists of local and national faunas. There is no morphological evidence that would contradict synonymizing this 'variety' with the stem species.

ATTRACTIDES AFFINIS (SZALAY, 1946, *NEC* LUNDBLAD, 1927) = *ATTRACTIDES DRAGONENSIS* K. VIETS, 1949

Megapus latipalpis affinis Szalay, 1946
preocc., *A. latipalpis dragonensis* nom. nov. K. Viets, 1949
Syn. to *A. latipalpis* (Motaş & Tanasachi, 1946): K. O. Viets, 1987

Type series: Missing. **Locus typicus:** Romania aus dem Grundwasser des Dragán-Tales (Valea Draganului, Kom. Bihar) 6.9.1942, 1 ♂ Leg. Dr. P. A. Chappuis.

Discussion: As the name '*affinis*' was preoccupied by Lundblad (1927b), K. Viets (1949) introduced the new name '*dragonensis*'. Szalay stated that he was not certain whether there was sufficient evidence for introducing a 'variety' name for this single juvenile specimen from Romania. He found mainly size differences, most remarkably in the L of the palp (L P-1 20, P-2 60, P-3 40 P-4 82, P-5 32, total L 234 – in the type of *A. latipalpis* 387 mm). As mentioned in the description of *A. latipalpis*, there is much reason to doubt that the type of *A. latipalpis* really had such a long palp. Most specimens from Central Europe agree with the total L provided by Szalay rather than with the original description, but differ in proportions of the seg-

ments. If we compare measurements and drawings published by Szalay, we find strong disagreement (e.g. P-2/3 L ratio 1.50, in fig. 2c, 1.25). These contradictions make it difficult to trust the measurement data, although it is still possible to deduce a good agreement with the stem species from the figures. Some differences mentioned in the text are surely due to the juvenile age of the specimen in question: lower general dimensions, but relatively larger dorsal muscle attachment sclerites, and weak indentations of anterior and posterior margins of the genital field (exactly corresponding to the shape of the primary sclerotization in *A. latipalpis*). My observations confirm the synonymization of *A. latipalpis dragonensis* with the stem species *A. latipalpis*.

ATTRACTIDES PUMILUS (SZALAY, 1946) (FIG. 49A–E)
Megapus pumilus Szalay, 1946
Syn. *A. primitivus* (Walter, 1947): syn. nov.; *A. losonensis* Rensburg, 1971: syn. nov.

Type series: Missing. **Locus typicus:** Romania, Im Grundwasser des Sebes-Körös Flusses (Crisul-Repede) beim Zusammenfluss mit dem Dragán-Bache (Kom. Bihar) 27.IX.1942, 1 ♂ von Dr. P. A. Chappuis gesammelt.

Material examined: *A. primitivus*, type series; *A. primitivus* NHMB Rensburg preps 25, 26 CH Belgio, 19.9.68 5; SMF 7919 ♂/♀ D Harz, Riefenbach.

Description:

General features

Original description and type series of *A. primitivus*:
dorsal integument: striated (9/10); muscle attachments: 5 pairs of sclerites, first pair including prefir, postoc, D-1, D-2 and Dgl-3, but postoc free and D-2 unsclerotized in juveniles, D-3 fused with Dgl-4, D-4 as a pair of longish sclerites not fused to any of the surrounding glandularia
I-L: I-L-5 and -6 little modified, L ratio 0.92-1.05, S-1 and -2 short, inserted side by side, with swollen, knob-shaped tips
excretory pore: sclerotized; Vgl-1: fused to Vgl-2, V-1-3 sclerotized in adults, but smooth in juveniles
palp: P-2 ventral margin straight, distally ending in a pointed, denticulated tip, ventral margin of P-3 straight, ending in a pointed ventrodistal edge, P-4 with ventral margin divided in three concave sectors 2 : 2 : 3, near insertion of ventral hair tubercular protrusions, sword seta approached to the distoventral hair.

Males

Paralectotype of *A. primitivus*, chelicera and palp SMF 7919, in parentheses original description:
genital field: anterior and posterior margins not indented, gonopore short, restricted to the area between Ac-1 and -2, hairs flanking its anterior edge only; genital setae: 35; Vgl-3 fused with V-1 (but free in juveniles)
idiosoma L/W 520/340 (393/245); glandularia 30
coxal field L 226 (180); Cx-3 W 202; Cx-1 + 2 mL 76, IL 163, W 178
I-L-5 dL 72 (68), vL 56, dL/vL 1.29 (1.30), HA-HC 23, 23, 24, dL/HB 3.13 (2.89)
S-1 L 30 (24), L/W 10.0, S-2 L 26 (20), L/W 13.0, interspace 0, L S-1/2 1.15
I-L-6 L 78 (65), HA-HC 23, 24, 24, dL/HB 3.25; L I-L-5/6 0.92
genital field L/W 108/110 (98/98), Ac-1-3 L 22-22-22
gnathosoma vL 115 (98); chelicera L 138, L/H 3.14, bS/claw 2.94

palp	P-1	P-2	P-3	P-4	P-5
L/W	20/22 (16/18)	52/36 (49/32)	52/30 (40/28)	84/24 (65/20)	25/8 (20/8)

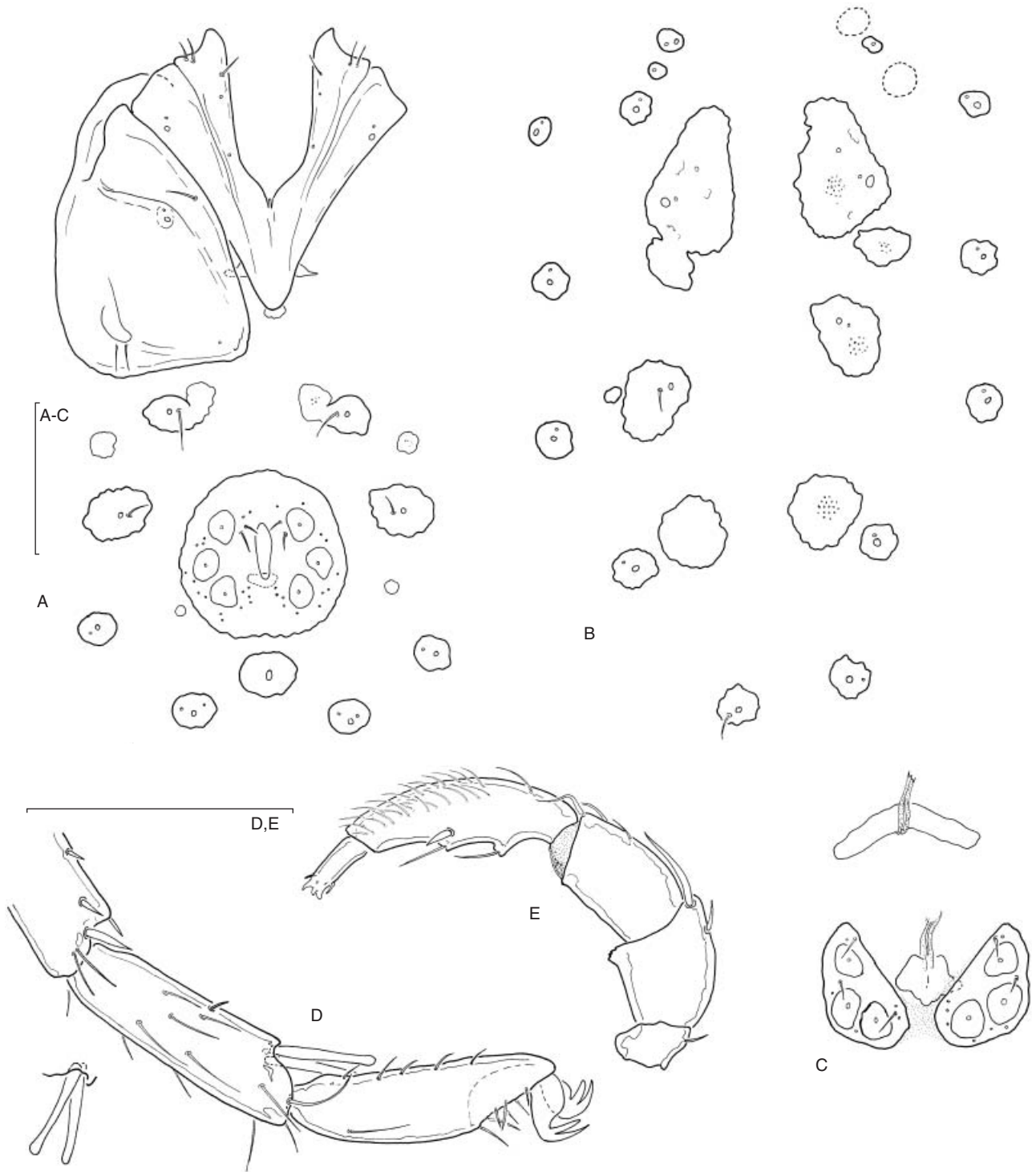


Figure 49. *Atractides pumilus*. A–C, type series of *A. primitivus* (= syn. to *A. pumilus*); D, E, ♂ from Harz (labelled '*A. primitivus*', SMF 7917). A, ♂ idiosoma, ventral view; B, ♂ idiosoma, dorsal view; C, ♀ genital field; D, ♂ I-L-5 and -6; E, ♂ palp, medial view. Scale bars = 100 μm.

(ratio)	0.91 (0.89)	1.20 (1.53)	1.47 (1.43)	3.50 (3.25)	3.13 (2.50)
rel.L	09 (08)	22 (26)	22 (21)	36 (34)	11 (11)
total L:	P-2/4 0.62 (0.75)				
	233 (190)				

Male (original description): No eyes visible, integument smooth, glandularia on enlarged round plates; mediocaudal margin of Cx-1 + 2 forming a tongue-shaped protruding tip; I-L-5 slightly modified, with nearly parallel dorsal and ventral margins; gonopore short, with anterior edge on the level of the centre of Ac-1, and posterior edge on the level of the centre of Ac-2, no hairs flanking the gonopore; following Szalay (1946: fig. 3g) there are no sclerotized muscle attachments in the area surrounding the genital field.

Males (paralectotype of *A. primitivus*): setae Dgl-1 long and fine; coxal field with regular anterolateral contour line due to barely protruding anterior edges of individual coxae, mediocaudal edge of Cx-1 + 2 tongue-shaped, caudal margins of Cx-4 straight, medially forming an abrupt right angle. Anterior edge of gonopore on the level of the centre of Ac-1, posterior edge on the level of the posterior margin of Ac-2, only two pairs of hairs flanking the gonopore at its anterior edge; chelicera misshaped, with S-shaped contorted claws, and palp damaged by crushing.

Females

Lectotype of *A. primitivus*:

genital field: pregen large and slender, genital plates on the level of postgen, short and triangular

idiosoma L/W 590/375; glandularia 30

coxal field L -, Cx-3 W -, Cx-1 + 2 mL 85, IL 170, W 196

I-L-5 dL 92, vL 73, dL/vL 1.26, HA-HC 26, 28, 29, dL/HB 3.29

S-1 L 35, L/W 11.7, S-2 L 31, L/W 10.3, interspace 0, L S-1/2 1.13

I-L-6 L 91, HA-HC 21, 22, 24, dL/HB 4.14; L I-L-5/6 1.01

genital field L/W 150/125, Ac-1-3 L 23, 25, 23

gnathosoma vL 85; chelicera L 168, L/H 4.67, bS/claw 2.57

palp	P-1	P-2	P-3	P-4	P-5
L/W	20/24	65/51	67/44	92/29	29/10
(ratio)	0.83	1.27	1.52	3.17	2.90
rel.L	07	24	25	34	11
total L:	P-2/4 0.71				
	273				

Dorsal idiosoma as in males, but muscle attachment sclerites generally smaller and D-4 not fused with Dgl-5, and D-5 unsclerotized; coxal field L not measurable (Cx-3 + 4 separated from Cx-1 + 2); arrangement of sclerites and glandularia in the posteroventral idiosoma as in males, but V-1 not fused with Vgl-1 and muscle attachment sclerites generally smaller; genital field with narrow pregen forming a long arc, long gonopore, and triangular genital plates (L = 80 µm) flanking the postgen.

Discussion: The single male specimen on which the original description was based, disappeared in 1956. *A. pumilus* cannot be confused with any species known at that time due to the particular shape of S-1

and -2 on I-L-5, the male genital field with gonopore restricted to the area of Ac-1 and -2 and not flanked by hairs, the P-2 with pointed ventrodiscal protrusion, the P-4 bearing a protruding tubercle near the insertion of the proximoventral hair, and the sword seta approaching the distoventral hair. As observed in several other cases, Szalay's measurements partially contradict his figures, although the latter agree closely with the available specimens from Central Europe. As a result of the lack of type specimens, this contradiction cannot be resolved. Due to the synonymization of *A. primitivus* with *A. pumilus*, we now have a more accurate idea of the range of variability in both sexes of this species. Of the species known at that time, *A. dentipalpis*, so far known only from females, is probably closely related to *A. pumilus*. Also in *A. dentipalpis*, I-L-5 and -6 is slightly modified in shape, bearing short sword setae with knob-shaped tips, placed close together, and the palp has a denticulated, pointed ventrodiscal protrusion on P-2. *A. dentipalpis* differs from *A. pumilus* in the absence of dorsal muscle attachment sclerites, a shorter and stouter I-L-6, P-4 with only very weakly developed denticles near ventral hair insertions, and sword seta P-4 placed halfway between ventral hairs.

Habitat: Hyporheobiont.

Distribution: Central and south-east Europe (2, 4, 5, 8–10) (Pešić, in press e).

ATRACTIDES LONGUS (WALTER, 1947)

Megapus longus Walter, 1947

Syn. to *A. oblongus* (Walter, 1944): syn. nov.

Type series: Lectotype ♂, here designated: NHMB *Megapus longus* Walter ♂ Sorne 29.7.1944 Coll. Walter; Typus; Sorne ob. Undervelier N°60/1944 29.7.1944; XV/87. Pasted over: *Megapus longus* Walter [undecipherable] Pr. 1587 Typ ♂. State of conservation: perfect, Gsk *in situ*, right I-L and gnathosoma separate, lateral, one palp isolated lateral, precipitations in embedding fluid. Paralectotype ♂: NHMB DIII b.51 g, Schweiz, Brülbach b. Brülisau 3.8.1945 Coll. Walter'. State of conservation: dorsum/ventrum separated, gnathosoma and both I-L separated lateral, one palp isolated, mounted in Hoyer's fluid from vial material together with one undissected deutonymph (Gerecke). Paralectotypes ♀: NHMB *Megapus longus* Walter ♀ Schwendebach 3.8.1945 Coll. Walter; Typus; Schwendebach ob E. W. Wasser-auen 3.8.1945; XVI/32. Pasted over: *Megapus longus* Walter D.6 B 51 Pr. 1632 Typ ♀. State of conservation: good, right I-L and III-L and gnathosoma (incl. chelicerae) separate lateral, both palps isolated, in oblique position (measuring impossible) no precipitations; NHMB DIII b.51 f, Schweiz, r. Zuf. d. Brülbach, 3.8.1945 Coll. Walter. State of conservation: dorsum/ventrum separated, gnathosoma and both I-L separated, palps and chelicerae (with claws remaining in the gnathosoma) isolated, mounted in Hoyer's fluid from vial material (Gerecke).

Description: see under *A. oblongus* (Walter, 1944).

Discussion: As often found in Walter's descriptions, measurements are out by c. 10–20%. Both males are obviously juveniles (weak sclerotization, perhaps also the name-giving slender idiosomal shape, straight caudal margin of Cx-4 with an abrupt mediocaudal

angle; in one specimen palps damaged with crushed P-4). Walter compared *A. longus* to *A. subterraneus*, a species similar in having a slightly modified shape of I-L-5 and -6, but with both sexes differing in the genital and postgenital field (with very small Ac, Vgl-1 separate from Vgl-2) and palp (with long, flattened dorsal setae on P-2/3, sword seta of P-4 near ventrodistal hair). Among the species with unsclerotized muscle attachments and Vgl-1 fused to Vgl-2, *A. longus* is very similar to *A. spinipes* and *A. oblongus*, but differs from *A. fonticolus* in the nonlineated integument, and from *A. latipes* in the slightly modified shape of I-L-5 and -6, with narrow setal interspace.

With regard to most measurements, males and females are within the range of variability of *A. spinipes*, and some of the minor differences could possibly be explained by the juvenile age of the members of the type series of *A. longus*: in males, the slightly more slender genital field (L/W 0.82–0.94, in *A. spinipes* 0.97–1.05) and in females the more slender coxal field (L/Cx-3 W 0.87–0.91, in *A. spinipes* 0.76–0.86). The shape of I-L-5 and -6 of the two species is similar, with the only exception being the sword setae arranged still more closely together than in *A. spinipes* (interspace in females 9–12, in males 7–8 µm; *A. spinipes*: females 12–16, males 8–10 µm). Also in the mouthparts, only slight differences are found: the total L of the female palp remains below the minimum in *A. spinipes*, but in view of the extreme variation in palp length in males, this is a relatively insignificant character. In the measured female and two males of *A. longus*, P-2 is more slender than in *A. spinipes* (in the female also P-4), while this segment is rather stout in males. The L/H ratio of P-4 is, however, strongly influenced by probably artificial inflation of this segment, especially in juveniles. In both sexes a difference is found in the shape of the chelicera, with a basal segment/claw ratio of 2.51–2.70 (in *A. spinipes* 2.21–2.38). The most significant difference between these two similar species concerns the genital field of females: while the Ac of *A. spinipes* are arranged in a weakly curved line, with Ac-2 trapezoidal in shape, in *A. longus* they form an obtuse angle, and the Ac-2 is triangular in shape, with its medial point directed towards the gonopore. In males, a difference between the two species is found in the arrangement of Ac-3: in *A. spinipes*, their anterior margin lies in the posterior fifth of the gonopore, in *A. longus*, they are shifted anteriorly and flank the posterior third of the gonopore. Furthermore, the number of genital hairs flanking the gonopore is 4–5 pairs in *A. longus*, but 6–7 pairs in *A. spinipes*.

A genital field perfectly corresponding in shape and arrangement of Ac is found in the little known *A. oblongus*. If we compare the measurements of the females of *A. longus* with the holotype of *A. oblongus*,

we find only minute differences: the palp is 15% longer, I-L-5 and -6 and P-2 and -3 are relatively thicker. Such differences in proportions are best explained as deformations, easily caused in slide mounted juveniles due to weak sclerotization. *A. longus* is therefore considered a synonym of *A. oblongus*, a species closely related to *A. spinipes*.

ATTRACTIDES RECTIPES (WALTER, 1947;
NEC SOKOLOV, 1934) = *ATTRACTIDES DENTIFERUS*
K. VIETS 1949

Megapus rectipes Walter, 1947

preocc., *A. dentiferus* nom. nov. K. Viets, 1949

Syn. to *A. latipalpis* (Motaş & Tanasachi, 1946):
Schwoerbel, 1959c

Type series: Lectotype ♀, here designated, NHMB *Megapus rectipes* ♀ Walter Kaltbrunnental 24.10.1943 Coll. Walter; Typus; Kaltbrunnental Kiesbank 36/1943 24.10.1943; XV/41. Pasted over: *Megapus rectipes* Wtr. DIIIb55, Pr. 1541 Typ ♀. State of conservation: perfect, idiosoma complete, right I-L separate, gnathosoma separated, in oblique position, chelicerae and palps separate, lateral, palps crushed. Paralectotype ♂: as lectotype, but XV/42; Pr. 1542 Typ ♂. State of conservation: idiosoma with right IV-L-3–6 missing, left I-L separate, lateral, Gsk separate, damaged, gnathosoma isolated, lateral, both chelicerae and both palps separate, palps badly damaged and distorted.

Discussion: When Walter described this species, he had no knowledge of *A. latipalpis*. Schwoerbel (1956) was the first to notice the morphological agreement between these two species, and all further authors followed his proposal to synonymize *A. dentiferus* with *A. latipalpis*. Reexamining the types is difficult due to the poor state of conservation of the mouthparts. The male specimen agrees with measurements from Central European specimens attributed to *A. latipalpis* (e.g. Cx-1 + 2 mL 94, IL 154, W, 190, I-L-5 dL 105, vL 87, I-L-6 L 102 µm). The thicker palp and I-L segments are an artefact caused by crushing of the mounted appendages. As regards the dimensions of the genital field (L/W 100/98 µm), it is in agreement with a specimen from Luxembourg and differs both from the published data of the type of *A. latipalpis*, and from specimens from the Black Forest (Schwoerbel, 1961a) with larger genital fields. As regards the low L ratio I-L-5/6 of 1.03, it agrees with the original description. Also the female agrees with the dimensions published in Schwoerbel's bibliography, with the exception that proportions of leg and palp segments are altered due to mounting artefacts. Some measurements are: coxal field L 252, Cx-3 W 275, Cx-1 + 2 mL 112, IL 178, W 218, genital field L/W 153/153, chelicera L 204, L/H 5.10, basal segment/claw 2.34, palp total L 307, I-L-5 dL 121, vL 105, S-1 L 70 (L/W 14.0), S-2 L 56 (L/W 14.0), I-L-6 L 90 µm. Only the L ratio I-L-5/6 of 1.34 differs strongly from the original description and would result in a surprisingly high range of variability of 1.04–1.34. However, the other investigated specimens from Central Europe are

intermediate in this character. *A. latipalpis* is here considered a variable species, with *A. dentiferus* a junior synonym. However, improved knowledge of the range of variability of south-eastern European populations could result in the resurrection of this name for Central European populations with relatively short I-L-6.

ATRACTIDES PRIMITIVUS (WALTER, 1947)

Megapus primitivus Walter, 1947

Syn. to *A. pumilus* (Szalay, 1946): syn. nov.

Type series: Lectotype ♀, here designated, NHMB *Megapus primitivus* ♀ Walter Aurig 25.7.1943 Coll. Chappuis; XV/56; Typus; leg. Chappuis Grundwasser Aurig unweit Sibiu Rumänien 25.7.43; D.III b 54 P3.1556 Typ ♀. State of conservation: gnathosoma separate, lateral, both palps separate, all legs *in situ*, but clearly visible. Paralectotype ♂: NHMB as lectotype, but XV/57 and Pr.1557 Typ ♂. State of conservation: idiosoma laterally crushed, Cx-1 + 2 medially pushed one upon the other, both I-L- and left III/IV-L missing, gnathosoma separate lateral, both palps isolated.

Discussion: In his description, Walter did not discuss relationships and diagnostic features, and clearly was not aware of the existence of the very similar *A. pumilus*, described from a collecting site about 100 km from the *locus typicus* of *A. primitivus*. Both species agree perfectly in the shape of coxae, I-L, genital field and mouthparts. The flattened P-4 in Szalay's (1946) figures 3(c,d) is a defect often found in weakly sclerotized juveniles. The few available measurements of *A. pumilus* indicate that Szalay's specimen was smaller, possibly a juvenile, but the low total L of palp (190 µm) cannot increase markedly with age. Szalay's measurements were frequently inaccurate: from his data, a L ratio P-2/3 of 1.23 can be deduced, but examination of his figure produces 1.0 (as found also in the types of *A. primitivus*). The most important difference concerns the sclerotization and extension of muscle attachments. In the type of *A. pumilus*, the postoc seta is not included in the anterior pair of dorsal sclerites, D-4 is not fused with Dgl-5, and D-5 as well as V-1–3 remain unsclerotized. Among the specimens from Harz and Switzerland, no such weakly sclerotized juveniles were found; however, there was considerable variability in the extension of idiosomal sclerites, which in one case were found to be much more extended than in the type series. In view of the age-dependent extension of muscle attachment sclerites, differences of this type are not suitable for species discrimination, and *A. primitivus* should be considered a synonym of *A. pumilus*.

ATRACTIDES DENTICULATUS (WALTER, 1947)

(FIG. 50A–G)

Megapus denticulatus Walter, 1947

Atractides microphthalmus [err.] Rensburg, 1971

Type series: Holotype ♀, NHMB, Boiron, 13.8.1945 Coll. Walter (caption by Bader); *Megapus denticulatus* Walter D III b.80 Pr.1644 ♀ Typus Boiron b. Anex 13.8.1945 (caption by Walter). State of conservation: nearly perfect, but left III-L missing, idiosoma laterally compressed, and genital field in oblique position.

Material examined: Luxembourg, coll. Gerecke & Schrankel. LUX Int 4, Ösling, Hoscheid, Schlännerbaach unter Chappelle St. Michel, 300 m, 07.08.1998 Karaman-Chappuis, 1 ♂, 3 ♀; LUX Int 10, Ösling, N Kalborn, R. de Janscheid oberhalb Mündung Roupelsbaach, 23.04.1999 Bou-Rouch, 1 ♀; LUX Int 11, Ösling, E Fischbach, Strumbaach, 335 m, 23.4.1999 Bou-Rouch, 1 ♂, 2 ♀; Germany, Schönbuch (TÜ) Goldersbach, 27.03.1989 Gerecke, D 315 oberhalb Teufelsbrücke 1 ♂; D 316 unterhalb Bettelwegbrücke 1 ♂, 1 ♀. Switzerland, NHMB, Rensburg Präp. 12, 18.8.1968 1 ♀; Schiess, Lützel, hyp. 1 ♂, 1 ♀.

Description:

General features

dorsal integument: striated (9/10); muscle attachments: Postoc, Dgl-3 and D-1 fused to a small, T-shaped platelet; D-2 a small sclerotized knob; Dgl-4 fused with D-3; D-4 unfused, the largest of the dorsal plates; V-4 roundish, V-2 not visible, V-3 fused with Vgl-4
coxal field: Cx-1 with a subcuticular mediocaudal process, and a less extending epicuticular appendix bearing a longish medial pit, most coxal setae fine and long
genital field: Ac in a weakly curved line
I-L: little modified, I-L-5 with S-1 and -2 similar in shape and close to each other, I-L-6 nearly straight, distally thickened, with strong claw.
IV-L: IV-L-5 with a long, fine, distal hair
excretory pore: sclerotized; Vgl-1: fused to Vgl-2
palp: weak sexual dimorphism; P-2 and P-3 robust, both with strongly convex ventral surface covered by fine denticulation; P-4 rather slender, ventral margin 1 : 1 : 1, with strong ventral denticle near proximal hair, and less protruding but well visible denticle near distal hair, sword seta enlarged, near the proximoventral hair; P-5 longish

Males

Specimens from Luxembourg

genital field: circular, with slightly flattened caudolateral and posterior margins, gonopore short and enlarged; genital setae: 34, anteriomedially arranged in a pair of small circles, not flanking the gonopore
palp: P-4 more robust than in females
idiosoma L/W 450/340; glandularia 18
coxal field L 198; Cx-3 W 234; Cx-1 + 2 mL 81, IL 134, W 192
I-L-5 dL 113, vL 92, dL/vL 1.23, HA-HC 26, 30, 33, dL/HB 3.77
S-1 L 61, L/W 10.2 S-2 L 55, L/W 11.0, interspace 5, L S-1/2 1.11
I-L-6 L 95, HA-HC 17, 16, 21, dL/HB 5.94; L I-L-5/6 1.19
genital field L/W 83/78, Ac-1–3 L 30, 23, 23
gnathosoma –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	22/24	74/51	54/44	85/28	29/14
(ratio)	0.92	1.45	1.23	3.04	2.07
rel.L	08	28	20	32	11
total L:	P-2/4 0.87				
264					

An unpaired, concave frontal plate with honeycomb-like surface bridging the area between Dgl-1 which have short, willow-leaf like seta; setae of Dgl-2–4 long and fine. Lenses of lateral eyes minute, but pigment dots clearly visible. Subcuticular mediocaudal process and epicuticular appendix of Cx-1 in older specimens less distinct due to secondary sclerotization. IV-L-6 often with numerous ventral setae arranged at regular distances on the ventral surface, but in some specimens the basal part of the segment without setation. Gonopore restricted to the level of Ac-1.

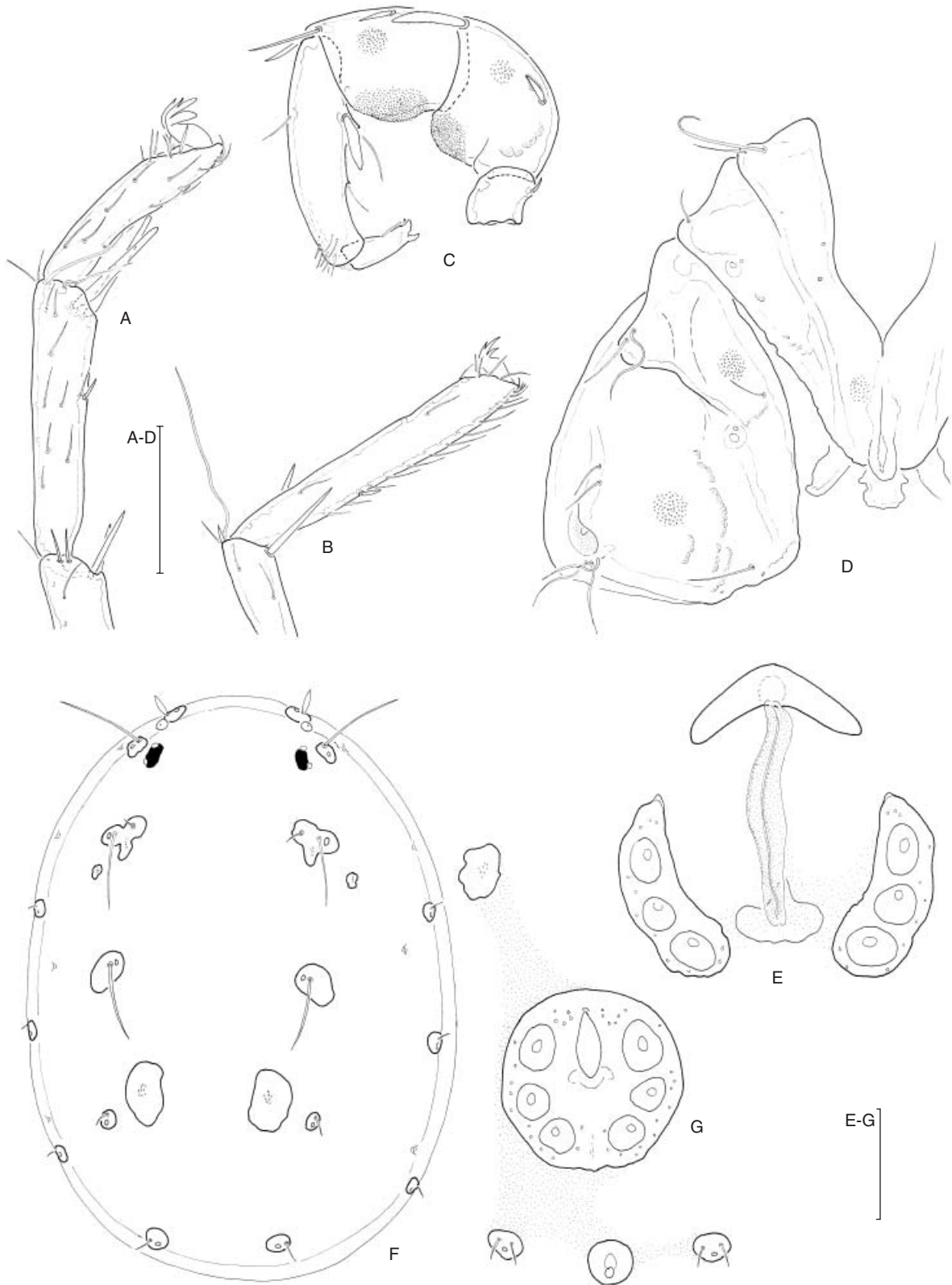


Figure 50. *Atractides denticulatus*, A–D holotype ♀, E–G specimens from Luxembourg. A, ♀ I-L-5 and -6; B, ♀ distal part of IV-L-5 and IV-L-6; C, ♀ palp, medial view; D, ♀ coxal field, E, ♀ genital field; F, ♂ dorsal idiosoma; G, ♂ genital field. Scale bars = 100 µm.

Females

Holotype, specimen from Luxembourg
 genital field: pregen boomerang-shaped, genital plates with a fine anterior tip of secondary sclerotization
 palp: similar to males, but P-4 more slender
 idiosoma L/W 800/600; glandularia 25
 coxal field L 310; Cx-3 W 400; Cx-1 + 2 mL 74, IL 198, W 300
 I-L-5 dL 180, vL 142, dL/vL 1.27, HA-HC 35, 41, 48, dL/HB 4.39
 S-1 L 90, L/W 12.9, S-2 L 80, L/W 10.0, interspace 7, L S-1/2 1.13
 I-L-6 L 144, HA-HC 27, 23, 27, dL/HB 6.26; L I-L-5/6 1.25
 genital field L/W 175/190, Ac-1-3 L 30, 28, 28
 gnathosoma vL 103; chelicera L 292, L/H 5.41, bS/claw 2.11

palp	P-1	P-2	P-3	P-4	P-5
L/W	30/40	117/82	90/72	130/40	47/20
(ratio)	0.75	1.43	1.25	3.25	2.35
rel.L	07	28	22	31	11
total L:	P-2/4 0.90				
	414				

Juvenile females lack the sclerotized V-1, in older highly sclerotized specimens, the denticulation of P-2 and -3 becomes nearly invisible. As pointed out by Schwoerbel (1961) the palp appears less robust than in males due to the more slender P-3 (L/H 3.10–3.25, in males 2.80–3.04).

Discussion: The holotype agrees with the measurements taken from females collected in Luxembourg, and the males from these collecting sites fit the first description of this sex provided by Schwoerbel (1961a) on the basis of specimens from Black Forest. *A. denticulatus* is obviously related to *A. cisternarum* from south-east Europe. Numerous common characters justify the introduction of a 'cisternarum species group' that includes also several species described later: median suture Cx-1 short, I-L-5 and -6 slightly modified with S-1 and -2 similar in shape, narrow setal interspace, male gonopore short, restricted to the anterior part of the genital field, palp without sexual dimorphism, with finely denticulated surface of P-2 and -3, and P-4 with a denticle near, and the sword seta inserted proximally from, the proximoventral hair.

A. denticulatus differs from *A. cisternarum* in its considerably greater size, the presence of sclerotized muscle attachments and the more robust palp with more extended denticulation fields on P-2 and -3. Apart from the characters in common with *A. cisternarum*, the species differs from all other formerly described *Atractides* in the arrangement of dorsal sclerites, and willow leaf-shaped setae of Dgl-1 and a long hair on IV-L-5 (two characters still unclear in *A. cisternarum*). However, remarkable morphological differences can be observed between specimens from south-east and Central Europe (Petrova, 1968b) and also between the populations from Germany and Luxembourg described here. The specimens from the Goldersbach are more slender in both sexes, with a longer median suture of Cx-1 (L in males 94–99, in

females 128 µm), Dgl-3 not fused with postoc + D-1. Furthermore, the male genital field is larger (L/W 124–130/120), anteriorly forming an obtuse angle and posteriorly truncate, with Ac-3 larger in diameter than Ac-1, and the gonopore extended to the level of the posterior margin of Ac-2. Interestingly, when compared with the holotype and the populations from Luxembourg, the total length of palps and I-L-5 and -6 is much greater in males and lower in females. These net differences suggest that future investigations on the geographical variation in *A. denticulatus* could prove that this taxon represents a species complex. Specimens described from Bulgaria (Petrova, 1968b) more closely resemble the Goldersbach population than the original description. They have smaller idiosomal dimensions, Dgl-3 not fused with postoc, relatively larger D-3 plates, a longer coxal field, and an elongated male gonopore. The specimens published by Rensburg under the name of *A. microphthalmus* in reality represent *A. denticulatus*. The denticulation of P-2 and -3 is clearly visible, and the measurements fit the description provided above for the holotype and the specimens from Luxembourg.

Habitat: Hyporheobiont.

Distribution: Central and south-east Europe, England (7–9, 18).

ATRACTIDES FIRMUS (WALTER, 1947)

Megapus firmus Walter, 1947

[syn. to *A. barsiensis*? (Motaş *et al.*, 1958) rejected synonymy]

Syn. to *A. loricatus* Piersig, 1898: syn. nov.

Type series: Holotype ♀, NHMB *Megapus firmus* Walter [red.] XV/IIIb 49 Pr.1370 Typ. ♀ ov. pasted over by *Megapus firmus* ♀ ov. Walter Orbe 26.7.1944 Coll. Walter; Typus; Nebengewässer im Quellgebiet der Orbe N.43/1944 26.7.44; XV/70.

Discussion: Since the first description, based on a single female, the only further record has come from Romania (Konnerth-Ionescu, 1979) but it lacks morphological information, and males have not been found. Diagnostic features considered by Walter are the large genital field, absence of two pairs of muscle attachment sclerites (anteriorly from the postoc and in the ventrolateral area of the idiosoma) and the postoc not fused with Dgl-3. However, with regard to all measurements and the taxonomically important shape of palp and I-L, the holotype of *A. firmus* is in nearly perfect agreement with *A. loricatus*, at that time a poorly understood species. The presence or absence, and the tendency to fuse, of idiosomal muscle attachment sclerites, are subject to considerable age-dependent variability. Motaş *et al.* (1958) proposed synonymization with *A. barsiensis*. Here, due to the unsclerotized excretory pore and agreement in all important mea-

surements, both *A. barsiensis* and *A. firmus* are considered synonyms of *A. lorincatus*.

ATTRACTIDES BITUBEROSUS (SOKOLOW, 1947)

Megapus nodipalpis bituberosus Sokolow in Behning & Popowa, 1947 (*nom. nud.*)

Species dubia

Type series: Missing; recorded from Armenia (Eriwan, River Zanga).

Description and Discussion: In Sokolow (1957) there is a one-line description of a double ventral hump on P-2 of males. The lack of information does not permit further consideration of this *species dubia*.

ATTRACTIDES PYGMAEUS (MOTAŞ & TANASACHI, 1948)
(FIG. 51A–G)

Megapus pygmaeus Motaş & Tanasachi, 1948

Type series: Missing. *Locus typicus:* Romania, Carpates Méridionales; Vallée du Riuşor (le Ruisseau) affl. de la Dâmbovitza (dép. De Muscel) le 20/X/1948, 1 ♂, 2 ♀.

Material examined: CSM, Egg, *Atractides pygmaeus* ♀ (collecting site: Austria, Bregenz Wald, Schwarzach unterhalb Alberschwende, Juli und Oktober, 1961, 2 ♂, 1 ♀ – the ♂ no longer available).

Description:

General features

Combined from Motaş *et al.* (1958), and Schwoerbel (1962)

dorsal integument: smooth; muscle attachments: postoc and Dgl-4 on enlarged sclerites, D-2 occasionally sclerotized as a minute knob; V-1–4 not sclerotized

coxal field: slender and longish, mediocaudal margin Cx-1 tongue-shaped, caudal margin Cx-4 oblique, directed anteriomedially

I-L: I-L-5/6 little modified, S-1 and -2 slender, closely together, I-L-6 straight, with strong claw; excretory pore: unsclerotized; Vgl-1: fused to Vgl-2

palp: weak sexual dimorphism; ventral margin of P-2 and P-3 straight, P-2 forming an acute ventrodistal angle; P-4 slender, hair insertions dividing the ventral margin 1 : 1 : 1, near a pronounced denticle, sword seta fine, near the distoventral hair

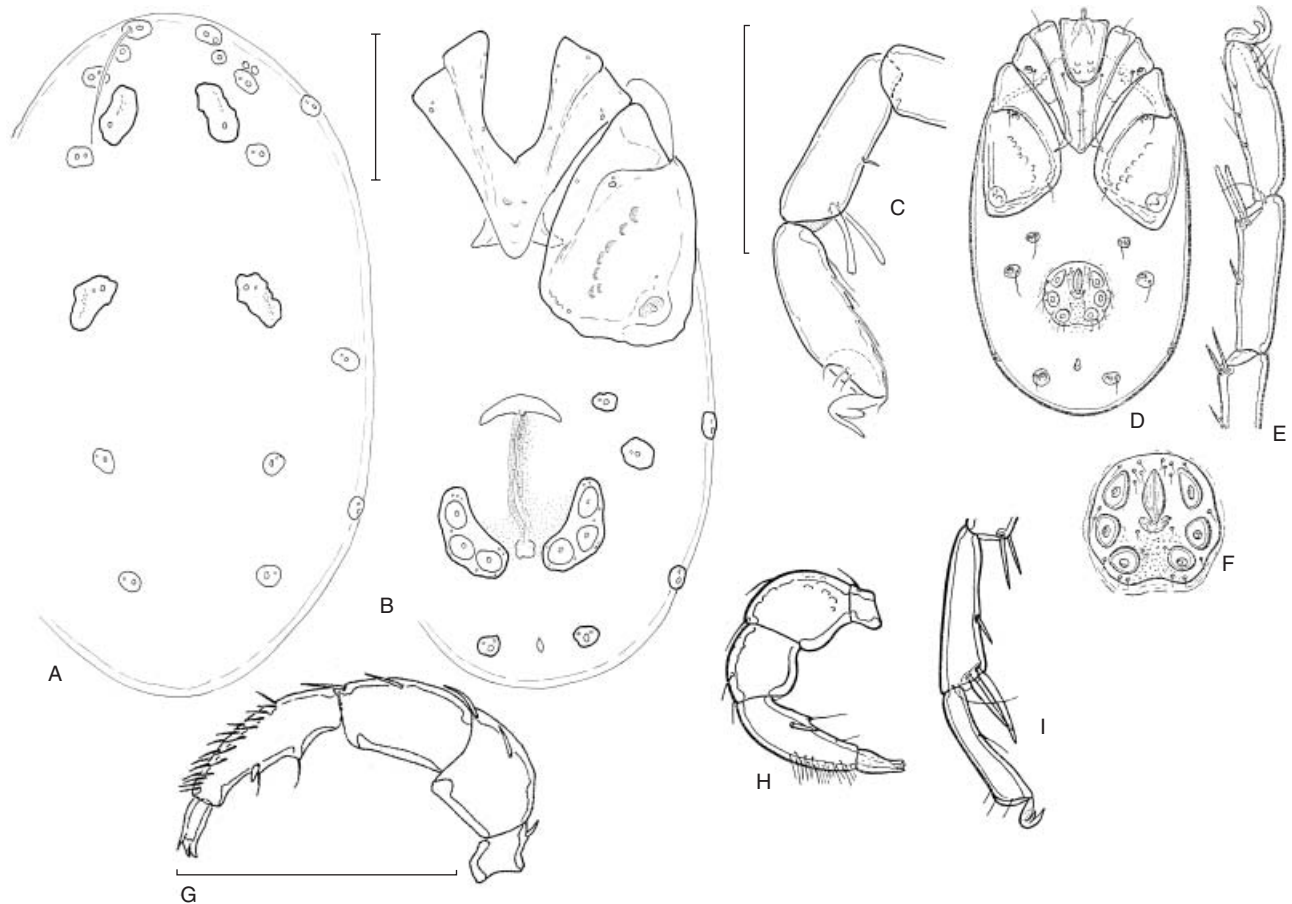


Figure 51. A–G, *Atractides pygmaeus*, A–C, ♀ from Austria, D–F, after Motaş *et al.* (1958); G, after Pešić (2001). A, ♀ idiosoma, dorsal view; B, ♀ idiosoma, ventral view; C, ♀ I-L-5 and -6, Scale bars = 100 µm; D, ♂ ventral idiosoma; E, ♂ I-L-5 and -6; F, ♂ genital field; G, ♂ palp, medial view. H, I, *Atractides microphthalmus* ♂ after Motaş *et al.* (1958). H, palp; I I-L-5 and -6.

Males

Combined from Motaş *et al.* (1958), and Schwoerbel (1962)
genital field: round, with slightly convex anterior, and slightly concave posterior margins, gonopore short; genital setae: 22

palp: P-4 slightly more robust than in females and with more dense dorsal hair cover

idiosoma L/W 320/195 (390/200); glandularia –

coxal field L 182; Cx-1 + 2 mL 60

I-L: dL I-L-5/6 1.0

S-1/2 –

genital field L/W 57/58, Ac-1–3 –

gnathosoma vL 57; chelicera L 100, L/H –, bS/claw 2.3

palp	P-1	P-2	P-3	P-4	P-5
L/H	14/15	38/28	46/24	58/18	20/8
(ratio)	0.93	1.36	1.92	3.22	2.50
rel.L	08	22	26	33	11
total L:	P-2/4 0.66				
	176				

In the figure of the original description, the postoc is on a simple, roundish platelet, while in females (and in Schwoerbel's figure of a male from Austria) this platelet is longish. The contour line of the glandularia, mainly the Vgl, is irregular. Motaş *et al.* (1958) figure a male with a very short gonopore, caudally reaching only the anterior area of Ac-2; in the specimen depicted by Schwoerbel (1962) the posterior edge of the gonopore is on the level of the anterior margin of Ac-3.

Females

Motaş *et al.* (1958), indications for specimen from coll. Schwoerbel in parentheses

genital field: pregen narrow, weakly curved, gonopore relatively long, genital plates short and stout, on the level of the postgen, directed laterally

palp: P-4 more slender than in males

idiosoma L/W 370/210; glandularia 18

coxal field L 191 (205); Cx-3 W (195); Cx-1 + 2 mL 60 (68), IL (118), W (143)

I-L-5 dL (85), vL (65), dL/vL (1.30)

S-1 L (33), S-2 L (30), interspace (0), L S-1/2 (1.1)

I-L-6 L (85); L I-L-5/6 (1.0)

genital field L/W (120/112), Ac-1–3 L (20, 17, 18)

gnathosoma vL 71 (75); chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	17 (18)/18	41 (55)/35	50 (60)/28	61 (72)/17	22 (22)/7
(ratio)	0.94	1.17	1.79	3.59	3.14
rel.L	09 (08)	21 (24)	26 (26)	32 (32)	12 (10)
total L:	P-2/4 0.67 (0.76)				
	191 (227)				

In the examined female, the seta of Dgl-1 is extremely long, all other setae are missing; following the original description, Dgl-3/4 also have long setae in both sexes. A pair of tiny lateral eye lenses, but no pigment, is visible on the level of Dgl-2. The crushed mouthparts and I-L of the only available specimen do not permit measuring height values and calculation of proportions.

Discussion: Only three species known at that time have similarly minute dimensions: *A. cisternarum*, *A. subterraneus* and *A. oblongus*. The latter is also similar in the slender coxal field and the smooth excretory pore, but has no sclerotized muscle insertions,

more modified I-L-5 and -6, no pronounced ventral denticles on P-4, and a different male genital field with long gonopore. Both *A. cisternarum* and *A. subterraneus* have the first leg with slightly modified terminal segments, but S-1 and -2 are relatively long and pointed, and the coxal field is more enlarged. *A. cisternarum* differs furthermore in the proximal position of the sword seta on P-4 and the sclerotized excretory pore, *A. subterraneus* in the strong, blade-like dorsal setae of P-2/3, and Vgl-1 not fused to Vgl-2. The shape of I-L (slightly modified terminal segments, narrow setal interspace, distally swollen) and palps (slightly modified, with an acute-angled ventrodiscal edge of P-2, prominent ventral denticles on P-4, and sword seta of P-4 in distal position) suggest a relationship to *A. pumilus*, as already mentioned. *A. pygmaeus* can be distinguished by its smaller size, less extended dorsal muscle attachments, the oblique caudal margin of Cx-4, and the unsclerotized excretory pore. Slight differences between the type material (as described by Motaş *et al.*, 1958) and the specimens from Austria (Schwoerbel, 1962) concern dimensions as well as the shape of the male genital field. Additional information on the morphology of this little known species is now published by Pešić (in press d).

Habitat: Hyporheobiont.

Distribution: Alps, Carpathians, Montenegro (4, 10) (Pešić, in press d).

ATRACTIDES MICROPHTHALMUS (MOTAŞ & TANASACHI, 1948) (FIG. 51H,I)

Megapus microphthalmus Motaş & Tanasachi, 1948 [syn. to *A. denticulatus*? (Schwoerbel, 1961a): rejected synonymy]

Type series: Missing. *Locus typicus:* Romania, Vallée du Riuşor (R. Pitesti) affluent de la Dâmbovitza, 20.X.1948, 1 ♂, 3 ♀.

Description:

General features

Original description

dorsal integument: smooth sans structure; muscle attachments: Postoc and D-1 fused to a small, longish platelet, Dgl-3 separate; Dgl-4 fused with D-3; D-4 unfused, the largest of the dorsal plates; V-1 as a roundish platelet, V-2–4 not sclerotized

coxal field: posterior margin Cx-1 convex, with a subcuticular protrusion

I-L: slightly modified, I-L-5 with S-1 and -2 similar in shape and close to each other, I-L-6 nearly straight, distally thickened, with strong claw, ventral margin lacking groups of fine hairs

excretory pore: sclerotized; Vgl-1: fused to Vgl-2

palp: ventral margins of P-2/3 convexly protruding, with smooth surface; P-4 slender, in sectors 2 : 2 : 1 due to ventral hair insertions, proximoventral hair inserted near a prominent denticle, distoventral hair without denticle, sword seta proximally from proximoventral hair

Males

Original description:

genital field: roundish, with slightly convex posterior margin, gonopore short, restricted to the area of Ac-1, Ac equal in diameter; genital setae: 30

palp: P-4 more robust and with more numerous hairs as compared with female

Idiosoma L/W 530/410; glandularia – (low diameter)
coxal field L 250; Cx-3 W –; Cx-1 + 2 mL 83, IL –, W –
I-L no measurements; L I-L-5/6 (following Fig. 24) 1.18
genital field L/W 122/118, Ac-1–3 L –
gnathosoma –; chelicera L 121, L/H – (5.26?), bS/claw 2.18

Palp	P-1	P-2	P-3	P-4	P-5
L/W	29/32	100/71	70/58	122/40	42/20
(ratio)	0.91	1.41	1.21	3.05	2.10
rel.L	08	28	19	34	12
total L:	P-2/4 0.82				
	363				

Setae of Dgl-1 willow leaf-shaped, lateral eyes very small; chelicera measurement site of H unclear.

Females

Original description:

genital field: pregen small and weakly curved, genital plates flanking nearly the whole gonopore and caudally extending over the level of the postgen, Ac in a weakly curved line, nearly equal in size

palp: P-4 more slender and with lower number of dorsal hairs than in males idiosoma L/W 570/470; glandularia – (small)

Coxal field L 277; Cx-3 W –; Cx-1 + 2 mL 66, IL –, W –
I-L –; L I-L-5/6 (following Fig. 29) 1.26
gnathosoma vL 105; chelicera L 132, L/H –, bS/claw 2.14

Palp	P-1	P-2	P-3	P-4	P-5
L/W	34/37	105/74	78/60	125/34	42/20
(ratio)	0.92	1.42	1.30	3.68	2.10
rel.L	09	27	20	33	11
total L:	P-2/4 0.84				
	384				

In figure 27 of the original description, the shape of the gonopore is irregular. This could indicate that it was longitudinally compressed, and in reality the genital plates are restricted to the posterior part of the genital field.

Discussion: The only later record of this species (Rensburg, 1971) refers to *A. denticulatus*, a species designated also by Motaş *et al.* as most closely related to *A. microphthalmus*. According to the original description, *A. microphthalmus* differs from *A. denticulatus* in the nondenticulated surface of P-2/3, and in the presence of sclerotized V-1 anteriorly from the genital field. Depending on age, both characters vary in *A. denticulatus*: juveniles may have an unsclerotized V-1, and in old specimens the denticulation of palp segments becomes nearly invisible; therefore, Schwoerbel (1961a) proposed the synonymization of *A. microphthalmus* with the latter species. Indeed, on the basis of available information, only minute further differences are observed: male and female agree with my measurements from the holotype and the Luxembourg populations of *A. denticulatus*, except for differences in genital field L/W and total palp L (lower in females, higher in males) and shape of P-4 in females (more slender). With regard to the ventral surface of I-L-6, a complete absence of hair groups (Motaş *et al.*

figure for both sexes one hair each) is extremely unusual in *Atractides*, suggesting damage or error rather than a diagnostic species character. However, in view of the possibility that morphologically nonhomogeneous populations of *A. denticulatus* could in future present a species complex, I propose that *A. microphthalmus* be considered a separate taxon within the *cisternarum* group of closely related species, at least until more information is available from the vicinity of the *locus typicus*.

Habitat: Hyporheobiont.

Distribution: Romania, known only from the *locus typicus* (10).

ATRACTIDES PROSILIENS (MOTAŞ & TANASACHI, 1948) (FIG. 52A–E)

Megapus prosiliens Motaş & Tanasachi, 1948

Type series: Missing. *Locus typicus:* Romania, Vallée de la Bughea, affluent du Rîul-Târgului (r. Pitești) le 21.IV.1948, 1 ♂.

Description:

General features

Original description, female unknown

dorsal integument: smooth; muscle attachments: Postoc and D-1 fused to a small, longish platelet, D-2 sclerotized, Dgl-3 separate; Dgl-4 fused with D-3; D-4 unfused, the largest of the dorsal plates; V-1 as a roundish platelet, V-2–4 not sclerotized

coxal field: posterior margin of Cx-1 convex, with a subcuticular protrusion I-L: I-L-5 with S-1 and -2 closely together, similar in shape and length, I-L-6 curved, with strong claws

excretory pore: sclerotized; Vgl-1: fused to Vgl-2 (?)

palp: P-2 with a prominent, rounded ventrodorsal edge, P-2 ventrally slightly concave, distally rounded, P-4 slender, divided by hair insertions in sectors 3 : 2 : 1, a fine denticle near, and sword seta proximally from, insertion of proximoventral hair

Male

Original description:

genital field: anterior margin extended in a blunt tip, posterior margin slightly indented, Ac similar in size, gonopore short, restricted to the anterior half of the genital field; genital setae: 30, anteromedially forming a group, not flanking the posterior part of the gonopore

idiosoma L/W 550/410; glandularia? (small)

coxal field L 264; Cx-3 W –; Cx-1 + 2 mL 82, IL –, W –
I-L: no measurements; L I-L-5/6 (calculated from Fig. 34) 1.33
S-1 L 66, L/W –, S-2 L 66, L/W –, interspace –, L S-1/2 1.0
genital field L/W 124/118, Ac-1–3 –
gnathosomal vL 104; chelicera L 165, L/H –, bS/claw 2.24

palp	P-1	P-2	P-3	P-4	P-5
L/W	26/32	92/67	64/52	112/38	37/17
(ratio)	0.81	1.37	1.23	2.95	2.18
rel.L	08	28	19	34	11
total L:	P-2/4 0.82				
	331				

I-L-5 distally enlarged, I-L-6 slightly narrowed in the centre; excretory pore sclerite pentagonal, anteriorly truncated.

Discussion: *A. prosiliens* has been recorded twice since its first description (Austria: Tilzer, 1968;

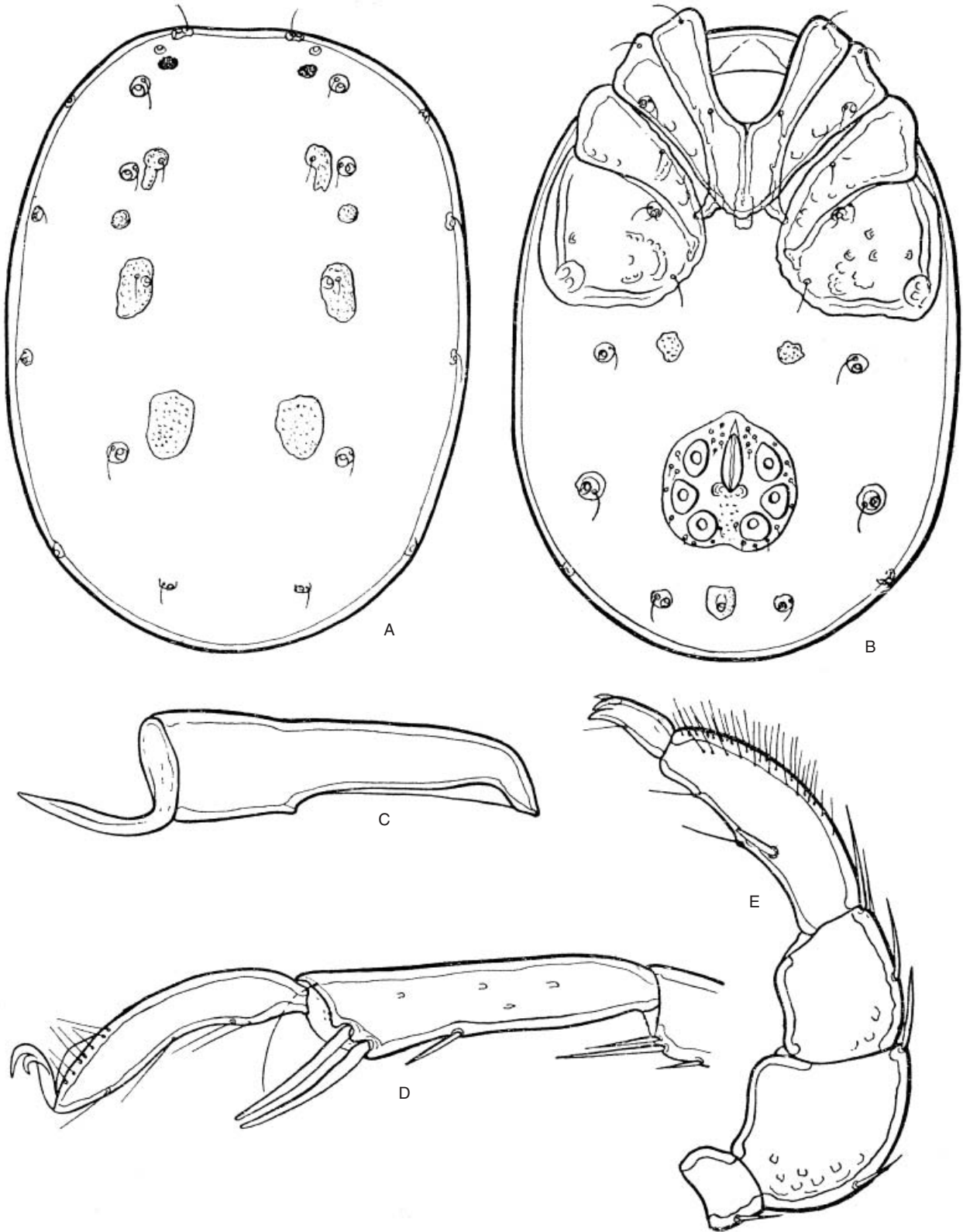


Figure 52. *Atractides prosiliens*, ♂ after Motaş *et al.* (1958). A, idiosoma, dorsal view; B, idiosoma, ventral view; C, chelicera; D, I-L-5 and -6; E, palp. No magnification scale bar available.

southern France: Giudicelli *et al.*, 1980); no additional morphological information has become available. As Schwoerbel (1961a) and Petrova (1968a) pointed out, the species is close to *A. denticulatus* (and belongs therefore to the *cisternarum* group) due to the minute lateral eyes, the arrangement of muscle attachments, I-L-5 with S-1 and -2 similar in shape, narrow setal interspace, sclerotized excretory pore, short male gonopore, restricted to the anterior part of the genital field, palp in both sexes with ventrodistal edge of P-2 protruding and rounded, and P-4 with sword seta near proximoventral hair. *A. prosiliens* differs from *A. denticulatus* and *A. microphthalmus* in the filiform, not willow leaf-shaped, setae of Dgl-1, I-L-5 distally enlarged, I-L-6 curved, setae of Dgl-1, I-L-5 distally truncate, and anterior margin of the genital field protruding. It is similar to *A. microphthalmus* in the non-denticulated ventral surface of P-2 and -3.

Habitat: Hyporheobiont.

Distribution: Romania (10) doubtful records from Austria, southern France (4?, 13?).

ATTRACTIDES SOKOLOWI (MOTAŞ & TANASACHI, 1948)
(FIG. 53A–F)

Megapus sokolowi Motaş & Tanasachi, 1948

Type series: Missing. *Locus typicus*: Romania, Vallée de la Bughea, basin de l'Argeş (reg. Pitesti) le 25.X.1948, 2 ♂, 3 ♀.

Description:

General features

Original description:

dorsal integument: lineated; muscle attachments: unsclerotized

coxal field: posteromedial margin of Cx-1 equally rounded

I-L: I-L-5 longish and slender, S-1 and -2 close to each other, similar in shape,

I-L-6 weakly curved, claws strong

genital field: Ac large, in triangular arrangement

excretory pore: sclerotized; Vgl-1: not fused to Vgl-2

palp: no sexual dimorphism, ventral margin P-2 weakly convex, P-3 straight,

P-4 divided 1 : 1 : 1, with weakly developed denticles near hair insertions, sword seta between ventral hair insertions, approached to distoventral hair

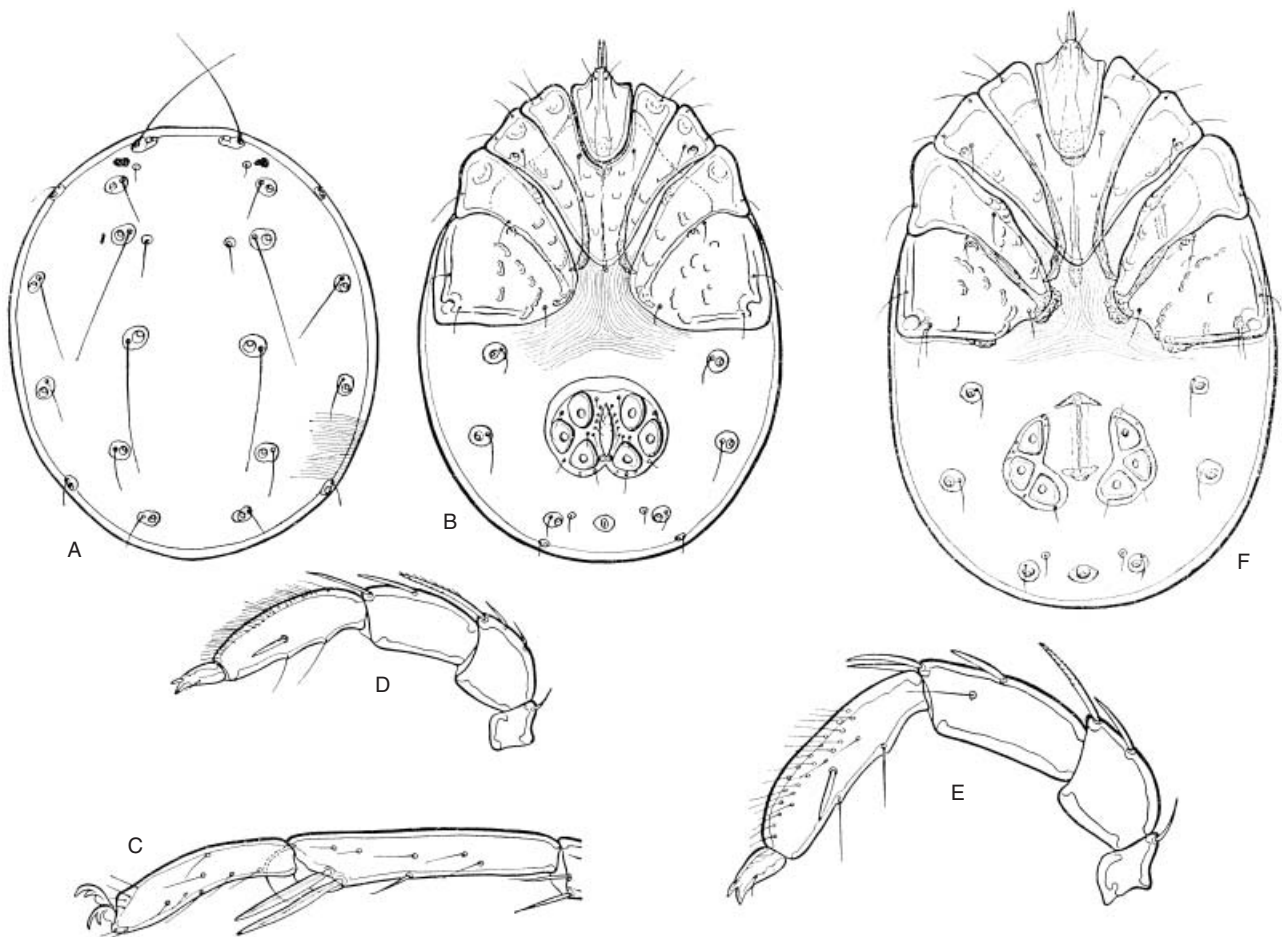


Figure 53. *Atractides sokolowi* after Motaş *et al.* (1958). A–D, ♂. A, idiosoma, dorsal view; B, idiosoma, ventral view; C, I-L-5 and -6; D, palp; E, F ♀. E, palp; F, idiosoma, ventral view. No magnification scale bar available.

Male

Original description:

genital field: slightly enlarged, with equally convex anterior and medially indented posterior margin

genital setae: 25

palp: P-4 more robust and with more dense hair cover than in females

idiosoma L/W 500/420; glandularia – (small)

coxal field L 284; Cx-3 W –; Cx-1 + 2 mL 116, IL –, W –

I-L: (no measurements, calculated from Fig. 48) I-L-5 dL/HB 4.73, I-L-6 L/HB 4.46, L I-5/6 1.34

genital field L/W 115/140, Ac-1–3 –

gnathosoma vL 112; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	26/28	58/45	72/56	94/30	31/12
(ratio)	0.93	1.29	1.29	3.13	2.58
rel.L	09	21	26	33	11
total L:	P-2/4 0.62				
	281				

Setae of Dgl-1 long and fine; no borders of secondary sclerotization around coxae and glandularia; caudal apodemes of Cx-1 + 2 forming a right angle. S-1 slightly longer and more slender than S-2.

Female

Original description:

genital field: pregen small and weakly curved, gonopore short, Ac-3 caudally from postgen

palp: more slender than in males, especially P-3

idiosoma L/W 595/495; glandularia – (small)

coxal field L 376; Cx-3 W –; Cx-1 + 2 mL 140, IL –, W –

I-L: neither measurements, nor figures

genital field L/W 150/198, Ac-1–3 L –

gnathosoma vL 157; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	34/36	78/56	104/44	134/38	38/19
(ratio)	0.94	1.39	2.36	3.53	2.00
rel.L	09	20	27	35	10
total L:	P-2/4 0.58				
	388				

Figure 50 of the original description depicts a specimen with caudal apodemes of Cx-1 + 2 strongly protruding and forming an acute angle, and well developed apodemes at medial and mediocaudal margins of Cx-4. This suggests that it was based on a juvenile.

Discussion: After the original description, further records of *A. sokolowi* were published from Poland (Biesiadka & Kowalik, 1973; Biesiadka, 1979a) and Bulgaria (Petrova, 1976) but without additional information on diagnostic characters. Motaş *et al.* (1958) discussed differences in relation to *A. subasper*, a species with extended dorsal sclerotization, *A. coriaceus* and *A. borceai*, here both considered synonyms of *A. walteri* and characterized by the unsclerotized anal pore and two taxonomically distant species from southern America. Of all species known at that time, *A. sokolowi* most resembles *A. tener*; both sexes of the former are generally small, but most characters agree.

As calculated from the figures of the original description, males have a more slender I-L-5 (L/HB 4.73, in *A. tener* 4.00) and a more compact I-L-6 (L/HB 4.46, in *A. tener* 5.00); and a few additional differences in the proportions of palp segments result from published measurements. All these differences could be due to deformations, intraspecific variability or different measurement techniques. The most significant character discriminating the two species is the integument surface, finely striated in *A. tener*, lineated in *A. sokolowi*. Furthermore, the genital setae of male *A. sokolowi* are lower in number and less densely arranged.

Habitat: Rhithrobiont.

Distribution: Eastern and south-east Europe (10, 16).

ATTRACTIDES SZALAYI (MOTAŞ & TANASACHI, 1948)

Megapus szalayi Motaş & Tanasachi, 1948

syn to *A. oblongus* (Walter, 1944): syn. nov.

Type series: Missing. *Locus typicus:* Romania, Vallée du Riuşorul, affluent de la Dâmbovitza (reg. Pitesti) le 22.X.1948, 1 ♂.

Discussion: Motaş *et al.* (1958) compared *A. szalayi* in their description with *A. issajewi* (Sokolow, 1928b) from Turkestan and the little known *A. borceai* from the French Alps, here considered a synonym of *A. walteri*. In fact, this taxon is closely related to *A. spinipes* and *A. oblongus*, as can be deduced from the combination of the following characters: small dimensions, minute glandularia, muscle attachments unsclerotized, coxal field longish, I-L-5 with S-1 and -2 similar in shape, narrow setal interspace, male genital field with convex anterior, and weakly indented posterior margin, excretory pore smooth, Vgl-1 + 2 fused, palp without sexual dimorphism. The single male on which the original description was based differs from *A. spinipes* in the shape of the genital organ, with the posterior third of the gonopore flanked by Ac-3 (in *A. spinipes* only the posterior fifth) and in the L/H ratio of P-2 (1.33, in *A. spinipes* < 1.25). Both character states are found in *A. oblongus*, a species poorly known at the time when *A. szalayi* was published. Also, in further characters underlined by the authors, such as the slightly concave posterior margin of Cx-4, and the position of the sword seta on P-4, there is good agreement with *A. oblongus*. Notwithstanding the lack of some important morphological details in the original description (e.g. I-L measurements) there is sufficient evidence for the synonymy of *A. szalayi* with *A. oblongus*. This interpretation finds confirmation in the analysis of preparations published under this name from Austria and southern Germany (see Discussion of *A. oblongus*).

ATRACTIDES PHREATICUS (MOTAŞ & TANASACHI, 1948) (FIG. 54A–G)

Megapus phreaticus Motaş & Tanasachi, 1948
Syn. *A. hyporheicus* Schwoerbel, 1961: syn. nov.

Type series: Missing. *Loci typici*: Carpathes Méridionales: Vallée du Riul Mare (La grande Rivière) affluent gauche de l'Olt (Dép. de Făgăras) près du village Porumbacu de Sus le 13/VIII/1948 2 ♀, Vallée du Sebeş, affluent gauche de l'Olt, le 15/VIII/1948 1 ♀, Vallée de la Bogata, affluent gauche de l'Olt (Dép. de Târnava-Mare) le 10/VIII/1948 1 ny.

Material examined: NHMB: Lützel, hyp. Coll. Schiess ♂; preparation in good general state, but details of appendages not clearly visible due to precipitations; one palp missing. CSM: 'Wagensteig' and 'Wagensteig, hyp.GW', two ♀, in both slides mouthparts and legs crushed due to dessication of mounting fluid; *Atractides hyporheicus* TYPE ♂, Krummenbach hyp. Grundw., 1960 (not the holotype of that taxon) one III-L and one IV-L missing, both I-L and mouthparts crushed due to dessication of mounting fluid; *Atractides hyporheicus* ♂ Steina, Okt. 61.

Description:**General features**

dorsal integument: smooth, an extremely fine striation locally visible in tangential view, in older specimens porous; muscle attachments: sclerotized, postoc fused with D-1, but Dgl-3 separate, sexual dimorphism in the posterior part of the dorsum

coxal field: Cx-1 with a long median suture, muscle attachments of Cx-2 strongly protruding and curved, their bases medially in touch, or leaving only a very narrow segment of posterior margin Cx-1; sutures Cx-3/4 curved and medially directed to the posterior margin of Cx-4, this margin rather straight

I-L: I-L-5 short and thick, S-1 and -2 weakly distanced from each other, long and with parallel margins, distally slightly enlarged and truncate, I-L-6 strong and thick, weakly curved, with maximum H at the base of the claw furrow

excretory pore: sclerotized, sclerite ring extended, with maximum width on the level of anterior margin of excretory pore; Vgl-1: fused with Vgl-2

palp: P-2 with slightly convex ventral margin, sexual dimorphism in shape of P-4, ventral margin 1 : 1 : 1, sword seta P-4 halfway between ventral hairs

Males

Specimen from NHMB [measurements], specimens from CSM

genital field: oval or roundish, but due to arrangement of gonopore and acetabula appearing oval, with slightly convex anterior, and concave posterior margins, gonopore restricted to the anterior part, with posterior margin on the level of Ac-2; genital setae: 46, medially flanking the anterior 2/3 of gonopore

palp: P-4 thickened, with dense dorsal hair cover, in dorsal view strongly enlarged

idiosoma L/W 530/360; glandularia 35

coxal field L 256; Cx-3 W 275; Cx-1 + 2 mL 107, IL 150, W 211

I-L-5 dL 103, vL 81, dL/vL 1.27, HA-HC 40, 39, 41, dL/HB 2.64

S-1 L 70, L/W 11.7, S-2 L 60, L/W 10.0, interspace 5, L S-1/2 1.17

I-L-6 L 98, HA-HC 28, 29, 32, dL/HB 3.38; L I-L-5/6 1.05

genital field L/W 105/103, Ac-1–3 L 32, 23, 29

gnathosoma vL –; chelicera L 177, L/H 5.2, bS/claw 2.4

palp	P-1	P-2	P-3	P-4	P-5
L/W	23/21	46/38	41/32	74/28	26/9
(ratio)	1.10	1.21	1.28	2.64	2.89
rel.L	11	22	20	35	12
total L:	P-2/4 0.62				
	210				

Lateral eyes with small lenses and little developed pigment; setae of Dgl-1 willow leaf-shaped, D-2 asymmetrically fused with, or separate from, Dgl-3, platelets of Dgl-4 + D-3, and D-4 large, an unpaired large

sclerite plate medially between D-4 and D-5, an unpaired sclerite knob between coxal and genital field, Ac-2 smaller than Ac-1 and Ac-3.

Females

Specimen from CSM

genital field: pregen narrow, with irregular anterior margin, postgen longish, T-shaped, with a porous posterior projection extending between the medio-caudal margins of the genital plates; gonopore long, only in its posterior half flanked by the genital plates

palp: P-4 slender, not inflated in dorsal view

idiosoma L/W 800/600; glandularia 38

coxal field L 345; Cx-3 W –; Cx-1 + 2 mL 124, IL 222, W 272

I-L-5 dL 165, vL –, dL/vL –, HA-HC –, dL/HB –

S-1 L 90, L/W 15.0, S-2 L 75, L/W 12.5, interspace 10, L S-1/2 1.2

I-L-6 L 167, HA-HC –, dL/HB –; L I-L-5/6 0.99

genital field L/W –, Ac-1–3 L 45, 40, 42

gnathosoma –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	28/–	70/–	77/–	102/–	29/–
(ratio)	–	–	–	–	–
rel.L	09	23	25	33	09
total L:	P-2/4 0.69				
	306				

No unpaired plate in the dorsal idiosoma between D-4 and D-5; muscle attachments less extended, and setal interspace wider than in males.

Discussion: Only descriptions of females have hitherto been published under this name (Motaş *et al.*, 1958; Schwoerbel, 1961b; Biesiadka, 1973). Apart from the slightly larger dimensions of the specimen from the Black Forest, the only remarkable difference concerns the shape of S-1 and -2: in their somewhat sketchy figures, both Motaş *et al.* and Biesiadka provide shorter, more pointed sword setae. However, in the figure based on the type material (Motaş *et al.*) the I-L is obviously in an oblique position, and the distal part of these setae is rather transparent. I consider the difference to have been caused by imprecise observation. *A. phreaticus* differs from all species known at that time in the particular shape of the posterior margin of Cx-1 + 2, with strongly protruding and curved muscle attachments nearly touching medially, or leaving only a minute segment of the posterior margin of Cx-1. The species is furthermore characterized by having I-L-5 and -6 similar in length, S-1 and -2 rather long, with parallel margins and distally truncate, narrow setal interspace, and I-L-5 strong and slightly curved. With regard to all these characters, *A. hyporheicus*, a species for which a female has yet to be found, is in agreement with *A. phreaticus*, and I consider it the male of this species. The male specimen presented here from the NHMB, in this sense correctly identified as *A. phreaticus*, agrees from all points of view with the material of *A. hyporheicus* from coll. Schwoerbel, except for generally smaller measurements. It derives from the collections published by Rensburg (1971) but for unclear reasons it was not mentioned in that paper.

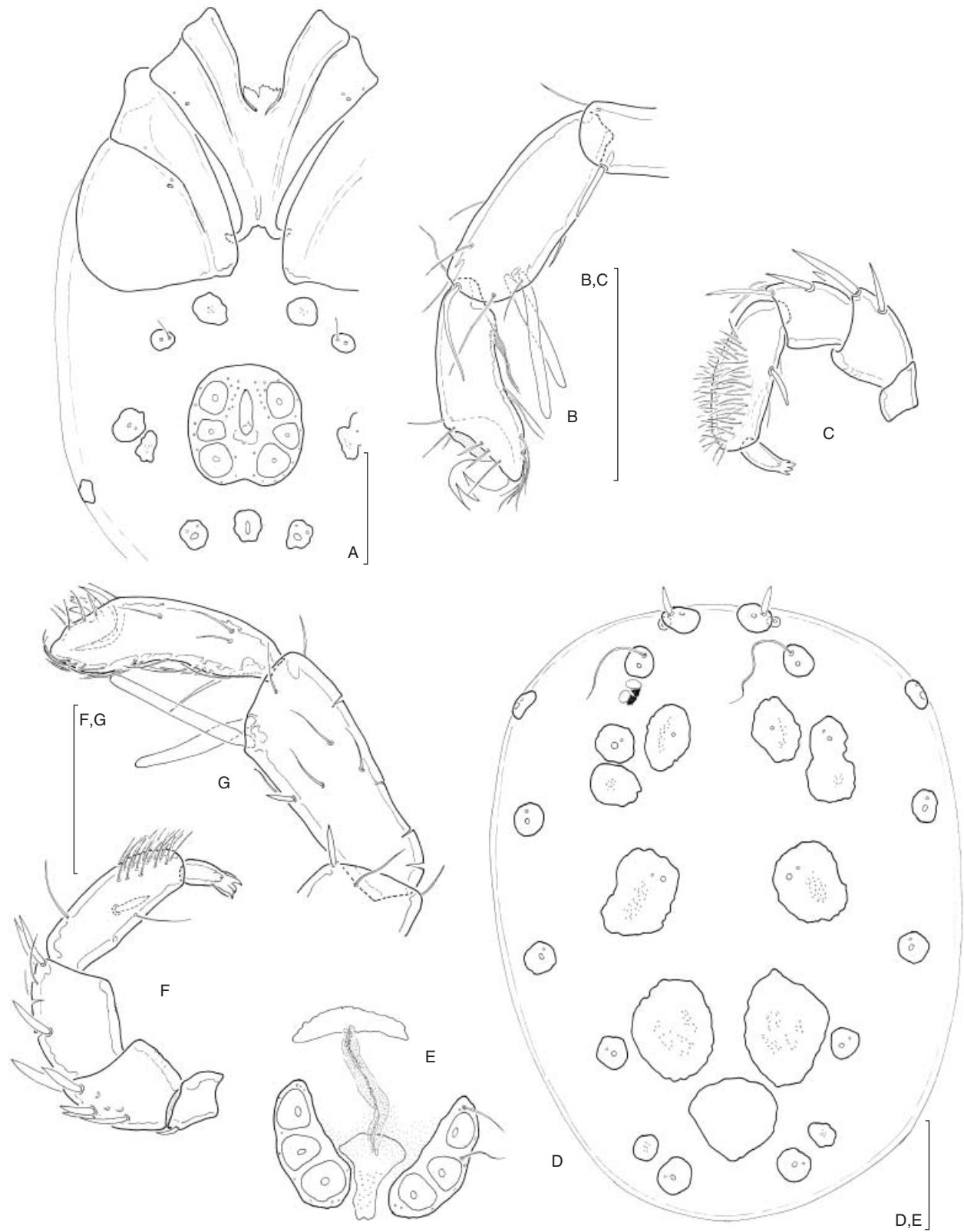


Figure 54. *Atractides phreaticus*. A–C, ♂ from Switzerland (NHMB); D, ♂ ex coll. Schwoerbel (Krummenbach, Black Forest), E–G ♀ ex coll. Schwoerbel (Wagensteigbach, Black Forest). A, ♂ idiosoma, ventral view; B, ♂ I–L-5 and -6; C, ♂ palp; D, ♂ idiosoma, dorsal view; E, ♀ genital field; F, ♀ palp; G, ♀ I–L-5 and -6. Scale bars = 100 µm.

In one of the specimens from coll. Schwoerbel, the genital field is more slender (L/W 1.1) in the other one the L/W is 1.0.

Habitat: Hyporheobiont.

Distribution: Central and south-east Europe (9, 10).

TRACTIDES AFRICANUS K. VIETS, 1949

nov. nom. pro *algeriensis* Lundblad, 1942, erroneously introduced

TRACTIDES LATIPALPIS DRAGONENSIS K. VIETS, 1949

nov. nom. pro *latipalpis affinis* Szalay, 1946 (see there)

TRACTIDES MADERICOLUS K. VIETS, 1949

nov. nom. pro *maderensis* Lundblad, 1941, erroneously introduced

TRACTIDES DENTIFERUS K. VIETS, 1949

nov. nom. pro *rectipes* Walter, 1947 (see there)

TRACTIDES SIMILIS (ANGELIER, 1949) (FIG. 55A–F)

Megapus similis Angelier (1949a)

(*Atractides simillimus* nov. nom. E. Angelier, 1953; err.)

Type series: No holotype defined, access impossible. *Loci typici*: France, Pyrénées-orientales. Entre Tech-sur-Tech et Arles-sur-Tech, 600 m environ., 18.08.1948, 1 ♂; a 1-km en amont de Prats-de-Mollo, 750 m, 17.08.1948 1 ♀.

Material examined: SMF 8000 *Atractides simillimus* (E. Ang.), 1949 ♀; Gave d'Ossau, Arudy (B.-Pyr.) 22.08.1949.

Description:

General features

Original description, SMF 8000

dorsal integument: striated (12/10); muscle attachments: two paired posterodorsal sclerites (not mentioned in original description)

coxal field: enlarged Cx-1 with median suture very short, and posterior margin weakly curved, bearing a strongly developed subcutaneous extension; suture Cx-3/4 laterally nearly perpendicular to the median line

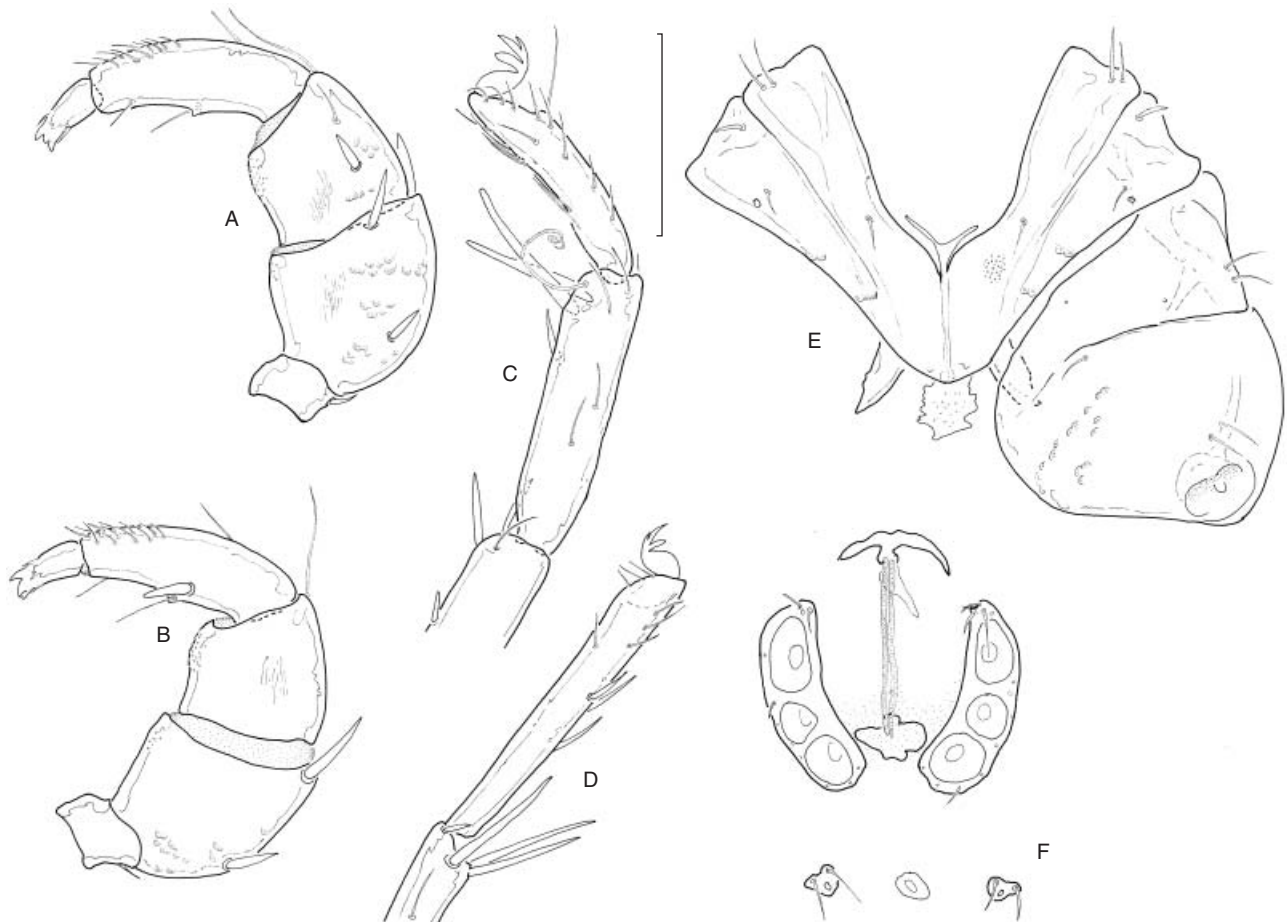


Figure 55. *Atractides similis*, ♀ SMF 8000. A, palp, lateral view; B, palp, medial view; C, I-L-5 and -6; D, II-L-6; E, coxal field; F, genital and postgenital field. Scale bar = 100 µm.

I-L: I-L-5 ventral seta in the distal third; S-1–2 similar in shape, slender, close to each other; I-L-6 weakly curved, with a strong claw
 genital field: Ac in a weakly curved line
 excretory pore: sclerotized; Vgl-1: fused to Vgl-2
 palp: no sexual dimorphism; P-2/3 rather thick, ventral margin slightly convex with finely denticulated surface (not mentioned in the original description), P-4 2 : 2 : 1, a denticle near insertion of, and sword seta inserted proximally from, proximoventral hair

Males

Original description

genital field: round, anterior margin with a weakly protruding medial tip, posterior margin weakly indented, gonopore rather long, extending from anterior margin of Ac-1 to anterior margin of Ac-3; genital setae: 32, medially restricted to the area between Ac-1, not flanking the gonopore

idiosoma L/W 480/350; glandularia –
 coxal field L 230; Cx-3 –; Cx-1 + 2 –
 I-L-5 dL 150, vL –, dL/vL –, HA-HC –, dL/HB –
 I-L-6 L 124, HA-HC –, dL/HB –; L I-L-5/6 1.21

genital field L/W 120/107, Ac-1–3 –
 gnathosoma vL 130; chelicera L 224, L/H 5.46, bS/claw 2.20

palp	P-1	P-2	P-3	P-4	P-5
L/W	28/34	113/70	75/60	125/35	38/18
(ratio)	0.82	1.61	1.25	3.57	2.11
rel.L	07	30	20	33	10
total L:	P-2/4 0.90				
	379				

Clearly a juvenile, as explained by Angelier (anterior margin of coxae protruding far over the anterior dorsal margin, coxae weakly sclerotized). Setae of Dgl-1 filiform (original description, fig. 20).

Females

Original description, in parentheses SMF 8000

genital field: pregen narrow, genital plates relatively large, flanking the whole gonopore and caudally clearly extending over the postgen

idiosoma L/W 480/340 (460/350); glandularia 25
 coxal field L 255 (225); Cx-3 W (284); Cx-1 + 2 mL (58), IL (162), W (243)
 I-L-5 dL 158 (142), vL (112), dL/vL (1.27), HA-HC (35, 36, 41), dL/HB (3.94)
 S-1 L (76), L/W (12.7), S-2 L 70, L/W (11.7), interspace (7), L S-1/2 (1.09)
 I-L-6 L 127 (119), HA-HC (21, 20, 24), dL/HB (5, 95); L I-L-5/6 1.24 (1.19)
 genital field L/W (126/122), Ac-1–3 L (32, 20, 27)
 gnathosoma vL 130 (–); chelicera L 285 (242), L/H 6.33 (4.94), bS/claw 2.31 (2.18)

palp	P-1	P-2	P-3	P-4	P-5
L/W	30/35 (22/–)	130/80 (103/–)	85/65 (74/–)	136/36 (105/–)	40/20 (38/–)
(ratio)	0.86 (–)	1.63 (–)	1.31 (–)	3.78 (–)	2.00 (–)
rel.L	07 (06)	31 (30)	20 (22)	32 (31)	10 (11)
total L:	P-2/4 0.98				
	342				

The specimen in SMF 8000 is small but agrees in the most important proportions. The differences observed in the chelicera are probably due to different measurement techniques. Measuring of the H of palp segments of SMF 8000 was impossible due to crushing; following Angelier's figures, palp segments are distinctly more slender than as depicted in Figure 55(A,B).

Discussion: *A. similis* is closest to *A. cisternarum* and *A. denticulatus*. Important common characters are the short median suture of Cx-1, the slightly modified I-L-

5–6 and arrangement of S-1 and -2, a sclerotized excretory pore, fused Vgl-1 + 2, and the palp without sexual dimorphism, with robust P-2 and -3, P-4 bearing a denticle near proximoventral hair and sword seta in proximal position. A further common character which possibly escaped the attention of Angelier, and is probably subject to variability, is the denticulation of the ventral surface of P-2 and -3. *A. similis* differs from *A. cisternarum*, and agrees with *A. denticulatus*, in major general idiosomal measurements, the presence of dorsal muscle attachment sclerites (little developed in juveniles and therefore not observed in the original description) the suture Cx-2/3 laterally nearly perpendicular to the median line, and the genital field with small, round Ac, in males the gonopore not shortened and enlarged, and in females the genital plates elongated, flanking an extended part of the gonopore.

Apart from generally smaller dimensions, the female SMF 8000 agrees quite well with the data provided for *A. denticulatus* (holotype and populations from Luxembourg). The gap in absolute measurement values is bridged by the intermediate dates published by Angelier. Agreement is found in the proportions of P-2–4 (with high values of relative L P-2, and P-2/4 ratio) and I-L-5 and -6. Without giving more details, Angelier proposed distinguishing the two species on the basis of the shape of the palp, probably referring to the presence/absence of denticulation on P-2 and -3. However, this character is expressed variably in *A. denticulatus*, and denticulation can be observed also in specimen SMF 8000. On the other hand, published measurements of the male palps and I-L-5 and -6 of *A. similis* exceed those of the male from Luxembourg here assigned to *A. denticulatus* by 30%. Furthermore, a difference is found in the setation of IV-L-5/6. The female SMF 8000 lacks a fine long fine distal hair on IV-L-5, and the ventral margin of IV-L-6 bears strong setae instead of the continuous line of equally fine setae extending over the whole segment in *A. denticulatus*. These characters are unclear for *A. prosiliens*, the species in shape of male genital field and Dgl-1 setae most similar to *A. similis*. *A. microphthalmus*, a further weakly defined species in this group, agrees in most measurements and proportions, but differs from *A. similis* in the shape of the male genital field and Dgl-1 setae, and in reduced ventral setation of I-L-6.

These differences, their variability and taxonomic significance should be investigated based on larger populations of the *cisternarum* species group.

Habitat: Hyporheobiont.

Distribution: Pyrenées-orientales, original description: Basses-Pyrénées (unpublished record from SMF); Alps (without locality identification; E. Angelier, 1953) (2, 4).

ATRACTIDES GRAECUS K. VIETS, 1950
(FIG. 56A–F)

Type series: Holotype ♀, SMF 6004 Griechenland, Yliki See b. Theben, Quelle, 7.9.42 Láska coll. State of conservation: chelicerae missing, mounting fluid with many precipitations.

Material examined: Data from first description of the male, based on two specimens from Montenegro (Fundina, Rašovići, rheocrene at 600 m, 22.02.2000, together with one ♀, Pešić, 2002a)

Description:

General features

dorsal integument: striated (8/10); muscle attachments: smooth
coxal field: posterior margin Cx-1 + 2 medially equally rounded, with slightly protruding apodemes
I-L: slightly modified, I-L-5 with S-1 and -2 similar in shape, short, blunt, closely together; I-L-6 weakly curved, distally slightly thickened
excretory pore: smooth; Vgl-1: separate from Vgl-2
palp: ventral margins P-2/3 straight, without any particular formations at distal edge, P-4 slender, ventral margin 1 : 1 : 1, a fine denticle near each ventral hair insertion, sword seta halfway between ventral hairs

Females

Holotype, original description
genital field: gonopore rather short, Ac in a curved line, increasing in surface (but not in maximum diameter) Ac-1-Ac-3
palp: ventral margins P-2/3 straight, without any particular formations at distal edge, P-4 slender, with ventral margin 1 : 1 : 1, a fine denticle near each ventral hair insertion, sword seta halfway between ventral hairs
idiosoma L/W 515/390; glandularia 25
coxal field L 260; Cx-3 W 325; Cx-1 + 2 mL 100, IL 200, W 263
I-L-5 dL 145, vL 121, dL/vL 1.20, HA-HC 30, 30, 36, dL/HB 4.50
S-1 L 45, L/W 9.0, S-2 L 45, L/W 9.0, interspace 4, L S-1/2 1.0
I-L-6 L 104, HA-HC 23, 30, 30, dL/HB 3.47; L I-L-5/6 1.39
genital field L/W 126/121, Ac-1-3 L 24, 24, 24
gnathosoma -, chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	16/23	66/46	84/40	101/25	28/12
(ratio)	1.13	1.43	2.10	4.04	2.33
rel.L	09	22	28	33	09
total L:	P-2/4 0.65				
	305				

As the I-L is in an oblique position, measurements were taken from figure 8 of Viets' original description. However, as he had detached the II-L instead of I-L, there is reason to assume that his figure depicts the (quite similar) II-L, and all measurements can be considered questionable. The whip-like seta of I-L-5 is lost. The original description 'Camerostome 104 by 70 µm. Capitulum (basal member) 104 by 70 µm' is not readily comprehensible and suggests that the measurements and morphological terms were confused.

Males

From Pešić (2002a), measurements in parentheses calculated from figures
genital field: anterior margin equally convex, posterior margin slightly indented, diameter Ac-1 and Ac-3 > Ac-2; genital setae: 40
idiosoma L/W 483/369; glandularia -
coxal field L 286; Cx-3 W 328; (Cx-1 + 2 mL 105, IL 200, W 270)
I-L-5 dL 131, vL 105, dL/vL 1.25, HA-HC -, 25, -, dL/HB 5.24
S-1 L 37, L/W 7.4, S-2 L 35, L/W 6.5, interspace 3.5, L S-1/2 1.03
I-L-6 L 111, HA-HC -, 29, -, dL/HB 3.96; L I-L-5/6 1.18
genital field L/W 90/106, (Ac-1-3 L 25, 23, 27)
gnathosoma vL -; chelicera L 156, L/H -, bS/claw 2.25

palp	P-1	P-2	P-3	P-4	P-5
L/W	27/-	62/-	73/-	98/-	28/-
(ratio)	-	(1.68)	(2.06)	(3.20)	-
rel.L	09	22	25	34	10
total L:	P-2/4 0.63				
	288				

Discussion: Viets (1950) did not discuss the diagnostic features of this species. At the time of publication, similarly short and stout S-1 and -2 of I-L-5, and a slightly modified I-L-6, were known only from *A. dentipalpis* and the two hyporheobionts *A. pumilus* and *A. pygmaeus*. *A. graecus* differs from the latter two in the absence of sclerotized muscle attachments, a less elongated coxal genital field, Vgl-1 not fused to Vgl-2, and the sword seta P-4 more distant from the distoventral hair. From *A. dentipalpis* it differs in having a more slender I-L-6 and P-2 with smooth, not denticulated ventrodiscal edge. The female collected together with the males in Montenegro (Pešić, 2002a) differs from the holotype in generally larger dimensions (e.g. coxal field L 350, Cx-3 W 450, palp total L 351, genital field L 175 µm). In view of the good agreement in proportions (only the I-L-5 and -6 are more slender) these differences are most probably age-dependending and/or due to geographical variability.

Habitat: Crenobiont.

Distribution: Greece, Montenegro, Bulgaria (5, 6, 7) (Pešić, in press c).

ATRACTIDES INFLATIPALPIS (K. VIETS, 1950)
(FIG. 57A–F)

Atractides nodipalpis inflatipalpis K. Viets, 1950
not to *A. nodipalpis*? Lundblad, 1956

Type series: Lectotype ♂, here designated, SMF 6305, ♂ ♀ Type Griechenland Yliki See, fließ. Verbindung 1943 Láskar, on slide together with two ♀. State good, but visibility disturbed by precipitation; ejaculatory complex and left IV-L-5/6 absent. Paralectotype: ♀ together with lectotype, both with damaged left IV-L, one of them with eight eggs.

Description:

General features

Type series
dorsal integument: lineated (4/10); muscle attachments: smooth
coxal field: mediocaudal margin of Cx-1 weakly curved or nearly straight
I-L: I-L-5 thickened, S-1-2 distanced and strong, S-2 shortened and enlarged; I-L-6 curved, distally strongly narrowed
excretory pore: smooth; Vgl-1: separate from Vgl-2
palp: sexual dimorphism, but in both sexes ventral margin P-2 distally protruding, ventral margin P-3 straight, P-4 ventral margin 1 : 1 : 1, with sword seta near distoventral hair

Male

Holotype
genital field: apple-shaped, anterior margin weakly convex, slightly irregular, posterior margin weakly indented, gonopore large; genital setae: 46, the medial ones lined along the anterior half of gonopore
palp: P-2 with several transverse incisions and strongly protruding ventrodiscal expansion, P-4 thickened, basally concave, in the central and distal part weakly convex

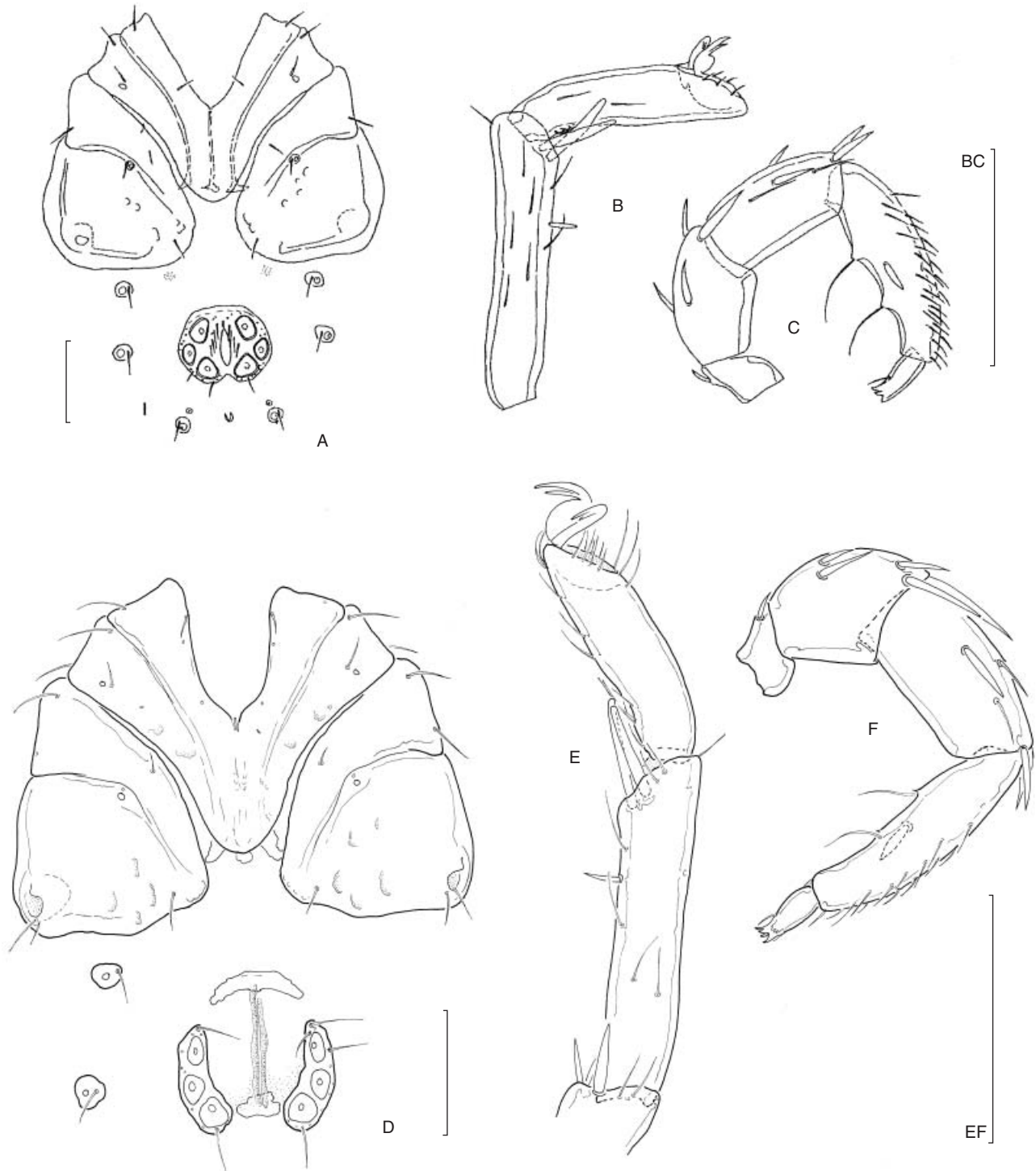


Figure 56. *Atractides graecus*. A–C, ♂ from Pešić (2002a); D–F, ♀ holotype SMF. A, ♂ ventral view; B, ♂ I-L-5 and -6; C, ♂ palp, medial view; D, ♀ coxal and genital field, E, ♀ I-L-5 and -6; F, ♀ palp, lateral view. Scale bars = 100 µm.

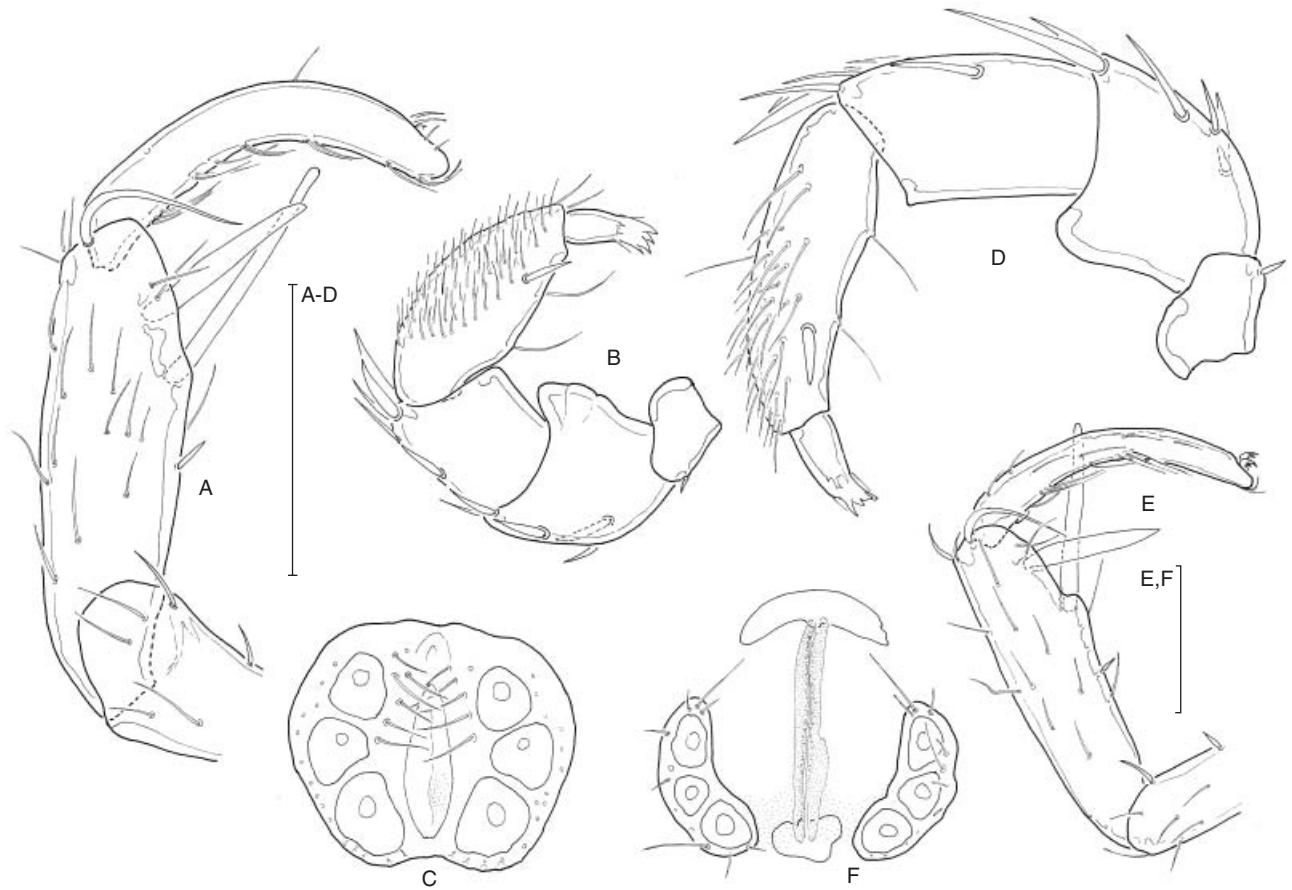


Figure 57. *Atractides inflatipalpis*. A–C, lectotype ♂ SMF, D–F, paralectotype ♀ SMF. A, ♂ I-L-5 and -6; B, ♂ palp, medial view; C, ♂ genital field; D, ♀ palp, medial view; E, ♀ I-L-5 and -6; F, ♀ genital field. Scale bars = 100 µm.

idiosoma L/W 470/360; glandularia 25
 coxal field L 256; Cx-3 W 306; Cx-1 + 2 mL 118, IL 185, W 323
 I-L-5 dL 159, vL 108, dL/vL 1.47, HA-HC 41, 51, 60, dL/HB 3.12
 S-1 L 91, L/W 13.0, S-2 L 72, L/W 7.2, interspace 17, L S-1/2 1.26
 I-L-6 L 125, HA-HC 33, 19, 17, dL/HB 6.58; L I-L-5/6 1.27
 genital field L/W 85/99, Ac-1–3 L 21, 23, 28
 gnathosoma vL 116; chelicera L 190, L/H 4.75, bS/claw 2.28

palp	P-1	P-2	P-3	P-4	P-5
L/W	28/26	63/57	49/41	87/37	30/10
(ratio)	1.08	1.11	1.20	2.35	3.00
rel.L	11	25	19	34	12
total L:	P-2/4 0.72				
	257				

idiosoma L/W 950/740; glandularia 25
 coxal field L 370; Cx-3 W 550; Cx-1 + 2 mL 108, IL 215, W 369
 I-L-5 dL 234, vL 166, dL/vL 1.41, HA-HC 65, 74, 92, dL/HB 3.16
 S-1 L 130, L/W 13.0, S-2 L 103 L/W 7.4, interspace 31, L S-1/2 4.2
 I-L-6 L 194, HA-HC 29, 20, 20, dL/HB 9.7; I-L-5/6 1.21
 genital field L/W 184/202, Ac-1–3 L 36, 33, 33
 gnathosoma vL 157; chelicera L 249, L/H 5.53, bS/claw 2.61

Palp	P-1	P-2	P-3	P-4	P-5
L/W	34/34	87/67	90/49	114/36	38/13
(ratio)	1.00	1.30	1.84	3.17	2.92
rel.L	09	24	25	31	10
total L:	P-2/4 0.76				
	363				

In general, the measurements provided here are in good agreement with the information in the original description, but Viets' computations of male idiosomal dimensions and glandularia diameter are out by 200%.

Females

Paratype
 genital field: genital plates compact, curved, without prominent anterior tip
 palp: P-2 with pronounced ventrodistal expansion, P-4 slender, sectors basally, between, and distally from ventral hairs each slightly concave

Discussion: Apart from some citations in checklists (compiled by K. O. Viets, 1987), Lundblad (1956) and Miccoli, (2002) are the only authors who have mentioned, albeit briefly, the species. Lundblad's statement that *A. inflatipalpis* should be considered taxonomically distant from *A. nodipalpis* is supported by numerous features: in *A. nodipalpis*, the integument is not lineated, I-L-6 less strongly narrowed distally, the male genital field deeply indented both anteriorly and posteriorly and with larger Ac, the

female genital field with Ac in triangular arrangement, the sword seta of P-4 inserted more proximally, and the ventral margin of female P-2 straight. *A. fluviatilis*, a species which has a similarly shaped I-L-5 and -6 (wide setal interspace, I-L-6 distally narrowed) and shares the distal position of the sword seta on P-4, differs from *A. inflatipalpis* in both sexes in having a striated integument, very much more slender P-3 (L/H ♂ > 1.5, ♀ > 2.3) and P-4 (L/H ♂ > 2.8, ♀ > 3.9) and larger Ac, with triangular arrangement in females.

With its combination of a lineated dorsal integument and a strong sexual dimorphism of P-2, *A. inflatipalpis* is most similar to *A. fonticolus* and *A. pennatus*. It differs from both species in the more distant S-1 and -2 on I-L-5 and the more slender I-L-6, and from *A. fonticolus* in the only weakly enlarged S-2 of I-L-5, and the strongly protruding finger-like extension of the male P-2. Furthermore, the following measurement differences are diagnostic between *A. inflatipalpis* and *A. pennatus* (in parentheses): palp total L ♂ 257 (354), ♀ 363 (454) µm; rel. L P-3 ♂ 19 (23), ♀ 25 (27)%, L/H P-3 ♂ 1.20 (1.54), ♀ 1.84 (2.28), P-4 ♂ 2.35 (2.49), ♀ 3.17 (3.62); L I-L-5/6 ♂ 159/125, ratio 1.27 (234/145, ratio 1.61), ♀ 234/194, ratio 1.21 (302/176, ratio 1.72); I-L-6 L/HB ♂ 6.58 (5.80), ♀ 9.70 (7.04).

Habitat: Rhithrobiont.

Distribution: Greece, Italy, Bulgaria (3, 6, 7) (Pešić, in press c).

ATRACTIDES REMYI (ANGELIER, 1951)

Megapus remyi Angelier, 1951

Syn. to *A. latipes* (Szalay, 1935): Angelier, 1954a

Type series: No access. *Loci typici*: France, Corse. Golo, près de Ponte-Castirla, 280 m, 25.08.1950, 2 ♀; Golo, à Ponte-Leccia, 160 m, 30.08.1950, 1 ♀; Rivière du Vecchio, sous le col de Vizzavona, 980 m, 20.08.1950, 1 ♀.

Discussion: In the preliminary publication, the author discussed only the diagnostic differences with *A. distans* and *A. diastema*, two taxonomically distant species. Later he noticed the similarity to *A. latipes*, and synonymized *A. remyi* with that species. Most measurements slightly exceed the values provided here for *A. latipes*, but the important proportions are in good agreement (e.g. I-L-5 dL/HB 2.43, L I-L-5/6 1.38). Dimensions of the palp as calculated from Angelier's data are (L/H, L/H ratio, relative L): P-1 25/24, 1.04, 09; P-2 58/40, 1.45, 21; P-3 76/36, 2.11, 27; P-4 84/25, 3.36, 30; P-5 34/-, -, 12; total L 277, P-2/4 ratio 0.69.

However, the (admittedly sketchy) figures of the specimens from Corsica published in 1954 depict the following differences to *A. latipes*: S-1 and -2 sharply

pointed, not blunt, and S-1 considerably enlarged, I-L-6 extremely narrowed at HB, and setation of palps rather uniform, without particularly enlarged and flattened dorsal setae. For the time being the synonymization of *A. remyi* with *A. latipes* is accepted, but we should keep in mind that in Corsica the presence of a modified island sister species of *A. latipes* is possible. This should be clarified by future variability studies.

ATRACTIDES GRACILIPES (ANGELIER, 1951)

(FIG. 58A–C)

Megapus gracilipes Angelier, 1951

Type series: No access. *Locus typicus*: France, Corse, Ruisseau affluent du San Pietro, au pied du col de Bavella, sous un pont de bois de la route Forestière 4, 400 m environ, 27.08.1950, 1 ♂.

Description:

General features

Original description, female unknown

dorsal integument: ?; muscle attachments: not sclerotized

coxal field: mediocaudal margin of Cx-1 between apodemes of Cx-2 extremely narrow; suture lines Cx-3/4 curved, in their medial part directed to the posterior margin of Cx-3 + 4

I-L: I-L-5 not enlarged distally, S-1 and -2 moderately distanced, S-1 longer and more slender than S-2; I-L-6 curved, equal in H all over the segment, claws strong

excretory pore: sclerotized; Vgl-1: fused to Vgl-2

palp: probably without sexual dimorphism, ventral margin P-2 equally convex, P-3 nearly straight, but in the distal part convex, P-4 1 : 1 : 1, rather slender, sword seta near proximoventral hair

Male

Original description

genital field: round, anteriorly convex, posteriorly slightly indented, gonopore extending from Ac-1 to Ac-3, Ac in triangular position; genital setae: 30

idiosoma L/W 600/450; glandularia petites

coxal field L 320; Cx-3 W -, Cx-1 + 2 -

I-L-5 dL 150, vL -, dL/vL -, HA-HC -, dL/HB -

S-1 L 95, L/W -, S-2 L 75, L/W -, interspace -, L S-1/2 1.26

I-L-6 L 120, HA-HC -, dL/HB -; L I-L-5/6 1.25

genital field L/W 105/120, Ac-1-3 L -

gnathosoma -, chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	25/25	80/55	90/47	130/38	37/-
(ratio)	1.0	1.45	1.91	3.42	-
rel.L	07	22	25	36	10
total L:	P-2/4 0.62				
362					

Discussion: Since the original description of this single male, no record or discussion of diagnostic characters has appeared in the literature. Angelier compared *A. gracilipes* only with *A. soproniensis*, a species here synonymized with *A. fonticolus*, which is similar to *A. gracilipes* in the shape of I-L-5 (not enlarged distally, narrow setal interspace, S-2 strongly enlarged) and of the male genital field, but characterized *inter alia* by a ventral protrusion of the male P-2, longer dorsal setae on P-2 and -3, and the sword seta P-4 inserted near the distoventral hair. The only other

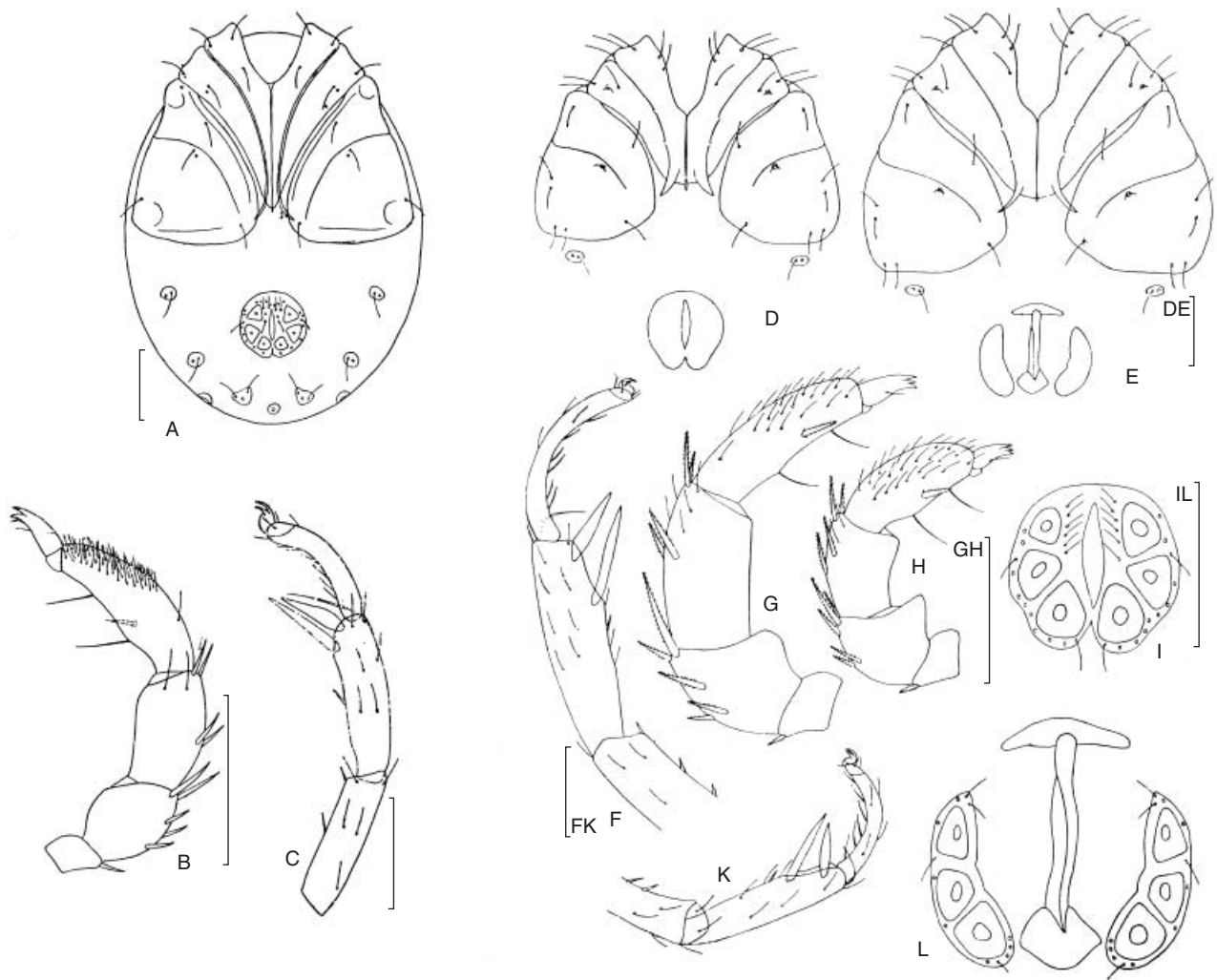


Figure 58. A–C, *Atractides gracilipes* ♂, from E. Angelier (1954). A, ventral idiosoma; B, palp, lateral view; C, I-L-5 and -6. D–L *Atractides corsicus*, from E. Angelier (1954). D, ♂ coxal and genital field, E, ♀ coxal and genital field; F, ♀ I-L-5 and -6; G, ♀ palp, medial view; H, ♂ palp, medial view, I ♂ genital field, K ♂ I-L-5 and -6, L ♀ genital field. Scale bars = 100 µm.

species known at that time with an extremely narrow caudal margin of Cx-1 between the apodemes of Cx-2 is *A. phreaticus*. Many differences (e.g. sclerotized muscle attachments, much more robust and weakly curved I-L-6, and shortened male gonopore in *A. phreaticus*) indicate that this common character is a convergence rather than a symptom of phylogenetic relation.

Notwithstanding the lack of information on important character states such as integument structure, I-L measurements, and female morphology, the diagnostic combination of the narrow mediocaudal margin of Cx-1, arrangement of the elements of the genital and postgenital area, and palp probably without sexual dimorphism, is sufficient for defining the species. However, proportions of the idiosoma as figured in the orig-

inal description suggest that it was based on a juvenile. A revision and redefinition of this taxon is necessary.

Habitat: Rhithrobiont.

Distribution: Corsica, known only from the *locus typicus* (3).

ATRACTIDES MORAVICUS LÁSKA, 1952

Syn. to *A. nodipalpis* Thor, 1899: syn. nov.

Type series: Apparently missing. *Locus typicus*: Czech Republic, Vsetínér Beskids, potok Jezerný, 23.08.1950 2 ♀.

Material examined: MMB 493; 179-4 Branà v Jindřichové Jeseniky, 18.9.1950 leg. Láška 1 ♀ (together with *A. gibberipalpis*, 2 ♂, 1 ♀); MMB 156; 428-1 Divoká Desná Jeseniky 11.8.1951 leg. Láška 2 ♀ (together with *A. nodipalpis* 3 ♀).

Discussion: The fate of the two female specimens on which the first publication of *A. moravicus* was based (Láska, 1952) is unclear. In 1964, Láska supplied the description of males based on a specimen from the *locus typicus*, but the preparation in question is no longer available. The examined specimens as authorized by Láska do not derive from the *locus typicus*. As far as I know, their collecting sites have not been recorded in a publication. However, they agree with the original description, and one female from MMB 428–1 was used to provide a detailed comparison of measurements.

Láska was convinced of the diagnostic significance of the wide setal interspace, and therefore compared the species with *A. distans* and *A. diastema*. It differs from the former in the shape of S-1 (not enlarged distally) and the slightly protruding ventrodiscal edge of P-2, and from the latter in the triangular arrangement of the Ac and the position of the sword seta P-4 proximal to the distoventral hair. All these character states are combined in *A. nodipalpis*. A study on a population of that species reveals considerable variability in the interspace, with maxima exceeding the values in *A. moravicus* (about 42 µm). Also, all other measurements fall within the range of variability of *A. nodipalpis*, except for the slightly more slender I-L-6 (L/HB 10.0) – a negligible detail in view of the extreme variation in this ratio in *A. nodipalpis* (6.5–9.6). S-1 (L/W 14.1) is more slender than in all specimens of the analysed population of *A. nodipalpis* (8.2–11.7) but its shape is obviously highly variable, and a similarly slender S-1 is found in the neotype of *A. nodipalpis*.

Judging from Láska's (1964) description, the shape of I-L-5 and -6 and the genital field of the male attributed to *A. moravicus* are much the same as typical specimens of *A. nodipalpis*, although the palp lacks the diagnostic ventral projection of P-2. As pointed out in the section dealing with intersexes, specimens with intersexual character combinations are not infrequently found when larger populations are studied. In fact, both species were collected from the same location. All things considered, there is sufficient evidence for considering *A. moravicus* to be conspecific with *A. nodipalpis*.

ATRACTIDES TATRENSIS SZALAY, 1953

Syn. to *A. vaginalis* Koenike, 1905: syn. nov.

Type series: Missing. *Locus typicus:* Hohe Tatra, Fehérvíz, 1150 m ü.d.M., 12°C, 3.VIII.1930, 1 ♂, 3 ♀ (site of the type series, further material listed under 'Weitere Fundorte; all material coll. Dudich).

Material examined: MMB (all leg. Láska): 164, 1325. prítok Ramzovky v Hor. Lipové, 11.8.1958 1 ♂ 3 ♀ 1038; 1103–3. Javorina, pot. u twist.chaty Belan. Tatry. 3.9.1956 3 ♀ 1049; 1107. Javorinka u novárny pod Havranem. Belan Tatry. 4.9.1956 3 ♀ 1059; 1113. Havrani potok nad Podopády. 5.9.1956 ♀

1071; 1120. Studeny p. v Strè Lesne Tatry. 7.9.1956 ♀ 1103; 1160. Prameny Moravice m Velkotji, Jeseniky, 18.6.1957. 2 ♀ 1105; 1228–1. Pramen nad Ostruznou. Jeseniky. 7.8.1957 12 ♂ 1106; 1228–2 Pramen nad Ostruznow. Jeseniky. 7.8.1957 12 ♀ 1107; 1228–3. Pramen nad Ostruznow. Jeseniky. 7.8.1957 12 ♀ 1108; 1228–4. Pramen nad Ostruznou. Jeseniky 7.8.1957. 12 ♀ 1131; 1236–3 Jamnický p. v pásma Jesa, 8.9.1957 2 ♀ 1148; 1247–3. Tichá dotina na zacatica Kp. Tatry. 12.9.1957 1 ♀ 1149; 1249–1. Koprová n Htinske det. Vys. Tatry. 13.9.1957 3 ♀ 1155; Potok pod Kopou Podbeinskou 14.9.1957 1 ♂, 1 ♀ 1157; 1254. Furkotský p. na. Tatr. magistrále. 14.9.1957 1 ♂ 1248; 1318–2. Pramenný p. pod. Serakem. 6.8.1958. 1 ♂ 2 ♀ piknc exempl.

Discussion: In his brief discussion, Szalay (1953) compared this species with *A. subasper*, *A. lacustris* and *A. scutatus* because of the presence of extended ventral sclerotization in the male. The presence of this character in *A. vaginalis* escaped his attention, which is not surprising as the only description of a male of that species at that time (Walter, 1922a) lacked figures. Neither Szalay's figures nor his measurements reveal any significant difference to *A. vaginalis*. The study of a huge amount of material classified by Láska under the name of *A. tatrensis*, and mainly coming from the Czech side of the Tatra mountains, confirms the synonymization of *A. tatrensis* with *A. vaginalis*. As in alpine populations, the posterior margin of Cx-4 is surrounded by a large border of secondary sclerotization including the Vgl-3 in most males, but in a few specimens this border is not fully developed and the Vgl-3 project over the posterior contour line. In 71 out of 72 specimens, the shape of palps and first legs agrees with *A. vaginalis*. There is only one exception, a female from prep. 1107, with I-L-6 not narrowed but enlarged distally as described for *A. adnatus*. As the specimen is a weakly sclerotized juvenile, this could be the consequence of a deformation. For the time being, the presence of *A. adnatus* in the Tatra mountains should be accompanied with a question mark.

ATRACTIDES OVIFORMIS SZALAY, 1953

Syn. to *A. vaginalis* Koenike, 1905: syn. nov.

Type series: Missing. *Locus typicus:* Hohe Tatra, Kalksteingebirge bei Szepesbela (Spišská Belá) Feketevíz, 920 m ü. d. M., 10°C, 5.8.1930, 1 ♂ gesammelt von Dr. E. Dudich.

Discussion: Since the initial description (Szalay, 1953) this species has not been discussed, and the name has appeared only in faunistic lists, including a single further locality record provided by Láska (1955a) from Slovakia. Szalay compared the species with *A. walteri*, *A. panniculatus*, *A. glandulosus*, *A. coriaceus* and *A. issajewi* (Sokolow, 1928) but was not aware of the close similarity to *A. vaginalis*. In fact, his measurements are only slightly higher than those provided here for *A. vaginalis*, and all proportions agree. According to his measurements, the P-4 is relatively elongated (37% of total length) and therefore the P-2/4 ratio is low (0.52). However, from his figure this value is calculated as 0.58, and the

measurement differences consequently are artefacts. Szalay's figures show the palp, ventral idiosoma and I-L-5 and -6 of a typical juvenile *A. vaginalis* male, with Vgl-3 not yet fused to the posterior border of Cx-4. Szalay clearly overlooked the variation in this latter character, and therefore did not compare this species with *A. tatrensis*, a species he described on the preceding page on the basis of specimens partly collected at the same site and date as *A. oviformis*. There is no doubt that they are conspecific, and *A. oviformis*, as *A. tatrensis*, represents a junior synonym of *A. vaginalis*.

ATTRACTIDES REMOTUS SZALAY, 1953 (FIG. 59A–H)

[syn. to *A. mitisi* (Walter, 1944): Biesiadka, 1979a – rejected synonymy]

Syn. *A. stygophilus* (Schwoerbel, 1959): syn. nov.

Type series: Missing. *Locus typicus*: Hohe Tatra, Szepesbela-Barlangliget (Spišská Belá) Belá-Bach, 14, 3°C, 8.8.1930, 1 ♂, 3 ♀ gesammelt von Dr. E. Dudich.

Material examined: NHMB: Switzerland Lützel, hyp., coll. Schiess, 1 ♂, 1 ♀; MMB Slovakia 361–4 Racibor u Orav. Podzámku. 14.7.1951 Leg. Láska 1 ♂ 1205–3 Racovský p. pred vtokem do Oravy 20.7.1957 Leg. Láska 1 ♂ 1 ♀; 1336–2 Nitra nad Prievidzou 21.9.1958 Leg. Láska 1 ♂; CSM: Germany, Black Forest, type series of *A. stygophilus* and further specimens (see there).

Description:

General features

dorsal integument: lineated; muscle attachments: smooth
coxal field: Cx-1 with narrow medio-caudal margin, all coxae seeming fused together, Cx-4 with extended posterior margin (of secondary sclerotization?)

I-L: S-1 and -2 far distanced and heteromorph, S-1 slender, S-2 enlarged in the basal third; I-L-6 curved, distally strongly narrowed
excretory pore: smooth; Vgl-1: separate from Vgl-2

palp: sexual dimorphism, in both sexes P-2 distoventrally protruding and sword seta P-4 near distoventral hair

Males

Original description, in parentheses specimen from NHMB

coxae: fused to a coxal shield
genital field: anterior margin weakly, posterior margin more strongly indented, Ac large, in triangular position; genital setae: 40, a line of setae flanking the gonopore

palp: ventrodistal protrusion P-2 nose-shaped, with rugose surface
idiosoma L/W 540/430 (540/420); glandularia small
coxal field L 342 (286); Cx-3 W (378); Cx-1 + 2 mL (135), IL (238), W (302)
I-L-5 dL 172 (180), vL (123), dL/vL (1.46), HA-HC (47, 51, 66), dL/HB 3.74 (3.53)

S-1 L 95, L/W 11.9, S-2 L 80, L/W 8.0, interspace 22, L S-1/2 1.19
I-L-6 L 133 (134), HA-HC (24, 17, 16), dL/HB (7.88); L I-L-5/6 1.29 (1.34)
genital field L/W 90/127 (100/125), Ac-1–3 L [35, 38, 40]
gnathosoma vL –; chelicera L (190), L/H (5.0), bS/claw (2.52)

palp	P-1	P-2	P-3	P-4	P-5
L/W	32/28 (27/27)	73/57 (65/61)	98/36 (69/47)	119/32 (96/49)	32/14 (34/11)
(ratio)	1.14 (1.00)	1.28 (1.07)	2.72 (1.49)	3.72 (1.96)	2.29 (3.09)
rel.L	09 (09)	21 (22)	28 (24)	34 (33)	09 (12)
total L:	P-2/4 0.61 (0.68)				
	354 (291)				

The original description of the male was based on a single badly damaged specimen. The male from

NHMB differs considerably from that described by Szalay; as on other occasions, however, his measurements are unreliable, probably due to the segments having been crushed. Also, the dates of the Swiss specimen are approximate. The specimen from NHMB is a juvenile (borderlines of coxae scarcely visible due to weak sclerotization, no secondary sclerite, excretory pore close to caudal idiosoma margin, P-4 inflated). In the specimen on which Szalay based his description and the male from NHMB Vgl-3 is not fused to the posterior margin of Cx-4, but Láska (1957) describes the age-dependent variability of this character. The male I-L is unusual in having large, rounded distal sheaths on I-L-4 and, to a lesser extent, I-L-5, flanking the insertion of the successive segment.

Females

Original description, in parentheses specimen from NHMB [MMB]

genital field: Ac in triangular arrangement
palp: much more slender than in males, P-2 with a ventrodistal hump
idiosoma L/W 810/660 (640/500); glandularia small
coxal field L 393 (350); Cx-3 W (420); Cx-1 + 2 mL (156), IL (265), W (350)
I-L-5 dL 240 (234), vL (148), dL/vL (1.58), HA-HC (64), 67 (64), (90), dL/HB 3.75 (3.66)
S-1 L 115 (123), L/W (13.7), S-2 L 102 (99), L/W (6.6), interspace (40), L S-1/2 1.13 (1.24)
I-L-6 L 180 (174), HA-HC (23, 15, 20), dL/HB (11.6); L I-L-5/6 1.33 (1.34)
genital field L/W 135/162, Ac-1–3 L [55, 55, 53]
gnathosoma –; chelicera L 176 (225), L/H (5.49), bS/claw 3.14 (2.57)

palp	P-1	P-2	P-3	P-4	P-5
L/W	32/28 (36/29)	73/57 (74/52)	98/36 (100/47)	119/32 (112/29)	32/14 (40/11)
(ratio)	1.14 (1.24)	1.28 (1.42)	2.72 (2.13)	3.72 (3.86)	2.29 (3.64)
rel.L	09 (10)	21 (20)	28 (28)	34 (31)	09 (11)
total L:	P-2/4 0.61 (0.66)				
	354 (362)				

The juvenility of the Swiss specimen makes comparison of measurements problematic. Szalay found in one of the specimens a single egg 106 µm in diameter.

Discussion: Szalay (1953) discussed similarities in shape of coxae and I-L-5 and -6 in a large number of European and non-European species, but without giving diagnostic features of *A. remotus*. Láska (1957) in his description of specimens from the present day Czech Republic, mentioned for the first time the similarity to *A. panniculatus* and outlined specific differences. Since then, the name has appeared only in faunistic lists from Eastern Europe (see K. O. Viets, 1987). Biesiadka (1979a) proposed synonymization with *A. mitisi*, a species here considered conspecific with *A. panniculatus*. The specimens from Switzerland probably derive from the collections published by Rensburg (1971) but for unclear reasons they do not appear in his lists.

Due to the character combination of lineated dorsal integument, smooth excretory pore, Vgl-1/2 not fused, and ventral margin of P-2 slightly protruding also in females, *A. remotus* is similar to *A. fonticolus*,

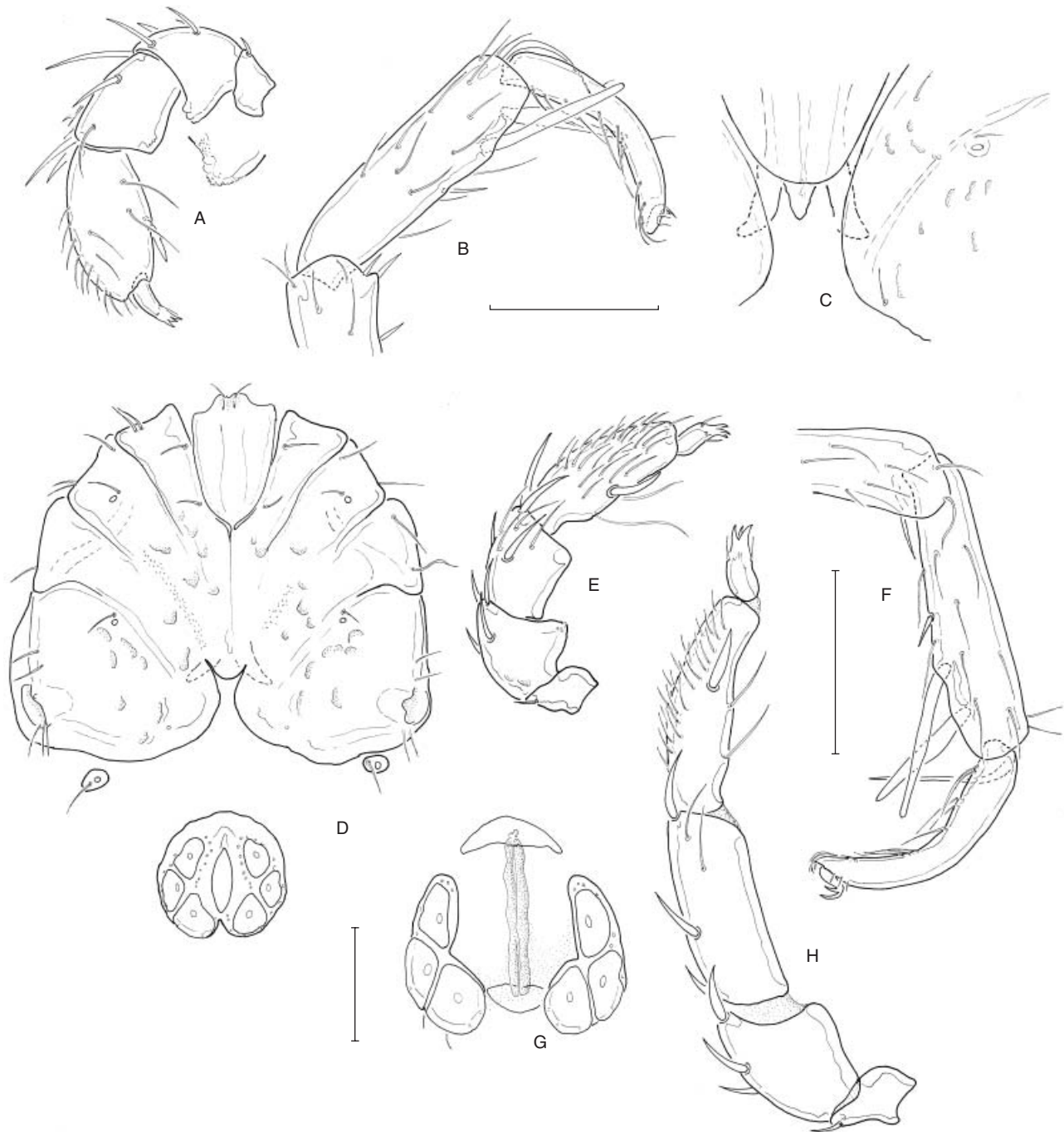


Figure 59. *Atractides remotus*. A–C, ♂ NHMB; D–F, ♂ MMB 1336–2; G; H, ♀ MMB 1496. A, ♂ palp, lateral view (inset: detail of ventrodistal projection); B, ♂ I-L-5 and -6; C, ♂ coxal field, mediocaudal edge Cx-1 + 2; D, coxal and genital field; E, ♂ palp, medial view; F, ♂ I-L-5 and -6; G, ♀ genital field; H, ♀ palp, medial view. Scale bars = 100 μ m.

A. pennatus, *A. panniculatus*, and *A. fissus*. Males of *A. remotus* differ from these species in the coxae fused to a coxal shield. Common characters of *A. remotus*, *A. fonticolus* and *A. pennatus* are the more or less closely situated ventral hairs of the male P-4, and male legs with extended distal sheaths of I-L-4/5.

A. fonticolus and *A. pennatus* differ in the relatively short I-L-6 (L ratio I-L-5/6 > 1.60), their larger dimensions, the more protruding P-2 in males, and the arrangement of the female Ac in a weakly curved line. Males of both *A. panniculatus* and *A. fissus* differ from *A. remotus* in having a far larger genital field (L > 150,

$W > 190$), a relatively short I-L-6 (L ratio I-L-5/6 > 1.35) and ventral hairs of P-4 further apart from each other. With females of both species the differences are less distinct (e.g. genital field L/W $> 170/200 \mu\text{m}$) and *A. fissus* occupies an intermediate position between the larger *A. panniculatus*, and smaller *A. remotus*. There is no difference in the I-L-5/6 ratio between females of the three species, but *A. remotus* has a more slender I-L-6 than *A. panniculatus* and *A. fissus* (L/HB 9.0–9.9). *A. remotus* females are more similar to *A. fissus* in the position of the ventrodistal hair of P-4 (further from the distal edge than in *A. panniculatus*). In view of these differences, *A. mitisi*, a species known only from females, is held to be a synonym of *A. panniculatus*, and not conspecific with *A. remotus*, while *A. panniculatus*, *A. fissus* and *A. remotus* can be considered a complex of related species.

Habitat: Rhithrobiont, hyporheophilous.

Distribution: Central Europe, Alps, Carpathians, Montenegro (4, 5, 7, 9, 10) (Pešić, 2002b).

ATRACTIDES SIMILLIMUS ANGELIER, 1953

nov. nom. pro *A. similis* (Angelier, 1949) not necessary

ATRACTIDES CORSICUS (ANGELIER, 1954) (FIG. 58D–L)

Atractides nodipalpis corsicus Angelier, 1954a

A. fonticolus corsicus (Angelier *et al.*, 1963)

Type series: No access. **Loci typici:** France, Corse, coll. Angelier. Station 4, Bevinco, sous le col de San Stephano, 320 m, 16.08.1950 1 ♀; Station 6, Golo, près de Ponte-Castirla, 280 m, 15.08.1950 1 ♀; Station 13, Rivière Casaluna, sur la bord de la route I.C. 39, à 2 km au nord-ouest de la route allant vers Poggio, 300 m, 31.08.1950 1 ♀; Station 20, Tavignano, à 6 km au sud-est de Corte, sous le pont de la route I.C.40, 300 m, 23.08.1950 1 ♂, 3 ♀; Station 22, Rivière du Vecchio, sous le col de Vizzavona, 980 m, 20.08.1950 1 ♀; Station 24, Fium Orbo, près de la route forestière n°10, 130 m, 26.08.1950 2 ♀; Station 37, Taravo, entre Forciolo et Olivèse, sous le pont de la route I.C.2, 400 m environ, 22.08.1950 1 ♀; Station 38, Taravo, à 2 km au sud des Bains de Taccana, sous le pont de la route nationale, 196 (pont d'Abra) 170 m, 22.08.1950 1 ♀; Station 44, Ruisseau de Crioscia affluent rive droite de la rivière Zona, à 3 km au nord-ouest de Zona, sur le bord de la route nationale 852, 700 m, 18.08.1950 3 ♀.

Description:

General features

dorsal integument: striated; muscle attachments: smooth
coxal field: mediocaudal margin Cx-1 weakly convex, caudal apodemes Cx-2 in a 45° angle
I-L: I-L-5 thickened, S-1–2 distanced; I-L-6 slender and strongly curved
excretory pore: smooth; Vgl-1: ?
palp: sexual dimorphism; P-4 ventral hairs 1:1:1, sword seta halfway between hair insertions

Males

Original description [calculated from figures]
genital field: apple-shaped, anteriorly weakly convex without indentation, posteriorly indented, Ac-3 $>$ Ac-2 $>$ Ac-1; genital setae: 35
palp: P-2 with unique, strongly protruding ventrodistal extension; P-3 with concave ventral margin, P-4 thickened

idiosoma L/W 640/500; glandularia?
coxal field L 308; Cx-3 W –; Cx-1 + 2 mL –, IL –, W –
I-L-5 dL 195, vL [118], dL/vL [1.65], HA-HC –, [43], –, dL/HB [4.53]
S-1 L 87, L/W –, S-2 L 61, L/W –, interspace 35, L S-1/2 1.43
I-L-6 L 128, HA-HC –, 15, –, dL/HB [8.4]; L I-L-5/6 1.52 [1.46]
genital field L/W 105/105, Ac-1–3 L –
gnathosoma vL 150; chelicera L 210, L/H 5.25, bS/claw 2.82

palp	P-1	P-2	P-3	P-4	P-5
L/W	34/37	72/67	75/51	95/407	29/–
(ratio)	0.92	1.07	1.47	2.38	–
rel.L	11	24	25	31	10
total L:	P-2/4 0.76				
	305				

Angelier's figure 93 shows strongly heteromorphic S-1 and -2 and an extremely curved I-L-6 thinnest in the centre of the segment. The protrusion of P-2 is unpaired ('sans protuberance hyaline distale').

Females

Original description (calculated from figures)
genital field: genital plates anteriorly pointed, Ac in a weakly curved line
palp: P-2 with a rounded ventrodistal hump, ventral margin P-3 straight, P-4 more slender
idiosoma L/W 800 (750–830)/640; glandularia?
coxal field L 410; Cx-3 W –; Cx-1 + 2 mL –, IL –, W –
I-L-5 dL 245, vL [150], dL/vL [1.63], HA-HC –, 71, –, dL/HB [3.45]
S-1 L 115, L/W –, S-2 L 87, L/W –, interspace 52, L S-1/2 1.32
I-L-6 L 188, HA-HC –, dL/HB [11.7]; L I-L-5/6 1.30
genital field L/W 150/162, Ac-1–3 L –
gnathosoma vL 185; chelicera L 260, L/H 5.78, bS/claw 3.33

Palp	P-1	P-2	P-3	P-4	P-5
L/W	33/40	89/72	110/54	128/31	41/–
(ratio)	0.83	1.24	2.04	4.13	–
rel.L	08	22	27	32	10
total L:	P-2/4 3.83				
	401				

Discussion: Angelier considered this taxon to be related not only to *A. pennatus* but also to *A. fonticolus* as is indicated by his proposal in 1963 to assign it as a subspecies of the latter. Both sexes of *A. corsicus* differ from these species in the striated, not lined integument, I-L-5 and -6 with S-1 and -2 both longer, wider setal interspace, and a long and slender I-L-6 (in both *A. pennatus* and *A. fonticolus*, L ratio I-L-5/6 > 1.6). Furthermore, *A. corsicus* males and females differ from *A. pennatus* in the position of the sword seta P-4 (proximal, not distal to the distoventral hair) and males differ from *A. fonticolus* males in the uniform, pointed shape of P-2. In the shape of I-L-5 and -6, setal interspace, and slender terminal segment, *A. corsicus* is similar to *A. fluviatilis*. In males, *A. fluviatilis* differs in a relatively long I-L-6 (L ratio I-L-5/6 1.25–1.38), in the setation of the genital field (medial row of setae flanking the gonopore more extended caudally, reaching the anterior margin of Ac-3) and in the morphology of the palp (P-2 with little protruding ventrodistal protrusion, sword seta P-4 inserted more distally, on the level of the distoventral hair). Both sexes of *A. fluviatilis* have more slender palp segments (e.g. L/H P-2 ♂

1.18–1.38, ♀ 1.54–1.60; P-3 ♂ 1.70–1.80, ♀ 2.31–2.39). At moment, females can be distinguished solely only on the basis of these proportions. This character is of doubtful value both because it is easily influenced by crushing of preparations, and because of the considerable variability among local populations of *A. fluviatilis*. Taxonomy of the *A. fluviatilis/corsicus* species complex should be investigated based on populations from an extended geographical range.

Habitat: Rhithrobiont.

Distribution: Corsica, known only from the *loci typici* (3).

ATRACTIDES UMBONIPALPIS SZALAY, 1954

Species dubia

Type series: Missing. *Locus typicus*: Hoverla (Máramaroscher Schneegebirge, Nordöstliche Karpathen) aus einem Bache, 1600 m ü. d. M., 16.08.1939 1 ♂, 1 ♀ von Dr. E. Dudich gesammelt.

Discussion: After the first description of one male and one female (Szalay, 1954), *A. umbonipalpis* was not recorded again, and the taxonomic state of *A. umbonipalpis* was never discussed. Szalay compared it with *A. subasper*, *A. glandulosus*, *A. coriaceus*, and *A. paniculatus*, four species similar in having Vgl-3 fused to the posterior margin of Cx-4. All these species differ strongly from several points of view. Instead, *A. umbonipalpis* agrees well with *A. vaginalis*, a species in which the extension of the coxal sclerotization varies according to age in males. With regard to dimensions and proportions, only minute differences can be found between *A. umbonipalpis* and *A. vaginalis*, mainly regarding the shape of the male palp (P-2 proximoventrally concave, P-4 laterally inflated in the area of the dorsal hair cover) and the rather strongly protruding distoventral edge of I-L-5 in both sexes. Due to the observed differences and the lack of type material, a definitive decision is impossible. *A. umbonipalpis* is a *species dubia*, probably a synonym of *A. vaginalis*.

ATRACTIDES DIGITATUS LUNDBLAD, 1954 (FIGS 60A–D, 61A–F)

Type series: SMNH Holotype ♂ 4352. Typ. *Atractides digitatus* Ldbl. ♂ Spanien. Fjällbäck 3 mil nordost Granada, 12.6.1935– Leg. O. Lundblad. State of conservation: gnathosoma *in situ*, both palps, both I-L and left IV-L separate, laterally, left III-L missing. Paratype ♀ 4353. Allotyp. *Atractides digitatus* Ldbl. ♀ [like holotype]. State of conservation: like holotype, but gnathosoma separate, laterally, and legs complete.

Material examined: Spain: Aragon, Beceite, Rio Mataranya upstream Vall del Prat, 600 m, 18.04.1998 Gerecke, 4 ♂, 4 ♀

Description:

General features

dorsal integument: striated, leathery; muscle attachments: sexual dimorphism in the dorsal area, but V-1–3 unsclerotized in both sexes

coxal field: Cx-1+2 plate caudally narrowed and caudal margin of Cx-1 strongly curved, apodemes of Cx-2 directed laterally; Cx-4 with sexual dimorphism

I-L: I-L-5/6 very stout, wide setal interspace, both apically rounded but extremely heteromorphic, S-1 thick, long and slightly curved, S-2 slender and short; I-L-6 curved, equal in height from the base to the claw furrow

genital field: Ac large, in triangular position

excretory pore: smooth; Vgl-1: not fused to Vgl-2

gnathosoma: with an elongated rostrum, pointed in ventral view

chelicera: with a relatively long, fine and rather straight claw

palp: very stout, P-3 with slightly concave ventral margin, sword seta P-4 between ventral hairs or approached to proximoventral hair, sexual dimorphism of P-2 and P-4

Males

Holotype, in parentheses specimens from Aragon

Muscle attachments: unpaired anterior dorsal shield anteriorly pointed, posteriorly enlarged and with straight caudal margin, including prefr, postoc, Dgl-3 and D-1, unpaired posterior dorsal shield with slightly convex or indented anterior, and undulating lateral/caudal margins including Dgl-4–6 and D-3–5

Coxae: Cx-4 caudally with extended secondary sclerotization including Vgl-3
Genital field: anterior margin with irregularly convex secondary sclerotization, posterior margin medially indented; genital setae: [50]

palp: P-2 with a strong and narrow, finger-like distoventral protrusion, P-4 ventrally protruding in a blunt tip at the insertion level of the distoventral hair, ventral hairs long, close to each other, dividing the ventral margin 3 : 1 : 2

idiosoma L/W 490/370; glandularia 28

coxal field L 302; Cx-3W 310; Cx-1+2 mL 145, IL 210, W 243

I-L-5 dL 121, vL 85, dL/vL 1.42, HA-HC 49, 56, 61, dL/HB 2.16

S-1 L 65, L/W 7.22, S-2 L 29, L/W 7.25, interspace 16, L S-1/2 2.24

I-L-6 L 104, HA-HC 29, 28, 30, dL/HB 3.71; I L-5/6 1.16

genital field L/W – (124)/144(148), (Ac-1–3 L 38, 50, 45)

gnathosoma vL 121; (chelicera L 281, L/H 6.24, bS/claw 1.60)

palp	P-1	P-2	P-3	P-4	P-5
L/W	25/29	65/57	54/40	74/38	35/15
(ratio)	0.86	1.14	1.35	1.95	2.33
rel.L	10	26	21	29	14
total L:	P-2/4 0.88				
	253				

Lundblad states that the integument is without structure; however, at least in tangential view a fine striation is visible. Dgl-1 with very long setae; in several males, also the slit organ laterally from D-2 is on a sclerotized platelet. Measurements of the dorsal shields following Lundblad: anterior shield L/W 160/214, posterior shield 250/240 µm. In the holotype and some of the compared specimens, the genital field is in an inclined position with the gonopore directed ventrocaudally; therefore, no L measurement is possible.

Females

Paratype

Muscle attachments: prefr, postoc, Dgl-3, and D-1 fused to an irregularly shaped, roundish plate, D-2–5 not sclerotized but visible as granulated areas, Dgl-4–6 and Lgl round, without sclerotized extensions

coxae: Cx-4 without caudal border of secondary sclerotization

genital field: Ac in characteristic triangular position with Ac-1–3 at equal interspace

palp: ventral margin P-2 weakly concave, distally without protrusion, P-4 narrowed from the base to the tip, with a slight thickening between the ventral hair insertions

idiosoma L/W 920/730; glandularia 30

coxal field L 370; Cx-3 W 470; Cx-1+2 mL 157, IL 256, W 320

I-L-5 dL 150, vL 99, dL/vL 1.52, HA-HC 52, 56, 65, dL/HB 2.68

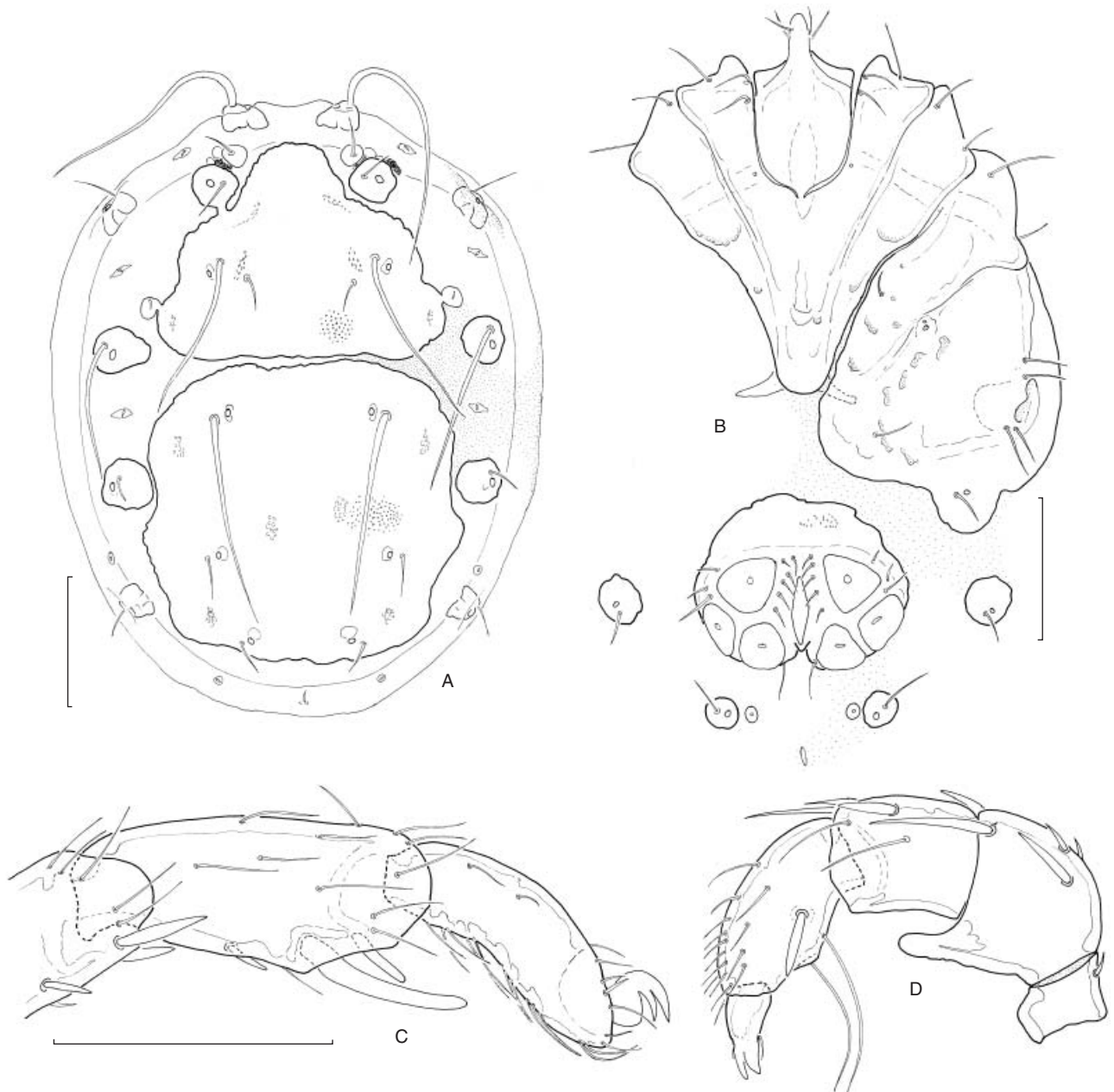


Figure 60. *Atractides digitatus* ♂. A, Gerecke E 131a, B–D, holotype SMNH 4352. A, dorsum; B, coxal, genital and post-genital field; C, I-L-5 and -6; D, palp, medial view. Scale bars = 100 µm.

S-1 L 70, L/W 7.8, S-2 L 32, L/W 5.3, interspace, 21, L S-1/2 2.19
 I-L-6 L 132, HA-HC 37, 39, 40, dL/HB 3.38; L I-L-5/6 1.14
 genital field L/W 202/250, Ac-1–3 L 67, 75, 83
 gnathosoma vL 180; chelicera L 428, L/H 7.93, bs/claw 1.89

palp	P-1	P-2	P-3	P-4	P-5
L/W	34/43	96/74	83/58	100/36	45/20
(ratio)	0.79	1.30	1.43	2.78	2.25
rel.L	09	27	23	28	13
total L:	P-2/4 0.96				
	358				

Following the measurements of Lundblad, diameter of the plates including Dgl-3 71–89 µm; gonopore L, 196, genitalia L 157 µm.

Discussion: The first description of this species is brief, consisting of a few sentences (Lundblad, 1954). In a later detailed description Lundblad (1956) demonstrated it was related to *A. octopus*. Common features in both sexes are the shape of the coxal field with sexual dimorphism in the caudal margin of Cx-4, the

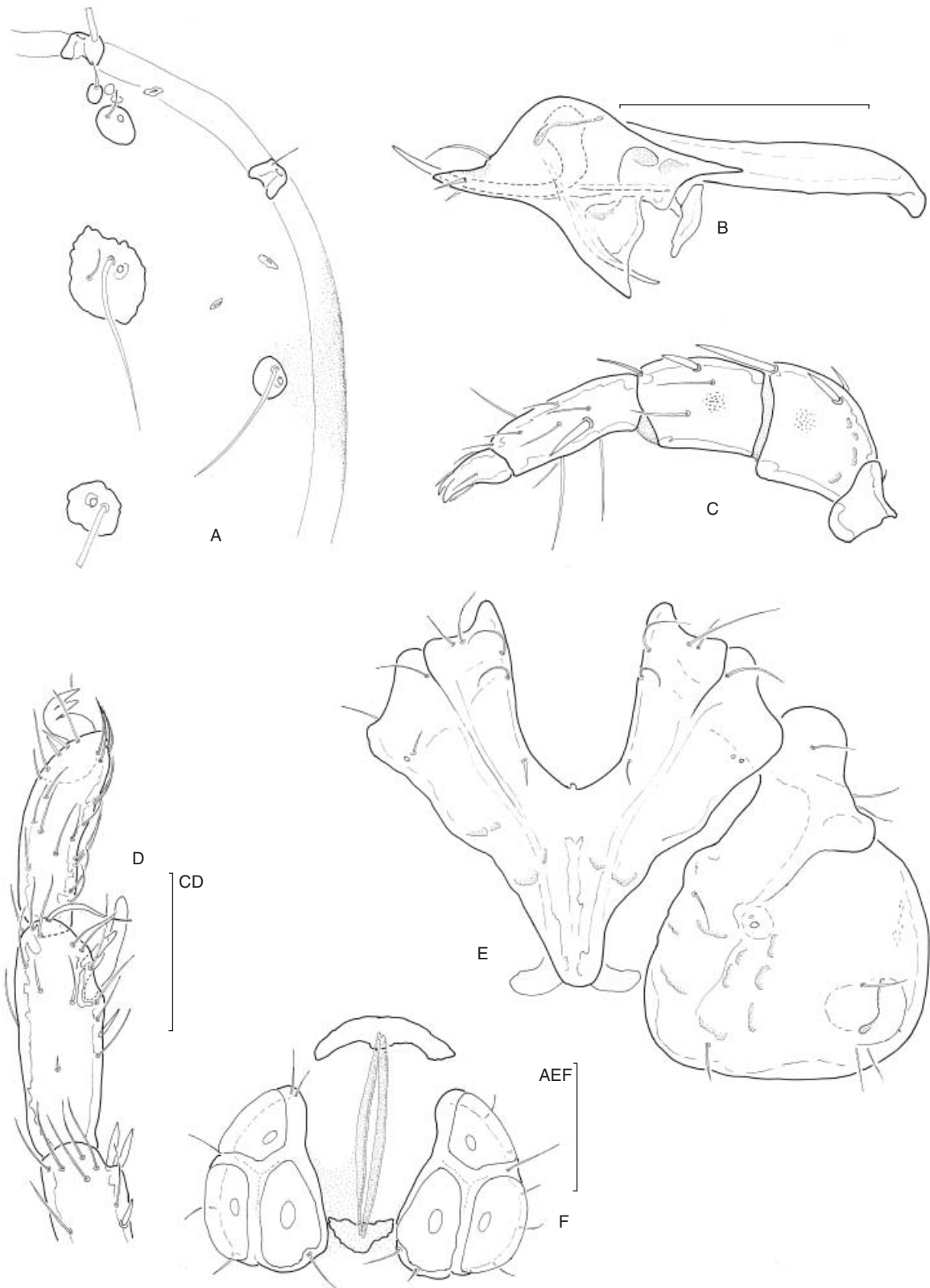


Figure 61. *Atractides digitatus* ♀. A, Gerecke E 131a, B–F, paratype SMNH 4353. A, dorsal idiosoma, partial view of anterolateral sector; B, gnathosoma with chelicera *in situ*, lateral view; C, palp, medial view; D, I–L-5 and -6; E, coxal field; F, genital field. Scale bars = 100 µm.

stout I-L-5 and -6 with heteromorphic S-1 and -2, and S-1 curved, the gnathosoma with projecting rostrum, the chelicera with long, fine, and weakly curved claw, and the robust palp with strong sword seta on P-4. Males agree also in the P-4 with bluntly protruding ventral margin and ventral setae arranged close together. Apart from the name-giving Ac number, *A. octoporus* differs in the muscle attachments (without sclerotization, thus no dorsal shields in males) in the less strongly expressed heteromorphy of S-1 and -2, more slender I-L-6, and the short ventrodistal protrusion of the male P-2. The relatively short and thick S-1 and -2, extended secondary sclerotization of male Cx-4, gnathosoma with pointed rostrum, chelicera with long, needle-like claw, and long ventral hairs of P-4 characterize *A. digitatus* as a representative of the *subasper* species group. Also in *A. subasper*, the male dorsum has an extended sclerotization, in some populations with two unpaired dorsal shields as in *A. digitatus*.

Habitat: Rhithrobiont.

Distribution: Spain: known so far from three sites in Granada and Oviedo (Lundblad, 1956); a new record from Aragon is provided here (1).

ATRACTIDES CLAVIPES LUNDBLAD, 1954 (FIG. 62A–H)

Type series: Holotype ♀ SMNH 4500. Typ.; *Atractides clavipes* Ldbl. ♀ Portugal. Cintra. Monserrate-Park. Rännil [in Lundblad (1956): äußerst kleiner Bach im Alsophila-Walde] 29.6.1935 Leg. O. Lundblad; additional record in the first description: France Vogesen. Schnellfließender, nicht kalter Bach (Mosel) gleich südlich von Remiremont. 22.6.1953, 1 ♀.

Material examined: Spain, E 132, Aragon, Beceite, Rio Mataranya. Rheohe-lokrene Acampamento El Parrissal, 650 m, 18.04.1998 Gerecke 1 ♂, 5 ♀.

Description:

General features

dorsal integument: finely striated; muscle attachments: sexual dimorphism
coxal field: Cx-1 + 2 mediocaudally narrowed and with tongue shaped medial tip, apodemes of Cx-2 directed laterally, Cx-4 with sexual dimorphism
I-L: slightly modified, I-L-5 short, with setae S-1 and -2 inserted on the same level and homoiomorphic, with blunt tip; I-L-6 weakly curved, strongly thickened from the base to the claw furrow, claw strong
excretory pore: smooth; Vgl-1: not fused to Vgl-2 (except for mature males)
palp: P-2 without a ventrodistal protrusion, but forming a distinct ventrodistal angle, P-3 slightly concave proximally, slightly convex distally, P-4 with sexual dimorphism

Males

First description; specimen from E 132

Muscle attachments: Dgl-1 enlarged, medially nearly in touch; Postoc as an unsclerotized, granulated area of integument, D-1 and Dgl-3 fused to an irregular platelet, D-2–4 sclerotized as roundish platelets, D-5 as an unsclerotized area of integument, V-1–3 sclerotized, a small, unpaired medial sclerite anteriorly from genital field

coxae: Cx-4 with broad border of secondary sclerotization including Vgl-3
genital field: round, with extended, convex anterior border of secondary sclerotization, posterior indentation bipartite due to a small medio-caudal projection; genital setae: 38

palp: P-2 ventrodistally with thickened integument, forming a right distal angle, P-4 maximum H on the level of the proximoventral hair, ventral hairs strongly approached to each other, ventral sectors 3 : 1 : 3, both accompanied by a very fine denticle, sword seta distally from distoventral hair

idiosoma L/W 580/380; glandularia 35
coxal field L 286; Cx-3 W 286; Cx-1 + 2 mL 124 IL 203, W 228
I-L-5 dL 110, vL 90, dL/vL 1.22, HA-HC 27, 31, 35, dL/HB 3.55
S-1 L 40, L/W 6.7, S-2 L 37, L/W 6.2, interspace, 0, L S-1/2 1.1
I-L-6 L 127, HA-HC 23, 25, 31, dL/HB 5.08; L I-L-5/6 0.87
genital field L/W 100/108, Ac-1–3 L 25, 25, 24
gnathosoma vL 105; chelicera L 172, L/H 5.4, bS/claw 2.4

Palp	P-1	P-2	P-3	P-4	P-5
L/W	25/23	60/52	67/40	87/30	28/11
(ratio)	1.09	1.15	1.68	2.90	2.55
rel.L	09	23	25	33	10
total L:	P-2/4 0.69				
	267				

The setae of Dgl-1/3/4 and probably also Lgl-2 (lost in the studied specimen, but with large insertion pit) are particularly elongated. The anterior seta of S-1 and -2 (on the side of the whip seta, and probably the homologue of S-2) is slightly thicker.

Females

Holotype, specimen from E 132 in parentheses

Muscle attachments: unsclerotized, visible as granulated integument areas only

coxae: no, or only very weakly developed, secondary sclerotization, Vgl-3 far distant from posterior margin of Cx-4

genital field: gonopore rather long, Ac in a weakly curved line

palp: P-2 with ventrodistal edge forming a right angle, P-4 more slender than in males and ventral hairs more distanced from each other, ventral sectors 3 : 2 : 3, sword seta on the level of the distoventral hair

idiosoma L/W 800/600 (740/545); glandularia 37
coxal field L 335 (315); Cx-3 W 385 (410); Cx-1+2 mL 140 (128), IL 245 (235), W 285 (285)

I-L-5 dL 148 (150), vL 122 (120), dL/vL 1.21 (1.25), HA-HC 35, 40, 43 (37, 40, 45), dL/HB 3.70 (3.75)

S-1 L 52 (50), L/W 7.4 (7.1), S-2 L 52 (48), L/W 7.4 (6.9), interspace, 0, L S-1/2 1.04

I-L-6 L 140 (162), HA-HC 26, 27, 43 (28, 30, 42), dL/HB 5.19 (5.40); L I-L-5/6 0.96 (0.93)

genital field L/W 182/190 (187/189), Ac-1–3 L 32, 27, 32 (37, 40, 40)
gnathosoma vL 132 (137); (chelicera L 238, L/H 5.29, bS/claw 2.66)

Palp	P-1	P-2	P-3	P-4	P-5
L/W	32/27 (32/32)	85/65 (87/77)	100/55 (102/62)	115/33 (112/35)	35/15 (37/12)
(ratio)	1.19 (1.00)	1.31 (1.13)	1.82 (1.65)	3.48 (3.20)	2.33 (3.08)
rel.L	09 (09)	23 (24)	27 (28)	30 (30)	10 (10)
total L:	P-2/4 0.74 (0.78)				
	367 (370)				

The slight morphological difference between the setae S-1/2 described for males is not found in the female I-L. With increasing age, the pregenitalia and genital plates develop a small, irregular border of secondary sclerotization. In Lundblad's figure 104B, the insertion of the sword seta P-4 occurs between the ventral hairs, but in the text he states that it is located near the distal hair. In all specimens from E 132, this seta is inserted on the level of the distoventral hair.

Discussion: The first description of this species consisted of a few sentences only (Lundblad, 1954). In the

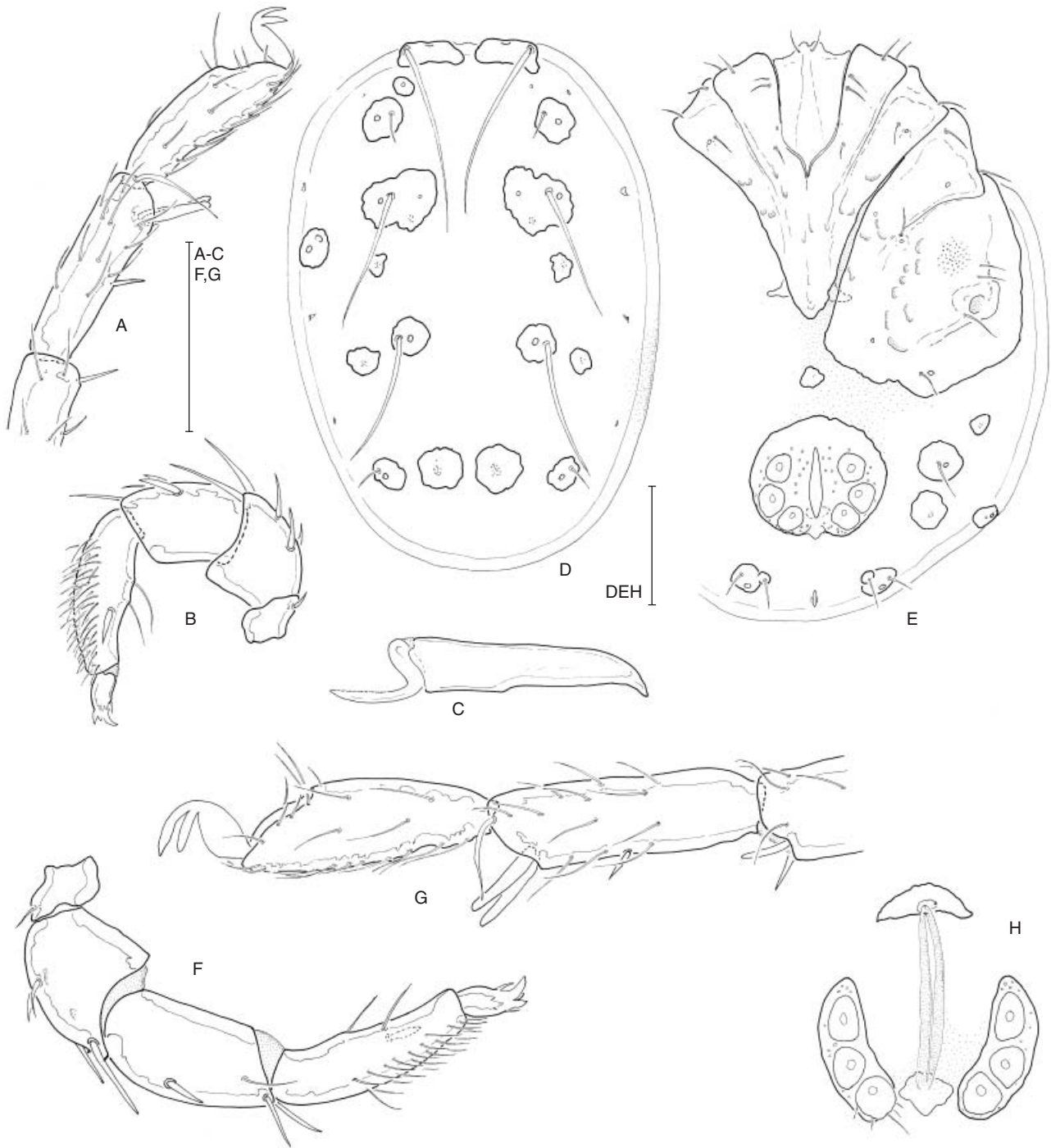


Figure 62. *Atractides clavipes*, Gerecke E 132, A–E, ♂, F–H, ♀. A, ♂ I-L-5 and -6; B, ♂ palp, medial view; C, ♂ chelicera; D, ♂ dorsum; E, ♂ ventral view; F, ♀ palp, lateral view; G, ♀ I-L-5 and -6; H, ♀ genital field. Scale bars = 100 µm.

more detailed description (Lundblad, 1956) he mentioned the similarity in shape of the I-L of *A. clavipes* as compared with members of the taxonomically distant subgenus *Tympanomegapus*, but did not discuss diagnostic characteristics for separating *A. clavipes* from related species of *Atractides s.s.* The species has not been seen since the first description, and the male is described here for the first time.

Species similar to *A. clavipes* in the slightly modified I-L-5 and -6 with relatively short, homoiomorphic S-1 and -2 are *A. dentipalpis*, *A. pumilus*, *A. pygmaeus*, and *A. graecus*. These species could represent a monophyletic 'dentipalpis group' as they also share a weak or absent sexual dimorphism of P-2. Posteriorly narrowed Cx-1 + 2 is a character also found in *A. pumilus* and *A. pygmaeus*, two species that differ from *A. clavipes* in the fusion of Vgl-1 + 2 and more pronounced ventral denticles on P-4. Furthermore, *A. pygmaeus* differs in being much smaller and also in having sclerotized muscle attachments in females. *A. pumilus* differs in having a sclerotized excretory pore and distoventral denticles on P-2. The latter character is distinctive also for *A. dentipalpis*, a species furthermore differing from *A. clavipes* in the broader, less protruding mediocaudal margin of Cx-1 + 2. Males of *A. graecus* differ in unsclerotized muscle attachments, females can be separated only on the basis of generally smaller dimensions (e.g. idiosoma L 515, coxal field L 260, genital field L 126, palp L 305 µm), the more slender palp (L/H P-2 1.4, P-3 2.1, P-4 4.0) with a lower L ratio P-2/4 (0.65) and the sword seta inserting halfway between the ventral hairs of P-4. The female from E 132 agrees very well with the holotype, except for the stouter P-2-4 and I-L-5 and -6, with a smaller L/H ratio. Attention should be paid to the individual range of variability of these characters during future population studies. The relatively slight difference observed could also be an artefact resulting from the crushing of appendages mounted in Hoyer's fluid.

Habitat: Rhithrobiont; crenophilous.

Distribution: Portugal, Spain (here recorded for the first time), France (Lundblad, 1956; specimen not checked), Italy (Miccoli, 2002) (1, 3, 8).

ATRACTIDES ABDITUS (WALTER) BADER, 1955

Species dubia

Type series: Missing. **Locus typicus:** Höhlen von S. Canziano (Rinaldini-Dom); following Stammer (1932): collecting site R3, 1928/1929

Discussion: '*Atractides abditus* (Walter)' was first published as a *nomen nudum* in a faunistic survey of the Timavo catchment in eastern Italy/Slovenia (Stammer, 1932). Bader found the female on which this species should be based and gave a 'posthumous'

description. Since then, it has not been discussed and the type specimen is now lost. Characters of eventual taxonomic importance provided in that description are: integument striated, idiosoma L/W 800/585, glandularia diameter max. 30 µm; caudal apodemes Cx-2 slightly protruding, suture Cx-3/4 strongly curved and in its medial part directed caudally; I-L-5/6 L 205/166 (ratio 1.23) median setal interspace, S-2 larger than S-1, I-L-6 curved, only slightly thinning in the centre; gonopore L 150, genital plates L 100 µm, L Ac-1 > Ac-2/3, excretory pore smooth (?) position of Vgl-1 unclear; palp L 360 µm, ventral margins of P-2 not strongly convex, of P-3 slightly concave, of P-4 straight; P-4 ventral sectors 1:1:1, sword seta between ventral hair insertions.

In view of the Ac arranged in a weakly curved line, Bader regarded it as related to the little known *A. arcuatus* and restricted the discussion to some measurement differences between these two taxa. Due to the scanty information, and in view of the absence of type material, no interpretation of *A. abditus* is possible and it remains a *species dubia*.

ATRACTIDES PROTENDENS K. O. VIETS, 1955 (FIG. 63A-F)

Type series: Holotype ♂, SMF 899 *Atractides protendens* K. O. Viets ♂ Holotypus; Hetzles; Erlangen. Schliersbach; Forstquelle. H.-J. Stammer leg. 12.9.1949. 899; Allotype ♀ SMF 626, as holotype, but .24.4.1949. Paratype ♂, SMF 910, as holotype, but Schlierbach, kleine Nebenquelle. . . . Slides in perfect state of conservation, with both palps and I-L separate, laterally; in holotype ♂ gnathosoma *in situ*, in paratype ♂ separate; allotype ♀ slide with two specimens dissected in different ways.

Description:

General features

dorsal integument: lineated (with relatively short lines, 2-3/10 µm); muscle attachments: smooth
coxal field: mediocaudal margin Cx-1 convex, weakly protruding, apodemes of Cx-2 short
I-L: I-L-5/6 little modified, S-1 and -2 close to each other, rather short and similar in shape, I-L-6 stout, weakly curved, maximum H at base of claw furrow
excretory pore: smooth; Vgl-1: not fused to Vgl-2
palp: weak sexual dimorphism, ventral margins P-2/3 straight, without extensions, sword seta P-4 strong, between ventral hair insertions, but approached to distoventral hair

Males

Holotype SMF 899
genital field: anteriorly convex, with a narrow border of irregular secondary sclerotization, posteriorly indented; genital setae: 60
palp: ventral margin of P-2 forming a right distal angle, not protruding, P-4 thickened, sword seta slightly curved, ventral margin 1:2:2
idiosoma L/W 515/400; glandularia 24
coxal field L 270; Cx-3 W 315; Cx-1 + 2 mL 108, IL 189, W 243
I-L-5 dL 130, vL 96, dL/vL 1.35, HA-HC 25, 34, 45, dL/HB 3.82
S-1 L 53, L/W 8.8, S-2 L 54, L/W 7.7, interspace, 8, L S-1/2 0.88
I-L-6 L 112, HA-HC 24, 23, 30, dL/HB 4.87; L I-L-5/6 1.16
genital field L/W 117/117, Ac-1-3 L 35, 38, 32
gnathosoma vL 108; chelicera -

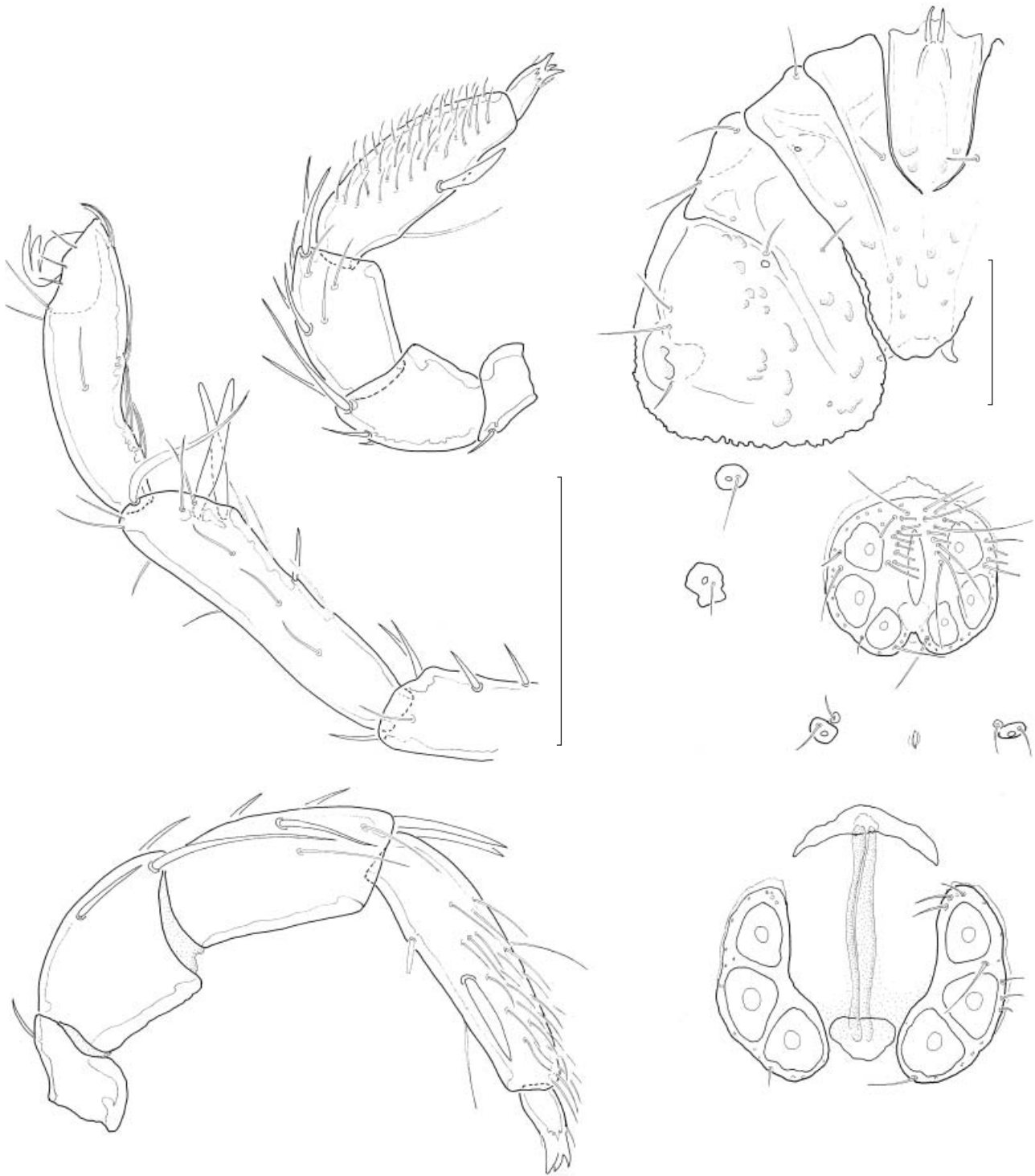


Figure 63. *Atractides protendens*. A–D, holotype ♂ SMF 899; E, F, paratype ♀ SMF 626. A, ♂ I-L-5 and -6; B, ♂ palp, medial view; C, ♂ coxal field; D, ♂ genital and postgenital field, E, ♀ genital field; F, ♀ palp, medial view. Scale bar = 100 μ m.

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/22	54/40	65/34	92/31	27/10
(ratio)	1.32	1.35	1.91	2.97	2.70
rel.L	11	20	24	34	10
total L:	P-2/4 0.59				
267					

The integument sculpture is particularly strong, formed by relatively short lines (L = 10–50 µm) about 1 µm wide. The caudal margin of Cx-4 is straight and perpendicular to the median axis, irregular in shape due to secondary sclerotization. Ventral margin of I-L-5 with three fine setae in addition to the typical seta. Genital field with densely arranged, rather long setae (Fig. 63D); most hairs depict only insertion bases). Ventrodistal hair of P-4 lost in the holotype.

Females

Paratype SMF 626
genital field: genital plates bean-shaped, with very narrow anteriomedial border of secondary sclerite
palp: more slender than in males, ventral sectors of P-4 1 : 1 : 1
idiosoma L/W 870/730; glandularia 36
coxal field L 392; Cx-3 W 515; Cx-1 + 2 mL 126, IL 265, W 351
I-L-5 dL 170, vL 121, dL/vL 1.40, HA-HC 30, 45, 63, dL/HB 3.78
S-1 L 74, L/W 10.6, S-2 L 71, L/W 7.9, interspace, 12, L S-1/2 1.04
I-L-6 L 150, HA-HC 31, 29, 40, dL/HB 5.17; L I-L-5/6 1.13
genital field L/W 193/207, Ac-1–3 L 47, 55, 47
gnathosoma vL 153; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	35/25	76/49	85/43	94/30	33/13
(ratio)	1.40	1.55	1.98	3.13	2.54
rel.L	11	24	26	29	10
total L:	P-2/4 0.81				
323					

Integument lines longer (up to >100 µm) and glandularia distinctly larger than in males. Genital plates L 145 µm, pregen without secondary sclerotization.

Discussion: The first description of this species (K. O. Viets, 1955a) was provided without discussing diagnostic characters; in a second paper with additional morphological information (K. O. Viets, 1955b) the author compared it only with *A. issajewi* Sokolow, 1928; a species known from Uzbekistan, similar in the medially extending secondary sclerotization of the male genital field, but differing in integument structure, and shape and setation of I-L and palp. *A. protendens* is unique among all species with lineated integument in the combination of a rather short I-L-5, and as a consequence L ratio I-L-5/6 < 1.20, a thickened I-L-6, short S-1 and -2, equal in shape, and narrow setal interspace. The only further lineated species with such a low I-L-5/6 ratio are *A. insulanus*, endemic to Madeira, with separated and strongly heteromorphic S-1 and -2, and *A. inflatipalpis*, a species known only from females, which is much larger in dimensions (e.g. L S-1/2 130/103 µm) and has a slender I-L-6. Both sexes of *A. protendens* also differ from

most other species with a lineated integument in having comparatively small idiosomal and gnathosomal sclerites.

Among the nonlineated taxa, most species with a low I-L-5/6 ratio tend to be small and generally adapted to interstitial habitats (*A. subterraneus*, *A. cisternarum*, *A. oblongus*, *A. pumilus*, *A. denticulatus*, *A. pygmaeus*, *A. microphthalmus*, *A. phreaticus*, *A. similis*). Exceptions include *A. distans*, a larger species with slender I-L-6 and strongly heteromorphic S-1 and -2, *A. dentipalpis*, known only from females, with a denticulate ventrodistal protrusion of P-2, and *A. samsoni*, with more slender I-L-5 and a distally protruding ventral margin of male P-2.

Habitat: Crenobiont.

Distribution: Central Europe, Alps (Germany, Austria, Italy) (4, 9).

ATTRACTIDES CIRCUMCINCTUS SCHWOERBEL, 1956 (FIG. 64A–H)

Type series: Holotype ♂, CSM Hydrachnellae 457 Pionae Atractidae *Atractides*; *A. circumcinctus* TYPUS ♂ ADA6–Quelle am Schauinsland, 1000 m, 27. State of conservation: anterior coxal plate fractured, left I-L- separate, oblique, both palps separate, lateral (one with P-4 inflated, the other one collapsed) precipitations in the mounting medium.

Material examined: CSM [as the original description is based on a single male, none of the following specimens is part of the type series] SAUTER-QUELLE FELDBERG/SCHW: Okt., 1960 1 ♂; Schwarzwald 1077 1 ♂; Hydrachnellae 294 Pionae Atractidae *Atractides*; *A. circumcinctus* P.Typus ♀. Bohrerbach, Oberlauf, in Moosen Freiburg, Jan, 1954 1 ♀; Quelltümpel Haslachtal 20.3.1957 1 ♀; Schwarzwald 1081 4 ♀ on one slide; Schwarzwald 1067 1 ♀ Fundort?, three slides marked paratypoid and numbered 786, 797, 801, each bearing 1 ♀.

Description:

General features

dorsal integument: finely striated; muscle attachments: smooth
coxal field: sexual dimorphism

I-L: I-L-5 extremely elongated, with dorsal and ventral margins only weakly diverging distally, narrow setal interspace, homoiomorphic, bluntly pointed; I-L-6 extremely shortened, curved, and with dorsal and ventral margins converging from the base to the claw furrow
genital field: Ac in a weakly curved line, rather small
excretory pore: smooth; Vgl-1: fused to Vgl-2 in most cases
palp: weak sexual dimorphism P-2, ventral margin P-3 straight, P-4 with sword seta between ventral hairs

Males

Holotype, palp measurements from original description
coxal field: merged to an unique plate by extended and fused borders of secondary sclerotization, at the caudal margin including Vgl-3, mediocaudally, an indentation reaching the level of the former mediocaudal margin of Cx-1, apodemes of Cx-2 (included in the sclerotized surface) directed laterally
genital field: longish, primary sclerite margin anteriorly slightly indented, but secondary sclerotization convexly protruding, with irregular border, caudal indentation weak, completely filled with secondary sclerite and therefore posterior margin nearly straight; gonopore caudally reaching the centre of Ac-3, in its anterior 2/3 flanked by hairs; genital setae: 40
palp: ventral margin P-2 weakly convex, distally forming an obtuse angle, but not protruding; P-4 thicker than in females, with more dense dorsal hair cover, 1 : 2 : 1

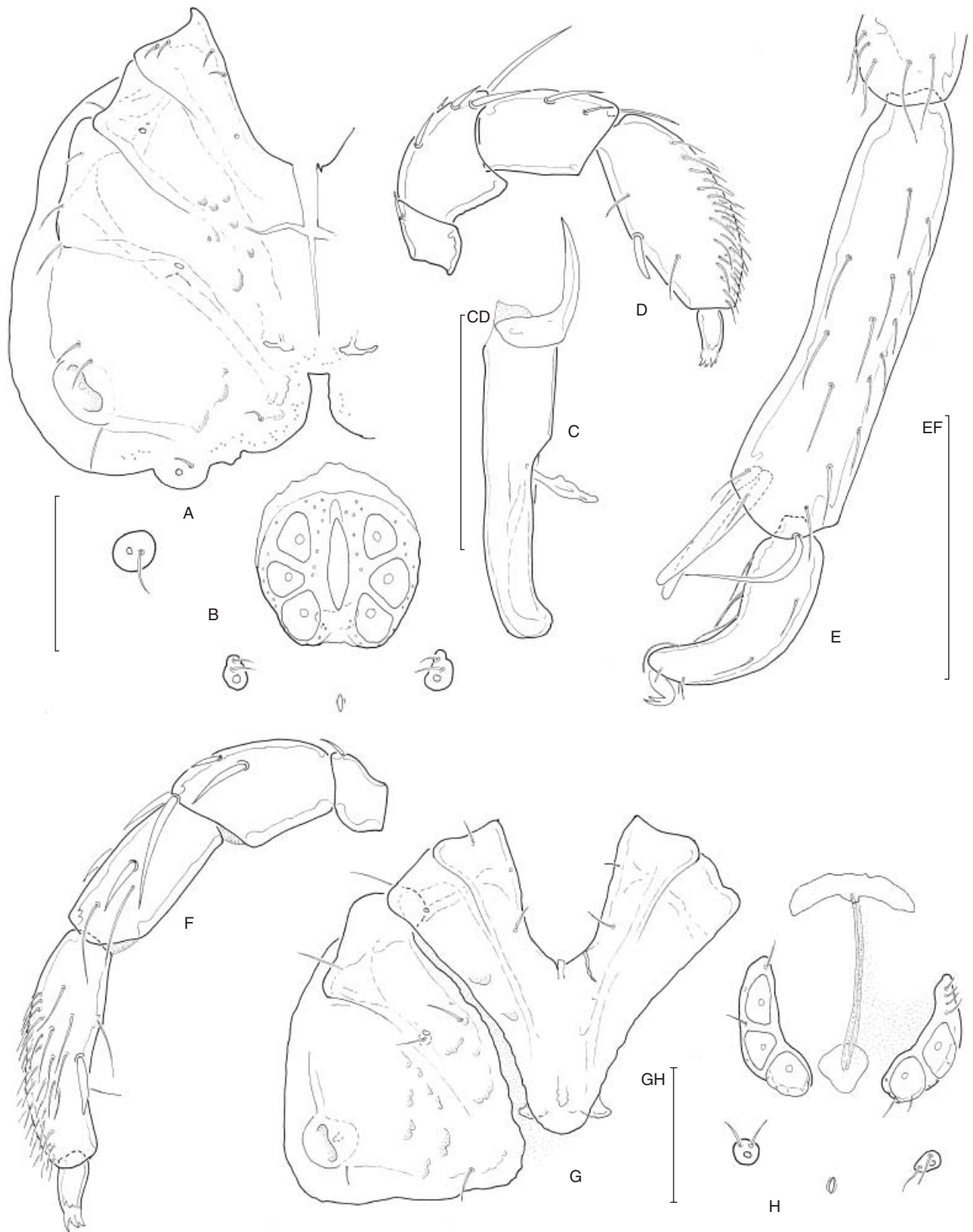


Figure 64. *Atractides circumcinctus*. A–D, holotype ♂ CSM, E–H, ♀ 'Bohrerbach' CSM. A, ♂ coxal field; B, ♂ genital and postgenital field; C, ♂ chelicera; D, ♂ palp, medial view; E, ♀ I-L-5 and -6; F, ♀ palp, medial view; G, ♀ coxal field; H, ♀ genital field. Scale bar = 100 µm.

idiosoma L/W 500/425; glandularia 25
 coxal field L 290; Cx-3 W 324; Cx-1 + 2 mL 135, IL 216, W 260
 I-L-5 dL 150, vL 138, dL/vL 1.09, HA-HC 30, 40, 40, dL/HB 3.75
 S-1 L 55, L/W 11.0, S-2 L 5, L/W 9.2, interspace, 1, L S-1/2 1.0
 I-L-6 L 71, HA-HC 28, 20, 17, dL/HB 3.55; L I-L-5/6 2.11
 genital field L/W 117/100, Ac-1-3 L 32, 25, 35
 gnathosoma vL 100; chelicera L 155, L/H 5.0, bS/claw 1.98

palp	P-1	P-2	P-3	P-4	P-5
L/W	26/26	64/38	61/32	96/38	26/6
(ratio)	1.00	1.68	1.91	2.53	4.33
rel.L	10	23	22	35	10
total L:	P-2/4 0.67				
273					

Setae of Dgl-1 long, all glandular platelets oval and with slightly irregular margins. Due to crushing of I-L and palps in all specimens, no L/H ratios can be taken. However, measurements of length and proportions should be only slightly affected by these alterations. As the I-L of the holotype is positioned slightly obliquely, two additional males from CSM were measured: I-L-5 dL/vL 154–158/134–138 μm (1.14–1.15); I-L-6 L 80–84 μm , L I-L-5/6 1.88–1.92. Available measurements of undamaged sclerites and palps are in agreement with the original description.

Females

Specimen from Bohrerbach
 coxal field: coxal plates separate, with narrow borders of secondary sclerotization
 genital field: with large, equally curved pregen and bean-shaped genital plates
 palp: ventral margin P-2 straight, passing to the distal margin in a curved line; ventral margin P-4 1 : 1 : 1
 Idiosoma L/W 620/500; glandularia 25
 coxal field L 280; Cx-3 W 347; Cx-1 + 2 mL 126, IL 216, W 261
 I-L-5 dL 170, vL 152, dL/vL 1.12, HA-HC 38, 45, 45, dL/HB 3.78
 S-1 L 63, L/W 10.5, S-2 L 60, L/W 6.7, interspace, 1, L S-1/2 1.05
 I-L-6 L 78, HA-HC 28, 20, 17, dL/HB 3.90; L I-L-5/6 2.18
 genital field L/W 171/162, Ac-1-3 L 42, 33, 35
 gnathosoma vL 100; chelicera L 184, L/H 5.4 bS/claw 2.41

palp	P-1	P-2	P-3	P-4	P-5
L/W	26/21	61/39	66/31	90/28	28/10
(ratio)	1.24	1.56	2.13	3.21	2.80
rel.L	10	23	24	33	10
total L:	P-2/4 0.68				
271					

Female in good state of conservation, measurements verifiable. In most details, good agreement with the description provided for the male. Left Ac-1 missing due to individual being misshaped; in one of the compared specimens, Vgl-1 asymmetrically fused with Vgl-2 on one side, but separate on the other. Regarding measurements of P-4, contradiction with Schwoerbel's (1958) data (L/H ratio of 4.89) is best explained if the measurement of height was taken at the base of the segment instead of at the point of maximum thickness. Setal interspace varying in the compared specimens (2–7 μm), probably a consequence of crushing. Additional measurement values from six

compared females: I-L-5 dL/vL 173–183/152–178, ratio 1.03–1.20, I-L-6 L 80–90, L ratio I-L-5/6 2.03–2.16.

Discussion: In the first description, in view of the extended ventral sclerotization of the male, and the rather homoiomorphic S-1 and -2, Schwoerbel compared *A. circumcinctus* with *A. walteri* (sub nom. *coriaceus*), *A. vaginalis*, *A. subasper* and *A. umbonipalpis* – the latter a *species dubia* due to incomplete documentation. Since the publication of additional information and the first description of the female (Schwoerbel, 1958) no further records have been provided. In fact, the extended secondary sclerotization of the male coxal field, combined with unsclerotized dorsal muscle attachments, a rather short, curved and distally tapering I-L-6, fused setae Vgl-1 + 2, a smooth excretory pore, and a palp with weak sexual dimorphism, testifies to a close relationship between *A. circumcinctus* and *A. vaginalis*, which should be considered representatives of a monophyletic 'vaginalis group'. Both sexes of *A. vaginalis* differ from *A. circumcinctus* in minute, knob-shaped glandularia (diameter < 20 μm) the relatively short I-L-5 (L ratio I-L-5/6 < 1.8) and the genital field with larger Ac in a triangular arrangement (males also in the enlarged genital field: L/W < 1.0). The material presented here also indicates a more slender P-4 in both sexes, a date that requires confirmation from additional, better preserved material. Schwoerbel (1959b) documented the presence of *A. circumcinctus* and *A. vaginalis* in the Black Forest, partly coexisting in the same habitat. Indeed, one male in his collection from Feldberg fits perfectly the diagnosis provided for *A. vaginalis*, apart from the presence of slightly enlarged glandularia. Also, all females from CSM labelled *A. vaginalis* have larger glandularia, and are furthermore similar to *A. circumcinctus* in the arrangement of Ac (curved line instead of a triangle). The length ratio I-L-5/6 in these specimens is 1.59–1.98, intermediate between the two species. However, in two females found together with the *A. vaginalis* male, this ratio is 1.59–1.70, and the line of Ac is more strongly curved, while in two females from Sauterquelle, it is 1.98–1.99 and the curvation of the Ac line is weak. This suggests that the ratio is the most important character for distinguishing *A. circumcinctus* and *A. vaginalis*. In this scenario, *A. vaginalis* is a rather variable species with local populations in the Black Forest and Alps differing in the size of glandularia and the arrangement of female acetabula.

Habitat: Crenobiont or crenophilous.

Distribution: southern Germany (Black Forest) (9).

ATRACTIDES PALPALIS (LUNDBLAD, 1956)*Atractides tener palpalis* Lundblad, 1956Syn. to *A. tener* Thor, 1899: K. O. Viets, 1957

Type series: Holotype ♂, SMNH 4552. Typ.; *Atractides tener* vs. *palpalis* Ldbl. ♂ Spanien. Arenas de Cabrales. Bergbäck. 17.9.1935 Leg. O. Lundblad. State of conservation: dorsal integument lost, gnathosoma and genital skeleton *in situ*, both I-L, both palps separate, lateral.

Discussion: Lundblad introduced this name for a 'variatio', without exactly defining its taxonomic state. As compared with *A. tener* (in brackets) he considered as diagnostic features the more slender palp with L/H P-2 1.46 (1.35), P-3 2.28 (1.95), P-4 3.59 (2.83) and a slightly longer I-L-6 with L ratio I-L-5/6 1.34 (1.38). Further differences are found in major dimensions of appendages, e.g. I-L-5/6204/152 (172/125) and palp total L 349 (300) µm, while measurements of the coxal field agree nearly perfectly. The genital field, with L/W 126/175 (112/128) µm, is relatively short due to the absence of an anterior border of secondary sclerotization. This difference, as well as the generally weak sclerotization, indicates that the type of *A. palpalis* is a juvenile. Viets (1957) pointed out that the proportion of I-L lies within the normal range of variability and proposed the synonymization of *A. palpalis* with *A. tener*. After a more thorough study of the variation in *A. tener*, Lundblad (1962) became convinced about this synonymy. It is confirmed by the agreement of important proportions of I-L and palps. However, study of the variation in additional specimens from the Iberian peninsula is desirable for better understanding the eventual genetic significance of the differences in palp shape.

ATRACTIDES ANELLATUS LUNDBLAD, 1956
(FIG. 65A–G)

Type series: Holotype ♀, SMNH 4114. Typ.; *Atractides anellatus* Ldbl. ♀ Spanien. La Junquera. Bäck. 30.5.1935. Leg. O. Lundblad. State of conservation: good, gnathosoma *in situ*, both I-L and both palps separate, lateral.

Material examined: Morocco, Oued Todra 10 km upstr. of Tinerhir, 17.03.1993 Smit, 1 ♂, 1 ♀

*Description:**General features*

dorsal integument: lineated (3/10 µm); muscle attachments: smooth
coxal field: posterior margin Cx-1 weakly convex, in the medial part nearly straight, apodemes of Cx-2 in a 45° angle
I-L: S-1 and -2 distanced and heteromorphic, both with blunt tips; I-L-6 slender, curved
excretory pore: sclerotized; Vgl-1: fused to Vgl-2
palp: weak sexual dimorphism, ventral margin of P-3 forming a fine longitudinal lamella in its distal half, P-4 sword seta between ventral hairs, nearer to the distoventral hair

Male

Morocco, coll. Smit
genital field: anterior margin straight, posterior margin slightly indented;
genital setae: 60

palp: ventral margin P-2 convex, without distinct distal protrusion; P-3 and P-4 rather robust, ventral margin P-4 1 : 1 : 1, with a minor elevation near proximoventral hair

idiosoma L/W 600/400; glandularia 25
coxal field L 305; Cx-3 W 356; Cx-1 + 2 mL 108, IL 205, W 275
I-L-5 dL 180, vL 115, dL/vL 1.57, HA-HC 45, 48, 70, dL/HB 3.75
S-1 L 102, L/W 10.2, S-2 L 75, L/W 7.5, interspace 25, L S-1/2 1.36
I-L-6 L 135, HA-HC 22, 18, 20, dL/HB 7.5; L I-L-5/6 1.33
genital field L/W 83/103, Ac-1-3 L 25, 23, 27
gnathosoma vL 138; chelicera L 224, L/H 6.05, bS/claw 2.11

palp	P-1	P-2	P-3	P-4	P-5
L/W	30/30	72/60	70/52	97/32	32/12
(ratio)	1.00	1.20	1.35	3.03	2.67
rel.L	10	24	23	32	11
total L:	P-2/4 0.74				
301					

The male of *A. anellatus* is known only from a brief description provided by Smit (1995) on the basis of the specimen also presented here. Conspecificity is confirmed by the good morphological agreement of the holotype and the female collected together with this male.

Females

Holotype, in parentheses measurements of the female from Morocco
genital field: pregen equally curved, genital plates bean-shaped
palp: P-2 ventral margin slightly thickened distally and forming an obtuse distal angle; P-3 ventral margin straight, distally forming a distinct, obtuse angle; P-4 ventral margin 1 : 2 : 1, sword seta insertion halfway between ventral hairs
idiosoma L/W 850/620; glandularia 30
coxal field L 356 Cx-3 W 455; Cx-1 + 2 mL 90, IL 225, W 311
I-L-5 dL 229, vL 135, dL/vL 1.70, HA-HC 54, 56, 99, dL/HB 4.09
S-1 L 132 (108), L/W 11.0 (9.0), S-2 L 90 (80), L/W 6.0 (5.3), interspace, 52 (35), L S-1/2 1.47 (1.35)
I-L-6 L 189, HA-HC 22, 16, 18, dL/HB 11.8 (8.4); L I-L-5/6 1.21
genital field L/W 157/171, Ac-1-3 L 36, 42, 31
gnathosoma vL 139; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	34/34	83/58	103/49	114/31	38/13
(ratio)	1.00	1.48	2.10	3.68	2.92
rel.L	09	22	28	31	10
total L:	P-2/4 0.73				
372					

Following Lundblad: gonopore L 143, genital plates 111 µm, ventral margin P-4 slightly elevated near insertion of proximoventral hair. Most dimensions and proportions of the specimen from Morocco agree with the holotype. Differences are found in the smaller size of the anterior acetabula (L Ac-1-3 25, 28, 30 µm) and a generally smaller I-L (dL/vL I-L-5 205/123, L S-1/2 108/80, I-L-6 168 µm) with slightly stouter S-1 and -2 (L/W 9.0, 5.3) and I-L-6 (L/H 8.4). The chelicera dimensions (not available from the holotype) are: total L 253, L/H 5.62, basal segment/claw 2.16.

Discussion: Lundblad (1956) compared *A. anellatus* in the first description only with *A. tener*, a taxonomically distant species, as documented by numerous differential characters: integument not lineated, Vgl-1 separate from Vgl-2; P-3 (in females also P-4) more slender

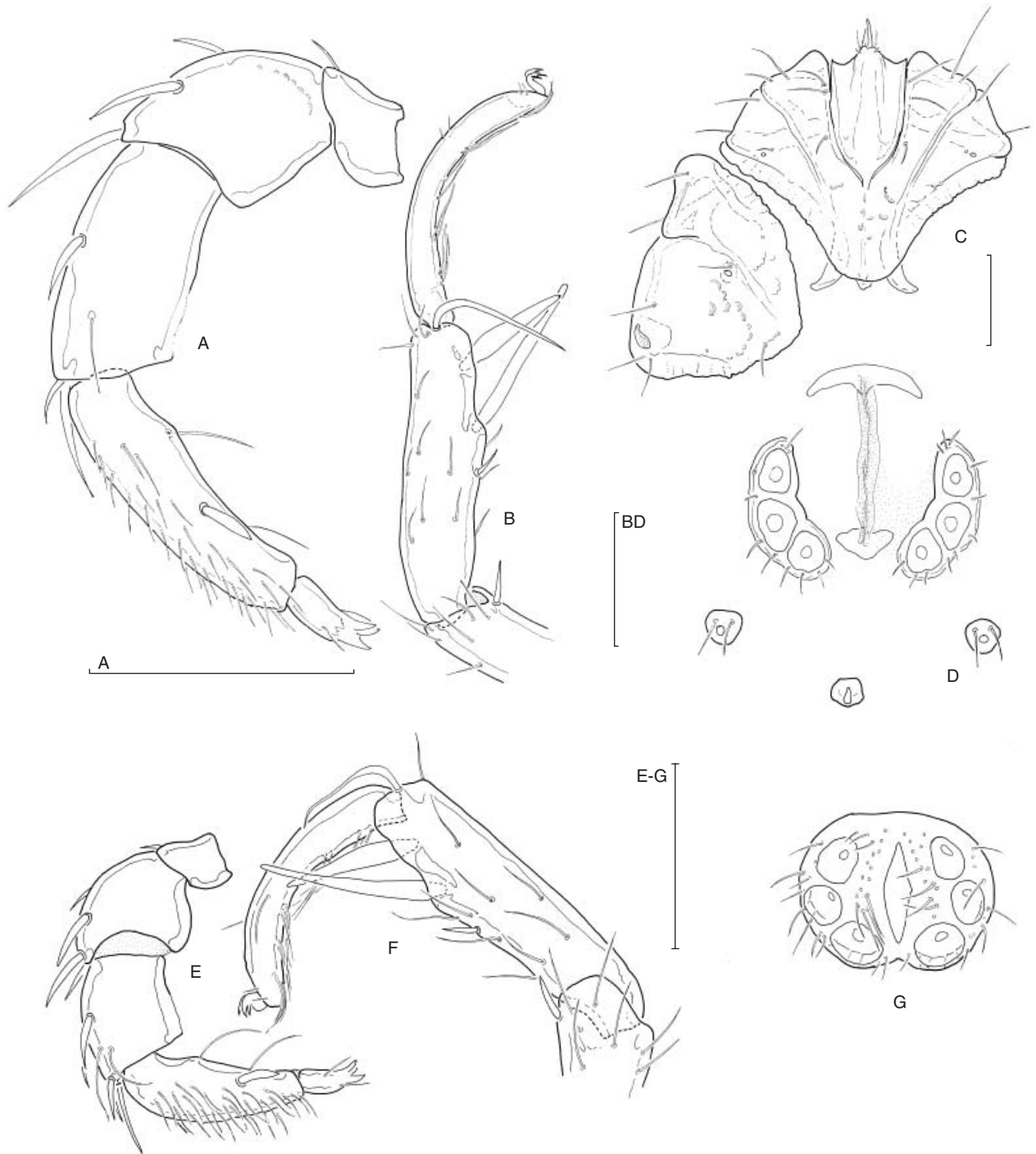


Figure 65. *Atractides anellatus*. A–D, holotype ♀ SMNH 4114, E–G, ♂ from Morocco, coll. Smit. A, ♀ palp, medial view; B, ♀ I-L-5 and -6; C, ♀ coxal field; D, ♀ genital and postgenital field, E, ♂ palp, medial view; F, ♂ I-L-5 and -6; G, ♂ genital field. Scale bar = 100 μm.

(L/H P-3 ♂ 1.95; ♀ 2.40, ♀ P-4 3.97); S-1 and -2 close together and homoiomorphic (setal interspace 7–17, L ratio 1.03–1.04) and I-L-6 robust (L/HB 5.00–5.55, dL ratio in both sexes I-L-5/6 1.38). Four species combining the character states of a lineated integument and a sclerotized excretory pore were known at the time of the description of *A. anellatus*: the three Madeiran endemics *A. maderensis*, *A. insulanus*, and *A. macaronensis*, and the south-east European *A. sokolowi*. The latter species is easily distinguished by the narrow setal interspace, and numerous additional morphological features very similar to *A. tener* (see above). Also in *A. maderensis*, the setal interspace is narrow (♂ 18, ♀ 22 µm) and I-L-6 is very short compared with I-L-5 (ratio 1.50); furthermore, this species is unique in having a strong ventrodistal protrusion on P-2 in both sexes. In *A. macaronensis*, the excretory pore sclerite is only a half ring, the median suture of Cx-1 is considerably longer, both the I-L-5 ratio dL/vL and dL/HB are lower, and the ♀ P-2 is stouter. *A. insulanus*

is rather similar in many measurements and proportions, but has a stouter P-4 (L/H ♂ 2.78, ♀ 3.29) and a lower I-L-5 dL/HB ratio. The presence of a fine longitudinal ventral lamella on P-3 suggests that the continental *A. anellatus* is a representative of a species group whose radiation gave origin to the Madeiran endemics.

Habitat: Rhithrobiont.

Distribution: Spain; Morocco, known only from the *locus typicus* and one site in the southern High Atlas (x, 1).

ATRACTIDES RIVALIS LUNDBLAD, 1956 (FIG. 66A–F)

Type series: Holotype ♀, SMNH 4989 Typ.; *Atractides rivalis* ♀ Ldbl. Österrike. Lunz, Källa. 28.5.1955. Leg. O. Lundblad. State of conservation: perfect; gnathosoma *in situ*, both I-L and palps separate, lateral.

Material examined: SMNH ♂ 5011; *Atractides rivalis* Ldbl. ♂. Österrike. Lunz. Källa. 28.5.1955 Leg. O. Lundblad

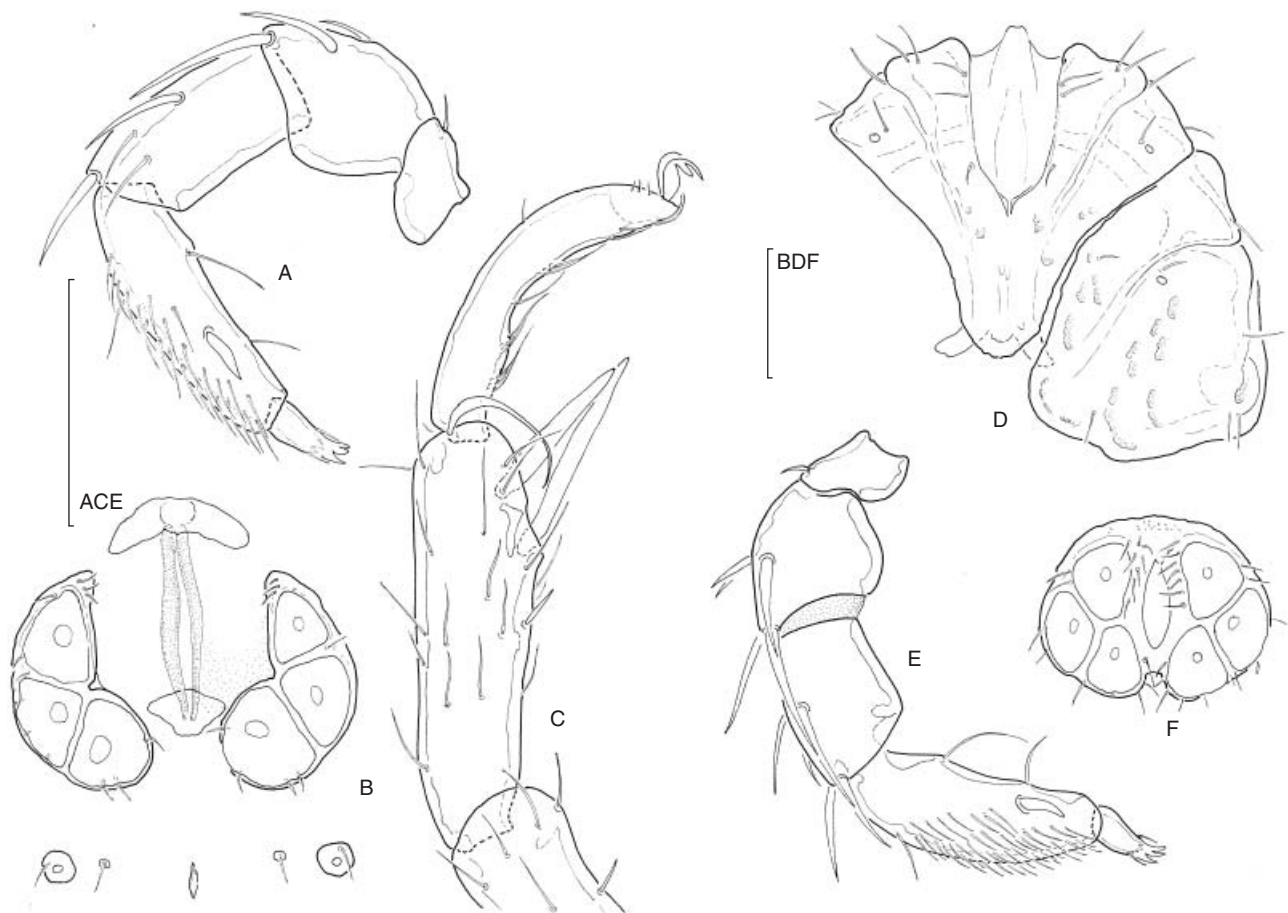


Figure 66. *Atractides rivalis*. A, B, holotype ♀ SMNH 4989, C–F, ♂ SMNH 5011. A, ♀ palp, medial view; B, ♀ genital and postgenital field; C, ♂ I-L-5 and -6; D, ♂ coxal field, E, ♂ palp; F, ♂ genital field. Scale bars = 100 µm.

*Description:**General features*

dorsal integument: lineated (3/10 µm); muscle attachments: smooth
 coxal field: mediocaudal margin Cx-1 equally convex, apodemes of Cx-2 in an obtuse angle
 I-L: setae S-1 and -2 moderately distanced and heteromorphic, I-L-6 curved, from the base to the claw furrow moderately tapering
 genital field: Ac large, in triangular position
 excretory pore: smooth; Vgl-1: not fused to Vgl-2
 palp: P-2 ventrodistally convex, but without protrusion, ventral margin of P-3 straight, P-4 with weak sexual dimorphism

Males

SMNH 5011, first description

genital field: wider than long, anterior margin indented but with an equally convex border of secondary sclerite, posterior margin indented to about the level of 1/3 Ac-3; genital setae: 36
 palp: P-4 thickened, ventral margin 1 : 1 : 1, slightly elevated near proximoventral hair, sword seta on the level of distoventral hair
 idiosoma L/W 620/500; glandularia 25
 coxal field L 324; Cx-3 W 365; Cx-1 + 2 mL 117, IL 229, W 365
 I-L-5 dL 172, vL 114, dL/vL 1.51, HA-HC 45, 52, 65, dL/HB 3.31
 S-1 L 90, L/W 11.3, S-2 L 72, L/W 7.2, interspace, 22, L S-1/2 1.25
 I-L-6 L 128, HA-HC 24, 20, 21, dL/HB 6.4; L I-L-5/6 1.34
 genital field L/W 139/180, Ac-1-3 L 63, 66, 59
 gnathosoma vL 135; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	34/24	65/49	67/45	105/36	31/12
(ratio)	1.42	1.33	1.49	2.92	2.58
rel.L	11	22	22	35	10
total L:	P-2/4 0.62				
	302				

Arrangement of Ac very compact, with posterior margin Ac-1 and anterior margin Ac-3 nearly touching; sword seta of P-4 relatively short, basally thick, bent upwards.

Females

Holotype

genital field: pregen rather short and thick, genital plates with blunt anterior tip, Ac-1/2 triangular in shape, Ac-3 enlarged, halfcircle-shaped, with straight margin facing Ac-2, convexly protruding mediocaudally
 palp: P-2 with ventral margin slightly less curved, and P-4 more slender, ventral margin 2 : 3 : 2, sword seta between ventral hairs, but nearer to distoventral hair
 idiosoma L/W 860/670; glandularia 25
 coxal field L 405; Cx-3 W 470; Cx-1 + 2 mL 168, IL 265, W 350
 I-L-5 dL 211, vL 141, dL/vL 1.50, HA-HC 61, 63, 69, dL/HB 3.35
 S-1 L 110, L/W 9.2, S-2 L 78, L/W 5.6, interspace 25, L S-1/2 1.41
 I-L-6 L 156, HA-HC 29, 20, 24, dL/HB 7.8; L I-L-5/6 1.35
 genital field L/W 234/270, Ac-1-3 L 62, 65, 75
 gnathosoma vL 180; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	38/29	80/58	92/46	119/36	36/14
(ratio)	1.31	1.38	2.00	3.31	2.57
rel.L	10	22	25	33	10
total L:	P-2/4 0.67				
	365				

Following Lundblad: gonopore L, 196, genital plate L, 182 µm; his figure 108 rather sketchy, especially the shape of Ac-3.

Discussion: For reasons which are unclear, Lundblad (1956) did not mention the existence in his collection

of a well-preserved male found on the same date and site as the holotype female. After the original description, only two further records of *A. rivalis* were published, from Austria (Tilzer, 1968) and Poland (Biesiadka, 1979a) but without additional information on morphology or taxonomy. Until now, only the female was known. Without further explanation, perhaps in view of some agreement in shape of genital plates, Lundblad stated that there was a similarity between *A. rivalis* and *A. angustiporus*, a species known from a single female collected in Spain. The latter differs from the former in the striated, not lineated integument, much smaller idiosoma (e.g. Cx-1 mL 94, IL, 180, Cx-1 + 2 W 179 µm, and smaller Ac), S-1 and -2 heteromorphic but similar in length (ratio 0.91), and a high L ratio I-L-5/6 (1.61).

Among the lineated *Atractides* species, similarly large Ac are found only in *A. panniculatus*, *A. fissus* and *A. legeri*. *A. panniculatus* is similar to *A. rivalis* in the distal position of the sword seta on P-4, but differs in the distally more extending ventral margin of I-L-5, with S-1 and -2 both longer and distinctly further apart (L S-2 ♂ 88, ♀ 108, setal interspace ♂ 33, ♀ 38 µm), a more slender I-L-6 (L/HB ♂ 8.05, ♀ 9.90) and more slender palp segments (in both sexes P-3, in females also P-2 and P-4); furthermore, the male genital field is longer, with L/W about 1.0. The little known *A. legeri* differs in the narrow setal interspace (12 µm) and more robust I-L-6 (L/HB 4.27, L ratio I-L-5/6 > 1.7).

Both sexes of *A. fissus* differ in having a wider setal interspace (♂ 46, ♀ 40 µm) and I-L-6 distinctly longer (♂ 162, ♀, 198 µm). Furthermore, while I-L and palp are rather similar in both sexes in *A. rivalis*, there is a sexual dimorphism in *A. fissus* (L/H ratio P-2 ♂ 1.15, ♀ 1.55; P-3 ♂ 1.56, ♀ 2.22; P-4 ♂ 2.87, ♀ 3.82), with P-2 in ♂ more robust and bearing a strongly protruding ventrodorsal extension, but not modified in ♀; sword seta P-4 placed proximal to distoventral hair in ♂, but distally in ♀; and I-L as well more robust in ♂ than in ♀ (I-L-5 dL/HB ♂ 3.16, ♀ 3.68; I-L-6 L/HB ♂ 6.23, ♀ 9.00). Female *A. fissus* can be distinguished from those of *A. rivalis* by lower Cx-1 mL (117) and IL (238 µm); and I-L-5 and -6 and P-2-4 more slender, while these values are similar in males of both species. A study of population variability in the species of the *panniculatus* group, including *A. panniculatus*, *A. fissus*, *A. legeri* and *A. rivalis*, is required for a better understanding of the relative importance of the characters elaborated here.

Habitat: Rhithrobiont.

Distribution: Austria, Poland. In view of the little understood morphology of *A. rivalis*, the two records after the first description need confirmation (4, 16).

ATRACTIDES ADNATUS (LUNDBLAD, 1956)

(FIG. 67A–F)

Atractides vaginalis adnatus Lundblad, 1956

Separate species: Bader, 1975

Atractides vaginalis Koenike, 1909 *partim*, Crema *et al.*, 1996, Gerecke *et al.*, 1998

Type series: Holotype ♂, SMNH 4627. Typ.; *Atractides vaginalis adnatus* Ldbl. ♂. Schweiz. Andermatt. Bäck. 8.7.1938. Leg. O. Lundblad. State of conservation: perfect, gnathosoma *in situ*, both I-L and palps separate, lateral, genital skeleton missing. Paratype ♀, as holotype but 4629. Allotyp.

Material examined: Berchtesgaden, Dsar 1, Koppenwand Quelle Exp. NW, 900 m, 26.07.1993 Gerecke 6 ♂, 7 ♀; Dsar 15, Schapbach spring area, 1170–1200 m, 12.06.1994 Gerecke, 15 ♂, 15 ♀.

*Description:**General features*

dorsal integument: striated; muscle attachments: smooth
 coxal field: caudal margin of Cx-1 weakly curved, occasionally nearly truncate, apodemes of Cx-2 directed laterally; Cx-3 may be fused locally to Cx-3, but no extended secondary sclerotization, and Vgl-3 never fused to Cx-4
 I-L: I-L-5 longish, S-1/2 homoiomorphic, narrow setal interspace, slender; I-L-5 short, weakly curved, of nearly equal H from the base to the claw furrow
 genital field: Ac in triangular position, relatively large
 excretory pore: smooth; Vgl-1: separate from Vgl-2
 palp: sexual dimorphism, sword seta near distoventral hair

*Males**Holotype*

genital field: anterior margin straight, posterior margin weakly indented, Ac-1 and -3 medially nearly in touch, lateral margins of Ac-2/3 undulating with hair insertions; genital setae: 30
 palp: ventrodorsal margin P-2 convexly protruding, ventral margin P-3 weakly concave proximally, convex distally, P-4 inflated, with maximum H near proximoventral hair, 1 : 1 : 1
 idiosoma L/W 515/370; glandularia 20
 coxal field L 284; Cx-3 W 302; Cx-1 + 2 mL 117, IL 202, W 238
 I-L-5 dL 148, vL 119, dL/vL 1.24, HA-HC 31, 38, 45, dL/HB 3.89
 S-1 L 68, L/W 11.3, S-2 L 61, L/W 10.2, interspace 6, L S-1/2 1.11
 I-L-6 L 105, HA-HC 26, 25, 26, dL/HB 4.2; L I-L-5/6 1.41
 genital field L/W 112/126, Ac-1-3 L 53, 48, 50
 gnathosoma vL 108; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	25/23	60/47	59/37	92/33	28/10
(ratio)	1.09	1.28	1.59	2.79	2.80
rel.L	09	23	22	35	11
total L:	P-2/4 0.65				
264					

In most specimens, striation of integument visible only on the ventral side; sword seta P-4 strong; no variability regarding the extension of secondary sclerotization of coxae. In one specimen from Berchtesgaden, palps asymmetrical (ventral margin of P-2 straight on one side).

*Females**Paratype*

genital field: pregen short and weakly curved, genital plates halfcircle-shaped, Ac-1/2 triangular, Ac-3 with straight margin facing Ac-2, medio-caudally convexly protruding; all Ac with undulating lateral margins
 palp: slender, P-2 ventral margin distally weakly convex, P-3 and P-4 ventral margins straight, P-4 3 : 2 : 2

idiosoma L/W 800/650; glandularia 20
 coxal field L 315; Cx-3 W 396; Cx-1 + 2 mL 135, IL 229, W 288
 I-L-5 dL 178, vL 142, dL/vL 1.25, HA-HC 40, 51, 48, dL/HB 3.49
 S-1 L 81, L/W 11.6, S-2 L 77, L/W 8.6, interspace 9, L S-1/2 1.05
 I-L-6 L 125, HA-HC 33, 28, 29, dL/HB 4.46; L I-L-5/6 1.42
 genital field L/W 206/198, Ac-1-3 L 60, 64, 60
 gnathosoma vL 126; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/24	66/47	76/40	101/29	32/13
(ratio)	1.21	1.40	1.90	3.48	2.46
rel.L	10	22	25	33	11
total L:	P-2/4 0.65				
304					

Striation visible not only in the area between genital plates and gonopore, as stated by Lundblad, but also on the remaining ventral surface, and in several specimens also dorsally. Following Lundblad: L gonopore 200, genital plates 128 µm.

Discussion: Lundblad (1956) distinguished this taxon from *A. vaginalis* by the less curved and more elongated I-L-6, but he also noted differences with several poorly known species such as *A. soproniensis* (here synonymized with *A. nodipalpis*, differing in wider setal interspace and presence of a ventrodorsal protrusion on male P-2) and *A. tatrensis* (here synonymized with *A. vaginalis*), *A. angustiporus* and *A. oblongus*. Lundblad stated correctly that *A. angustiporus* differs in having a longer P-3, more slender I-L-6, and wider interspace S-1/2; another important difference is the much longer I-L-5 and higher I-L-5/6 ratio of 1.61. *A. oblongus* is similar in having weakly developed integument striation and a narrower setal interspace, but differs in the much smaller size of idiosoma and appendages, and fused Vgl-1 + 2. *A. adnatus* cannot be considered a subspecies of *A. vaginalis* as both taxa were found together on numerous occasions (even at the *locus typicus*). The characters which facilitate confusion of the two taxa (small, knob-shaped glandularia, very fine integument striation, I-L with homoiomorphic narrow setal interspace, and genital field with relatively large Ac in a triangular arrangement) probably do not indicate a close relationship. *A. vaginalis* differs clearly in the shape of glandularia (further reduced in size), the tendency in males to form an extended coxal shield by secondary sclerotization, I-L-6 distally tapered and strongly curved (I-L-6 L/H 3.9–4.2, L ratio I-L-5/6 > 1.5) and a weaker sexual dimorphism of the palp with more slender segments in males.

Description of larvae: Martin (in press).

Habitat: Crenobiont.

Distribution: Alps (Germany, Switzerland) (4); Tatra? (see under *A. tatrensis*).

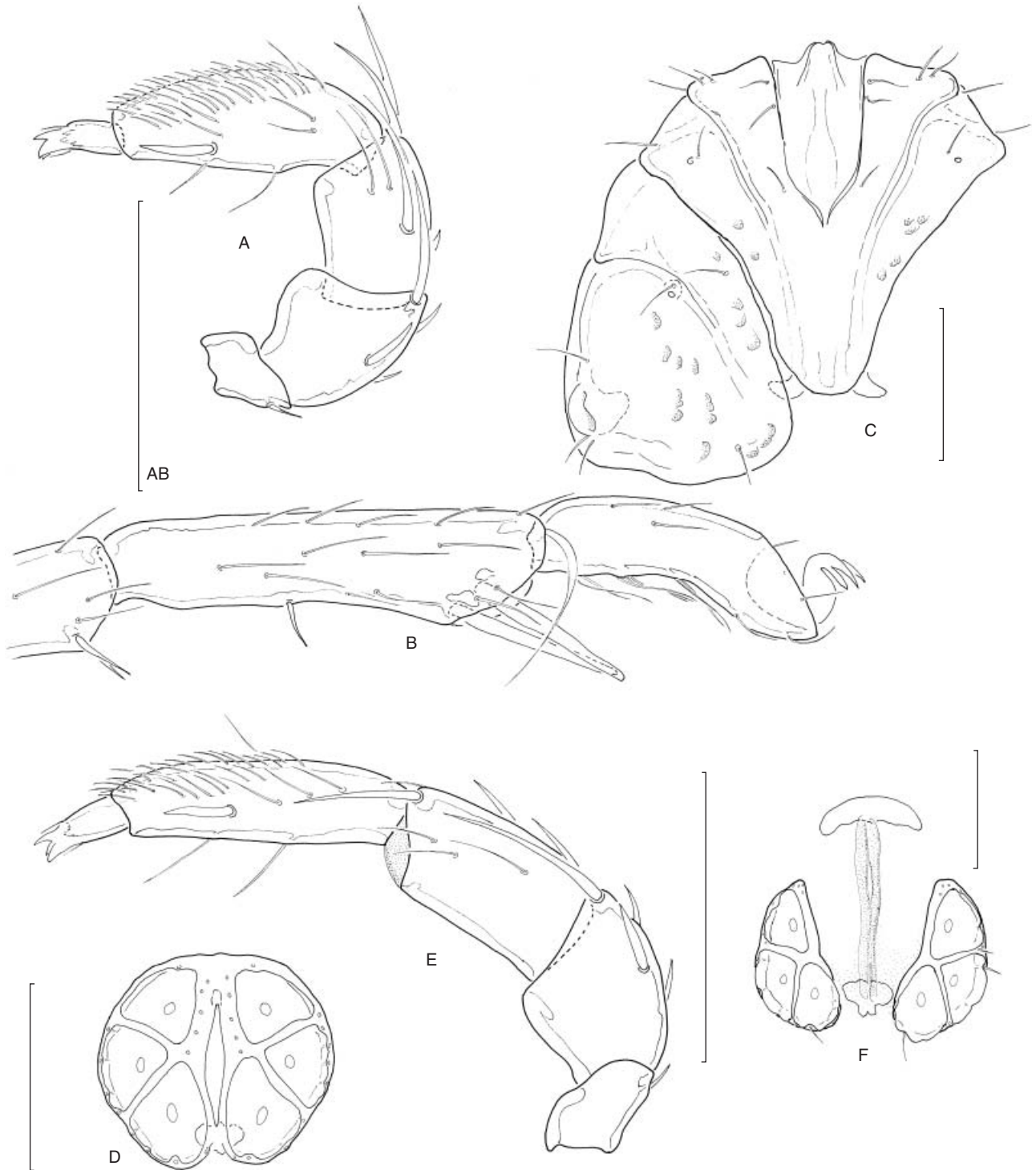


Figure 67. *Atractides adnatus*. A–C, holotype ♂ SMNH 4627; D, ♂ Berchtesgaden Dsar1; E, paratype ♀ SMNH 4629; F, ♀ Berchtesgaden Dsar1. A, ♂ palp, medial view; B, ♂ I-L-5 and -6; C, ♂ coxal field; D, ♂ genital field; E, ♀ palp, medial view; F, ♀ genital field. Scale bars = 100 μm.

ATTRACTIDES INFLATIPES (LUNDBLAD, 1956)
(FIG. 68A–D)*Atractides distans inflatipes* Lundblad, 1956
[syn. to *A. distans* (K. Viets, 1914): Lundblad, 1962b –
rejected synonymy]

Type series: Holotype ♀, SMNH 4104. Typ.; *Atractides distans inflatipes* Ldbl. ♀. Frankrike, Bains du Boulou. Bäck. 29.5.1935. Leg. O. Lundblad. State of conservation: good, gnathosoma *in situ*, palps, I-L and left IV-L separate, lateral. Paratype ♂ 4374. Allotyp.; *Atractides distans inflatipes* Ldbl. ♂. Spanien. Granada. Fjällbäck. 12.6.1935. Leg. O. Lundblad. State of conservation: good, but dorsal integument missing, palps, I-L and left IV-L separate, lateral, genital skeleton isolated, in anterior position (paratype not conspecific with holotype, see below).

Description:**General features**

dorsal integument: striated; muscle attachments: smooth
coxal field: caudal margin Cx-1 weakly convex, medially nearly straight; apodemes Cx-2 in a 45° angle
IL: I-L-5 considerably thickened at insertion S-1, with ventral seta inserting very close to S-1; large setal interspace, heteromorphic, thickened; I-L-6 curved, very slender

excretory pore: smooth; Vgl-1: separate from Vgl-2
palp: sexual dimorphism?

Females**Holotype**

genital field: pregen narrow, Ac in a weakly curved line
palp: slender, S-2 ventral margin very weakly convex, nearly straight, forming a right distal angle; P-3 ventrally straight, P-4 with a slight basal concavity, 1:2:2, sword seta between ventral hairs, approached to distoventral hair
idiosoma L/W 620/415; glandularia 21
coxal field L 320; Cx-3 W 360; Cx-1 + 2 mL 117, IL 198, W 365
I-L-5 dL 215, vL 125, dL/vL 1.72, HA-HC 66, 71, 96, dL/HB 3.03
S-1 L 125, L/W 8.9, S-2 L 83, L/W 4.9, interspace 49, L S-1/2 1.51
I-L-6 L 176, HA-HC 23, 16, 15, dL/HB 11.0; L I-L-5/6 1.22
genital field L/W 153/148, Ac-1-3 L 30, 35, 30
gnathosoma vL 117; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	30/25	70/43	84/36	102/26	33/10
(ratio)	1.20	1.63	2.33	3.92	3.30
rel.L	09	22	26	32	10
total L:	P-2/4 0.69				
	319				



Figure 68. *Atractides inflatipes*, holotype ♀ SMNH 4104. A, coxal field; B, genital field and postgenital field; C, palp, medial view; D, I-L-5 and -6. Scale bars = 100 µm.

Due to folded integument, at first view Vgl-1 + 2 seem fused, but they are only overlapping. Following Lundblad: L gonopore 143, genital plate 107 µm. Lundblad's indication 'P-1 with straight or weakly convex ventral margin' surely refers to P-2.

Discussion: Lundblad (1956) compared *A. inflatipes* with *A. latipes*, *A. cultellatus*, and *A. distans*, initially believing it to be a subspecies of the latter. The differences he noted include: in *A. latipes* the enlarged glandularia and sclerotized excretory pore; in *A. cultellatus* the larger, knife-like sword seta on P-4. He later (Lundblad, 1962b) felt that the differences with *A. distans* were insignificant and that *A. inflatipes* should be considered a junior synonym. This is, however, contradicted by morphological evidence. *A. distans* is similar in having a rather low I-L-5 L/HB ratio (3.14) but has a lower L ratio I-L-5/6 (1.03) and a much more slender S-1 (L/W 16.1, with distally enlarged and truncate tip) and S-2 (L/W 9.9). *A. inflatipes* has important characters in common with *A. cultellatus* and *A. algeriensis*: all Ac rather small, about 30 µm in diameter; I-L-5/6 L ratio of about 1.25; enlarged S-2 (L/W < 7.0) and similar palp measurements. Both species differ from *A. inflatipes* in having a more slender I-L-5 (L/HB > 3.3) and S-1, a lower L ratio S-1/2 (about 1.30) and a more or less convexly protruding ventral margin of P-2. As mentioned by Lundblad, *A. cultellatus* can be distinguished also by the stronger sword seta on P-4.

Lundblad himself was doubtful that the designated male allotype of *A. inflatipes* was really conspecific. The specimen on slide SMNH 4374 is similar to the holotype in several proportions, e.g. the considerably 'inflated' I-L-5 with rather distant S-1 and -2. However, the segment is not subrectangular as in the holotype, with dorsal and ventral margins equally diverging from the base to the articulation furrow, and I-L-6 is much more robust than in the female. A further important difference is the fusion of Vgl-1 + 2. A sexual dimorphism regarding this character is rare in *Atractides*, and if it is expressed, in the sex with fused Vgl-1 + 2 the platelet is always '8'-shaped, not perfectly round as in SMNH 4374.

This evidence is sufficient to establish the two specimens as not being conspecific. The Spanish male allotype of *A. inflatipes*, with its combination of small Ac with a diameter < 30 µm, smooth excretory pore, fused Vgl-1 + 2, dL/HB ratio of I-L-5, setal interspace > 15 µm, and I-L-5/6 L ratio c. 1.25, is similar to *A. spinipes* and *A. oblongus*. They both have stouter P-2 and -3 (L/H *A. spinipes* 1.14/1.53, *A. oblongus* 1.29/1.50), the sword seta P-4 located halfway between ventral hairs, and stouter I-L-6 (L/HB *A. spinipes* 4.58, *A. oblongus* 4.36). Furthermore, *A. spinipes* has a more slender I-L-5 (L/HB 3.26) while in *A. oblongus* the

interspace is smaller. Thus, the allotype of *A. inflatipes* could represent an undescribed species.

Distribution: Pyrenees (France). A further record was published from Montenegro while this manuscript was in press (2, 5) (Pešić, 2001).

ATRACTIDES LUNIPES LUNDBLAD, 1956 (FIG. 69A–D)

Type series: Holotype ♀, SMNH 4090. Typ.; *Atractides lunipes* Ldbl. ♀ Frankrike. Argeles. Bäck. 29.5.1935. leg. O. Lundblad. State of conservation good; gnathosoma *in situ*, both palps, both I-L-separate, lateral.

Description:

General features

Female – male unknown
dorsal integument: lined (3–4/10 µm); muscle attachments: smooth
coxal field: Cx-1 + 2 short and large, posterior margin Cx-1 medially straight, apodemes of Cx-2 in an acute angle; coxal plates with distinct medial and caudal borders of secondary sclerite
I-L: I-L-5 protruding between ventral seta and S-1 insertion, wide setal interspace, heteromorphic; I-L-6 very slender and curved
excretory pore: smooth; Vgl-1: fused with Vgl-2
palp: sexual dimorphism?

Females

Holotype

genital field: pregen compact, thick, genital plates curved
palp: P-2 ventral margin distally protruding and strongly convex, P-3 ventrally straight, P-4 slender, ventral margin weakly extended near proximal hair insertion, sectors 2 : 3 : 1, sword seta halfway between ventral hairs
idiosoma L/W 870/690; glandularia 29
coxal field L 396; Cx-3 W 526; Cx-1 + 2 mL 130, IL 243, W 324
I-L-5 dL 225, vL 135, dL/vL 1.67, HA-HC 47, 52, 90, dL/HB 4.33
S-1 L 143, L/W 20.4, S-2 L 100, L/W 7.7, interspace 47, L S-1/2 1.43
I-L-6 L 193, HA-HC 20, 16, 18, dL/HB 12.06; L I-L-5/6 1.17
genital field L/W 162/166, Ac-1–3 L 34, 34, 34
gnathosoma vL 130; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	33/31	77/60	99/40	115/29	35/12
(ratio)	1.06	1.28	2.48	3.97	2.92
rel.L	09	21	28	32	10
total L:	P-2/4 0.67				
	359				

Following Lundblad: gonopore L 157, genital plates L 125 µm; coxal plates separated by an extended membranous area between Cx-2 and -3, anteromedial margin Cx-3 indented in the sector facing the apodeme Cx-2; anterior margin Cx-4 near glandular pore only slightly protruding.

Discussion: Lundblad (1956), noting the similarities of a large interspace between and the slender I-L-6, compared *A. lunipes* with *A. inflatipalpis*, *A. panniculatus* (sub nom. *A. mitisi*) and three species known from asiatic Russia (*A. gracilis*, *A. odarkensis*, and *A. gassowski*). In addition to other characters, the three Russian species differ in having a straight, not convexly protruding P-2, while the species of the *A. panniculatus* group have large acetabula in a tri-

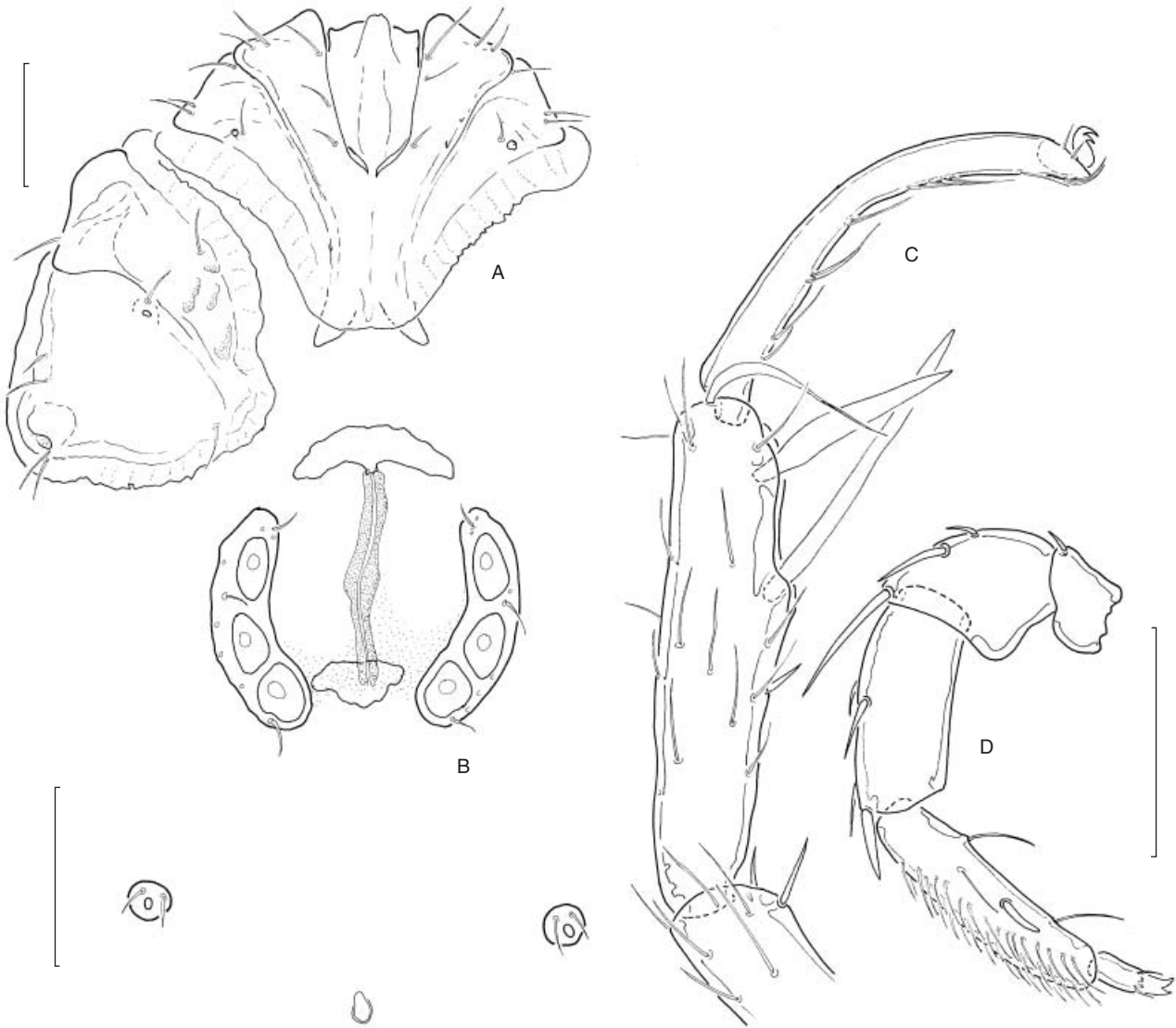


Figure 69. *Atractides lunipes*, holotype ♀ SMNH 4090. A, coxal field; B, genital and postgenital field; C, I-L-5 and -6; D, palp, medial view. Scale bars = 100 µm.

angular arrangement. *A. inflatipalpis* has less slender I-L-5 (dL/HB 3.16), I-L-6 (L/HB 9.7), P-3 (L/H 1.84) and P-4 (L/H 3.17) and fused Vgl-1 + 2. Three further species with setal interspace >30 µm, a rather long S-1 (L > 120 µm) and an unsclerotized excretory pore are known from Europe. *A. distans* has a less slender I-L-5 (dL/HB 3.14), distally enlarged S-1 with a blunt tip, and a stouter P-4 (L/H 3.47); *A. arcuatus*, a little known species from the Caucasus, and *A. remotus* both have Vgl-1 and Vgl-2 not fused, a stouter I-L-5 (dL/HB 3.04 resp. 3.66) and a higher L ratio I-L-5/6 (>1.30).

A. lunipes differs from all western Palearctic species in having a very fine and slender S-1 (L/W 20.4). Further diagnostic characters include the

lined integument, a smooth excretory pore, fused Vgl-1 + 2, wide setal interspace and a very slender I-L-6 (L/HB 12.06).

Habitat: Rhithrobiont.

Distribution: Pyrenees (France), one further record – with a question mark – from Macedonia (Pešić, 2003). (2, 6).

ATTRACTIDES CLAVIPALPIS (LUNDBLAD, 1956)
(FIG. 70A–H)

Atractides nodipalpis clavipalpis Lundblad, 1956

Type series: Holotype ♂, SMNH 4357. Typ.; *Atractides nodipalpis clavipalpis* Ldbl. ♂. Spanien. Algeciras. Bäck. 21.6.1935. Leg. O. Lundblad. State of

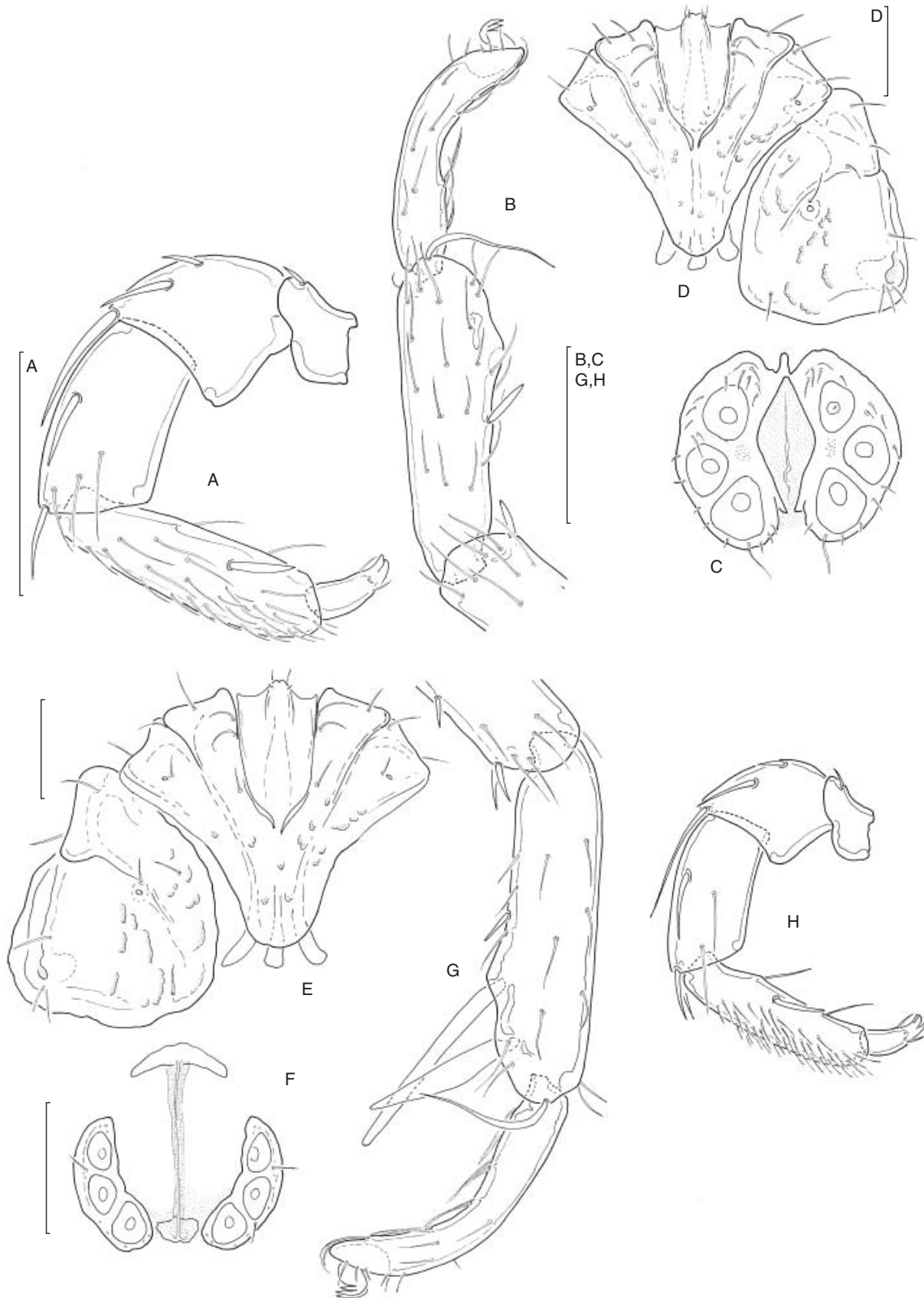


Figure 70. *Atractides clavipalpis*. A–D, holotype ♂ SMNH 4357, E–H, paratype ♀ SMNH 4362. A, ♂ palp, medial view; B, ♂ I-L-5 and -6; C, ♂ genital field; D, ♂ coxal field, E, ♀ coxal field; F, ♀ genital field; G, ♀ I-L-5 and -6; H, ♀ palp, medial view. Scale bars = 100 μm.

conservation: good, gnathosoma *in situ*, both palps, both I-L separate, lateral, genital skeleton isolated, anterior. Paratype ♀, SMNH 4362. Allotyp.; [as holotype]. ♀. State of conservation: as holotype, but dorsal integument missing.

Description:

General features

dorsal integument: striated; muscle attachments: smooth
coxal field: caudal margin Cx-1 strongly convex, apodemes Cx-2 in an acute angle

I-L: I-L-5 with strong ventral seta, proximally subrectangular, distally protruding near insertion S-1, I-L-6 curved, inflated proximally, from the centre to the claw furrow with parallel dorsal and ventral margins

excretory pore: smooth; Vgl-1: separate from Vgl-2

palp: ventral margin distally slightly protruding and forming a right angle

Males

Holotype

genital field: anterior margin with a notch and bead structure, a fine median tip projecting in a deep indentation; genital setae: 34, medially restricted to the anterior edge of the gonopore and not extending caudally over the level of the anterior margin of Ac-1, caudal margin with a deep indentation extending to about $\frac{1}{2}$ L of Ac-3; gonopore strongly enlarged in its centre

palp: ventrodorsal projection of P-2 with rugose surface, P-4 club-shaped, with maximum H at distoventral hair, ventral margin 3:2:1, sword seta between ventral hairs, nearer to the distoventral hair

idiosoma L/W 650/500; glandularia 24

coxal field L 342; Cx-3 W 405; Cx-1 + 2 mL 144, IL 256, W 306

I-L-5 dL 183, vL 128, dL/vL 1.43, HA-HC 49, 61, 72, dL/HB 3.00

S-1 L 103, L/W 10.3, S-2 L 81, L/W 6.23, interspace 23, L S-1/2 1.27

I-L-6 L 143, HA-HC 29, 21, 23, dL/HB 6.81; L I-L-5/6 1.28

genital field L/W 112/130, Ac-1-3 L 32, 30, 37

gnathosoma vL 139; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	33/31	74/65	89/48	113/35	39/14
(ratio)	1.06	1.14	1.85	3.23	2.79
rel.L	09	21	26	32	11
total L:	P-2/4 0.65				
348					

Left and right genital plate connected only by minute anterior and posterior hypodermal sclerite bridges (the latter broken in the holotype). The presence, at the anterior margin of the genital field, of a well developed border of secondary sclerite suggests that the particular shape of its anteromedial and posteromedial edges is not due to immaturity of the specimen. No secondary sclerotization at the coxal plates.

Females

Paratype

genital field: pregen narrow, weakly curved; genital plates bean-shaped, with a fine anterolateral border of secondary sclerite

palp: P-2 with a less protruding distoventral edge than in male, P-4 not club-shaped, maximum H near proximoventral hair, ventral sectors 2:3:2, sword seta between ventral hairs, slightly nearer to proximoventral hair

idiosoma L/W 840/620; glandularia 25

coxal field L 338; Cx-3 W 437; Cx-1 + 2 mL 144, IL 247, W 311

I-L-5 dL 209, vL 141, dL/vL 1.48, HA-HC 52, 61, 78, dL/HB 3.43

S-1 L 121, L/W 13.4, S-2 L 92, L/W 6.1, interspace 27, L S-1/2 1.32

I-L-6 L 163, HA-HC 30, 21, 24, dL/HB 7.76; L I-L-5/6 1.28

genital field L/W 175/157, Ac-1-3 L 27, 29, 31

gnathosoma vL 144; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	32/30	80/59	98/45	115/29	39/15

(ratio)	1.07	1.36	2.18	3.97	2.60
rel.L	09	22	27	32	11
total L:	P-2/4 0.70				
364					

Following Lundblad: L gonopore 157, genital plate 110 μ m.

Discussion: Lundblad (1956) compared this taxon in his first description only with *A. nondilatatus*, here considered a *species dubia*, the taxonomic status of which will probably remain enigmatic. A male genital field with a characteristic 'notch and bead' structure is found only in *A. nodipalpis* and *A. robustus*, two species which, in males, differ markedly from *A. clavipalpis* in the ventrodorsal protrusion of P-2, P-4 distally tapering, not club-shaped, in females a longer palp (total L > 390 μ m) and a higher L ratio I-L-5/6 (>1.30), and in both sexes larger acetabula in a triangular arrangement. Another species which has a striated integument, smooth excretory pore, unfused Vgl-1/2, relatively small acetabula and similar morphology of I-L-5 and -6 is *A. cultellatus*, so far known from a single female specimen in Spain. It differs from *A. clavipalpis* in having a shorter median suture of Cx-1 (90 μ m), a wider setal interspace (44 μ m) and a more slender I-L-6 (L/HB 10.24).

Habitat: Rhithrobiont.

Distribution: Spain, known only from the *locus typicus* in Andalusia (1).

ATRACRIDES MACROLAMINATUS LÁSKA, 1956

(FIG. 71A–E)

A. loricatus Piersig 1898 *partim*, Crema *et al.*, 1996, Gerecke *et al.*, 1998

Type series: Lectotype ♂, here designated, MMB Cis. 928 *Atractides gibberipalpis* 2 ♀ *A. macrolaminatus* 1 ♂ *A. longus* 1 ♀; snad paratyp. údaj o pohlani neodporida údajem v popisu S 8160; 962–1 Studený p-u Zverovky, Liptovske Hote 10.9.1954 Leg. Laska [as mentioned in the text on the slide, probably due to a typographic error, a female is reported for this locality in the original description. In view of the particularly misshaped genital field of the individual, there is no doubt that the figures of the male are based on this specimen]. State of conservation: good, gnathosoma *in situ*, both palps and one I-L separate, lateral, some precipitations. Paralectotypes: 2 ♀ MMB Cis 927 *Atractides macrolaminatus* 2 ♀; Syntypus; Invent. c. 4068–69 (Ent. Mor. museum Brno) 956 Mlýnice u Strbskeho plesa, Vys.Tatry. 29.8.1954 Leg. Laska. State of conservation: good, as holotype, one ♀ dorsal, the other ventral.

Material examined: MMB, 1270–2 Javorinka Bes.Tatry 23.6.1958 Leg. Laska 1 ♂; 1121–1 potok v Tatranske Poljane. 7.9.1956 Leg. Laska 1 ♀; 1241. Jamnický pot. v pasmutesa Lipt. Hote. 10.9.1957 Leg. Laska 1 ♀. Germany, National Park Berchtesgaden: Dsar4, Zirbeneck, 1350 m, 1.8.1993 20 ♂, 15 ♀; Dsar7, Mittereisalm/Hirschbichl, 1270 m, 30.5.1994 1 ♂, 2 ♀; Dsar15, Schapbach, 1100–1170 m, 12.6.1994 8 ♂, 8 ♀.

Description:

General features

dorsal integument: striated; muscle attachments: sclerotized, Postoc + D-1 + Dgl-3 fused, Dgl-4 + D-3 fused, the remaining elements separate; all plates rather large

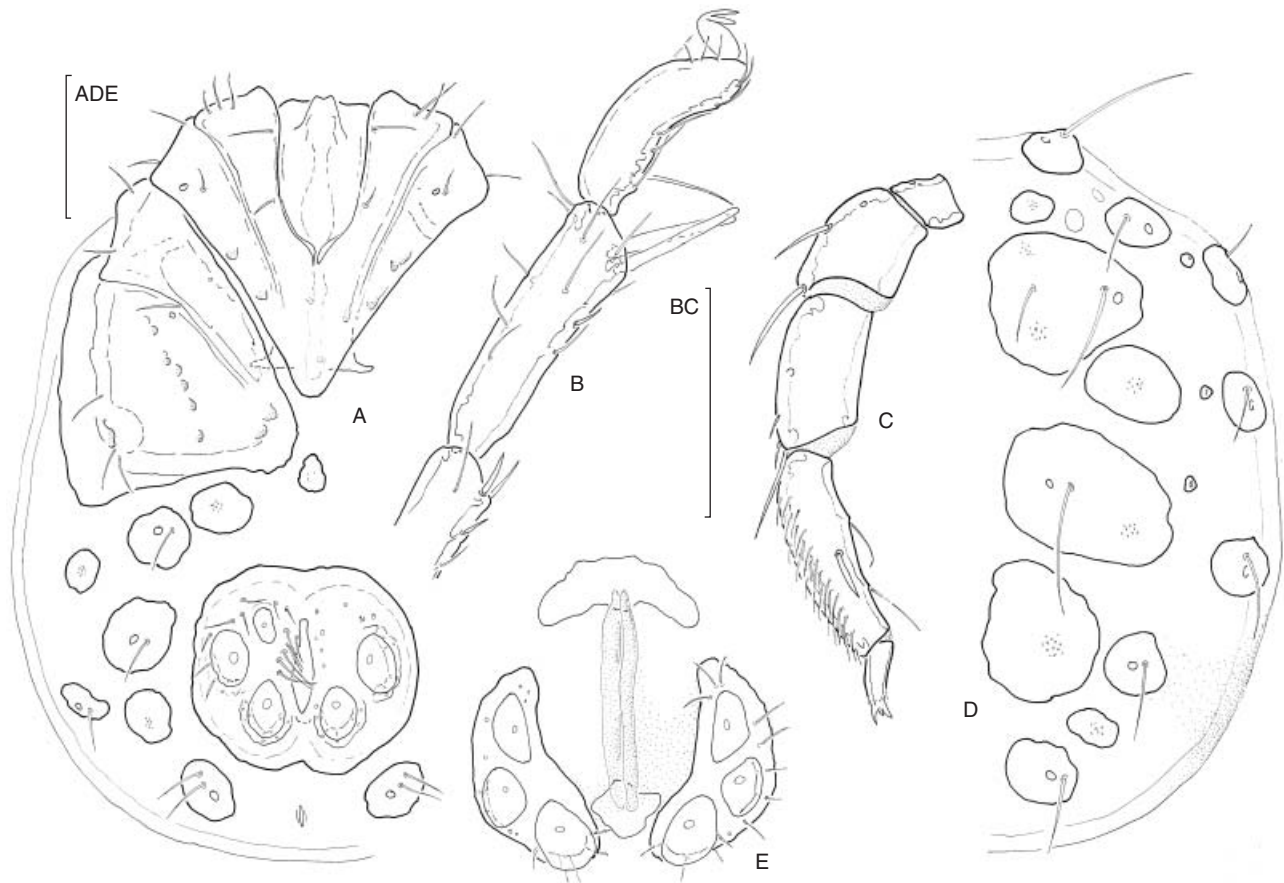


Figure 71. *Atractides macrolaminatus*. A–D, lectotype ♂ MMB 962–1; E, paralectotype ♀ MMB 956. A, ♂, partial ventral view; B, ♂ I-L-5 and -6; C, ♂ palp, medial view; D, ♂, partial dorsal view; E, ♀ genital field. Scale bars = 100 µm.

coxal field: caudal margin Cx-1 tongue-shaped protruding, apodemes Cx-2 short, directed laterally; Cx-4 laterally with extended border of secondary sclerite
 I-L: I-L-5 little thickened, S-1/2 homoimorphic, slender and blunt, narrow setal interspace; I-L-6 stout, curved, equal in H from the base to the claw furrow, claws strong
 excretory pore: smooth; Vgl-1: fused with Vgl-2
 palp: no sexual dimorphism, ventral margins of P-2/3 straight, P-4 slender, ventral margin with weakly projecting denticles near hair insertions, 1 : 1 : 1, sword seta slender, halfway between ventral hairs

Males

Lectotype
 genital field: completely surrounded by an extended border of secondary sclerite, this border weakly concave anteriorly and with a shallow indentation caudally, outline of primary sclerite border indicating an apple-shape, Ac-2/3 laterally on slightly elevated socles; genital setae: 46
 idiosoma L/W 530/390; glandularia 45
 coxal field L 275; Cx-3 W 295; Cx-1 + 2 mL 98, IL 187, W 227
 I-L-5 dL 130, vL 100, dL/vL 1.30, HA-HC 30, 35, 42, dL/HB 3.71
 S-1 L 57, L/W 11.4, S-2 L 48, L/W 9.6, interspace 6, L S-1/2 1.19
 I-L-6 L 90, HA-HC 22, 22, 24, dL/HB 4.09; L I-L-5/6 1.44
 genital field L/W 133/153, Ac-1–3 L (25), 40, 44
 gnathosoma vL 94; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	25/23	62/40	70/37	90/28	28/10
(ratio)	1.09	1.55	1.89	3.17	2.8

rel.L	09	23	25	33	10
total L:	P-2/4 0.69				
	275				

Dgl-1 with long, slender setae; maximum diameter of the three largest dorsal plates: D-1 110, D-3 130, D-4 95 µm. One unpaired medial platelet between coxal and genital fields, the genital field of the lectotype misshaped, with the left Ac-1 completely absent, and the right Ac-1 reduced in size. In the male MMB 1270–2, Ac-1 48 µm in diameter.

The specimens from Berchtesgaden agree with the holotypes from most points of view. Minor differences are found in the slightly longer P-4, and consequently a lower P-2/4 ratio, and slightly lower I-L-5 dL/vL and dL/HB ratios. The following range of variability was established from Bavarian specimens (mean [min-max], n = 25 for idiosoma measurements, n = 8 for palp and I-L measurements):

Genital field L/W 129/158 (110–164/135–205); Ac-1 42 (30–50); D-1 110 (80–155); D-2 121 (105–154); P-2 L/H 62/43 (60/40–65/45) ratio 1.45 (1.39–1.53); P-3 L/H 71/37 (68/33–73/39) ratio 1.95 (1.87–2.23); P-4 L/H 97/29 (93/28–100/33) ratio 3.31 (2.92–3.55); I-L-5 dL/vL 119/95 (113/88–130/103) ratio

1.26 (1.23–1.29); I-L-5 HB 35 (33–38) dL/HB 3.44 (3.29–3.69); I-L-6 L/HB 89/23 (85/21–93/25) ratio 3.90 (3.70–4.24); I-L-5 dL/I-L-6 L 1.35 (1.29–1.44).

Females

Paralectotype

genital field: pregen robust and large, genital plates triangular, with irregularly concave medial margin and a relatively extended sclerotized surface between Ac-1–3

idiosoma L/W 590/480; glandularia 45

coxal field L 327; Cx-3 W 355; Cx-1 + 2 mL 108, IL 216, W 276

I-L-5 dL 144, vL 117, dL/vL 1.23, HA-HC 40, 42, 47, dL/HB 3.43

S-1 L 70, L/W 10.0, S-2 L 67, L/W 7.4 interspace 5, L S-1/2 1.04

I-L-6 L 102, HA-HC 27, 24, 35, dL/HB 4.25; L I-L-5/6 1.41

genital field L/W 197/205, Ac-1–3 L 50, 45, 50

gnathosoma vL 115; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	28/25	72/50	87/43	108/30	36/11
(ratio)	1.12	1.44	2.02	3.60	3.27
rel.L	08	22	26	33	11
total L:	P-2/4 0.67				
	331				

Maximum diameter of the three largest dorsal plates: D-1 100, D-3 110, D-4 90 μm . As in males, an unpaired platelet between coxal and genital fields. The sword seta of P-4 in Láska (1956: fig. 5B) nearer to the distoventral hair, but in the lectotype and paralectotypes studied here located exactly halfway between the ventral hairs.

The type series lies within the range of variability of the specimens from Berchtesgaden, except for slightly lower ratios of L/H P-4 (3.6) and dL/vL I-L-5 (1.23). The following range of variability was established from Bavarian specimens (mean [min-max], $n = 45$ for idiosoma measurements, $n = 10$ for palp and I-L measurements):

Genital field L/W 205/213 (168–180/245–259); Ac-1 53 (40–65); D-1 107 (80–160); D-2115 (90–130); P-2 L/H 76/48 (70/45–83/53) ratio 1.60 (1.38–1.72); P-3 L/H 90/43 (85/39–98/48) ratio 2.10 (1.89–2.25); P-4 L/H 111/29 (105/26–120/33) ratio 3.91 (3.69–4.00); I-L-5 dL/vL 141/110 (130/103–153/120) ratio 1.28 (1.26–1.30); I-L-5 HB 39 (35–40) dL/HB 3.66 (3.38–3.81); I-L-6 L/HB 102/24 (95/23–108/25) ratio 4.19 (3.80–4.56); I-L-5 dL/I-L-6 L 1.39 (1.32–1.50).

Discussion: *A. macrolaminatus* is a representative of the *A. loricatus* group, characterized by well sclerotized muscle attachments and large glandular plates; a coxal field with subtriangular coxal plates, the anterior one pointing caudally, the posterior ones medially; I-L-5 slightly thickened with S-1 and -2 a little heteromorphic, narrow setal interspace; I-L-6 stout, curved, and with rather parallel dorsal and ventral margins; a genital field with Ac separated by large sclerite stripes, in females with triangular genital plates, and a slender palp without sexual dimorphism, with straight ventral margins of P-2 and P-3.

In the same paper, Láska gave a detailed redescription of what all authors at that time considered to be *A. loricatus*, a species with a sclerotized excretory pore, and he compared *A. macrolaminatus* with the two species of the *loricatus* species group which in his opinion were characterized by a smooth excretory

pore, *A. barsiensis* and *A. adenophorus*. Revision of the type series indicates that *A. loricatus* actually has an unsclerotized excretory pore, and *A. barsiensis* is a junior synonym of *A. loricatus*. Males of *A. loricatus* differ from *A. macrolaminatus* in having smaller muscle attachment plates (diameter of D-3 80 μm) but the considerable age-dependent variation in this character in specimens from Berchtesgaden generates the expectation that values can overlap to a certain degree. A clearer distinction is possible due to their smaller and more slender genital field (L/W 103/112, Ac-1 diameter 26 μm) with deeply indented caudal margin, and the stouter palp (L/H P-2 1.33, P-3 1.82) with generally shorter segments (L P-2 52, P-3 60, P-4 88 μm) and lower P-2/4 ratio (0.59).

Distinguishing females is more difficult. There are no major differences in the dimensions of muscle attachments. The genital field of *A. loricatus* is more slender than in all specimens of *A. macrolaminatus* from Berchtesgaden ($W = 175 \mu\text{m}$) but this character is age-dependent in females, and might also change during preparation and mounting. As in males, absolute L and L/H ratio of palp segments are slightly below the minima established in Berchtesgaden (P-2 67 μm , 1.35; P-3 78 μm , 1.56; P-4 99 μm). An overlap of all these measurement values is probable when larger populations of *A. loricatus* are studied, and distinguishing the two similar species is no longer possible in the absence of males.

A. adenophorus bears a small but distinct sclerite embracing the caudal edge of the anal pore. Furthermore, this species, known only from females, differs from *A. macrolaminatus* in its much smaller idiosoma (e.g. Cx-1 mL 63 μm , all Ac < 40 μm , and minute dorsal plates) and stouter I-L-6 (dL/HB 3.77).

While all the Bavarian specimens mentioned above were collected in a number of different spring habitats quite distant from each other, morphologically they form rather homogeneous populations. There is one enigma: in one site four females appeared which from their measurements lie within the range of variability of *A. macrolaminatus*, but they have an excretory pore surrounded by a well developed sclerite ring. They were caught in two different years in the same 100 metre section of a stream monitored over a period lasting over 5 years. In all the other sites populations with a smooth excretory pore were present. These facts suggest that these differences have a genetic basis that requires further investigation.

Description of larvae: Martin (in press).

Habitat: Crenobiont.

Distribution: Alps (first record from Germany), Tatra mountains (4, 10).

TRACTIDES CRASSIPES (SOKOLOW, 1957)

A. nodipalpis crassipes Sokolow, 1957
nom. nud., erroneous for *Unionicola crassipes* (Müller,
 1776) (citing Behning & Popowa, 1947)

TRACTIDES NITRAENSIS LÁSKA, 1959

Syn. to *A. oblongus* (Walter, 1944): syn. nov.

Type series: Lectotype ♂, here designated, MMB Cis. 1528. *Atractides nitraensis* 1 ♂ 1 ♀; 1329–2 Pramený tok Nitry, 19.9.1958 Leg. Láška. State of conservation: good, gnathosoma, both palps and both I-L separate, laterally. Paralectotypes: ♀, together with the lectotype on the same slide and prepared in the same way; ♀ 1329–3, [like lectotype].

Material examined: MMB 1102–1 Tatr. Lomnice potok u Moravy. Tatr. 3.9.1956 Leg. Láška 1 ♀; 1108. Řička Bialka na potské; hranici. Tatr. 4.9.1956 Leg. Láška 1 ♀; 1230–2 Ramzovka nad Horní Lipovcu 8.8.1957 Leg. Láška 2 ♂; 1454–5 Kaniánský pot. Ponitn 17.8.1963 Leg. Láška 1 ♀ (together with *A. distans* ♀); NHMB Prep. 24 29.9.1968 Belgio Coll. 5' 1 ♂.

Discussion: Láška (1959) compared *A. nitraensis* in his initial description only with *A. protendens*, a morphologically very different species with lineated integument, unfused Vgl-1 + 2, and a very stout I-L-6. The specimens of the type series are, however, representatives of the *A. spinipes* group containing the closely related species *A. spinipes* and *A. oblongus*. As these species are minute and have comparatively few morphological particularities, the taxonomic assessment of *A. nitraensis* requires a presentation of selected measurements and proportions. Measurement values not included within the following survey were found widely overlapping with both species compared.

Males ($n = 3$): idiosoma L about 450, coxal field L 256–270, Cx-1 mL 106–120, genital field L/W 80/92, palp total L 212–252 μm ; L/H ratio P-2 1.37–1.39, P-3 1.76–1.89, P-4 2.96–3.00; I-L-6 L 94–98 μm , L/HB 4.70–4.90.

Females ($n = 4$): idiosoma L 590, coxal field L 165, mL 105–117, palp total L 256–273 μm ; L/H ratio P-2 1.44–1.51, P-3 2.08–2.14, P-4 3.48; setal interspace 10–15 μm ; I-L-6 L 105, L/HB 5.25–6.10.

The only difference with both of the compared species is the slightly increased size of *A. nitraensis* males (coxal field, Cx-1 mL) and there is no significant diagnostic character restricted to *A. nitraensis*. *A. nitraensis* differs from *A. spinipes* (in parentheses) and corresponds to *A. oblongus* in the longer median suture of Cx-1 (<100 μm in both sexes); in males more slender segments P-2 (L/H < 1.20) and P-3 (L/H < 1.62) and a relatively stockier P-4 (L/H > 3.10); and in the more slender I-L-6 of females (L/HB < 4.9). Furthermore, *A. nitraensis* agrees with *A. oblongus* also in the shape of the genital field, in males with the posterior third of the gonopore flanked by the Ac-3, in females with the Ac not in a line, but in a triangular arrangement. The females of *A. nitraensis* agree with

two females in MMB (962–1, 1269–1) labelled as *A. longus*. Both *A. longus* and *A. nitraensis* are synonyms of *A. oblongus*.

Since the first description, *A. nitraensis* has been reported only once from Switzerland (Rensburg, 1971). The specimen in question confirms the proposal of synonymization provided here. As stated correctly by Rensburg, the measurements of the male genital field published by Láška are erroneous, with a margin of error of c. 50%. The female of prep. MMB 1454–5 surely represents a different species, possibly *A. nodipalpis*. In this specimen, the anterior coxal plate is less slender and with a weakly curved caudal margin of Cx-1, Vgl-1 far apart from Vgl-2, S-2 enlarged, and I-L-6 more slender (L/H 6.5).

TRACTIDES LIMNICOLA SCHWOERBEL, 1959

Syn. to *A. nodipalpis* Thor, 1899: syn. nov.

Type series: Holotype ♀, CSM *TRACTIDES limnicola* ♀ 1159 TYPUS; Lac Gérardmer 27.IX.1956. State of conservation: gnathosoma, both palps, both I-L, and both IV-L separate, lateral; mounting medium contains precipitations and has contracted, leaving idiosoma uncovered; mouthparts and legs under separate cover, crushed.

Discussion: Schwoerbel (1959a) compared this species with *A. nodipalpis*, *A. clavipes* (at that time regarded a subspecies of *A. nodipalpis*) and *A. distans*, examining the shape and dimensions of the genital field (without giving details) and I-L-5 and -6 (setal interspace wider than in *A. clavipes*, but narrower than in *A. distans*). Since the first description there have been no further records of, or discussions concerning, *A. limnicola*. The holotype is misshaped both in the genital field (right genital plate with Ac-1/3 reduced in size, and Ac-2 completely missing) and in the I-L (setal interspace on the right I-L 9 μm , on the left, 20 μm). *A. limnicola* is morphologically quite distant from *A. clavipes* (with shortened S-1 and -2 nearly touching, much thicker I-L-6, and Ac in females arranged in a curved line, not in a triangle as in *A. limnicola*) and from *A. distans* (S-1 and -2 strongly heteromorphic and far apart; thicker I-L-5). When compared with *A. nodipalpis*, only minute differences are found. Most measurements lie within the range of variability established for that species or slightly below the minima (e.g. setal interspace 20 μm , in *A. nodipalpis* 25–43 μm , L ratio I-L-5/6 1.29, in *A. nodipalpis* 1.32–1.56). In view both of the extended range of variability of *A. nodipalpis*, and the fact that the type of *A. limnicola* is an asymmetrically misshaped individual, there is good reason to consider it a synonym of the former species. This assumption is also supported by the fact that *A. nodipalpis* is by far the most common species in southern Central Europe, and locally may be found also in stagnant water habitats.

ATRACTIDES STYGOPHILUS (SCHWOERBEL, 1959)

Atractides nodipalpis stygophilus nom. nud. Schwoerbel (1959c) descr. Schwoerbel (1961a)

Syn. to *A. remotus* Szalay, 1953: syn. nov.

Type series: Holotype ♂, CSM Steina G.29; *ATRACTIDES nodipalpis stygophilus* ssp.n. TYPE ♂. State of conservation: idiosoma with all legs except for left III-L more or less damaged or lost; gnathosoma, both I-L, chelicerae, palps separate, laterally, crushed. Paratype ♀, CSM Steina G.30; *ATRACTIDES nodipalpis stygophilus* ssp.n. ALLOTYPUS ♀. State of conservation: idiosoma with only left I-II-L *in situ*, further legs partly broken, together with mouthparts under separate cover, crushed; the I-L *in situ*, not crushed, clearly visible. There is a contradiction between the locality indicated on the slide labels and the original description ('Oberlauf der Breg in 940 m ü.N.N. 1 ♂ und 1 ♀').

Discussion: Describing this taxon as a subspecies of *A. nodipalpis*, Schwoerbel only compared it with taxa placed on this taxonomic level at that time. The only taxon with coxal plates merged to form a continuous coxal shield, and a rather long I-L-6 (L ratio I-L-5/6 1.2) is *A. nodipalpis intermedius*, an incompletely known taxon here considered a *species dubia*. In fact, *A. stygophilus* is a typical representative of the *panniculatus* species group, due to the combination of a lineated integument, I-L with wide setal interspace, slender I-L-6, Ac in triangular arrangement in both sexes, excretory pore smooth, and Vgl-1 + 2 unfused. It is most similar to *A. remotus* due to the fusion of the coxal plates in males, genital field with relatively small acetabula, P-4 with ventral hairs placed close together and strong sword seta in distant distal position. All measurements taken from the idiosoma of the types, or published in the original description for the mouthparts and I-L, agree with the values established for *A. remotus* from specimens ex coll. Láška (MMB). A slight difference in the broader and longer genital field of *A. stygophilus* is explained by the age-dependent extension of secondary sclerites. Láška described the variation in secondary sclerotization of *A. remotus*; the male holotype is a mature specimen with extended sclerite borders. *A. stygophilus* is thus a junior synonym of *A. remotus*.

ATRACTIDES TORRENTICOLUS LÁŠKA, 1960

Species dubia

Type series: Possibly missing. Not recorded from MMB, and no information available about eventual collocation in the museums at Prague and Bratislava. *Locus typicus:* Czech Republic, River Moravice (Velky Kotli) 16.8.1957 1 ♀.

Discussion: *A. torrenticolus* is a '*Tetramegapus*' species with only two pairs of acetabula in the genital field. As mentioned by Láška, all species of this subgenus are each known from a single female. Their common character, the reduced number of acetabula, is clearly the product of misshaping. I-L-5 and -6 resembles that of *A. fonticolus*, but in view of the mis-

shaped genital field and the lack of information on important characters, no decision about its eventual synonymy is possible. Láška's figure 7C shows a pair of Vgl-1 + 2 with both setae separate from the glandular platelet, a character state never observed in any other specimen in the course of this revision. *A. torrenticolus* is thus a *species dubia*.

ATRACTIDES ORGHIDANI SCHWOERBEL, 1961, *NEC*

MOTAŞ & TANASACHI, 1961 =*ATRACTIDES*

TRAPEZIFORMIS NOM. NOV. SCHWOERBEL, 1961

nom. nud. Schwoerbel (1961a) descr. Schwoerbel (1961b)

ATRACTIDES CERBERUS SCHWOERBEL, 1961

Syn. to *A. oblongus* (Walter, 1944): syn. nov.

Type series: Lectotype ♂, here designated, Germany, Black Forest, CSM *ATRACTIDES cerberus* ♂; Breg Oberlauf Insel I.X.1959. State of conservation: idiosoma intact, but with left II-IV-L missing; both I-L, palps and gnathosoma laterally under separate cover, badly crushed. Paralectotype: ♂ *ATRACTIDES cerberus* ♂; Tiefenbach b. kl. Bohrerbach G.24. State of conservation: similar to lectotype but appendages more damaged and completely desiccated.

Material examined: Black Forest, CSM Steina G.23 1 ♂; Steina G.21 1 ♀ Seebach, hyp. 1400 m 26.5.1961 1 ♂, 1 ♀ [labelled as ♂]; Wagensteig, hyp. GW 13.5.61 1 ♂; hyp. Grundw. Nebenbach Fischbach 1 ♂.

Discussion: Schwoerbel (1961a) compared this species in the original description with *A. szalayii*, a species described from Romania which is poorly known and in this revision is synonymized with *A. oblongus*. He considered as diagnostic differences the presence of sclerotized muscle attachments in the dorsal idiosoma of the male, a more slender P-4 in females, and a basally narrowed I-L-6. In fact, *A. cerberus* is a representative of the *A. spinipes*-*A. oblongus* species group, characterized by smaller size, a weakly striated, nearly smooth integument, small glandularia, a rather slender coxal field, smooth excretory pore, fused Vgl-1 + 2, and I-L-5 with S-1 and -2 homoiomorphic and placed close together. A basally narrowed I-L-6 is found in both sister species, as well as in many other species of the genus, and cannot serve as a diagnostic feature. The difference in shape of the P-4 was based on published measurement data only. As mouthparts of all available specimens of *A. cerberus* are badly damaged, no control measurement is possible, but in general the L/H ratio is variable, mainly in mounted specimens, and species definitions cannot be based on such measurement ratios. Schwoerbel's statement on the sclerotization of the muscle attachments is not confirmed by the revision of his preparations. As usual in soft-bodied *Atractides*, muscle attachments are characterized by granulated areas of the membrane just at

those sites where paired sclerites are depicted in Schwoerbel's fig. 10(b). However, neither in the lectotype, nor in the other mounted specimens, are attachment sclerites present.

Both the lectotype and (in parentheses) additional specimens examined agree with *A. oblongus* and differ from *A. spinipes* as follows (all dimensions in μm). Males: coxal field L 265, median suture Cx-1 115 (100–115) genital field L/W 90/87 (75–90/80–95). Females: median suture Cx-1 100–130. Several female specimens from springs at higher elevations, with considerably larger Ac, possibly represent a different species. However, the general morphology of the male holotype provides sufficient evidence for a synonymization of *A. cerberus* with the so far little known *A. oblongus*.

ATRACTIDES LONGIPES SCHWOERBEL, 1961, *NEC*
HALBERT, 1944 = *ATRACTIDES PSAMMOPHILUS* NOM.
NOV. SCHWOERBEL, 1965

nom. nud. Schwoerbel (1961a) descr. Schwoerbel (1961b) [preocc.]

Syn. to *A. oblongus* (Walter, 1944): syn. nov.

Type series: Lectotype σ , here designated, CSM Germany, Black Forest Krummenbach, hyp. Grundw., 1960; *Atractides longipes* σ TYPUS PHOT. State of conservation: idiosoma intact, but only right II-L and left IV-L *in situ*; all other legs dissected and mounted together with mouthparts under separate cover, crushed and desiccated. Paralectotype: female from the same collecting site (mentioned in the original description) lost.

Discussion: Schwoerbel compared *A. psammophilus* in his initial description with *A. firmus*, a taxonomically quite distant species here synonymized with *A. lorricatus*, because he interpreted the dorsal muscle attachments as sclerotized platelets. In reality, at least in the lectotype (Schwoerbel figured the lost female paralectotype) they form only granulated areas in the dorsal membrane. *A. psammophilus* differs furthermore from *A. lorricatus* in having smaller glandular platelets, relatively larger acetabula and a more slender palp. Schwoerbel's figure 2a is possibly based on a different male insofar as the anterior coxae, and to a minor extent also the genital field, are shorter and wider. The Cx-1 of the lectotype are rather slender and longish (mL Cx-1 108 μm) with a more strongly curved mediocaudal margin, and the genital field is only slightly enlarged (L/W 83/94 μm) with the medio-caudal extension of secondary sclerite slightly protruding.

The lectotype of *A. psammophilus* is obviously a representative of the *A. spinipes*–*A. oblongus* group, characterized by small dimensions, a finely striated integument, long coxal field, slightly modified S-1 and -2 on I-L-5, Vgl-1 + 2 fused, and a smooth excretory pore. The latter character was correctly identified by Schwoerbel but his figures suggest the presence of an

excretory pore sclerite. Indeed, the excretory pore margin has sclerotized lips, but no proper ring (with a ventrally directed surface) is formed. In all measurements, as well as the shape and setation of palp and I-L (with S-1 and -2 more similar in length than depicted in Schwoerbel's fig. 2e) the specimen fits the description of *A. oblongus*. Regarding the name-giving length of posterior leg segments 4–6, no noteworthy difference is found between males of *A. oblongus* (L IV-L-4/5/6 148–155/170–178/132–144) and the holotype of *A. psammophilus* (L IV-L-4/5/6 163/182/144). The unusual shape of the two terminal segments in the latter (with IV-L-5 slightly convex, and IV-L-6 slightly concave) is most probably due to individual misshaping. At the *locus typicus*, *A. longipes* was collected together with specimens of *A. oblongus* (sub nom. *A. szalayi*) and should be considered its junior synonym.

ATRACTIDES TRAPEZIFORMIS SCHWOERBEL, 1961
(FIG. 72A–G)

nom. nov. pro Atractides 'orghidani' Schwoerbel, 1961a
nom. nud., nec Motaş & Tanasachi, 1961, descr. Schwoerbel, 1961d.

Type series: Lectotype σ , here designated, Germany, Black Forest CSM *Atractides trapeziformis* σ TYPE PHOT.; Krummenbach hyp. Grundw., 1960. State of conservation: idiosoma with only left III-L *in situ* and intact, the other legs ruptured, mostly missing, one I-L separate, together with gnathosoma, palps and detached chelicerae lateral under separate cover, crushed. Paralectotypes: CSM σ *ATRACTIDES trapeziformis* σ TYPUS; Krummenbach So.1960. State of conservation: right II-L and left II-IV-L *in situ*, gnathosoma, both palps, I-L, right III/IV-L under separate cover, laterally; σ *ATRACTIDES trapeziformis* σ ; Krummenbach So.1960. State of conservation: one I-L missing, the other separate, together with gnathosoma and both palps laterally under separate cover.

Material examined: CSM, Germany, Black Forest, Seebach, hyp. 1400 m, 26.5.61, 1 σ

Description:

General features

dorsal integument: striated; muscle attachments: smooth
coxal field: slender; Cx-1 with convexly protruding mediocaudal margin, apodemes of Cx-2 directed laterally
I-L: I-L-5 distally considerably thickened, S-1/2 homoiomorph, slender and blunt, narrow setal interspace, I-L-6 weakly curved
excretory pore: smooth; Vgl-1: fused with Vgl-2
palp: weak sexual dimorphism, ventral margin of P-2 and P-3 straight, distally not protruding, P-4 1 : 1 : 1, sword seta between ventral hairs, approached to proximoventral hair

Males

Lectotype, in parentheses original description
genital field: trapeziform, with nearly straight, converging lateral margins on the level of Ac-2/3, anterior margin equally convex or nearly straight, posterior margin weakly indented; genital setae: 46
palp: P-4 maximum H near the proximal hair insertion projecting in an obtuse angle, distally weakly concave
idiosoma L/W 500/370; glandularia 45
coxal field L 250; Cx-3 W 280; Cx-1 + 2 mL 94, IL 180, W 210
I-L 5 dL 120, vL 95, dL/vL 1.26, HA-HC –, dl/HB –

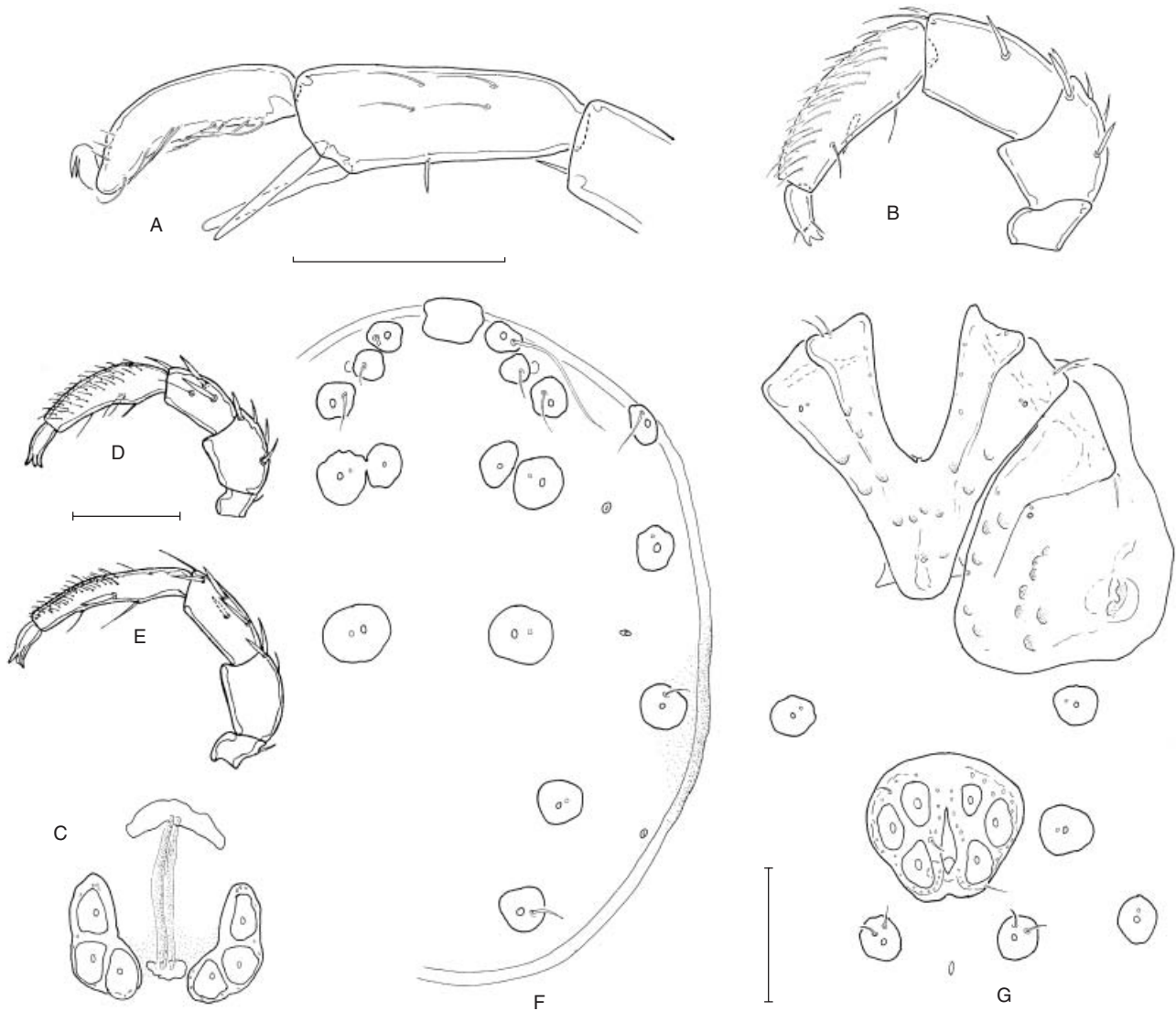


Figure 72. *Atractides trapeziformis*. A–C, paratype ♀ D, E, from Schwoerbel (1961d); F, G, paratype ♂. A, ♀ I-L-5 and -6; B, ♀ palp, lateral view; C, ♀ genital field; D, ♂ palp, lateral view; E, ♀ palp, medial view; F, ♂ partial dorsal view; G, ♂ partial ventral view. Scale bars = 100 µm.

S-1 L 70, L/W –, S-2 L 64, L/W –, interspace 6, L S-1/2 1.9
 I-L-6 L 100, HA-HC –, dL/HB –, L I-L-5/6 1.20
 genital field L/W 105/110, Ac-1–3 L 25, 28, 33
 gnathosoma vL 96; chelicera L 170, L/H –, bS/claw 2.40

palp	P-1	P-2	P-3	P-4	P-5
L/W	(21/16)	61/42	64/29	93/16	29/10)
(ratio)	(1.31)	1.45	2.21	5.81	2.90)
rel.L	(08)	23	24	35	11)
total L:	P-2/4 (0.66)				
(268)					

All glandularia on extended platelets, occasionally Dgl-4 and postoc fused, a distinct anterior frontal plate present. No measurements of mouthparts and appendages possible with the mounted specimens due to crushing. The height measurements of palp seg-

ments in the table above (from the original description) obviously taken at the distal end of segments and therefore not comparable with the standard in this paper.

Females

Paralectotype
 genital field: Ac in an obtuse triangle
 palp: slender, maximum H near proximoventral hair, put segment here less protruding than in males
 idiosoma L/W 560/400; glandularia 40
 coxal field L 248; Cx-3 W 300; Cx-1 + 2 mL 98, IL 185, W 225
 I-L-5 dL 137, vL 105, dL/vL 1.30, HA-HC –, dL/HB –
 S-1 L 77, L/W –, S-2 L 57, L/W –, interspace 12, L S-1/2 1.34
 I-L-6 L 105, HA-HC –, dL/HB –; L I-L-5/6 1.30
 genital field L/W 148/140, Ac-1–3 L 34, 30, 34
 gnathosoma –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	(26/26)	58/45	74/29	96/16	29/10)
(ratio)	(1.00)	1.29	2.55	6.00	2.90)
rel.L	(09)	20	26	34	10)
total L:	P-2/4 (0.60)				
(283)					

As in males, H-values do not meet the standards of this paper, while the L-values agree with new measurements. L/H ratios are much higher than in other species because H was probably measured at the distal edge of segments. Due to the destruction of mouthparts, no control is possible.

Discussion: As stated by Schwoerbel (1961b) in the first description, the male of *A. trapeziformis* is unique among the European species in the particular shape of the genital field (after which it was named). It differs from most other species with a smooth excretory pore and fused Vgl-1 + 2 in enlarged glandularia (diameter in species of the *A. spinipes-oblongus* group < 30 µm). The only species combining an identical arrangement of the postgenital area and extended glandularia, *A. glandulosus* and *A. walteri* (cited by Schwoerbel sub nom. *A. coriaceus*) differ from *A. trapeziformis* in having larger acetabula (diameter >50 µm in ♂, >40 µm in ♀) and a relatively short I-L-6 (L ratio I-L-5/6 > 1.30 in ♂, >1.50 in ♀). Furthermore, *A. walteri* differs in the unique, papillate integument, and *A. glandulosus* in the much larger dimensions (e.g. ♂ genital field 117/139, I-L-5 170, ♀ I-L-5 233, palp total L 378 µm).

Habitat: Hyporheobiont.

Distribution: southern Germany, Black Forest, known only from the collecting sites provided in the original description (9).

ATRACTIDES HYPORHEICUS SCHWOERBEL, 1961

nom. nud. Schwoerbel, 1961a, descr. Schwoerbel, 1961b

Syn. to *A. phreaticus* (Motaş & Tanasachi, 1948): syn. nov.

Type series: Holotype lost, no specimen from the *locus typicus* in coll. Schwoerbel. *Locus typicus:* Kleine Wiese unterhalb Tegernau im südlichen Schwarzwald 1 ♂.

Material examined: SCHW *Atractides hyporheicus* TYPE ♂; Krummenbach hyp. Grundw., 1960 [type designation incorrect]; *Atractides hyporheicus* ♂ Steina, Okt.61.

Discussion: In the first description, Schwoerbel (1961b) compared it with *A. latipalpis*, a species similar in having an enlarged P-4, but different in shape and setation of both palp and I-L-5 and -6. Regarding the morphology of the posterior margin of Cx-1 + 2 (mediocaudal margin of Cx-1 extremely reduced due to the apodemes of Cx-2 nearly touching medially) and of

I-L-5 and -6 (with slender, homoiomorphic S-1 and -2 and very short and stout I-L-6) *A. hyporheicus* agrees with *A. phreaticus*, a species so far known only from females. All differences to *A. phreaticus* can be considered the product of sexual dimorphism: generally smaller measurements of idiosoma and appendages; more extended sclerotization of muscle attachments and presence of an additional, unpaired posterodorsal plate; narrower setal interspace; P-4 inflated, with strongly convex dorsal margin and enlarged in dorsal view. While males and females have not yet been found together at the same collecting site, in view of these agreements *A. hyporheicus* is here considered a synonym of *A. phreaticus*.

ATRACTIDES PILOSUS SCHWOERBEL, 1961

Syn. to *A. tener* Thor, 1899: syn. nov.

Type series: Holotype ♀ CSM, Germany, Black Forest *ATRACTIDES pilosus* ♀ TYPUS; Gauchach So, 1960. *Locus typicus:* im hyporheischen Grundwasser der Gauchach, etwa 100 m vor Einmündung in die Wutach [without date]. State of conservation: many appendages damaged by crushing, chelicerae missing; both I-L, right III-/IV-L, gnathosoma and both palps separate laterally under separate cover, desiccated and crushed.

Discussion: Schwoerbel (1961b) considered *A. pilosus* a species bound to subsurface waters and compared it with *A. subterraneus*, a species with I-L-5 and -6 similar in shape, but differing in having much smaller dimensions and slender genital plates with acetabula arranged in a weakly curved line. The specimen is obviously a juvenile (very weak sclerotization, absence of secondary sclerite, nearly invisible integument striation). Also the weak pigmentation of the lateral eyes and the particular shape of the P-2 could be explained by the juvenile age of the specimen. In fact, notwithstanding the damage due to crushing, the fact that the ventral margins of left and right P-2 were differently shaped can still be seen, and thus the unusual, axe-shaped extension of P-2 in Schwoerbel's figure 6b is best explained as an individual aberration. Apart from some differences explainable by juvenility (smaller dimensions, segments of some appendages thickened due to weak sclerotization) the holotype of *A. pilosus* agrees with females of *A. tener*: I-L-5 and -6 slightly modified, with S-1 and -2 homoiomorphic and slender, S-2 pointed; I-L-6 weakly curved, basally rather thick, narrowed in the centre, inflated on the level of the claw furrow; P-4 1 : 1 : 1, sword seta between ventral hairs, nearer the distoventral one. The sclerotization of the excretory pore is weakly developed, but a distinct oval area surrounding the pore slit marks the future sclerite ring. The hairs and fine ventral setae of IV-L-5/6 (after which it is named) are found in all controlled specimens of *A. tener* from southern Germany. In this scenario, the particular slow movements and bright white idiosomal colouration of the holotype of

A. pilosus described by Schwoerbel should be considered as resulting from immaturity rather than adaptation to subterranean life; *A. pilosus* is thus a synonym of *A. tener*.

ATRACTIDES MICROCAVATICUS SCHWOERBEL, 1961

Syn. to *A. nodipalpis* Thor, 1899: syn. nov.

Type series: Holotype ♀ CSM Donauversickerung 11.IX.1960; *ATRACTIDES microcavaticus* TYPUS. State of conservation: idiosoma intact, right IV-L missing, both I-L, gnathosoma, palps, chelicerae under separate cover, crushed and desiccated.

Material examined: CSM, Beera hyporheisch 11.IX.1960 1 ♂, 1 ♀.

Discussion: As mentioned by Schwoerbel (1961b) the female type specimen of *A. microcavaticus* has most character states in common with *A. nodipalpis*. He considered the following as diagnostic for taxonomic separation: genital plates longer than gonopore, I-L-6 relatively short and thus I-L-5/6 ratio higher, narrower setal interspace. Instead, both the I-L-5/6 ratio (1.45) and setal interspace (36 µm) are within the range of variability, and even close to the mean values, established for a population of *A. nodipalpis* from southern Germany. The gonopore of the specimen appears indeed to be rather short, but the relative length of the female gonopore is a variable character not suitable for species discrimination in *Atractides*, and *A. microcavaticus* should be considered a junior synonym of *A. nodipalpis*. The second specimen in CSM labelled as *A. microcavaticus*, but not mentioned in the literature, is most probably an intersex of *A. nodipalpis*. A definitive taxonomic assessment is impossible due to poor state of conservation.

ATRACTIDES SCHLIENZI SCHWOERBEL, 1961

Syn. to *A. nodipalpis* Thor, 1899: syn. nov.

Type series: Holotype ♀ CSM Steina 21.XII.60; *Atr. schlienzi* n. sp. ♀ TYPE ♀. State of conservation: gnathosoma *in situ*, damaged; right I-II-L, one chelicera, both palps together under separate cover, crushed and desiccated.

Material examined: CSM *Atractides schlienzi* ♂ Steina Okt., 1961 1 ♂ (probably not conspecific).

Discussion: Schwoerbel (1961b) considered the combination of the rather long and curved segment I-L-6 (L ratio I-L-5/6 238/158 = 1.51) and the relatively narrow setal interspace (25 µm) as a diagnostic feature separating *A. schlienzi* from all other *Atractides* species. Instead, both values lie within the range of variability of, and all available measurements and morphological features agree with, *A. nodipalpis*. The particular curvature of S-1 is due to damage, as is documented by a kink in the sclerotization of the seta. No information has ever been published about the male of *A. schlienzi*. A male in CSM so labelled is badly damaged and of problematic taxonomic status. In view

of its lined integument, it cannot be conspecific with *A. schlienzi*, but possibly represents *A. remotus*. *A. schlienzi* is thus a junior synonym of *A. nodipalpis*.

ATRACTIDES LAETUS LUNDBLAD, 1962

Syn. to *A. samsoni* (Sokolow, 1936): syn. nov.

Type series: Holotype ♀, SMNH 5325. Typ.; *Atractides laetus* Ldbl. ♀ Blek. Kristianopel Bäck vid Brämsebro 14.6.1934 Leg. O. Lundblad. State of conservation: dorsum of idiosoma lost, gnathosoma *in situ*, both palps and I-L separate, laterally.

Discussion: Lundblad's original description of *A. laetus* was based on two female specimens, and he restricted the discussion of diagnostic features to a comparison with *A. tener*. Biesiadka (1978) provided a description of the male and additional morphological details of females, but again compared the species only with *A. tener*. Both authors were unaware of the similarity to *A. samsoni* from Russia. In view of the characteristic combination of a striated integument, smooth excretory pore, Vgl-1 + 2 not fused, slightly modified I-L with homoiomorphic S-1 and -2, and a palp with ventrodiscal protrusion in both sexes, there is much evidence that the population described by Biesiadka is conspecific with the types of *A. laetus* from Sweden. On the other hand, a comparison of measurements including a detailed analysis of Biesiadka's figures reveals only minor differences in absolute values with the type of *A. samsoni*, but a nearly perfect agreement in all proportions. Differences which concern the most important dimensions in the type of *A. samsoni* (e.g. L I-L-5/6 170/145 µm, S-1 and -2 longer with wider interspace, genital field larger) are possibly the effect of different measurement standards. The extension of the male genital field in *A. samsoni* has been increased by crushing and by the presence of an additional supranumerary acetabulum. A further slight difference found in the position of the sword seta on P-4 (halfway between the ventral hairs in the types of *A. laetus* and *A. samsoni*, but nearer the distoventral hair in the Polish population) could at best indicate a genetic separation of the Polish specimens. However, the insertion of this seta was found to be variable to a certain extent also in other species. There is thus no reason to doubt the synonymy of *A. laetus* with *A. samsoni*.

ATRACTIDES NEUMANI (LUNDBLAD, 1962)

(FIG. 73A–F)

Atractides nodipalpis neumani Lundblad, 1962b

Type series: Holotype ♂, SMNH 5318 Typ., *Atractides neumani* Ldbl. ♂ Hälsingland: Färila. Svartån vid Kilbo 15.6.1923 leg. O. Lundblad. State of conservation: perfect, gnathosoma *in situ*, both palps and both I-L separate, laterally, genital skeleton separate, posteriorly. Paratype ♀, SMNH 5319. Allotyp, label and state as holotype.

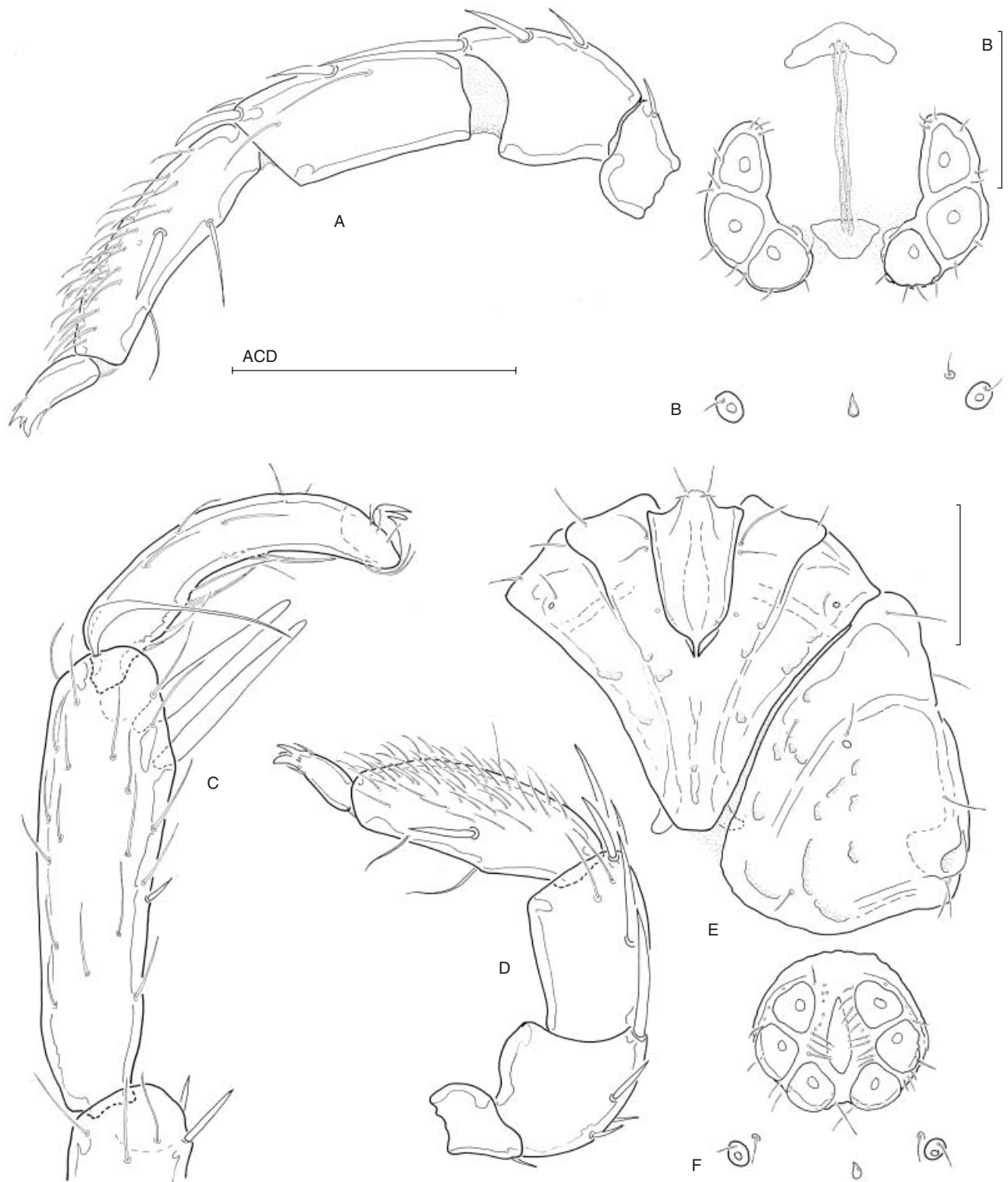


Figure 73. *Atractides neumani*. A, B, paratype ♀ SMNH 5319, C–F, holotype ♂ SMNH 5318. A, ♀ palp, medial view; B, ♀ genital and postgenital field; C, ♂ I-L-5 and -6; D, ♂ palp, medial view; E, ♂ coxal field; F, ♂ genital and postgenital field. Scale bars = 100 µm.

Description:**General features**

dorsal integument: striated; muscle attachments: smooth
 coxal field: slender, with rather long median suture Cx-1 + 2
 I-L: I-L-5 robust, with homoiomorphic S-1 and -2
 excretory pore: smooth; Vgl-1: not fused to Vgl-2
 palp: weak sexual dimorphism

Male**Holotype**

genital field: anterior margin convex, posterior margin weakly indented, Ac triangular; genital setae: 44, in a dense row flanking the gonopore, but in scattered arrangement at the lateral and posterior margins
 palp: ventral margin P-2 convex, but not forming a ventrodistal projection, P-3 straight, P-4 2 : 2 : 1, slightly elevated near insertion of proximoventral hair; sword seta near proximoventral hair
 idiosoma L/W 500/405; glandularia 22
 coxal field L 310; Cx-3 W 338; Cx-1 + 2 mL 136, IL 210, W 265
 I-L-5 dL 159, vL 116, dL/vL 1.37, HA-HC 40, 47, 54, dL/HB 3.38
 S-1 L 79, L/W 11.3, S-2 L 70, L/W 7.8, interspace 13, L S-1/2 1.13
 I-L-6 L 121, HA-HC 24, 19, 17, dL/HB 6.37; L I-L-5/6 1.31
 genital field L/W 112/121, Ac-1-3 L 32, 37, 32
 gnathosoma vL 108; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	28/25	63/46	67/40	92/35	32/12
(ratio)	1.12	1.37	1.68	2.63	2.67
rel.L	10	22	24	33	11
total L:	P-2/4 0.68				
282					

Tips of S-1 and -2 rounded, S-2 distinctly thicker than S-1; anterior margin of genital field formed by secondary sclerotization, line of medial genital setae ending near the anterior edge of Ac-3.

Female**Paratype**

genital field: Ac in an obtuse angle, Ac-1/2 subtriangular, Ac-3 with rounded mediocaudal margin
 palp: P-2 ventral margin slightly convex, P-3 straight, P-4 1 : 2 : 1, sword seta between ventral hairs, nearer to the proximal one
 idiosoma L/W 680/530; glandularia 22
 coxal field L 324; Cx-3 W 410; Cx-1 + 2 mL 126, IL 220, W 302
 I-L-5 dL 189, vL 130, dL/vL 1.45, HA-HC 49, 54, 65, dL/HB 3.50
 S-1 L 116, L/W 14.5, S-2 L 85, L/W 7.1, interspace 18, L S-1/2 1.36
 I-L-6 L 139, HA-HC 24, 19, 20, dL/HB 7.32; L I-L-5/6 1.36
 genital field L/W 166/140, Ac-1-3 L 33, 38, 38
 gnathosoma vL 126; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	30/28	71/47	85/39	100/28	35/12
(ratio)	1.07	1.51	2.18	3.57	2.92
rel.L	09	22	27	31	11
total L:	P-2/4 0.71				
321					

Discussion: *A. neumani* has not been recorded since the first description, and was ignored by K. O. Viets (1978) probably because it was published as a 'variety' after the new edition of the International Code of Zoological Nomenclature in 1961. There is no reason to support the placement of this taxon as a subspecies of *A. nodipalpis*. Apart from the absence of a distinct ventrodistal projection of the male P-2 and the convex anterior margin of the male genital field, both sexes differ from *A. nodipalpis* in smaller I-L and palp seg-

ments. Both sexes of *A. neumani* differ from *A. valencianus*, the only European species discussed in the original description, as follows: integument not lineated, short medial suture Cx-1 + 2, and smaller Ac. *A. neumani* is similar to *A. clavipalpis* and *A. samsoni* due to the following features: homoiomorphic S-1 and -2, with small interspace, strongly curved but stocky I-L-6, Ac not very enlarged, postgenital field with smooth excretory pore and unfused Vgl-1/2, and a palp with weak sexual dimorphism. In both sexes of *A. clavipalpis* the setal interspace is wider than in *A. neumani*. Furthermore, males differ in the indented anterior margin of the genital field and the clavate shape of P-4, and females in the arrangement of the Ac in a weakly curved line. Both sexes of *A. samsoni* differ from *A. neumani* in the shorter median suture of Cx-1 and -2, more slender S-1 and -2, I-L-6 only weakly curved and more robust, and a slighty, but distinctly extending ventrodistal projection of P-2.

Lundblad compared *A. neumani* also with *A. issajewi* (Sokolow, 1928) from Central Asia, a species known only from males, and similar in having a slightly protruding ventral margin of P-2 and homoiomorphic S-1 and -2. As stated by Lundblad, *A. issajewi* is distinguished by the higher number of setae on the lateral margin of the genital plate. *A. neumani* is characterized by a clear-cut combination of morphological features but, especially in females, this species might be confused with *A. nodipalpis* if no measurements were taken.

Distribution: Sweden. Known only from the *locus typicus* (22).

***ATRACTIDES GOMERAE* LUNDBLAD, 1962**
(FIG. 74A-D)

Type series: Holotype ♀ SMNH 6007. Typ.; *Atractides gomerae* Ldb. ♀. Kasariassarna. Gomera. El Cedro. Bäck. 20.4.1957. Leg. O. Lundblad. State of conservation: perfect, gnathosoma *in situ*, both I-L, both palps separate, laterally.

Description:**General features****Male unknown**

dorsal integument: lineated; muscle attachments: smooth
 coxal field: posterior margin Cx-1 broadly convex, apodemes of Cx-2 strong
 I-L: I-L-5 inflated, with interspaced, strongly heteromorphic S-1 and -2 with blunt tips, S-1 curved, S-2 enlarged; I-L-6 slender, curved
 excretory pore: smooth; Vgl-1: not fused with Vgl-2
 palp: ventral margin P-2 straight, distally forming a right angle; P-3 straight, in the distal half with a fine longitudinal lamella; P-4 1 : 1 : 1, sword seta near proximoventral hair

Female**Holotype**

genital field: pregen strong, curved, Ac in a weakly curved line, Ac-1 longish, interspaced from the roundish Ac-2/3

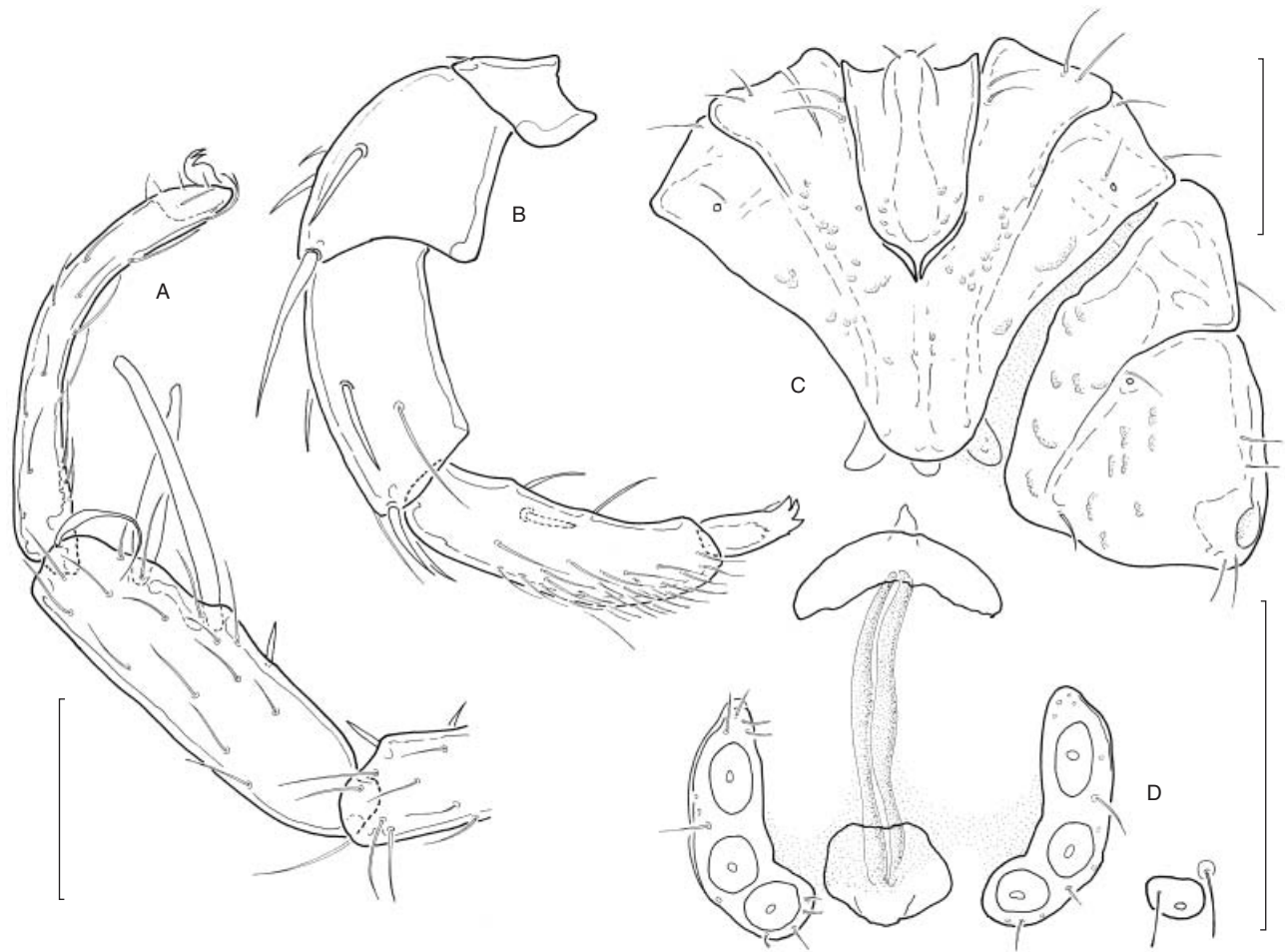


Figure 74. *Atractides gomeræ*, holotype ♀. A, I-L-5 and -6; B, palp, lateral view; C, coxal field; D, genital field (inset: Vgl-1/2). Scale bars = 100 µm.

idiosoma L/W 560/430; glandularia 22
 coxal field L 315; Cx-3 W 374; Cx-1 + 2 mL 117, IL 220, W 302
 I-L-5 dL 202, vL 11, dL/vL 1.80, HA-HC 58, 65, 100, dL/HB 3.11
 S-1 L 141, L/W 14.1, S-2 L 100, L/W 6.7, interspace 38, L S-1/2 1.41
 I-L-6 L 204, HA-HC 26, 20, 23, dL/HB 10.2; L I-L-5/6 0.99
 genital field L/W 117/126, Ac-1-3 L 21, 18, 17
 gnathosoma vL 317; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	31/27	74/54	85/38	96/27	31/11
(ratio)	1.15	1.37	2.24	3.56	2.82
rel.L	10	23	27	30	10
total L:	P-2/4 0.77				
	339				

The genital field is in an oblique position, with the postgen extremely enlarged.

Discussion: There are many species with a lineated cuticula, S-1 and -2 of I-L-5 long and quite far apart, and a slender I-L-6. Of these, several are easily distinguished from *A. gomeræ* by the relatively short I-L-6 (ratio dL I-L-5/6 > 1.2: *A. arcuatus*, *fonticolus*, *pennatus*, *inflatus*, *valencianus*, *inflatpalpis*, *remo-*

tus), and most of them also differ in having larger Ac. *A. lunipes*, which is similar but with the I-L-5/6 proportion not as high (1.17) differs from *A. gomeræ* in having larger Ac, Vgl-1 fused to Vgl-2, and a more slender I-L-5 (L/HB 4.33). In view of the above-mentioned character combination, Lundblad (1962a) considered *A. gomeræ* to be closely related to *A. insulanus* from Madeira and the continental *A. distans*, and proposed as diagnostic features of *A. gomeræ* S-2 with a blunt rather than pointed tip, and relatively long I-L-6. *A. insulanus* also differs from *A. gomeræ* in having a sclerotized excretory pore, larger palp with stouter P-3 and -4, and thicker I-L-5 with wider setal interspace. *A. distans* differs from *A. gomeræ* in having a nonlineated integument, smaller coxal measurements, and larger acetabula.

A particular feature of *A. gomeræ* is the fine longitudinal lamella on the ventral margin of P-3. A similar character is also found in *A. maderensis*, *A. insulanus*, and *A. macaronensis*, three endemics of the island of

Madeira, and in *A. anellatus*, a species distributed both in Iberia and the Maghreb. Notwithstanding several clearly distinctive features, these species are possibly representatives of a monophyletic *maderensis* species group that has radiated in the extreme south-western Palaearctic and on islands in the eastern Atlantic.

Habitat: Rhithrobiont.

Distribution: La Gomera (Canary Islands, Spain), known only from the *locus typicus* (1).

ATTRACTIDES TENERIFENSIS LUNDBLAD, 1962
(FIG. 75A–F)

Type series: Holotype ♂, SMNH 6008. Typ.: *Atractides tenerifensis* Ldbl. ♂. Tenerife. Cumbre de Ergo. Källa. 7.4.1957. Leg. O. Lundblad. State of conservation: left coxae damaged, apart from right II/III–L all other legs, as well as palps separate, laterally; genital skeleton absent. Paratype: ♀ SMNH 6009. Allotyp, label and state as holotype, but left III–L still *in situ*.

Description:

General features

dorsal integument: striated; muscle attachments: sclerotized, in a pattern similar to *A. clavipes*, but with less extended sclerites
coxal field: rather slender, posterior margin Cx-1 parabolic, medial margin Cx-3 + 4 forming a rounded acute angle

I–L: little modified, with I–L-5/6 nearly equal in L, S-1 and -2 short, with blunt tips, closely together, whip seta weakly developed, I–L-6 straight, thick excretory pore: smooth; Vgl-1: sexual dimorphism, fused to Vgl-2 in males, but separate in females

palp: without sexual dimorphism, P-2/3 robust, in both segments ventral margin straight and forming a pointed distal angle, P-4 rather slender, ventral margin 2 : 1 : 2, elevated and with a denticle near proximal hair, a simple denticle near distal hair, sword seta robust and curved, near proximoventral hair, P-5 thick, with a fine denticle, one dorsal, and paired ventral claws

Male

Holotype

genital field: due to extended secondary sclerotization anterior margin convex and maximum width on the level of Ac-1, posterior margin straight, Ac small; genital setae: 52

palp: ventrodistal angle of P-2 slightly more pronounced, P-4 thicker than in females

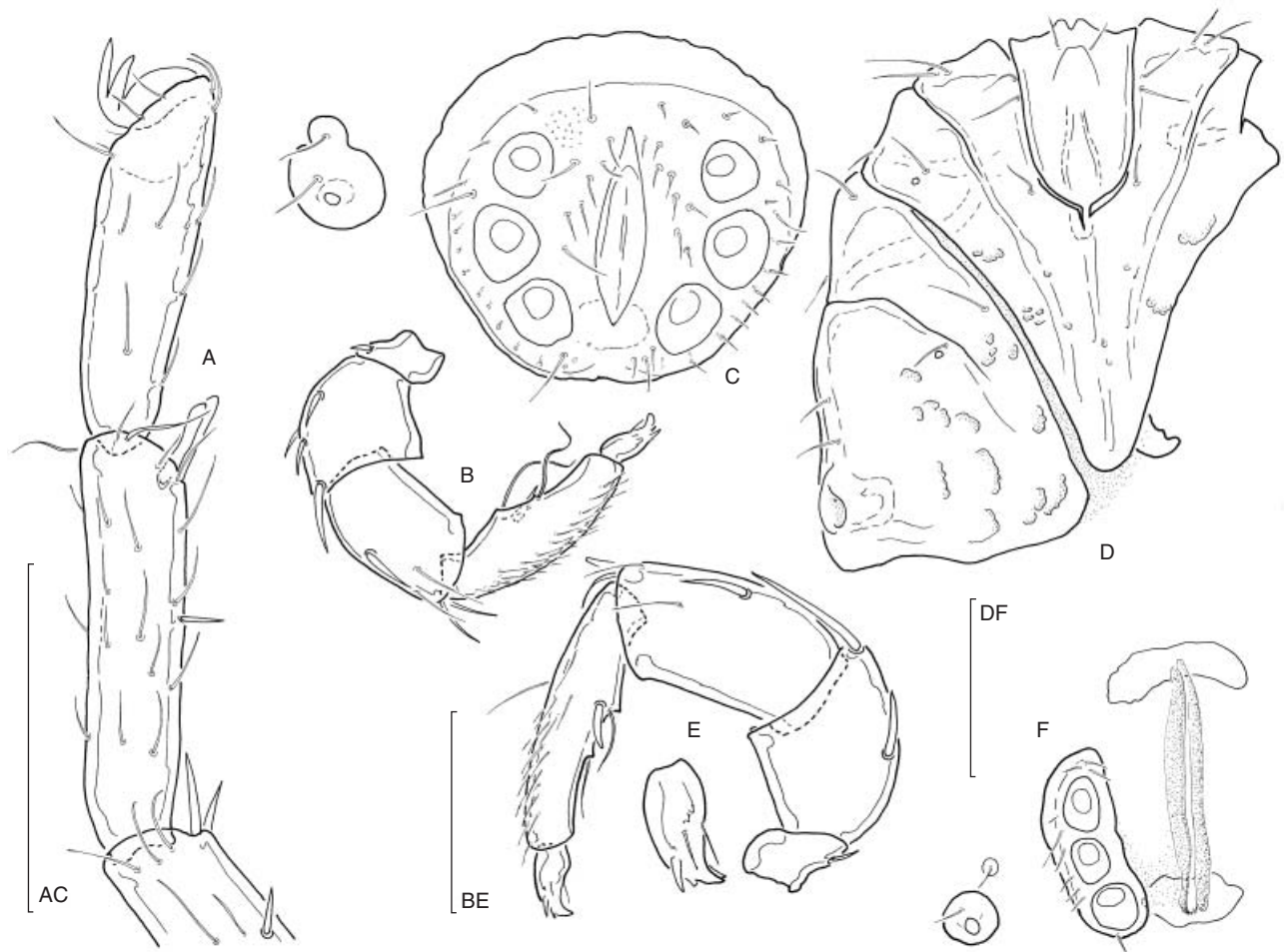


Figure 75. *Atractides tenerifensis*. A–D, holotype ♂ SMNH 6008; E, F, paratype ♀. A, ♂ I–L-5 and -6; B, ♂ palp, lateral view; C, ♂ genital field (inlet: Vgl-1 + 2); D, ♂ coxal field, E, ♀ palp, medial view (inlet: P-5); F, ♀ genital field, partial view (inlet: Vgl-1/2). Scale bars = 100 µm.

idiosoma L/W 560/360; glandularia 40
 coxal field L 293; Cx-3 W 315; Cx-1 + 2 mL 148, IL 220, W 252
 I-L-5 dL 130, vL 108, dL/vL 1.20, HA-HC 28, 31, 34, dL/HB 4.19
 S-1 L 31, L/W 7.8, S-2 L 26, L/W 5.2, interspace 0, L S-1/2 1.2
 I-L-6 L 116, HA-HC 25, 30, 30, dL/HB 3.87; L I-L-5/6 1.12
 genital field L/W 103/112, Ac-1-3 L 18, 24, 20
 gnathosoma vL 108; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/25	74/58	81/47	108/34	29/12
(ratio)	1.16	1.28	1.72	3.18	2.42
rel.L	09	23	24	33	12
total L:	P-2/4 0.69				
	321				

Hypodermis thick and strong, leather-like, with fine porosity.

Female

Paratype

genital field: pregen thick, weakly curved, genital plates with a distinct anterolateral border of secondary sclerotization, Ac in a nearly straight line
 palp: ventrodorsal edge of P-2 less prominent, and P-4 more slender than in the male

idiosoma L/W 800/600; glandularia 40
 coxal field L 358; Cx-3 W 430; Cx-1 + 2 mL 153, IL 270, W 324
 I-L-5 dL 168, vL 145, dL/vL 1.16, HA-HC 31, 34, 38, dL/HB 4.94
 S-1 L 33, L/W 6.6, S-2 L 31, L/W 5.2, interspace 0, L S-1/2 1.06
 I-L-6 L 141, HA-HC 28, 32, 35, dL/HB 4.41; L I-L-5/6 1.19
 genital field L/W 162/162, Ac-1-3 L 43, 36, 36
 gnathosoma vL 148; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	34/29	96/69	121/63	138/34	38/16
(ratio)	1.17	1.39	1.92	4.06	2.38
rel.L	08	22	28	32	09
total L:	P-2/4 0.70				
	427				

Integument as described for the male.

Discussion: In his description of *A. tenerifensis*, Lundblad (1962a) did not discuss systematic relations. Its most striking feature, the slightly modified I-L-5 and -6 with short, blunt and homoiomorphic S-1 and -2 placed close together, is found in several other European species. Among these, the interstitial-dwelling *A. subterraneus*, *A. cisternarum*, *A. pumilus* and *A. pygmaeus* all differ in having much smaller dimensions and small glandular sclerites. Furthermore, *A. cisternarum* and *A. pumilus* have a sclerotized excretory pore. *A. dentipalpis* (known in the female sex only) differs in the denticulation of P-2 and smaller dimensions of glandularia, coxae, terminal segments of I-L, Ac, and mouthparts. *A. graecus*, a species with similar morphology of I-L, has a stouter anterior coxal plate (with shorter medial suture Cx-1 + 2) and longer, more slender S-1 and -2. With regard to dimensions of idiosoma and appendages, but also in the rarely found sexual dimorphism in the postgenital area (Vgl-1 + 2 fused in males, but separate in females) *A. tenerifensis* is similar to *A. clavipes*. The latter species can be distinguished from *A. tenerifensis* by more extended muscle attachment sclerites,

longer S-1 and -2 (L > 35 µm) a more robust I-L-5 (L/HB < 4.0) and a relatively long I-L-6 (L ratio I-L-5/6 < 1.0).

Habitat: Crenobiont.

Distribution: Tenerife (Canary Islands, Spain), known only from the *locus typicus* (1).

ATRACTIDES PETKOVSKII SCHWOERBEL, 1963

Syn. to *A. fonticolus* (K. Viets, 1920): syn. nov.

Type series: Holotype ♀, CSM n. sp., without locality or name label, in a drawer labelled Macedonien. State of conservation: only left II-L and right II/III-L *in situ* and entire, all other legs damaged or missing, coxal field with several fracture lines, both I-L and one further leg, and both palps under a separate cover, crushed and desiccated. *Locus typicus:* Der genaue Fundort ist unbekannt: Mazedonien.

Discussion: The following features can be extracted from the original description and observations on the holotype of *A. petkovskii*: (all measurements in µm) idiosoma L/W 970/860, integument lineated, dorsal glandularia diameter 23, but Vgl-4 35, coxal field L 485, Cx-1 + 2 mL 105, IL 295, W 370; L ratio I-L-5/6 224/124 (ratio 1.81) S-1/2 L 80/60, L/W 10.0/3.8, interspace 12; genital field L/W 185/235, genital plate L/W 136/56, Ac diameter 45, 47, 50; P-1-5 L/H 40/40, 88/72, 92/52, 112/40, 36/14, P-2 with a slightly protruding ventrodorsal edge, ventral margin P-4 3 : 2 : 2, sword seta near distoventral seta. Schwoerbel compared *A. petkovskii*, probably due to the proportions of I-L-5 and -6, with *A. angustiporus* from Spain, and with *A. rivalis* from Austria, a species with completely different I-L morphology. The little known *A. angustiporus* differs in the unlineated integument, a relatively long I-L-6 (L I-L-5/6 232/144 µm, ratio 1.61) a distinctly longer S-2 (103 µm) and wider setal interspace (22 µm).

A. petkovskii agrees with *A. fonticolus* in the shape and dimensions of I-L-5 and -6, strongly elongated I-L-5 bearing characteristically heteromorphic S-1 and -2, as well as integument and palp morphology. The only observed difference – slightly larger acetabula (in *A. fonticolus* diameter < 40 µm) – concerns a character with a generally wide range of variability (see Discussion under *A. parviporus*). As far as this species is concerned, no reason can be found to argue against its synonymization with *A. fonticolus*.

ATRACTIDES GALLICUS (ANGELIER ET AL., 1963)

(FIG. 76A–F)

Atractides fonticolus gallicus Angelier et al., 1963

Type series: No access, probably in coll. Angelier, Toulouse. As in the original description no holotype designation is provided; all published locality records are *loci typici* (12-month investigation, providing neither datum, nor specimen number specification): France, Massif Central, ruisseau Céret; Stat. 2: En amont de la Route nationale 88; Stat. 5: Entre les barrages des Farguettes

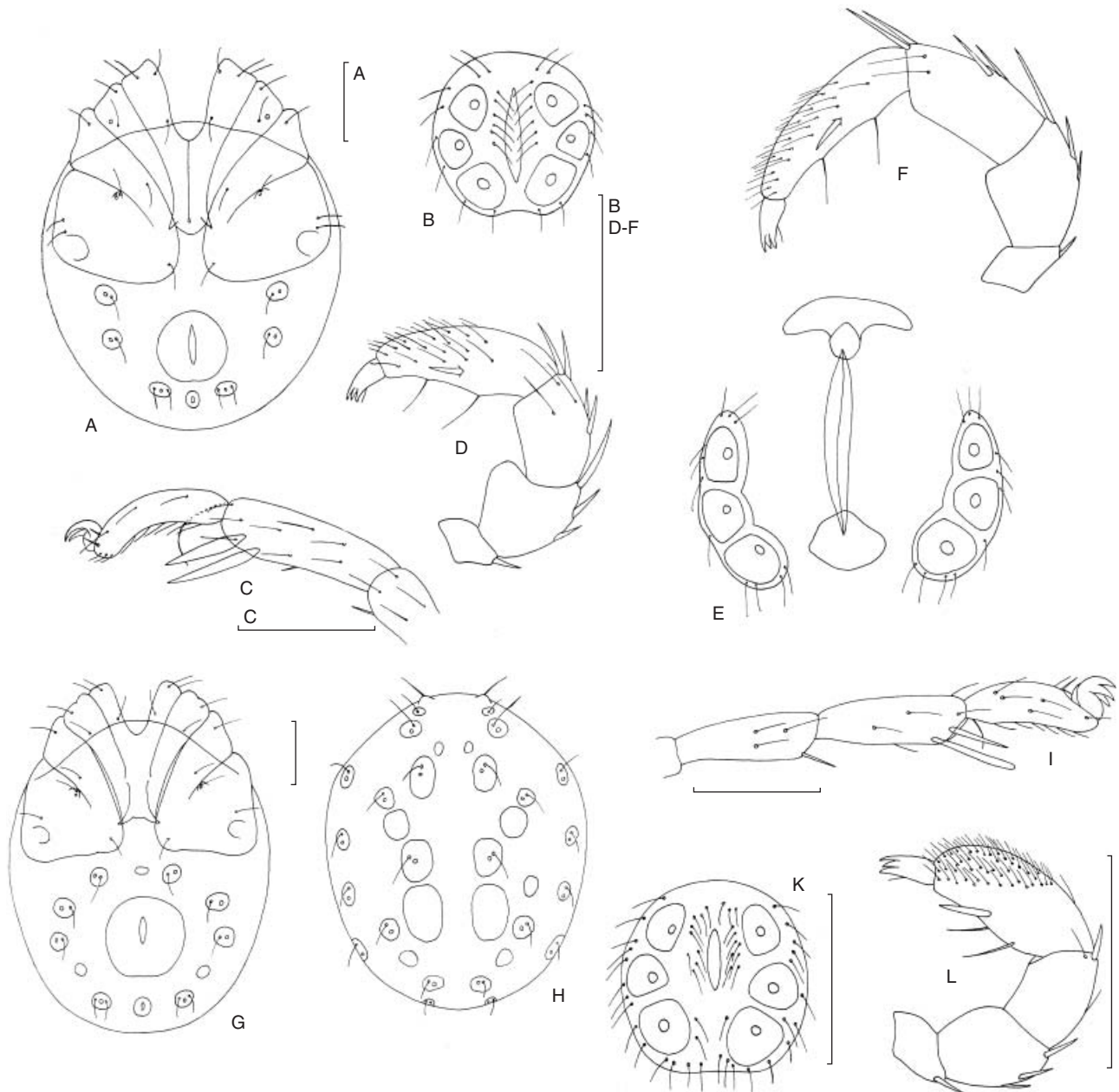


Figure 76. (from Angelier *et al.*, 1963) A–F, *Atractides gallicus*, A–D, ♂; E, F, ♀. A, ♂ ventral view; B, ♂ genital field; C, ♂ I-L-5 and -6; D, ♂ palp, medial view; E, ♀ genital field; F, ♀ palp, medial view. G–L, *Atractides vandeli*, ♂. G, ventral view; H, dorsal view, I I-L-5 and -6, K, genital field, L, palp, medial view. Scale bars = 100 µm.

et de la Roucarié; Stat. 6: En amont du barrage de la Roucarié, près du pont d'Almayac; Stat. 8: Près du pont de la route de Trévien.

Description:

General features

dorsal integument: ?; muscle attachments: smooth
 coxal field: medioposterior margin Cx-1 + 2 equally rounded, apodemes Cx-2
 little projecting, forming an acute angle
 I-L: I-L-5 setae S-1 and -2 rather large, pointed, little interspaced
 excretory pore: sclerotized; Vgl-1: fused with Vgl-2
 palp: sexual dimorphism

Males

Original description, partly calculated from figures
 genital field: anterior margin equally convex, posterior margin with shallow
 indentation, nearly straight; genital setae: 28
 palp: ventral margin P-2 with a well-developed, smooth distal projection; P-3
 straight, P-4 1 : 1 : 1, slightly protruding near proximoventral hair, sword
 seta halfway between ventral hairs
 idiosoma L/W 495/410; glandularia –
 coxal field L 295; Cx-3 W 310; Cx-1 + 2 mL 123, IL 200, W 245
 I-L-5 dL 130, vL –, dL/vL –, HA-HC –, dL/HB –
 S-1/2 –
 I-L-6 L 104, HA-HC –, dL/HB –; L I-L-5/6 1.25

genital field L/W 87/84, Ac-1-3 L 24, 21, 33
gnathosoma vL 104; chelicera L 120, L/H -, bS/claw 1.55

palp	P-1	P-2	P-3	P-4	P-5
L/W	25/33	59/49	62/37	95/33	29/-
(ratio)	0.76	1.20	1.68	2.88	-
rel.L	09	22	23	35	11
total L:	P-2/4 0.62				
	270				

The authors' measurement of I-L-5 L (165 µm) is mistaken, as can be seen from an examination of their figure 11. There is a rather schematic distribution of genital setae in their sketchy figure 9; the number probably exceeds 28.

Females

Original description, partly calculated from figures

genital field: Ac in a weakly curved line, Ac-1-3 increasing in diameter
palp: more slender than in male, P-2 ventral margin distally forming a right angle

idiosoma L/W 715/580; glandularia -
coxal field L 315; Cx-3 W -, Cx-1 + 2 -
I-L-5 dL 183, vL -, dL/vL, HA-HC -, dL/HB -
S-1/2 -
I-L-6 L 154, HA-HC -, dL/HB -, L I-L-5/6 1.19
genital field L/W 172/183, Ac-1-3 L 27, 30, 33
gnathosoma vL 128; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	32/30	71/50	85/40	108/27	29/-
(ratio)	1.07	1.42	2.13	4.00	-
rel.L	10	22	26	33	09
total L:	P-2/4 0.66				
	325				

The authors' figure 14 indicates I-L-5/6 180/135 µm, ratio 1.32.

Discussion: The authors suggested considering *A. fonticolus* as a separate species, and ranked the new taxon as a subspecies of the latter. However, they did not discuss any diagnostic differences between *A. fonticolus s.s.* and *A. fonticolus gallicus*. The published data provide sufficient evidence to conclude it is taxonomically distant from *A. fonticolus*. The latter has larger dimensions (e.g. male genital diameter > 120 µm) a relatively short I-L-6 (L ratio I-L-5/6 about 1.6), an unsclerotized excretory pore, more slender P-2/4, but a stronger P-3, and the sword seta on P-4 is placed near the distoventral hair.

The available information, which contains several contradictions between text and figures, provides a vague basis only for consideration on the state of this taxon. Further measurements of I-L-5 and -6 and S-1 and -2, as well as information on integument structure, and eventual sexual dimorphism in the postgenital area are necessary before a taxonomic assessment is possible. However, the combination of unsclerotized dorsal muscle attachments, relatively long and curved I-L-6, S-1 and -2 not far apart, male genital field nearly round and with few setae (< 30?), sclerotized excretory pore, Vgl-1 + 2 fused (at least in males) sex-

ual dimorphism in the ventral margin of P-2, allow a preliminary diagnosis separating *A. gallicus* from all *Atractides* species known at the time of its description.

Habitat: Rhithrobiont.

Distribution: France, known only from the type localities at River Céret (Massif Central) (8).

ATRACTIDES VANDELI ANGELIER ET AL., 1963 (FIG. 76G-L)

Type series: no access, probably in coll. Angelier, Toulouse; described from a single male. *Locus typicus:* France, Massif Central, from a 12-month investigation, no datum; Ruisseau du Céret, Stat. 2, en amont du pont de la Route nationale 88.

Description:

General features

Female unknown

dorsal integument: ?; muscle attachments: sclerotized, postocularia and all dorsalia as separate platelets, not fused with neighbouring glandularia
coxal field: Cx-1 + 2 rather slender, with straight mediocaudal margin, apodemes of Cx-2 directed laterally

I-L: rather stout, slightly modified segments I-L-5/6; S-1 and -2 heteromorphic, interspaced, S-1 distally slightly thickened, with rounded tip, S-2 equally narrowed from the base to the tip, pointed; I-L-6 short, with nearly parallel dorsal and ventral margins

excretory pore: sclerotized; Vgl-1: fused with Vgl-2

palp: sexual dimorphism?

Male

Original description, measurements in parentheses based on Figures

genital field: nearly round, with convex anterior, and straight, not indented posterior margin, Ac-3

distinctly larger than Ac-1/2, gonopore short, restricted to the anterior half of the genital field, its anterior margin on the level of the centre of Ac-1, posterior margin anterior from the posterior edge of Ac-2; genital setae: 50

palp: ventral margin P-2 equally convex, without particular distal extension, ventral margin P-3 slightly concave, P-4 inflated, ventral margin slightly convex proximally, anterior from sword seta slightly concave, 2 : 1 : 2, sword seta anterior from distoventral hair

idiosoma L/W 555/420; (glandularia 30-40)
coxal field L 265; (Cx-3 W 290; Cx-1 + 2 mL 127, IL 200, W 218)

I-L-5 dL 120, vL -, dL/vL -, HA-HC -, (dL/HB 3.1)

S-1 L 70, L/W?, S-2 L 50, L/W?, interspace 15, L S-1/2 1.4

I-L-6 L 105, HA-HC -, 33, -, dL/HB 3.18; L I-L-5/6 1.14

genital field L/W 123/118, Ac-1-3 L 30, 29, 36

gnathosoma vL 110; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	28/28	44/40	43/34	88/38	26/-
(ratio)	1.00	1.10	1.26	2.32	-
rel.L	12	19	19	38	11
total L:	P-2/4 0.50				
	229				

The particular shape of the inflated P-4 is observed occasionally in various species as an individual morphological state (perhaps interpretable as a natural consequence of a particular physiological condition rather than a preparation artefact). As a consequence, the presence or absence of ventral denticles, as well as the relative position of hairs and setae cannot be judged, and the morphology of this segment is not con-

sidered further. The setae of Dgl-1 are elongated rather than flattened.

Discussion: The authors considered *A. vandeli* to be a member of the *loricatus* species group, and discussed the differences in palp morphology to that of *A. loricatus*. *A. vandeli* differs from all the species of this group in the long medial suture line and straight mediocaudal margin of Cx-1 + 2, I-L-5 with heteromorphic S-1 and -2, weakly curved I-L-6, genital field with shortened gonopore and Ac arranged in a weakly curved line, straight ventral margin of P-2, and insertion of the sword seta distal to the distoventral hair. Instead, *A. vandeli* is clearly a representative of the *cisternarum* species group, composed of mainly interstitial dwelling species characterized by the character combination of sclerotized dorsal muscle attachments, robust and slightly modified segments I-L-5 and -6, and, an unmistakable synapomorphy, the strongly shortened male gonopore. Of these species, *A. cisternarum*, *A. denticulatus*, *A. microphthalmus* and *A. prosiliens* differ in the larger coxal field with short medial suture Cx-1 + 2. *A. cisternarum* and *A. denticulatus* differ additionally in having homoiomorphic S-1 and -2, narrower setal interspace, and a denticulated ventral surface of P-2. In *A. microphthalmus* and *A. prosiliens*, S-1 and -2 are slightly further apart, but they differ from *A. vandeli* in having a more elongated and slender I-L-5 and -6. *A. pygmaeus*, *A. pumilus* and *A. phreaticus* agree with *A. vandeli* in the slender coxal field, with a rather narrow mediocaudal margin of Cx-1 + 2. *A. pygmaeus* and *A. pumilus* have homoiomorphic S-1 and -2 less apart, *A. pygmaeus* has unsclerotized posterodorsal muscle attachments and excretory pore, and *A. pumilus* a longer male gonopore, relatively small Ac, and straight ventral margin of P-2 forming a pointed distal extension.

The species most similar to *A. vandeli* is *A. phreaticus*. They agree in shape of coxae, arrangement of Ac, proportions of I-L-5 and -6, and distal position of sword seta on P-4. *A. vandeli* differs from *A. phreaticus* in having longer setae at Dgl-1, smaller dorsal muscle attachment sclerites with complete absence of an unpaired posteriodorsal plate, and stronger heteromorphy of S-1 and -2, with S-2 bearing a pointed tip. For the time being, *A. vandeli* should be accepted as a separate species. However, it could become a junior synonym of *A. phreaticus* as the extent of dorsal sclerotization is probably age-dependent, and the representation of setal morphology in the figures of the original description is not verifiable to the last detail.

Habitat: Hyporreobiont?

Distribution: France, known only from the *locus typicus* in the Massif Central (8).

ATRACTIDES PSAMMOPHILUS SCHWOERBEL, 1965
nov. nom. pro A. longipes Schwoerbel, 1961, *nec* Halbert, 1944; syn. to *A. oblongus* (Walter, 1944) see there.

ATRACTIDES LONGIPORUS PETROVA, 1968
 (FIG. 77A–D)

Type series: No access. Holotype ♀, Institut Zoologique et Musée à Sofia, tube S.T. 8. *Locus typicus*: les eaux de la rivière Véléka, Katchula, dans la région du Burgas, le 4.IX.1964

Description:

General features

Male unknown

dorsal integument: striated; muscle attachments: partly sclerotized: Dgl-2 shifted medially and fused with the prefr and postoc (? – see discussion); D-2 as a separate platelet caudolaterally from Dgl-3, D-3 fused with Dgl-4, D-4 anteromedially from Dgl-5, separate; V-1–3 not sclerotized

coxal field: slender, mediocaudal edge of Cx-1 + 2 narrow, concave, apodemes of Cx-2 directed caudally

I-L: little modified, ventral seta of I-L-5 inserted in the proximal half of the segment, setae S-1 and -2 homoiomorphic, slender, rather long and with rounded tips, I-L-6 weakly curved

excretory pore: sclerotized; Vgl-1:?

Females

Original description, in parentheses measurements from Petrova's drawings: genital field: pregen tiny, gonopore very long, genital plates positioned in an obtuse angle, restricted to the level of the postgen

palp: ventral margin of P-2 straight, forming a pronounced distal angle, P-3 straight, P-4 slightly convex, 1 : 1 : 1, sword seta near proximoventral hair

idiosoma L/W 510/366; glandularia – coxal field L 200; Cx-3 W –; (Cx-1 + 2 mL 100), IL –, W – I-L-5 dL –, vL –, (dL/vL 1.24), HA-HC –, (dL/HA 3.27)

S-1/2 – (interspace < 5)

I-L-6 L –, HA-HC –, (dL/HA 4.18; L I-L-5/6 1.29)

genital field L/W 174/–, (Ac-1–3 L < 15)

gnathosomal vL –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	18/–	42/–	46/–	51/–	18/–
(ratio)	–	(1.36)	(1.22)	(2.50)	–
rel.L	10	24	26	29	10
total L:	P-2/4 0.82				
	175				

Setae Dgl-1 short and enlarged, lateral eyes small. The peculiarity in the dorsal idiosoma of *A. longiporus* is the presence of a seta-bearing platelet between the lateral eyes, while the glandularia lying posteriorly (Dgl-3) remain unfused with the neighbouring D-2. In the figure provided by Petrova, this platelet bears the glandularia Dgl-2. This would be a surprising situation unique in the genus (the position of these glandularia is normally lateral to the eyes). More probably, Petrova misinterpreted the postocular setae (which would otherwise be missing in her drawing) as a pair of glandular setae, and overlooked the pair of glandularia Dgl-2. The genital plates are bean-shaped, L/W 60/30 µm.

Discussion: As stated by Petrova (1968b), *A. longiporus* has several characters in common with other

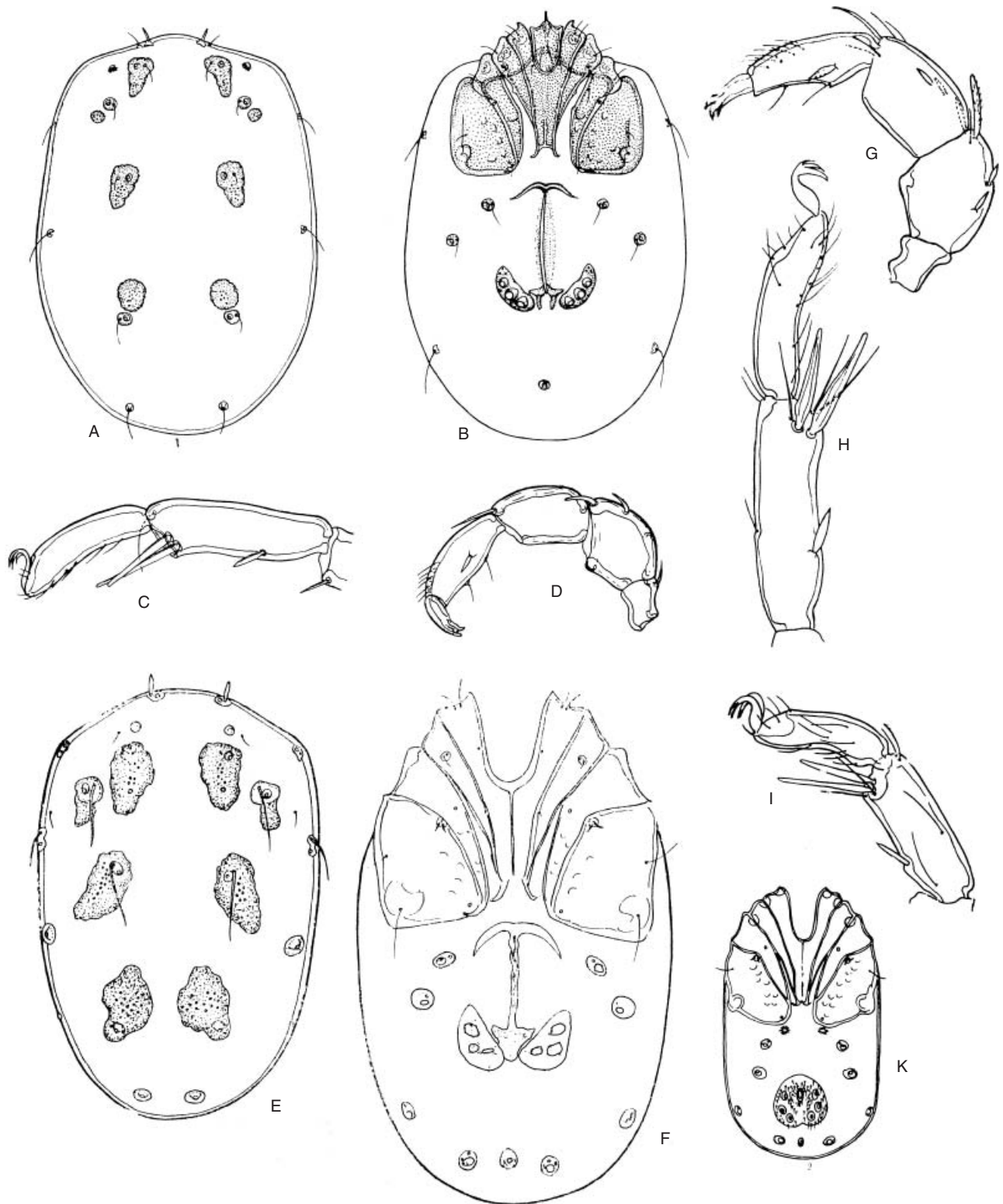


Figure 77. A–D, *Atractides longiporus* ♀ (from Petrova, 1976). A, dorsal; B, ventral view; C, I-L-5 and -6; D, palp, medial view; E–K *Atractides asticae*; E–H ♀ (from Petrova, 1968). E, dorsal; F, ventral view; G, palp, medial view; H, I-L-5 and -6; I, K, ♂ (from Petrova, 1974). I, I-L-5 and -6; K ventral view. No measurement scale bars available.

interstitial-dwelling species such as *A. cisternarum*, *A. denticulatus* and *A. latipalpis*. It is a member of the *cisternarum* species group. The combination of the following – a particularly elongated female gonopore, sclerotized excretory pore, slender S-1 and -2 with rounded, but not knob-shaped tips – make *A. longiporus* most similar to *A. cisternarum*, *A. microphthalmus*, and, with reservation, *A. prosiliens* (known from males only). *A. cisternarum* differs from *A. longiporus* in the absence of sclerotized muscle attachments, a more slender I-L-5 (L/H 4.80) a relatively long I-L-6 (L ratio I-L-5/6 1.07) and a palp with larger dimensions (e.g. P-4 L 72, total L 217 μm) and more slender segments (L/H P-2 1.67, P-3 1.56, P-4 3.00). The little-known *A. microphthalmus* differs in a less slender, relatively shortened coxal field (e.g. Cx-1 mL 66 μm) and much larger palp dimensions (P-4 L 125, total L 384 μm). Differences of the same type emerge also in comparison with the male of *A. prosiliens* (Cx-1 mL 82 μm , P-4 L 112, total L 331 μm). As female mouthpart dimensions are always larger than those of conspecific males, *A. longiporus* cannot represent the female of *A. prosiliens*.

A. longiporus is additionally unique among *Atractides* species due to two characters: (1) ocular area combining a larger platelet between the eyes (probably prefr + postoc) and Dgl-3 and D-2 as separate platelets, and (2) position of the ventral seta in the proximal half of I-L-5. For the time being, this combination is diagnostic for *A. longiporus*, but it should be checked with larger numbers of individuals. The arrangement of dorsal muscle attachments and glandularia is rather variable and age-dependent, and uncommon positions of the ventral seta I-L-5 are occasionally found as individual aberrations.

Habitat: Hyporheobiont.

Distribution: Bulgaria, known only from the *locus typicus*. (7).

***ATRACTIDES ASTICAE* PETROVA, 1968**
(FIG. 77E–K)

Type series: No access; holotype ♀, tube S.T.12, paratype ♀, tube S.T.13, Institut Zoologique et Musée à Sofia. *Locus typicus:* les eaux hyporhéiques de la rivière Véléka, près de Katcul, 3.IX.1964 1 ♀, 25.III.1965 1 ♀. Further published records (Petrova, 1974): south-east Bulgaria, rivière Mladejka (affluent de la riv. Véléka, sondages effectués dans le dépôt d'alluvions) 02.11.1973 1 ♂, 4 deutonymphs; rivière Véléka (les eaux hyporhéiques) 31.10.1973 1 ♂, 2 deutonymphs.

Description:

General features

dorsal integument: striated; muscle attachments: sclerotized, postoc + D-1, and Dgl-3 + D-2, Dgl-4 + D-3, Dgl-5 + D-4, each fused to four pairs of longish platelets, at least one pair of V-1–3 as separate sclerite knobs
coxal field: elongated, posteromedial margin Cx-1 narrow, concave

I-L: I-L-5 subrectangular, ventral seta in the proximal half of the segment, S-1 and -2 homoiomorphic, basally enlarged, distally equally narrowed, with rounded tips; narrow setal interspace, I-L-6 weakly curved, equal in H from the base to the claw furrow
excretory pore: sclerotized; Vgl-1: fused to Vgl-2
palp: ventral margin P-2 straight, distally forming an obtuse angle, P-3 straight, P-4 protruding near proximoventral hair, 3 : 2 : 1, sword seta proximally from proximoventral hair

Females

Original description, in parentheses measurements from Petrova's drawings: genital field: pregen tiny, strongly curved, gonopore rather long, genital plates in a right angle, restricted to the level of the postgen, Ac in triangular position

idiosoma L/W 400/234; glandularia –
coxal field L 204; Cx-3 W –; Cx-1 + 2 mL (85), IL –, W –
I-L-5 –, (dL/HB 3.23)
S-1/2 –, (interspace < 5)
I-L-6 L –, HA-HC –, (dL/HB 4.35; L I-L-5/6 1.11)
genital field L/W 129/99, (Ac-1–3 L < 20)
gnathosoma –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	24/–	54/–	51/–	57/–	24/–
(ratio)	–	(1.26)	(1.50)	(2.60)	–
rel.L	11	26	24	27	11
total L:	P-2/4 0.95				
	210				

As in *A. longiporus*, probably due to an error Petrova (1968a) figured a pair of glandular openings in the plate including prefr and postoc. The position of setae on I-L-5 suggests that the leg was figured in a distorted position, measurements taken from the figure should be regarded as questionable. Petrova stated that no sclerotized ventral muscle attachments were present, but one pair is depicted in her figure 15.

Males

Petrova (1974), in parentheses measurements from Petrova's drawings
genital field: anterior margin convex, posterior margin weakly indented; genital setae ca. 60, in dense rows at lateral and medial margins; gonopore very short, its caudal edge on the level of the anterior margin of Ac-2
palp: P-4 slightly thicker and with more dense hair cover than in females
idiosoma L/W 390/232; glandularia –
coxal field L 199; (Cx-3 W 214; Cx-1 + 2 mL 90, IL 158, W 164)
I-L-5 –, (dL/HB 2.81)
S-1/2 – (L ratio 1.29), interspace – (low)
I-L-6 L –, HA-HC –, (dL/HB 3.70; L I-L-5/6 1.18)
genital field L/W 79/75, (Ac-1–3 L < 20)
gnathosoma –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	21/–	37/–	41/–	50/–	21/–
(ratio)	–	(1.30)	(1.59)	(2.23)	–
rel.L	12	22	24	29	12
total L:	P-2/4 0.74				
	170				

Lateral eyes small but pigmented, Dgl-1 willow leaf-shaped.

Discussion: As with the preceding species, *A. asticae* is a representative of the *cisternarum* species group. Due to the sclerotized excretory pore, sclerotized dorsal muscle attachments, long female gonopore and acetabula in a triangular arrangement, the species is

most similar to *A. pumilus* and *A. pygmaeus*. Both differ from *A. asticae* in having smaller dorsal sclerites, with posterior dorsalia and glandularia separate from each other, more slender S-1 and -2, and a more elongated P-4 (P-2/4 ratio < 0.8). *A. pumilus* is generally larger, *A. pygmaeus* is the only other *Atractides* species with similarly minute dimensions, but it differs from *A. asticae* in having a shorter, more enlarged coxal field. In their very short gonopore restricted to the anterior part of the genital field, males are most similar to *A. cisternarum*, *A. denticulatus*, *A. microphthalmus*, and *A. prosiliens*. A particular feature, found elsewhere only in *A. longiporus*, is the position of the ventral seta on I-L-5 in the proximal half of the segment. As *A. asticae* was collected at (or near) the *locus typicus* of the former species, they merit a detailed comparison: the differences in the extension and fusion of dorsal sclerites, shape of pregen and length of the gonopore could be age-dependent, and dimensions of the coxal field and palp influenced by individual developmental conditions; the difference in shape of S-1 and -2 (larger in *A. asticae*) could be caused by different positions of the depicted I-L. However, the known only female of *A. longiporus* has a much stouter P-3, and the acetabula arranged not in a triangle, but in a weakly curved line. These differences are sufficient to consider *A. asticae* and *A. longiporus* two well defined, co-occurring sister species. Petrova (1974) provides also a brief description of the deutonymph.

Habitat: Hyporheobiont.

Distribution: south-east Bulgaria, known only from the basin of the River Véléka (7).

TRACTIDES CAGIALLENSIS RENSBURG, 1971

Species dubia

Type series: Holotype ♀ NHMB *Atractides cagiallensis* sp. nov. coll. ♀ NHMB Prep. 51 30.9.1968 Cagiallo 10.5°C Coll. 11. State of conservation: preparation desiccated, subjects still surrounded by mounting medium, but crushed; all legs *in situ*, only IV-L-4/5 missing; gnathosoma incl. chelicera, and both palps separate, laterally.

Discussion: The single female on which the description is based is obviously juvenile, very weakly sclerotized and without secondary sclerite (Rensburg's observation: 'glandularia and setae [...] not as closely associated as in other described forms' describes a typically juvenile feature). Following the original description, the specimen has the coxal plates fused to a coxal shield, a lineated integument, a rather high I-L-5/6 ratio (1.70) heteromorphic S-1 and -2 (L S-1 105, L/W 8.8, L S-2 92, ratio 5.8) 22 µm apart, a smooth excretory pore, unfused Vgl-1/2, Ac (diameter about 45 µm) in triangular arrangement, and a relatively long palp (total L 390 µm) without particular morphological fea-

tures. Due to the observed presence of a coxal shield, Rensburg compared *A. cagiallensis* to *A. tatrensis*, a species here synonymized with *A. vaginalis*. Clear differences in the latter include the much larger idiosomal sclerites and appendages, but also the morphology of the I-L (short, homoimorphic S-1 and -2). The coxal plates of the specimen are asymmetrically interlocked, and therefore it is doubtful if they were really fused. In juveniles, observing the degree and extension of sclerotization is often difficult due to the low differences between the sclerotized and membranous parts of the integument.

In view of the scanty documentation in the original description, combined with the poor state and juvenile age of the holotype and the absence of further authorized material for examination, there is no means of establishing the identity of this taxon. *A. cagiallensis* is thus a *species dubia*.

TRACTIDES LOSONENSIS RENSBURG, 1971

Syn. to *A. pumilus* (Szalay, 1946); syn. nov.

Type series: Holotype ♀, NHMB, *Atractides losonensis* sp. nov. ♀; NHMB prep. 105 10.10.1968 Golino Losone Grench 12°C Coll. 27 (in original description: small stream near army dog training camp 100 m from road). State of conservation: good, left I-L including coxa detached, left Cx-1 + 2 fractured, gnathosoma, one chelicera and left palp detached, all separated appendages in oblique position, measurements not possible. Paratype ♀, NHMB, labelled like holotype, prep. 106. State of conservation: partly desiccated, but subject still surrounded by medium, left IV-L- missing; both I-L, left II-L, gnathosoma and left palp detached, laterally; both palps deformed by crushing, other appendages distorted (probably due to juvenile age).

Discussion: Rensburg considered *A. losonensis* to be closely related to *A. primitivus*, a species here synonymized with *A. pumilus*, and proposed the following diagnostic differences: V-1-3 unsclerotized; genital plates much shorter than gonopore, articulating with postgen via mediocaudal indentations; Ac different in shape (without giving more details). He was not aware that *A. pumilus* had first been described as a species without sclerotized V-1-3. The degree of sclerotization of these muscle attachments is obviously subject to intraspecific variability and not suitable for taxonomic purposes. I could not detect any difference between females of *A. pumilus* and *A. losonensis*, either in the organization of the mediocaudal margin of genital plates, or in shape of Ac. As the latter agrees with the idiosoma and appendage measurements provided for *A. pumilus*, it represents a junior synonym of that species.

TRACTIDES MAGNIPALPIS RENSBURG, 1971

(FIG. 78A-C)

Type series: Holotype ♀ NHMB on two slides, *Atractides magnipalpis* sp. nov. siehe prep. 127 coll. ♀; Prep. 111 17.10.1968 Foss bei Bedrina 8°C Coll. 30, containing idiosoma with both II/III-L and one IV-L *in situ*, and one chelicera. State of conservation: mounting medium with fine precipitations; Prep. 127:

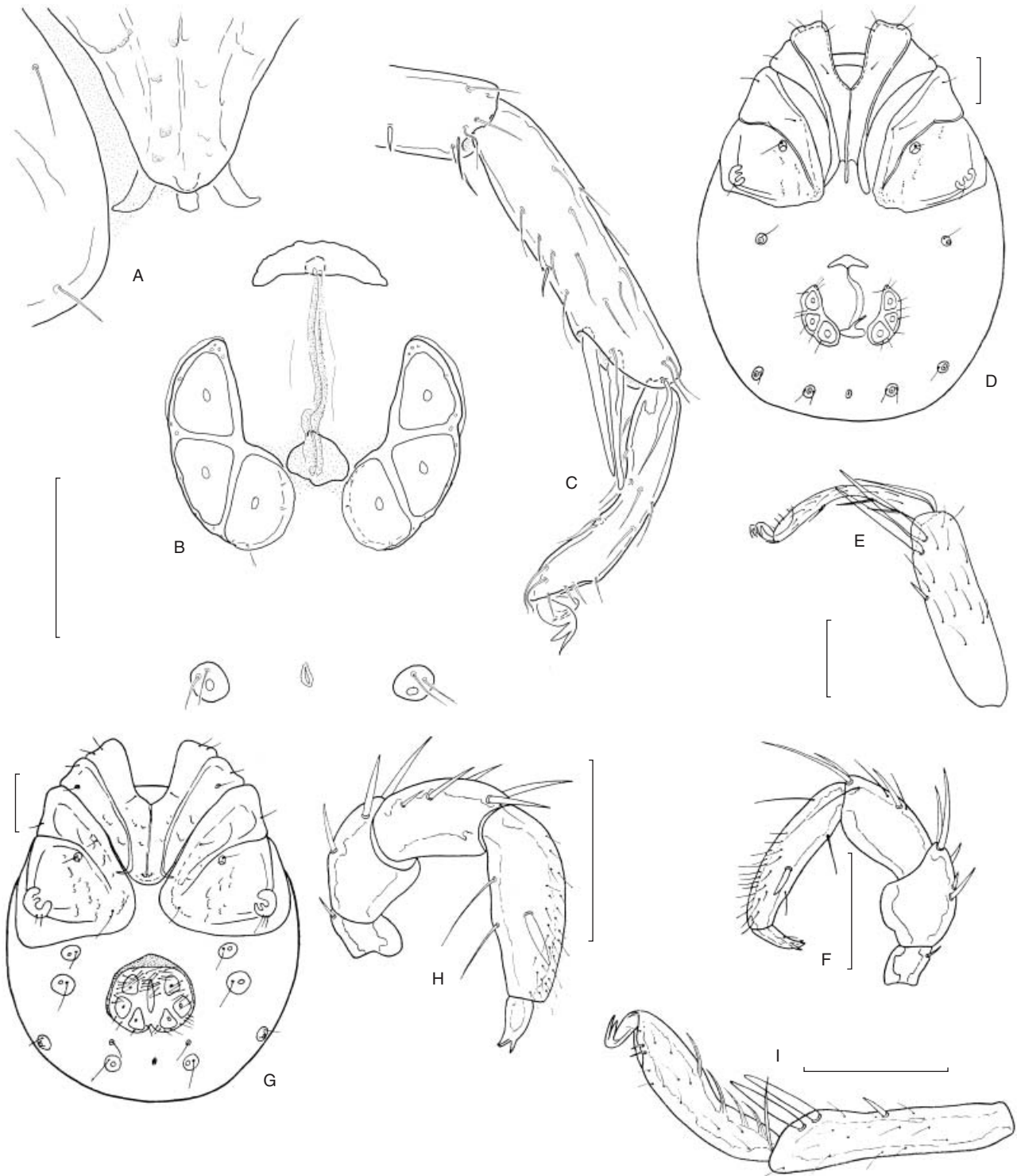


Figure 78. A–C, *Atractides magnipalpis*, holotype ♀, NHMB. A, coxal field, mediocaudal edge of Cx-1 + 2; B, genital and postgenital field; C, I-L-5 and -6. D–F, *Atractides barbara*, ♀ from Biesiadka (1978). D, ventral view; E, I-L-5 and -6; F, palp, medial view. G–I, *Atractides gorcensis*, ♂ from Biesiadka (1978). G, ventral view; H, palp, medial view, I I-L-5 and -6. Scale bars = 100 µm.

labelled like Prep. 127, containing gnathosoma, both I-L and one IV-L. State of conservation: mounting medium desiccated and subjects crushed, one palp and distal part of one I-L still surrounded by fluid. *Locus typicus*: Switzerland, Airolo, Foss near Bedrina.

Description:

General features

Male unknown

dorsal integument: striated; muscle attachments: smooth
coxal field: Cx-1 + 2 with a broad, straight posterior margin and a medial subcuticular tip

I-L: I-L-5 elongated and rather slender, S-1 and -2 homoiomorphic, narrow setal interspace, with round tips; I-L-6 weakly curved, remarkably narrowed in the centre, and thickened at the claw furrow

excretory pore: smooth; Vgl-1: fused to Vgl-2

palp: sexual dimorphism?

Females

Holotype, palp measurements from original description

genital field: short, pregen rather small, Ac in obtuse triangular arrangement, Ac-3 enlarged, protruding over the posteromedial margin

palp: slender, P-2-4 with straight ventral margins, P-4 1 : 1 : 1, sword seta halfway between ventral hairs

idiosoma L/W 830/470; glandularia 25

coxal field L 347; Cx-3 W 405; Cx-1 + 2 mL 153, IL 234, W 306

I-L-5 dL 202, vL 144, dL/vL 1.40, HA-HC 45, 47, 72, dL/HB 4.30

S-1 L 92, L/W 11.5, S-2 L 85, L/W 9.4, interspace 21, L S-1/2 1.08

I-L-6 L 161, HA-HC 30, 22, 29, dL/HB 7.32; L I-L-5/6 1.25

genital field L/W 189/184, Ac-1-3 L 48, 50, 55

gnathosoma -, chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	35/31	86/55	121/39	148/16	39/0
(ratio)	1.13	1.56	3.10	9.25	-
rel.L	08	20	28	34	09
total L:	P-2/4 0.58				
	429				

The palp measurements in the original description were obviously taken from the end of the segment (not maximum values) and are not compatible with the standards in this revision.

Discussion: 'The taxonomic position of the specimen is difficult to define. It does not exhibit any characteristic features except for its size which is not a sound basis for a species description. It is further exceptional to find such a large animal living in potamophreatic waters; the specimen is provisionally described as a new species.' Rensburg's (1971) comment is not particularly helpful. Indeed, none of the European species combines unsclerotized muscle attachments, smooth excretory pore, fused Vgl-1 + 2, large palp (total L > 400 µm) and I-L-5 with relatively high HC, but short S-1 and -2, and centrally narrowed I-L-6. *A. magnipalpis* is a weakly defined species with unclear systematic relations that needs further investigation.

Habitat: Hyporheobiont?

Distribution: Alps (Switzerland) known only from the *locus typicus* (4).

ATRACTIDES BARBARAE BIESIADKA, 1972

(FIG. 78D-F)

Type series: No access; in coll. Biesiadka, Poznan (?). *Locus typicus*: Carpates, district de Myslenice, vallée du torrent Olszowy Potok, eaux interstitielles hyporhéiques près de rhéocrène, 550 m d'altitude, 30 X, 1970 1 ♀.

Description:

General features

Male unknown

dorsal integument: striated (?); muscle attachments: smooth

coxal field: mediocaudal margin Cx-1 narrow, convex, with an elongated subcutaneous projection, apodemes Cx-2 directed caudally

I-L: I-L-5 large, subrectangular, setae S-1 and -2 homoiomorphic, long and pointed, narrow setal interspace; I-L-6 slender, extremely narrowed centrally

excretory pore: sclerotized; Vgl-1: fused to Vgl-2

Females

Original description, measurements from Biesiadka's figures in parentheses
genital field: pregen small, genital plates bean-shaped, Ac in a curved line

palp: P-2 strongly inflated distally, with convex ventral margin, P-3 weakly convex, P-4 slender, with straight ventral margin, 1 : 2 : 1, sword seta nearer to distoventral hair

idiosoma L/W 840/670; glandularia small

coxal field L 395; (Cx-3 W 489; Cx-1 + 2 mL 155, IL 289, W 355)

I-L-5 dL 265, vL -, dL/vL -, HA-HC -, dL/HB -

(S-1 L 135), L/W -, (S-2 L 138), L/W -, (interspace 10), L S-1/2 0.98

I-L-6 L 205, HA-HC -, (15), -, (dL/HB 13.7); L I-L-5/6 1.29

(genital field L/W 200/210, Ac-1-3 L 39, 44, 50)

gnathosoma -, chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	44/36	93/69	101/62	151/39	43/14
(ratio)	1.22	1.35	1.63	3.87	3.07
rel.L	10	22	23	35	10
total L:	P-2/4 0.62				
	432				

Used by several authors, the expression 'cuticle fine-ment striée' translates roughly as 'lineated'. Therefore the state of this character is not clear for *A. barbarae*. Following Biesiadka (1972b), measurements of genital plates are L/W 130/44 and gonopore L 130 µm, but in his figure the gonopore measures c. 180 µm. 'Pore excréteur entourné d'un petit anneau sclérotisé' - this description is interpreted, albeit somewhat doubtfully, as referring to a sclerite ring at the surface of the integument. In fact, Biesiadka goes on to describe a further species, *A. gorcensis*, with an excretory pore 'less sclerotized' than that of *A. sokolowi* (a species with a well developed sclerite ring) but in his figures, the anal pores of *A. barbarae* and *A. gorcensis* are depicted in the same way. The set of dorsal glandularia in Biesiadka's figure 14 is incomplete.

Discussion: Biesiadka stated that diagnostic features were found in the morphology of I-L and palp, but did not go into detail. He mentioned only some similarity to *A. longitibialis* in view of the elongated, subrectangular I-L-5. This taxon, here placed in synonymy with *A. pennatus*, is similar in the inflated ventral margin of P-2, but differs clearly in the relatively short and

more robust I-L-6 (I-L-5/6 L ratio 1.7). The character combination of sclerotized An, setae Vgl-1 + 2 fused, and unsclerotized dorsal muscle attachments is found only in very few species. *A. latipes* differs in larger dorsal glandularia and thicker I-L-5, with strongly heteromorphic S-1 and -2; *A. maderensis* and *A. anellatus* have a lineated integument, a character still unclear for *A. gallicus*. *A. maderensis* and *A. gallicus* differ both in smaller acetabula and a more robust I-L-6. Furthermore, all these species differ from *A. barbarae* in a wider setal interspace. In all other European species, elongated S-1 and -2 are found combined with an increased interspace between their insertions and in most cases also with heteromorphy. Long (>130 µm) homoimorphic S-1 and -2 with a small interspace is a character combination distinctive for *A. barbarae*. From several other aspects, the species is not well defined and its taxonomic status is unclear.

Habitat: Crenobiont or hyporheobiont?

Distribution: Poland, Carpathians, known only from the *locus typicus* (10).

ATRACTIDES GORCENSIS BIESIADKA, 1972
(FIG. 78G–I)

Type series: No access; in coll. Biesiadka, Poznan (?). *Locus typicus:* Carpates, district de Myslenice, vallée du torrent Olszowy Potok, eaux interstitielles hyporhéiques près de rhéocrène, 550 m d'altitude, 30 X, 1970 1 ♂.

Description:

General features

Female unknown

dorsal integument: striated; muscle attachments: smooth
coxal field: Cx-1 + 2 with large, weakly curved mediocaudal margin, apodemes of Cx-2 directed laterally, short

I-L: little modified, S-1 and -2 homoimorphic, rather short and large, pointed, close to each other

excretory pore: smooth; Vgl-1: separate from Vgl-2

palp: probably weak sexual dimorphism, ventral margin P-2 little protruding, P-3 straight, P-4 2 : 1 : 2, sword seta strong, between ventral hairs, nearer to the distal one

Male

Original description, in parentheses measurements from Biesiadka's figures
genital field: anterior margin convex, medially protruding; genital setae: 42
palp: P-4 inflated, with strongly curved dorsal margin
idiosoma L/W 600/480; (glandularia 40)
coxal field L 335; (Cx-3 W 400; Cx-1 + 2 mL 145, IL 245, W 327
(I-L-5 dL 171, vL 125, dL/vL 1.37, HA-HC 36, 44, 60, dL/HB 3.89)
(S-1 L 66, L/W –, S-2 L 68, L/W –, interspace 7, L S-1/2 1.03)
(I-L-6 L 156, HA-HC –, 32, –, dL/HB 4.88; L I-L-5/6 1.09)
genital field L/W 130/150, Ac-1–3 L 35, 40, 35
gnathosoma –; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
(L/W	31/–	69/–	74/–	109/–	31/–)
(ratio)	–	–	–	–	–
(rel.L	10	22	24	35	10)
(total L:	P-2/4 0.63)				

314

The total length of I-L-6 was measured between the proximal edge of the segment and the base of the claw furrow (128 µm). Following the measurement standard used here, the total length is in fact 156 µm. Biesiadka's palp measurements would result in a total length of 973 µm, exceeding the idiosoma length by 50%. From a comparison with his figure 19 results, these measurements are mistaken by a factor of about 3.5. Furthermore, the palp was depicted in an oblique position, indicated by the view of the P-2 and -3 articulation.

Discussion: Biesiadka (1972b) compared this species with *A. sokolowi* and found differences in the integument (fine porosity, not lineated) and the smooth anal pore. *A. gorcensis* differs furthermore from that species in smaller acetabula, and the more robust shape of segments P-4 and I-L-6. *A. gorcensis* is characterized by the combination of unsclerotized dorsal muscle attachments, enlarged glandularia, I-L-5 with S-1 and -2 short, homoimorphic, and close together; I-L-6 robust, weakly curved, ratio I-L-5/6 1.09; genital field with convex anterior and indented posterior margins, excretory pore smooth; and Vgl-1/2 separate. Three species have similar character combinations. *A. arcuatus*, a little known species from the Caucasus, differs possibly in the lineated integument, and lower measurements for the palp (total L 230 µm) and genital field (L/W 100/100 µm). *A. protendens* is similar in shape and proportions of I-L, but has smaller absolute measurements in this appendage, and differs furthermore in a shorter median suture Cx-1, and a lineated integument. *A. samsoni* can be distinguished by its smaller glandularia, shorter suture Cx-1, smaller genital field (L/W 90/96, Ac-1–3 27, 20, 34) and the presence of a distinct ventrodial projection on P-2. *A. gorcensis*, known only from males and *A. barbarae*, known from a single female, share the same type locality. As strong sexual dimorphism is never found in characters such as the shape of the posterior margin of Cx-1, sclerotization of the excretory pore, shape of S-1 and -2 and proportions of I-L-6, it is clear that they are representatives of different, unrelated species.

Habitat: Crenobiont or hyporheobiont?

Distribution: Poland: Carpathians, known only from the *locus typicus* (10).

ATRACTIDES UBINICUS TUZOVSKIJ, 1980
(FIG. 79A–E)

Type series: Holotype ♀, provisionally in coll. Gerecke, Tübingen as a gift of the author: 12.5.1976 Krasnodarskoje obl., R. Ubin, N°1506 *Atractides ubinicus* ♀. State of conservation: slide-mounted, gnathosoma and all appendages *in situ*, idiosoma flattened, but appendages probably not malformed by crushing; left III-L missing, right II-L detached.

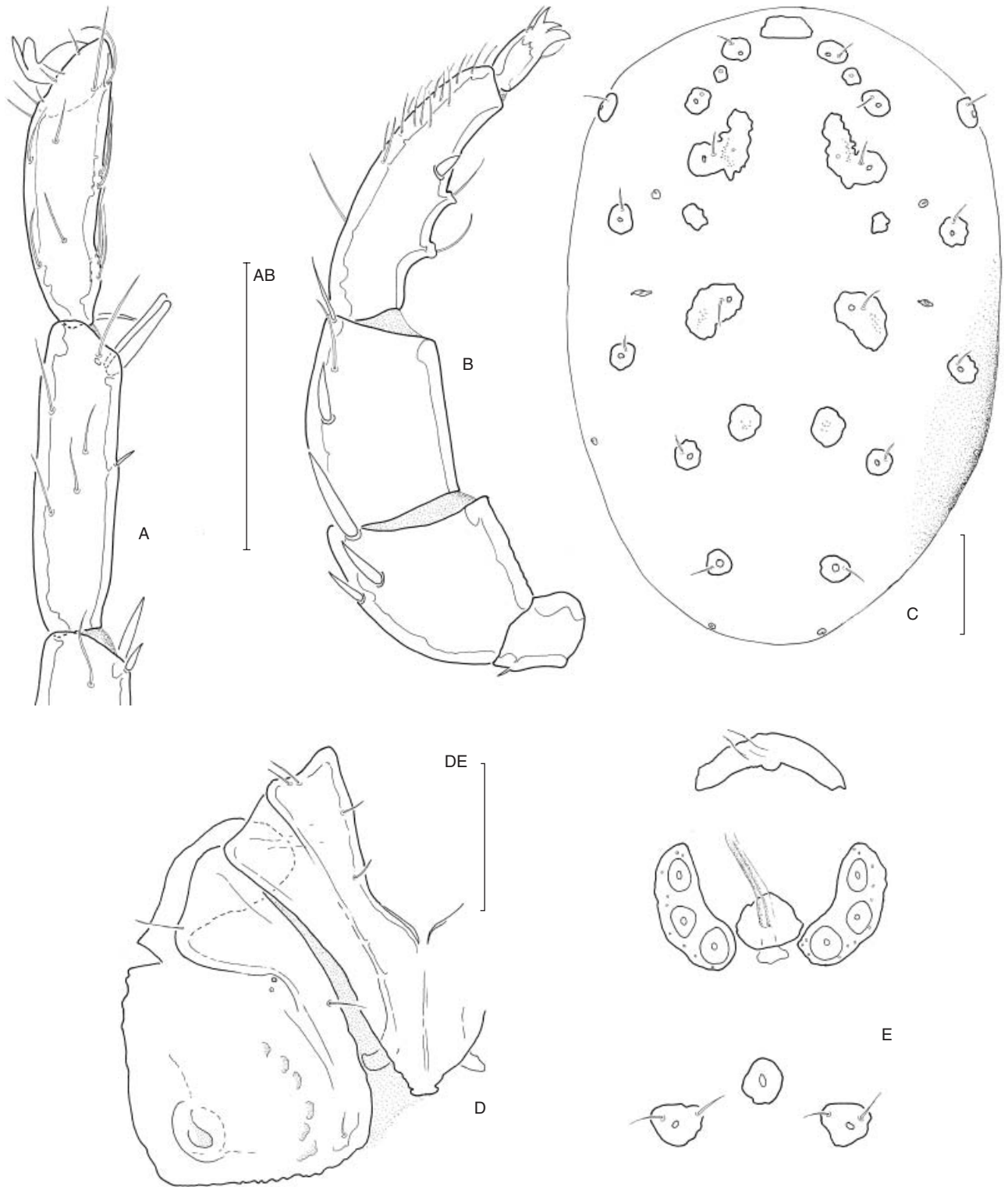


Figure 79. *Atractides ubinicus*, holotype ♀, coll. Tuzovskij 1506. A, I-L-5 and -6; B, palp, medial view; C, dorsum; D, coxal field, E, genital and postgenital field. Scale bars = 100 μm.

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*Description:**General features*

Male unknown

dorsal integument: striated (7/10 µm); muscle attachments: sclerotized; postoc, D-1, and Dgl-3 on a L-shaped platelet, D-2 separate, D-3 fused with Dgl-4, D-4 separate, V-1-3 unsclerotized
 coxal field: mediocaudal margin Cx-1 + 2 parabolic, with irregular, pointed medial tip, apodemes Cx-2 directed laterally
 I-L: little modified, I-L-5 subrectangular, S-1/2 short, homoiomorphic, with knob-shaped tip, inserted on the same level
 excretory pore: sclerotized; Vgl-1: fused with Vgl-2

Females

Holotype:

genital field: pregen strong, genital plates bean-shaped, Ac in a little curved line, rather small
 palp: ventral margin P-2 distally extended in a fine rectangular denticle, P-3 straight, P-4 with strongly prominent extensions near both ventral hairs, 1 : 1 : 2, sword seta strong and short, distally from distoventral hair, P-5 slender, with strong claws
 idiosoma L/W 600/450; glandularia 35
 coxal field L 280; Cx-3 W 350; Cx-1+2 mL 100, IL 200, W 243
 I-L-5 dL 117, vL 90, dL/vL 1.30, HA-HC 28, 30, 33, dL/HB 3.90
 S-1 L 37, L/W 7.4, S-2 L 34, L/W 6.8, interspace 0.1, L S-1/2 1.09
 I-L-6 L 107, HA-HC 22, 22, 28, dL/HB 4.86; L I-L-5/6 1.09
 genital field L/W 143/143, Ac-1-3 L 21, 21, 23
 gnathosoma -, chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	27/30	77/60	80/52	105/35	30/12
(ratio)	0.90	1.28	1.54	3.00	2.50
rel.L	08	24	25	33	09
total L:	P-2/4 0.73				
	319				

Due to crushing of the idiosoma, coxa measurements probably incorrect; Cx-1 + 2 IL, W, and Cx-3 W in particular exceed the natural conditions.

Discussion: The description of this species (Tuzovskij, 1980) did not include a discussion of affinities. The character combination of slightly modified I-L-5 and -6 (L ratio I-L-5/6 < 1.2, mostly about 1.0) with short homoiomorphic S-1 and -2, and P-2 with straight ventral margin distally ending in a denticle-like projection, or an acute or right angle, makes *A. ubinicus* similar to *A. dentipalpis*, *A. graecus*, and *A. tenerifensis*. They differ from *A. ubinicus* not only in the more proximal position of the sword seta on P-4, but also in less projecting ventral projections on this segment. *A. clavipes*, a species with sword seta P-4 shifted distally as in *A. ubinicus*, differs, apart from the less protruding ventral projections on P-4, in having generally larger dimensions, and more slender palp segments. In the particular shape of the P-4, with ventral hairs accompanied by distinct, apically truncated, projections, *A. ubinicus* is most similar to *A. pumilus*. However, it differs from that species not only in the more distal position of the sword seta on P-4, but also in its peg-like shape.

Habitat: Rhithrobiont.*Distribution:* Russia, The Caucasus, known only from the *locus typicus* (24).*ATRACTIDES HEVERSI* K. O. VIETS, 1982 (FIG. 80A-D)

Type series: Holotype ♀, SMF KOViets 7258 *Atractides (Polymegapus) heversi* KOViets ♀ Holotypus, Israel, Nahal Dan, Stn 6-3 Ortal leg. 25.7.1979 IES 1610; Aca. 1149. State of conservation: perfect, dorsum, palps, and all legs detached, separate, appendages lateral, gnathosoma and chelicerae *in situ*.

*Description:**General features*

Male unknown

dorsal integument: striated (10/10 µm); muscle attachments: smooth
 coxal field: Cx-1 + 2 with mediocaudal margin extremely narrowed between the strong, caudolaterally-directed apodemes of Cx-2, caudal margin of Cx-4 with two concave sectors separated by a little pronounced extension near an apodeme
 I-L: I-L-5 with diverging ventral and dorsal margins, setae S-1/2 strongly heteromorphic and distanced, S-1 strong, curved, with blunt tip, S-2 slender, straight and pointed: I-L-6 robust, equal in H from the base to the claw furrow
 genital field: with more than 4 pairs of Ac various in size
 excretory pore: smooth; Vgl-1: separate from Vgl-2
 gnathosoma with elongated, slender and pointed rostrum
 palp: sexual dimorphism?

Females

Holotype:

genital field: pregen strong, equally curved, genital plates halfcircle-shaped with 5 Ac on the right, 6 on the left side
 palp: robust, ventral margin P-2 straight, with a slight kink in the centre of the segment, P-3 straight, P-4 basally concave, from the proximoventral hair to the distal end of the segment straight, 2 : 1 : 2, P-5 stout, with elongated claws
 idiosoma L/W 720/530; glandularia 45
 coxal field L 293; Cx-3 W 369; Cx-1 + 2 mL 103, IL 211, W 260
 I-L-5 dL 152, vL 103, dL/vL 1.48, HA-HC 41, 48, 59, dL/HB 3.17
 S-1 L 79, L/W 8.8, S-2 L 45, L/W 6.4, interspace 19, L S-1/2 1.76
 I-L-6 L 119, HA-HC 30, 28, 29, dL/HB 4.25; L I-L-5/6 1.28
 genital field L/W 157/193, Ac-1-3 L 10, 20, 30
 gnathosoma vL 157; chelicera -

palp	P-1	P-2	P-3	P-4	P-5
L/W	32/29	72/49	72/39	84/30	31/16
(ratio)	1.10	1.47	1.85	2.80	1.94
rel.L	11	25	25	29	11
total L:	P-2/4 0.86				
	291				

Additional measurements published by K. O. Viets: genital plate L 108, gonopore 160, I-L-3/4 82/127, IV-L-3-6 131, 173, 203, 172 µm.

Discussion: Due to the increased number of Ac, Viets placed this species within the subgenus *Polymegapus*. He found striking differences to the other members of this subgenus: absence of sclerotized dorsal muscle attachments (present in all other members) and completely different organization of the I-L (plesiomorphically, I-L-5 ventral margin shorter than dorsal margin). In fact, notwithstanding the increased number of Ac, *A. heversi* is closer related to three species of *Atractides* s.s. - *A. subasper*, *A. octoporus* and *A. digitatus* - than to the *Polymegapus* species. Synapomorphic character states of the *subasper* species group including these four species are: stout segments I-L-5 and -6 with strongly heteromorphic S-1 and -2: S-1

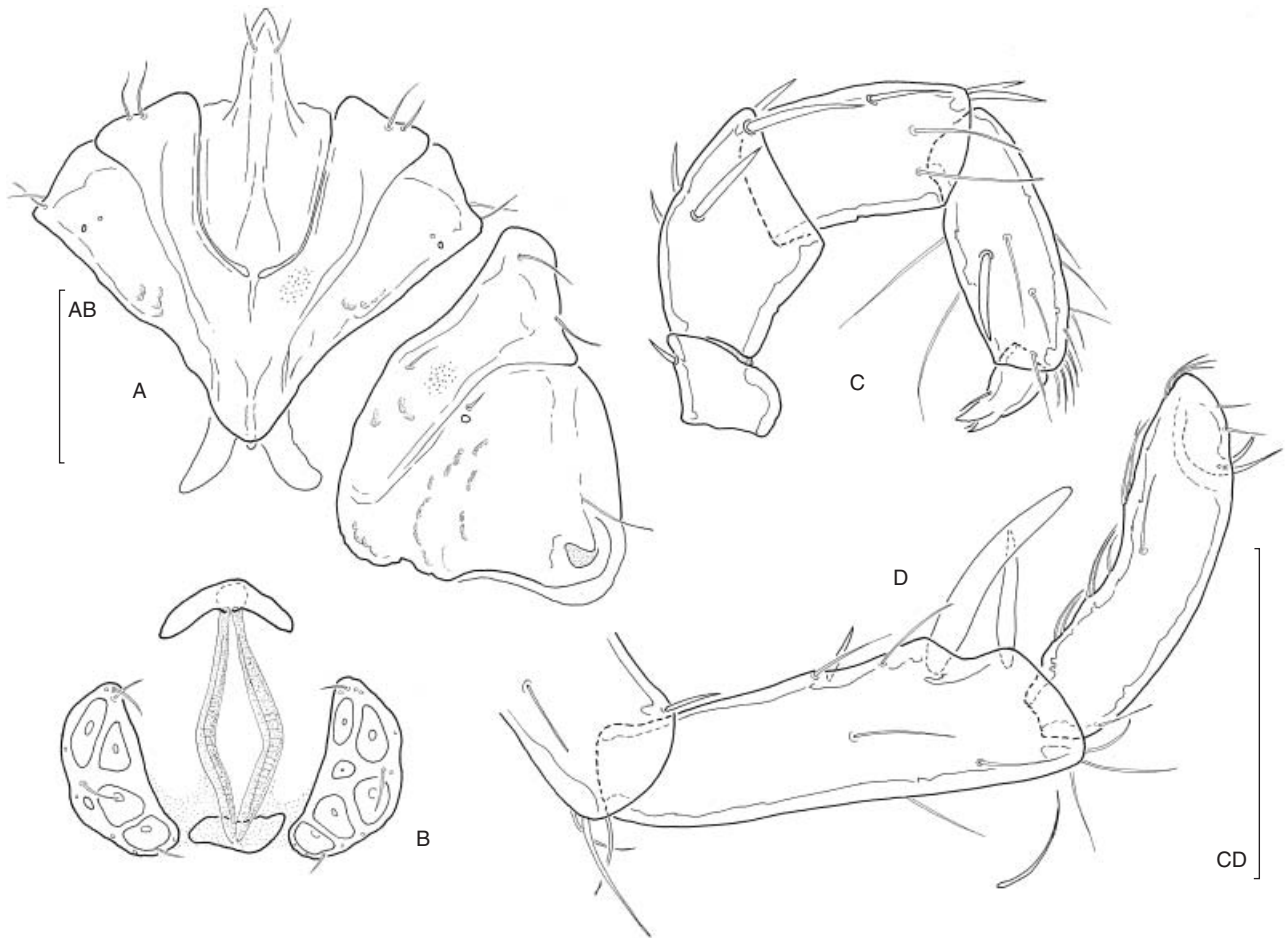


Figure 80. *Atractides heversi*, holotype ♀ SMF KOViets 7258. A, coxal field; B, genital field; C, palp, medial view; D, I-L-5 and -6. Scale bars = 100 µm.

robust, enlarged, and curved, S-2 much shorter and straight; gnathosoma with elongated, narrow rostrum, chelicera with a long, tiny, weakly curved claw; palp robust with P-4 bearing long ventral hairs inserted close together in the centre of the segment, and a strong sword seta. The species in this group represent steps in a gradual increase of osmoregulatory surface: *A. subasper* and *A. digitatus* with the plesiotypical three pairs of Ac, but enlarged in the latter, *A. octopus* with four pairs of Ac, probably due to a doubling of Ac-1, and *A. heversi* with still higher Ac numbers due to splitting of Ac. *A. heversi* also differs from the other species in having a shorter medial suture of Cx-1, more strongly developed apodemes of Cx-2, and Vgl-3 not fused to the posterior margin of Cx-4.

Habitat: Rhithrobiont.

Distribution: Israel, known only from the *locus typicus* (y).

ATRACTIDES PLACOCALLOSUS BADER, 1994

Syn. to *A. walteri* (K. Viets, 1925): syn. nov.

Type series: Holotype ♀, NHMB *Atractides placocallosus* ♀ Ova dals Buogls 25.9.1981 NP 91/64; Holotypus.

Discussion: Bader overlooked the presence of dorsal plates in a slide preparation of *A. loricatus* authorized by Piersig (here designated as lectotype of that species), convincing himself in the process that Motaş & Angelier (1927), together with all subsequent authors, had a mistaken concept of the species. He introduced a new name for all the material published under that name since then. His idea was that *A. placocallosus* should be a species with typical dorsal muscle attachment sclerites (as described many times for *A. loricatus*) and a sclerotized excretory pore. He came close to actually introducing a valid new species because, in contrast to the established opinion about the morphology of *A. loricatus*, the type revision reveals the absence of an anal sclerite. However, a further error

clearly occurred when he selected the holotype: the slide-mounted specimen represents *A. walteri*, and not a member of the *loricatus* species group.

ATRACTIDES FRANCISCANUS BADER &
GERECKE, 1996

Syn. to *A. separatus* (K. Viets, 1931): syn. nov.

Type series: Holotype ♂, NHMB D sar 16c, Bayern (BGL) Nationalpark, Sommerbichel, Quelle SW Herrenrpoint, 1300 m, 12°58'20E, 47°34'40 N, 13.06.1994 Gerecke leg. State of conservation: idiosoma entire, gnathosoma *in situ*, one palp and one I-L separate, laterally. Paratypes (slide mounted in various manner): 1 ♂, 1 ♀ in NHMB, 4 ♂, 1 ♀ in coll. Gerecke, Tübingen (2 ♂ from the same site, but one collected 12.06.1996); 3 ♂, 2 ♀ D sar 24a, Bayern (BGL) Nationalpark, Sommerbichel, Quelle N Herrenrpoint, 1250 m, 12°59'20E, 47°34'40 N, 10.06.96, leg. Gerecke.

Material examined: Germany, Berchtesgaden National Park, 2 ♂, 11 ♀ from the *locus typicus* and its surroundings (coll. Gerecke, Schrankel & Martin, 1996–2000).

Discussion: In their discussion of *A. franciscanus*, the authors did not include several species whose taxonomic status was uncertain because they were known from females only. Totschnig *et al.*, (1999) stated in their redescription of one of these species, *A. separatus*, that it was similar to *A. franciscanus*, with the caudally open anal sclerite an important common character, but found differences in absolute measurements: all females of the type series of *A. franciscanus* have distinctly larger dimensions of coxae and appendages. Measurements of additional specimens collected since then in a wider habitat range (but always in the surroundings of the *locus typicus*) have now bridged this gap, and demonstrate that *A. separatus* is a species more variable in dimensions, with *A. franciscanus* as its junior synonym.

ATRACTIDES ALLGAIER SP. NOV. (FIG. 81A–G)

A. distans (K. Viets, 1914) *partim* K. O. Viets, 1978
A. distans Gerecke, 2002

Type series: Holotype ♂, SMF KOViets 1809, *Atractides allgaier* nov. spec. Holotypus ♂ Gerecke [*Atractides distans* (Viets) ♂] Germany, Niedersachsen, Mölle, linker Zufluß; 1. Hals unten südl. Möllenbeck bei Rinteln 23.7.1953, 1809. Paratypes: SMF 1796, labelled as holotype, Germany, Niedersachsen, 'Mölle linker Zufluß von Hals z. westl. Straße; südl. Möllenbeck bei Rinteln [16/53] 22.7.1953 1796' 1 ♂, 1 ♀. Coll. Gerecke: Germany, Baden-Württemberg, Schönbuch (TÜ) D 459 Arbach bei Becklesgarten, 400 m, Gerecke 2 ♀; Goldersbach bei Teufelsbrücke 390 m, Gerecke D 453/3 5.9.1995 Moos, 1 ♀; D 453/4 5.10.1995 Steine, 4 ♂, 2 ♀.

Description:

General features

dorsal integument: lineated (4/10 µm); muscle attachments: smooth
coxal field: mediocaudal margin of Cx-1 + 2 with a large, slightly concave area between the laterally directed apodemes of Cx-2
I-L: I-L-5 ventral margin slightly expanding near the insertion of the ventral seta, dorsal and ventral margin between the narrow base of the segment and the ventral seta slightly diverging, more strongly diverging between this seta and the insertion S-1; S-1/2 strongly heteromorphic and distanced, S-1 long, slightly bent inwards, distally thickened and with trun-

cate tip, S-2 shortened, enlarged, with irregular blade and a blunt tip; I-L-6 long and slender, only slightly narrowed from the base to the tip.
excretory pore: smooth; Vgl-1: separate from Vgl-2
palp: weak sexual dimorphism, ventral margins of P-2 and P-3 straight, P-4 ventral margin 2 : 2 : 1, with denticles near hair insertions, but the distal one only little projecting, sword seta curved, near distoventral hair

Males

Holotype, variability of paratypes in parentheses:

genital field: apple-shaped, with nearly straight, irregular anterior margin, and a shallow posterior indentation; genital setae: 50
palp: more stout, sword seta P-4 slightly proximally from distoventral hair
idiosoma L/W 450/340 (380–600/300–500); glandularia 23
coxal field L 250 (230–305); Cx-3 W 275 (265–375); Cx-1 + 2 mL 74 (70–108), IL 153 (140–205), W 215 (210–295)
I-L-5 dL 132 (132–145), vL 90 (88–92), dL/vL 1.47 (1.47–1.63), HA-HC 37 (37–40), 42 (40–44), 55 (55–60), dL/HB 3.14 (3.14–3.55)
S-1 L 85 (85–98), L/W 11.3 (8.2–11.3), S-2 L 63 (62–72), L/W 8.3 (5.3–8.3), interspace 17 (17–25), L S-1/2 1.35 (1.31–1.48)
I-L-6 L 127 (123–127), HA-HC 17 (17–20), 16 (15–18), 15 (14–15), dL/HB 7.94 (6.89–8.33); L I-L-5/6 1.04 (1.04–1.17)
genital field L/W 80/85 (80–105/85–120), Ac-1–3 L 25, 15, 25
gnathosoma vL 105; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	20/18	50/35	55/32	75/27	30/10
(ratio)	1.11	1.43	1.72	2.78	3.00
rel.L	09	22	24	33	13
total L:	P-2/4 0.67 (0.61–0.67)				
230					
(230–238)					

Some asymmetries may be observed: one of the P-4 s may be inflated, with the sword seta inserted distal to the distoventral hairs, and S-1 may show the distal enlargement on only one of the two legs, probably due to distorted position.

Females

Paratype from SMF, in parentheses paratypes from coll. Gerecke:

genital field: pregen sickle-shaped, Ac in an equally curved line, Ac-1 longish and triangular, Ac-2 oval, Ac-3 semicircular
palp: rather slender, in particular P-4
idiosoma L/W 650/500 (450–650/380–500); glandularia 25
coxal field L 290 (290–298); Cx-3 W 390 (340–390); Cx-1 + 2 mL 84 (70–85), IL 187 (180–190), W 265 (265–290)
I-L-5 dL 178 (178–188), vL 98 (98–105), dL/vL 1.82 1.77–1.82, HA-HC 54 (54–60), 56 (56–62), 86 (86–92), dL/HB 3.18 (3.00–3.24)
S-1 L 136 (132–150), L/W 11.3 (11.0–12.5), S-2 L 85 (85–95), L/W 7.08 (5.8–7.3), interspace 45 (42–47), L S-1/2 1.60 (1.52–1.60)
I-L-6 L 178 (174–184), HA-HC (20–23), (15), (15), dL/HB (11.60–12.27); L I-L-5/6 1.00 (1.00–1.07)
genital field L/W 148/148 (115–150/120–150), Ac-1–3 L 30, 28, 25
gnathosoma vL 110; chelicera L 120, L/H 4.71, bS/claw 2.67

palp	P-1	P-2	P-3	P-4	P-5
L/W	27/25	64/40	72/35	92/25	32/10
(ratio)	1.08	1.55	2.06	3.68	3.20
rel.L	09	22	25	32	11
total L:	P-2/4 0.67				
285					
(385–301)					

Some details of the I-L-6 of the paratype from SMF could not be measured due to the oblique position of both I-L in the preparation.

Discussion: The exact derivation of the type specimens from SMF is unclear. K. Viets (1959) mentions

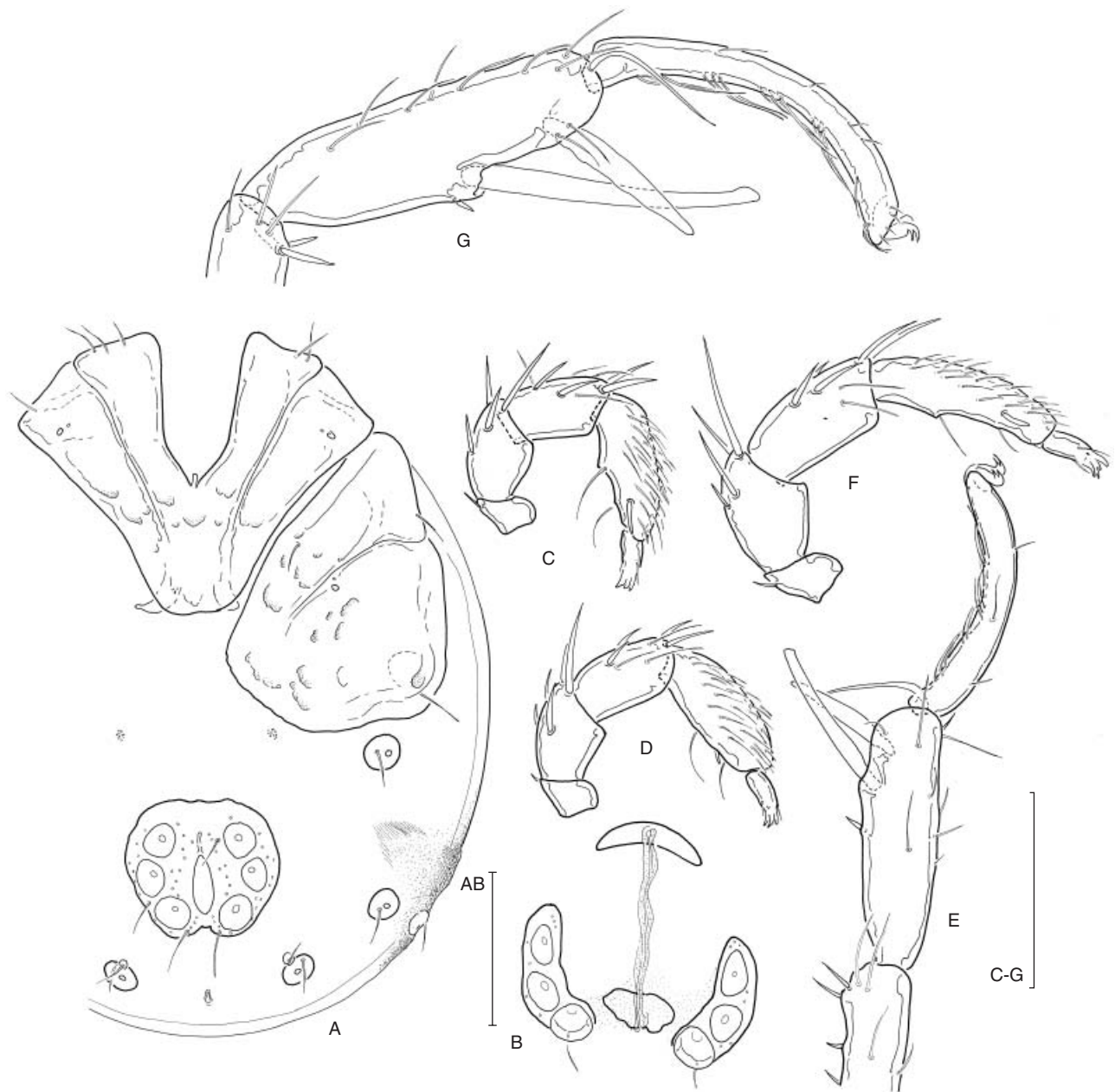


Figure 81. *Atractides allgaier*. A, paratype ♂, C-E holotype ♂ B, F, G, paratype ♀. A, ♂ ventral idiosoma partial view; B, ♀ genital field; C, ♂ palp, medial view; D, ♂ palp, lateral view; E, ♂ I-L-5 and -6; F, ♀ palp, medial view; G, ♀ I-L-5 and -6. Scale bars = 100 µm.

specimens identified as *A. distans* from the *locus typicus*, but refers to material collected and published by Illies dating from before the collection dates provided on the slides. As far as I know, the specimens discussed here were never published in faunistic inventories. Due to some common character states, populations of *A. allgaier* have confused with those of *A. distans* until now. *A. distans* differs from *A. allgaier* in larger dimensions of I-L (I-L-5 dL/vL ♂ > 160/ > 100

♀ > 190/ > 120, I-L-6 L ♂ > 160, ♀ > 184 µm); S-1 and -2 more slender (L/W S-1 > 15.0, S-2 > 7.3) and further apart in males (interspace ♂ > 28); I-L-6 of males more slender (L/HB ♂ > 9.0); palp distinctly longer (total L ♂ > 280, ♀ > 330 µm); P-3 more slender segment (L/H ♂ > 1.8, ♀ > 2.1). Furthermore, *A. distans* differs from *A. allgaier* in having a densely striated rather than lined integument.

The two species can be distinguished without diffi-

culty. Apart from the mentioned exception in integument structure, no intermediate character combinations have come to light. Examination of the evidence for variability provided by Besseling (1954) suggests that he had collected a mixture of *A. nodi-palpis* and *A. distans*.

A. diastema, a little defined species from Hungary and Poland, differs from *A. allgaier* in its much more extended coxal and genital fields, longer palp with more slender segment P-3, distinctly longer and more slender I-L-5 (and consequently a higher L ratio I-L-5/6 of 1.27) and less heteromorphic S-1 and -2 (L ratio S-1/2 1.25) S-1 not enlarged and truncated distally. *A. gomeræ*, a species similar in proportions of I-L (I-L-5/6 about 1.0, I-L-5 stout, with relatively short ventral margin, S-1 at the tip thickened and truncated) differs from *A. allgaier* in smaller dimensions of genital field (L/W < 130/130 µm) and acetabula (< 25 µm) and the sword seta P-4 located more proximally.

A. gassowskii, *A. gracilis*, and *A. odarkensis*, the three *A. distans*-like species described from Siberia (Sokolow, 1934) all differ from *A. allgaier* in their longer median suture Cx-1 + 2, longer and much more slender palps, segment I-L-5 absolutely and relatively longer and more slender, and more slender S-1.

Habitat: Rhithrobiont.

Distribution: Central Europe, at present known only from two sites in Germany; all former records of *A. distans* from the western Palaearctic questionable (9, 14).

Etymology: Christoph Allgaier (Tübingen) stands godfather of this new species.

ATRACTIDES BRENDLE SP. NOV. (FIG. 82A–K)

A. lorricatus Piersig, 1898 *partim*, K. O. Viets, 1978, Crema *et al.*, 1996, Gerecke *et al.*, 1998

Type series: Holotype ♂, Germany, Upper Bavaria, Berchtesgaden National Park 9, Königssee, Quelle 2 u. Sagereckwand, 605 m, 12°57'55E, 47°31'30 N, 31.05.1994 Gerecke & Goldschmidt; slide mounted in Hoyer's fluid, gnathosoma separate, laterally, both I-L, both palps separate, laterally, genital skeleton separate, anterior. Paratypes: 3 ♂, 4 ♀, same site and date as holotype.

Material examined: MMB: 1049; 1107. Javorinka n novárny pod Hamanem. Belan. Tatro. 4.9.1956 1 ♂ 154; 1121–1. potok v Tatranske Pojané. 7.9.1956 1 ♀.

Description:

General features

dorsal integument: finely striated (10/10 µm), inner layer with a honeycomb-like structure consisting of regularly arranged fields of fine porosity; muscle attachments: sclerotized, D-1 fused with postfr, postoc, and Dgl-3, occasionally also prefr; D-2 a separate, roundish platelet, D-3 fused with Dgl-4, D-4 free or fused with Dgl-5; V-1–3 as separate, roundish platelets coxal field: mediocaudal margin of Cx-1+2 extending over the level of the apodemes equally rounded, apodemes Cx-2 short and curved, their tips

directed laterally; Cx-3+4 subtriangular, with straight caudal margin slightly irregular due to secondary sclerotization.

I-L: I-L-5 elongated, ventral margin slightly convex near the base, slightly concave in the centre, and strongly diverging from dorsal margin in the sector between ventral seta and base of seta S-1; S-1/2 homoiomorphic, with rounded tips, narrow setal interspace, S-1 more slender and with a knob-shaped tip; I-L-6 equally curved, with dorsal and ventral margins slightly converging from the base to the claw furrow.

excretory pore: posteriorly embraced by an U-shaped sclerite; Vgl-1: fused to Vgl-2

palp: little sexual dimorphism, ventral margin P-2 weakly concave, with rugosity in its central part, P-3 straight, slightly convex in the centre, P-4 straight, 1 : 1 : 1, with a fine denticle near proximoventral hair insertion, sword seta halfway between ventral setae or nearer to the distoventral one.

Males

Holotype, in parentheses paratypes:

genital field: anterior margin straight or slightly concave, posterior margin indented, Ac in triangular arrangement and subtriangular in shape, with their medial edges directed to the gonopore; genital setae: 48

palp: slightly more stout than in females

idiosoma L/W 610/420 (550–600/420–450); glandularia 42

coxal field L 280 (256–300); Cx-3 W 310 (302–350); Cx-1+2 mL 92 (94–100), IL 175 (175–200), W 230 (220–280)

I-L-5 dL 146 (141–160), vL 120 (116–135), dL/vL 1.22 (1.19–1.24), HA-HC 32, 40, 43 (29–35, 38–45, 40–47), dL/HB 3.65 (3.56–3.74)

S-1 L 62 (61–72), L/W 10.3 (8.7–10.3), S-2 L 58 (61–62), L/W 8.3 (6.9–7.8), interspace 7, L S-1/2 1.07 (1.00–1.16)

I-L-6 L 98 (92–100), HA-HC 25, 23, 23 (25–28, 23–24, 22–23), dL/HB 4.26 (4.00–4.35); L I-L-5/6 1.49 (1.53–1.62)

genital field L/W (–)160 (150/157–180), A-1–3 L (54, 54, 58)

gnathosoma –; chelicera L (197), L/H (5.63), bS/claw (2.46)

palp	P-1	P-2	P-3	P-4	P-5
L/W	25/23	63/40	72/35	100/30	30/9
(ratio)	1.09	1.58	2.06	3.33	3.33
rel.L	09	22	25	34	10
total L:	P-2/4 0.63 (0.60–0.64)				
290					
(282–316)					

Holotype with a misshaped left I-L (ventral seta I-L-5 sword-like, in dimensions similar to S-1 and -2, I-L-6 with dorsal and ventral margins diverging from the base to the claw furrow); in all specimens, the genital field in oblique position, directed ventro-caudally. To facilitate measurement, it was detached from the idiosoma in one of the paratypes; most of the genital seta insertions minute, their presence marked only by fine setal channels in the sclerite. The specimen from the Tatra region has a more slender genital field (L/W 121/139 µm) and slightly smaller dimensions of some appendage segments, but in terms of the all important proportions of I-L and mouthparts, lies within the range of variability of *A. brendle*.

Females

Paratypes:

genital field: pregen enlarged, with anterior border of secondary sclerite, Ac in triangular position, Ac-3 protruding caudally

palp: more slender than in male

idiosoma L/W 650–800/500–550; glandularia 50

coxal field L 280–340; Cx-3 W 360–410; Cx-1 + 2 mL 99–112, IL 189–220, W 243–300

I-L-5 dL 160–185, vL 128–147, dL/vL 1.22–1.26, HA-HC 36–40, 43–50, 47–55, dL/HB 3.66–3.72

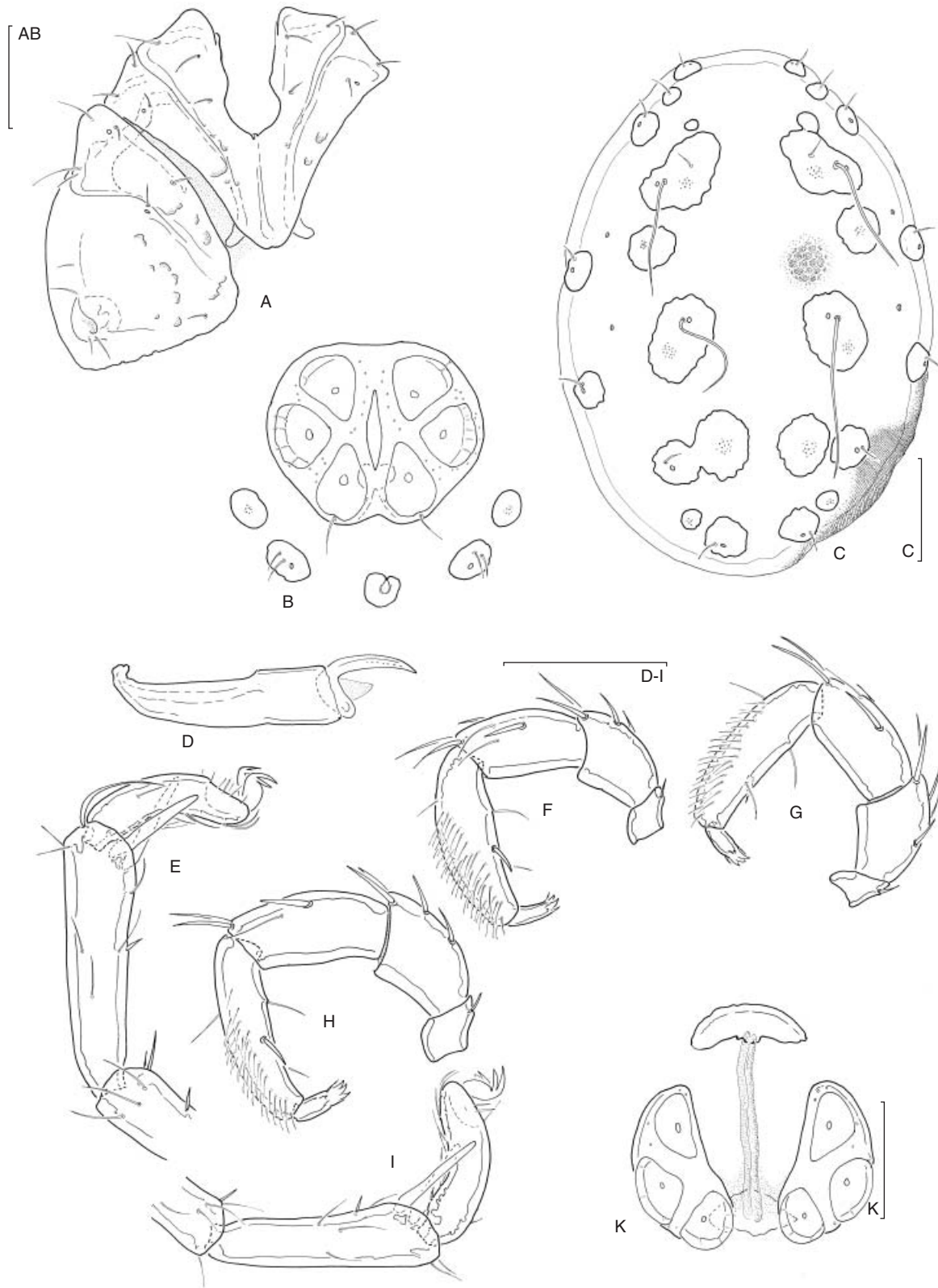


Figure 82. *Atractides brendle*. A, C–G, holotype ♂ B, paratype ♂, H–K paratype ♀. A, ♂ coxal field; B, ♂ genital and post-genital field; C, ♂ dorsum; D, ♂ chelicera; E, ♂ I-L-5 and -6; F, ♂ palp, medial view; G, ♂ palp, lateral view; H, ♀ palp, medial view, I ♀ I-L-5 and -6, K ♀ genital field. Scale bars = 100 µm.

S-1 L 72–75, L/W 9.3–10.3, S-2 L 66–72, L/W 6.6–9.0, interspace 8–10, L S-1/2 1.03–1.14

I-L-6 L 99–110, HA-HC 26–28, 24–25, 23, dL/HB 4.13–4.50; L I-L-5/6 1.59–1.68

genital field L/W 202–230/230–280; Ac-1–3 L 68, 58, 50

gnathosoma vL –; chelicera L 188–207, L/H 4.7–5.0, bS/claw 2.34–2.47

palp	P-1	P-2	P-3	P-4	P-5
L/W	28–30/ 23–30	68–77/ 40–50	79–100/ 35–45	103–120/ 26–30	32–36/ 11–12
(ratio)	1.00–1.26	1.54–1.70	2.04–2.30	3.90–4.22	2.67–3.27
rel.L	08–09	21–22	25–28	33	10
total L:	P-2/4 0.64–0.66				
	311–360				

Maximum diameter of dorsal plates: D-1 78–85, D-3 94–96 µm; as in males, the Tatra specimen differs in having several sclerite measurements slightly below the minimum of the Bavarian population, but there are no significant differences in proportions of appendages.

Discussion: The type revision of *A. loricator* indicates that it is characterized by a smooth excretory pore. The only hitherto described species from the *A. loricator* species group with an excretory pore sclerite remains *A. adenophorus*, based on a single female from Spain. All populations with an excretory pore sclerite attributed in numerous publications to *A. loricator* need revision, and the populations from the Alps most probably refer to *A. brendle*. Comparison with the figures published by Bader (1994) indicates that the species is probably identical to what he intended to call '*A. placocallosus*' (see above), but this name is no longer available because a specimen of *A. walteri* is deposited as the holotype of that species.

A. adenophorus has an anal sclerite rather similar to that of *A. brendle*: U-shaped and embracing the posterior margin of the anal pore. The holotype differs from *A. brendle* females in its distinctly smaller dimensions (e.g. coxal field L 238, Cx-3 W 297, Cx-1 + 2 mL 63, IL 136, W 126; palp L 276; I-L-5 dL/vL 123/99, S-1/2 L 60/54, I-L-6 L 83 µm) and a more robust I-L-6 (L/HB 3.77).

In *A. separatus*, another species with a sclerotized excretory pore, the sclerite is restricted to the anterior edge of the anal pore. It is easily distinguished from *A. brendle* also by the absence of the sclerotized dorsal muscle attachments typical of the *loricator* species group, and in males by the presence of an extended ventral shield. Four females of *A. macrolaminatus* were found at Berchtesgaden which differ from typical representatives of that species in having a sclerite ring around the excretory pore. These specimens of uncertain taxonomical status differ from *A. brendle* not only in the excretory pore sclerite (ring-, not U-shaped, but also in numerous other features that distinguish the two species: I-L-5 relatively short (dL/vL < 113–105/88–103 µm in ♂, 130–153/103–120 µm in ♀, ratio I-5 dL/I-L-6 L 1.29–1.50 in both sexes) and

I-L-6 distally thickened in mature specimens, D-1 sclerites much larger (maximum diameter up to 160 µm).

Habitat: Crenobiont.

Distribution: At present ascertained only from the *locus typicus* in upper Bavaria and one site in the Tatra mountains, but probably widely distributed in a number of European mountain ranges (4, 10).

Etymology: Named after Matthias Brendle (Tübingen).

ATRACTIDES CHELIDON SP. NOV. (FIG. 83A–G)

Type series: Holotype ♂, MNHL, *Atractides chelidon* nov. spec. Holotypus ♂ Gerecke; Lux int4c Ösling, Hoscheid, Schlönerbaach u. Chapelle St. Michel, Interstitial 3, 300 m, 72.5/113.2, 7.8.1998 Gerecke & Schrankel. State of conservation: gnathosoma separate, laterally, with palps and chelicerae *in situ*, left I-L detached, laterally (mounted on slide together with five deutonymphs of *A. denticulatus*).

Description:

General features

Female unknown

dorsal integument: nearly smooth, only locally, in tangential view an extremely fine striation visible (12/10 µm); muscle attachments: smooth
coxal field: sclerotization only weak, with a dense porosity, mediocaudal margin of Cx-1 + 2 swallow-tail shaped, with apodemes of Cx-2 in an acute angle, and between the apodemes indented, Cx-3+4 slender, suture line Cx-3/4 nearly straight, not anteriorly projecting near the glandular pore on Cx-4

I-L: little modified; I-L-5 with little diverging, straight dorsal and ventral margins, setae S-1/2 homoiomorphic, short and pointed, side by side, flagellar seta short and weakly modified; I-L-6 nearly straight, dorsal and ventral margins equally diverging from the base to the claw furrow, but with the typical ventral setae groups, claw strong
excretory pore: smooth; Vgl-1: separate from Vgl-2

Males

Holotype:

genital field: anterior margin equally convex, posterior margin with a deep indentation, Ac relatively large; genital setae: 40

palp: ventral margin of P-2 slightly convex in the distal half, but without extensions, P-3 straight, P-4 4 : 4 : 1, slightly protruding near insertion of proximoventral hair, distoventral hair shifted to the lateral surface of the segment, sword seta compact, inserted far distally, between the levels of the ventral hair insertions, with a cover of very fine dorsal hairs

idiosoma L/W 750/550; glandularia 25 µm

coxal field L 330; Cx-3 W 400; Cx-1 + 2 mL 90, IL 205, W 270

I-L-5 dL 135, vL 110, dL/vL 1.23, HA-HC 30, 33, 35, dL/HB 4.09

S-1 L 42, L/W 8.4, S-2 L 40, L/W 8.0, interspace 0, L S-1/2 1.05

I-L-6 L 1132, HA-HC 23, 27, 35, dL/HB 4.89; L I-L-5/6 1.02

genital field L/W 100/124, Ac-1–3 L 35, 33, 40

gnathosoma –; chelicera L 227, L/H 6.49, basal segment/claw 3.37

palp	P-1	P-2	P-3	P-4	P-5
L/W	25/24	50/37	52/30	90/25	27/11
(ratio)	1.04	1.35	1.73	3.60	2.45
rel.L	10	20	21	37	11
total L:	P-2/4 0.56				
	244				

No lateral eye lenses visible; the gnathosomal bay asymmetrical due to a preparation artefact, with the

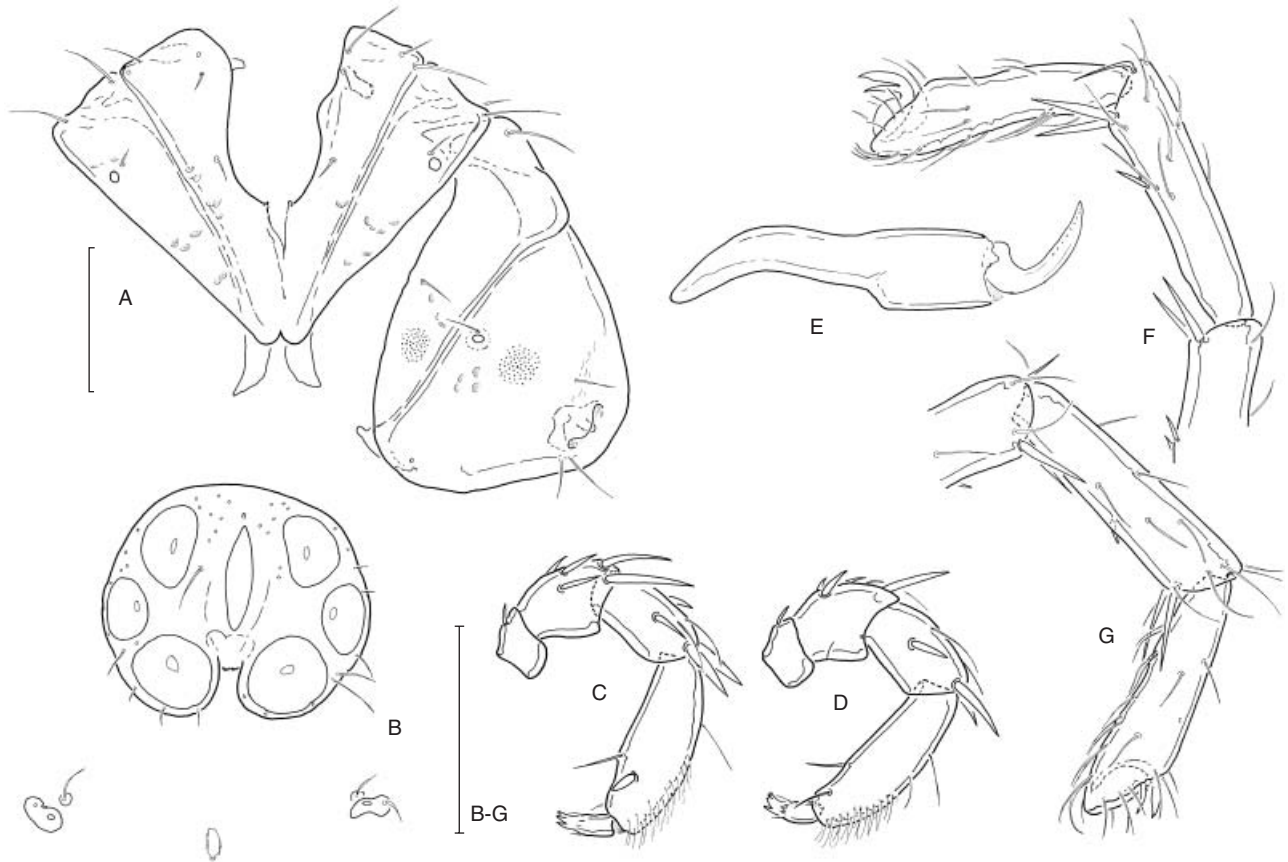


Figure 83. *Atractides chelidon*, holotype ♂. A, coxal field; B, genital and postgenital field; C, palp, medial view; D, palp, lateral view; E, chelicera; F, I-L-5 and -6 anteriorly; G, I-L-5 and -6 posteriorly. Scale bars = 100 µm.

apodeme of the left margin bent laterally, that of the right margin bent medially.

Discussion: *Atractides chelidon* is unique among all western Palearctic representatives of the genus in the morphology of the palp, with both ventral setae placed far distally, and the distoventral seta shifted to the lateral margin of the segment. It is furthermore characterized by the slightly modified I-L, with terminal segments at first view appearing equal in shape to II/III-L, and in the swallow-tail mediocaudal margin of Cx-1 + 2. The latter character is similarly found in *A. phreaticus* and *A. asticae* which, apart from their 'normal' palp morphology, with ventral setae inserted more proximally, both differ in having a much more sclerotized idiosoma (with muscle attachment plates, sclerotized excretory pore, and Vgl-1 + 2 fused).

Many of the problems discussed in this paper have arisen from species described from single specimens. Repetitive collections in the interstitial habitats of the *locus typicus* did not produce additional finds, but documented that the holotype of *A. chelidon* could not be

a misshaped representative of any of the other *Atractides* species living at this site (*denticulatus*, *distans*, *latipalpis*, *latipes*; Gerecke *et al.*, in press). *A. chelidon* displays an interesting combination of plesiotypical characteristics (slightly modified I-L, glandulare of Cx-4 not projecting rostrally and thus suture Cx-3/4 straight) and derived features (morphology of anterior coxal plates and palp). Characters also observed in other subterranean species such as *A. subterraneus* and *A. cisternarum*, including absence of lateral eyes, small hardened sclerites and smooth integument, suggest that *A. chelidon* is a hyporheobiont. In many hyporheobionts one may observe the presence of slightly modified first legs and the absence (or weak development) of a sexual dimorphism in palps. However, *A. chelidon* has surprisingly large dimensions for an interstitial dwelling species.

Etymology: *chelidon* (greek = swallow) referring to the swallow-tail shaped mediocaudal margin of Cx-1 + 2.

Distribution: Luxemburg, known only from the *locus typicus* (8).

SUBGENUS *TYMPANOMEGAPUS* THOR, 1923

(FIG. 84)

Diagnosis: Posterior margin of Cx-1 narrowed and medially truncated; I-L-5 and -6 slightly modified, with S-1 and -2 homoimorphic, rather short, I-L-6 slightly curved and distally inflated; gnathosoma boat-shaped, with strongly projecting rostrum; chelicera long and slender, (L/H > 8.0) with a strong, weakly curved claw; palps slender, P-1 elongated (L/H > 1.5), P-4 basally narrow, with a straight or slightly convex ventral margin lacking denticles near ventral hair insertions.

Discussion: All species attributed to this subgenus are morphologically rather homogeneous, distinguished mainly by fine differences in I-L and palp morphology. In the plesiomorphically homoimorphic S-1 and -2, they are similar to several species of *Atractides* s.s. with slightly modified I-L, mainly found in spring and interstitial habitats. Within the latter subgenus, the species of the *subasper* species group (with elongated gnathosomal rostrum) possibly represent a clade on the bridge to *Tympanomegapus*. To address this interesting question, additional studies on larval morphology and life cycles are necessary. *Tympanomegapus* species can be divided into two groups based on the (plesiomorphic) absence or (apomorphic) presence of 'cheeks' on P-5 (Fig. 84B,C).

ATRACRIDES PAVESII MAGLIO, 1905 (FIG. 85A–I)

Type series: Missing (D. Benfatti, pers. comm.). **Locus typicus:** River Ticino near Pavia, September/October (Maglio, 1906).

Material examined: SMF 7199, ♀, Italien, Vomano Fl. Moretti coll. 24.6.51; SMF 3698, ♀, Spanien, Zaragoza, Huerva-Fluß, 30.4.1917; SMF 5875, ♂ (Germany) Wümme b. Oberneuland, 27.7.1907, Viets coll.; SMF 1528, ♀ (Russia) Ost-Preußen, Alle-Fluß b. Heilsberg X.1902 Protz leg.

Rejected identifications: SMF 6011 ♀ Griechenland Yliki See b. Theben, 7.9.42 Laskar coll. (K. Viets, 1950 = *A. acutirostris*); SMF 7204 ♀ Italien, Iesi, Esino Fl., 30.7.1951 Moretti coll. (K. Viets, 1954 partim = *A. acutirostris*); SMF KOViets 7246 ♀ Israel Nahal Ortal 26.7.1979 IES 1627 Aca 1148 (unpubl. = *A. acutirostris*); SMF KOViets 2353 ♀ (Germany) Großer Stechlin See Westbucht, 80 cm, 29.10.1960 Mothes leg. (= *A. moniezi*).

Description:**General features**

dorsal integument: thick, inner layer with a regular pattern of fine crossing lines, locally like a knitting pattern, but laterally parallel centrifugal lines prevailing, upper integument layer finely striated; muscle attachments: smooth

coxal field: posterior margin of Cx-1 strongly curved or truncated, apodemes of Cx-2 forming an acute angle

I-L: I-L-5 with S-1/2 little distanced, with rounded tips, I-L-6 with a regular row of ventral hairs, claws strong

genital field: Ac in triangular arrangement

excretory pore: smooth; Vgl-1: sexual dimorphism? (fused to Vgl-2 in males, but separate in females)

palp: weak sexual dimorphism; anteroventral hair of P-4 shifted to the lateral side, sword seta distally from distal hair, very fine, nearly hair-like, P-5 with cheeks

Male

SMF 5875:

genital field: indentation at anterior margin very weak, at posterior margin deep; genital setae: 46

palp: P-4 slightly thickened and with dense cover of dorsal hairs
idiosoma L/W 740/600; glandularia 45

coxal field L 430; Cx-3 W 450; Cx-1 + 2 mL 160, IL 280, W 330

I-L-5 dL 208, vL 163, dL/vL 1.28, HA-HC 32, 42, 56, dL/HB 4.95

S-1 L 75, L/W 15.0, S-2 L 72, L/W 10.3, interspace 15, L S-1/2 1.04

I-L-6 L 144, HA-HC 32, 28, 35, dL/HB 5.14; L I-L-5/6 1.44

genital field L/W 140/180, Ac-1-3 L 40, 42, 45

gnathosoma vL 230; chelicera L 330, L/H 8.25, bS/claw 2.0

palp	P-1	P-2	P-3	P-4	P-5
L/W	45/30	75/40	104/35	130/37	34/14
(ratio)	1.50	1.88	2.97	3.51	2.43
rel.L	12	19	27	34	09
total L:	P-2/4 0.58				
388					

The attribution of this male to *A. pavesii* is uncertain (see below). Porosity of the coxae fine and dense; a slight incision of the plate bearing setae Vgl-1 + 2 suggests that their bases are secondarily fused and they might be separate in juveniles; distal margin of P-3 with convexly protruding lateral sheaths that cover the insertion of P-4.

Females

SMF 7199:

genital field: pre- and postgenital sclerites strong, Ac at equal interspaces, Ac-3 distinctly larger than Ac-1/2, a fine porosity in the medial area of the plate

palp: P-4 more slender and with less dorsal setae as compared with males
idiosoma L/W 1600/1200; glandularia 35

coxal field L 495; Cx-3 W 770; Cx-1 + 2 mL 116, IL 295, W 435

I-L-5 dL 242, vL 188, dL/vL 1.29, HA-HC 42, 57, 65, dL/HB 4.25

S-1 L 77, L/W 11.0, S-2 L 77, L/W 9.6, interspace 15, L S-1/2 1.00

I-L-6 L 172, HA-HC 37, 35, 42, dL/HB 4.91; L I-L-5/6 1.41

genital field L/W 195/246, Ac-1-3 L 45, 48, 60

gnathosoma vL 298; chelicera L 460, L/H 9.20, bS/claw 2.11

palp	P-1	P-2	P-3	P-4	P-5
L/W	54/32	84/48	122/42	145/36	44/14
(ratio)	1.69	1.75	2.90	4.03	3.14
rel.L	12	19	27	32	10
total L:	P-2/4 0.58				
449					

Setae of Dgl-1 short and strong; W measurements of coxal field of little significance due to the specimen being strongly crushed. As in males, distal margin of P-3 forming convexly protruding lateral sheets that cover the insertion of P-4.

Discussion: The original description (without figures) and a shorter repetition of this description (but including figures; Maglio, 1906) concentrate mainly on features characteristic for all species of the genus or subgenus. Maglio's additional statement 'aspect of the animal in dorsal view like *Torrenticola anomala* (K)' reveals limited powers of observation. The few significant measurement data agree with the female from Italy on which the description above is based: coxal field L 445, Cx-1 + 2 mL 126, gnathosoma ventral L

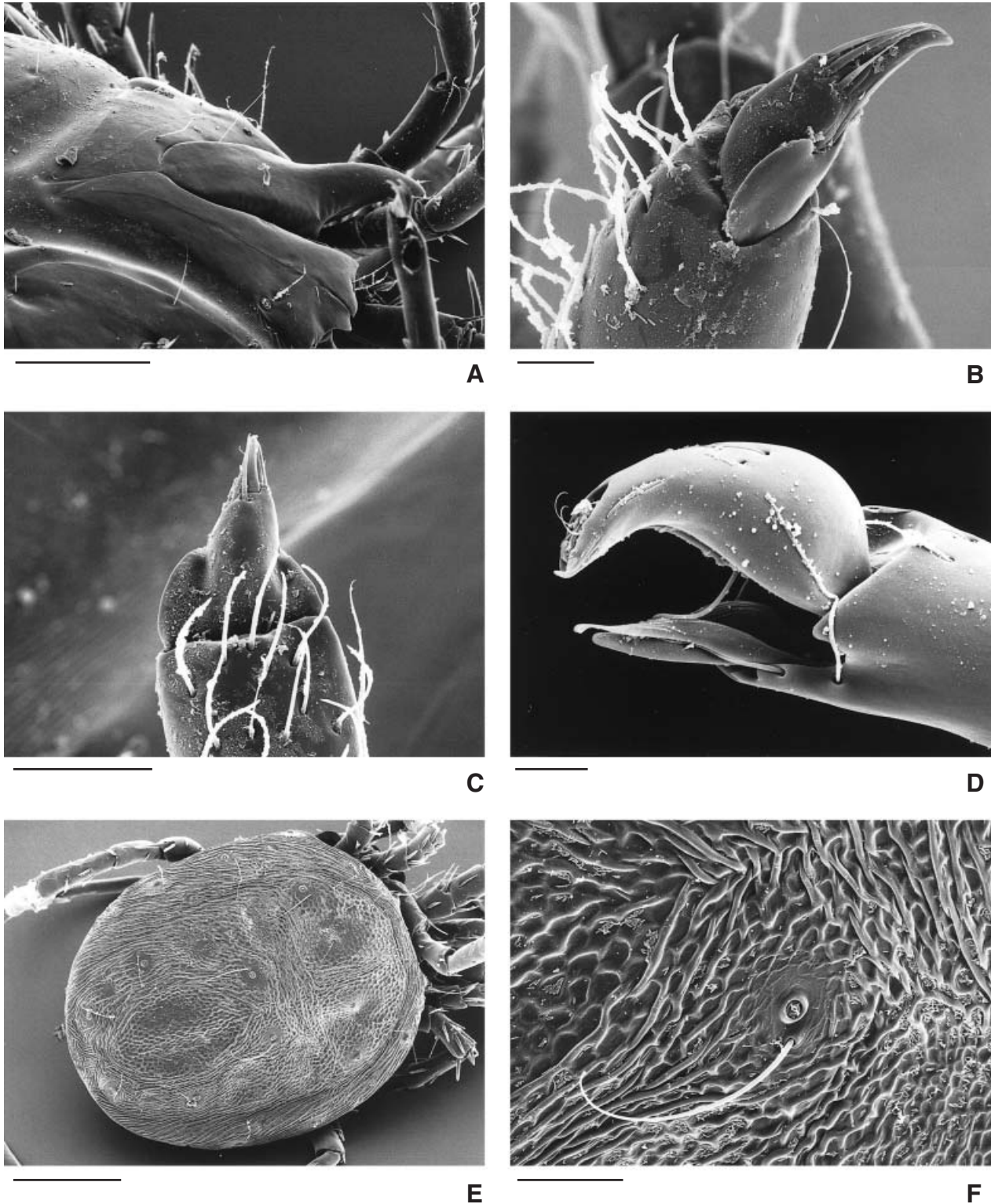


Figure 84. Morphology of the subgenera *Tympanomegapus* and *Polymegapus*. A–C, *A. acutirostris* ♀ (Sicily 1079 g). A, Cx-1 + 2 and gnathosoma, oblique ventral view, Scale bar = 100 µm; B, P-5 lateral view, Scale bar = 10 µm; C, P-5 dorsally, Scale bar = 20 µm; D–F, *A. polyporus* (Sicily dp67); D, I-L-5 and -6, Scale bar = 10 µm; E, dorsum, Scale bar = 100 µm; F, Dgl-4, Scale bar = 20 µm.

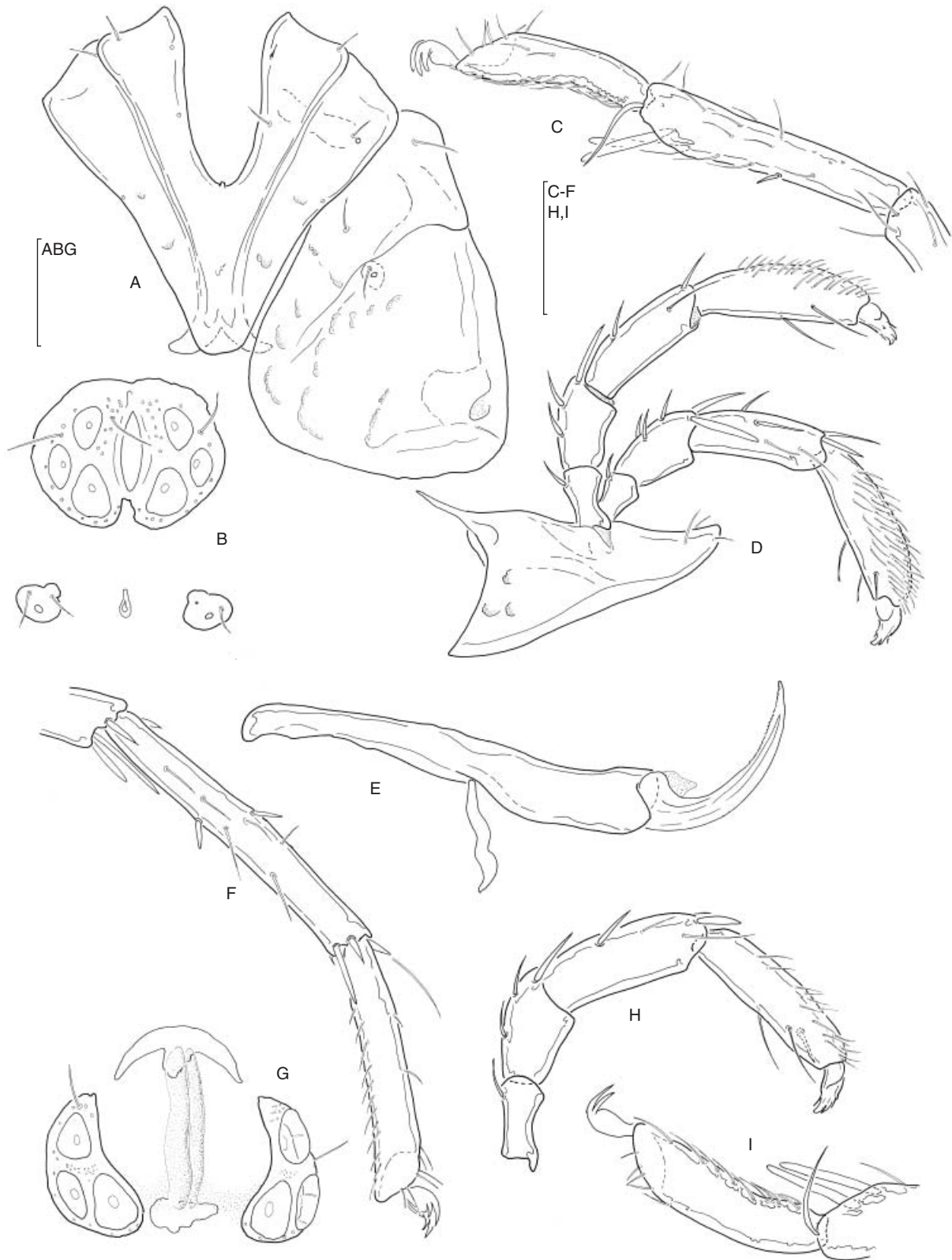


Figure 85. *Atractides pavesii*; A–D, ♂, Germany, SMF 5875. A, coxal field; B, genital and postgenital area; C, I–L-5 and -6; D, gnathosoma with palps *in situ*; E–I ♀, Italy, SMF 7199. E, chelicera; F, IV-L-5 and -6; G, genital field; H, palp, lateral view, I I-L-5 and -6, partial view. Scale bars = 100 µm.

315, relative L of palp segments (% total L, calculated from Maglio's indication '10 : 14 : 20 : 22 : 6') 14-19-28-31-8, I-L-5 dL 252, HB 45, S-1/2 L 75/70, I-L-6 L 164, and L ratio I-L-5/6 1.54. There are differences in the chelicerae (with a relatively short claw, basal segment/claw ratio 2.6) which could be due to a different way of measuring; no figures of this appendage are available. Good agreement in most measurement values is found between the female described above, the female from Russia (SMF 1528), and that from Spain (SMF 3689), while further specimens collected from other sites in Germany, Italy, Greece and Israel (see above) and labelled *A. pavesii*, represent different species. Based on the differences between them and the two above-mentioned females, the following diagnosis is presented for *A. pavesii*: leg claws without dorsal clawlets, terminal segments of I-L and their sword setae long (L I-L-5 > 220, I-L-6 > 160, S-1/2 > 60 µm), S-1 and -2 with rounded tips and interspace > 10 µm; L ratio I-L-5/6 > 1.30; palp total L > 400 µm, with particularly slender segments P-3 (L/H > 2.85) and P-4 (L/H > 3.95), sword seta of P-4 hair-like. The description, measurements, and figures published by Lundblad (1962) agree with this diagnosis.

Published information for males is very scanty, and no specimens collected south of the Alps are available at present. Compared to the German specimen described here, the distinctly smaller genital field (L/W 115/155 µm) of the male on which the original description was based could be explained by different extension of secondary sclerite. There is good agreement with the diagnosis given for the females: a different L/H ratio of P-3 is a sexual dimorphism found in many species of the genus. All authors agree that *A. pavesii* has no swimming hairs on III/IV-L. However, as swimming hairs are not easily visible, but easily lost in other *Tympanomegopus* species, more specimens of *A. pavesii* should be controlled for the expression of this character. In the female described here, one fine hair inserts on IV-L-5, about half the length of IV-L-6.

Distribution: Rarely recorded (and mostly from single specimens) from scattered areas in Europe; records need confirmation by additional collecting; Sweden, Germany, Italy, Spain, Russia (1, 3, 4, 9, 10, 14, 15, 16, 18). For a discussion of the record from Corsica (E. Angelier, 1954b) see under *A. acutirostris*.

TRACTIDES SPINIROSTRIS (THOR, 1923)

Megapus spinirostris Thor, 1923

Syn. to *A. pavesii* (Maglio, 1905): K. Viets 1955b

Type series: Lost; no holotype designation. *Loci typici:* Wolga basin: River Twertza near Twer, 21.06.1922, 1 ♀ (prep. 2554); River Mologa, 23.06.1922 1 ♂ River Kostroma, 30.06.1922 1 ♂.

Discussion: The diagnostic characters given by Thor for *A. spinirostris* concern age-dependent idiosomal proportions such as the relative distance between the coxal field and genital fields, the position of the excretory pore, and the sexual dimorphism of the palp. When comparing the P-3 of his female with Maglio's description, he was unaware that Maglio had depicted a male. The presence of a smooth, unstriated integument in *A. spinirostris* is most probably due to age or treatment during preparation. In several *A. pavesii*-like specimens, as well as in other *Atractides* species, stages of gradual detachment of the upper integument layer can be observed. Neither the figures nor the measurements published by Thor include any unequivocal information on the identity of this taxon. The presence of *A. pavesii*, confirmed here as covering an extended area all over Europe including former eastern Prussia (Russia), suggests that Viets' proposal to synonymize was correct.

TRACTIDES LACUSTRIS (LUNDBLAD, 1925)

(FIG. 86A–H)

Megapus lacustris lacustris Lundblad, 1925

Syn. *Atractides lacustris scutatus* (Lundblad, 1925): Besseling, 1954

Type series: Holotype ♂ SMNH 773, *Megapus lacustris* Lundbl. ♂ Småland Björkö socken Stensjön, 1–3 meter leg. O. Lundblad 18.7.1916 773 Typ (249). State of conservation: perfect, both I-L, all right legs, gnathosoma, chelicerae and one palp separate, laterally, one palp dorsally, Gsk separate, anterior. Paratype ♀ SMNH 772, *Megapus lacustris* Lundbl. ♀ Småland Nona Uixen leg. O. Lundblad 17.7.1916 772 Allotyp (242). State of conservation: as holotype, but gnathosoma *in situ*, two eggs.

Description:

General features

dorsal integument: striated; muscle attachments: sclerotized, extension of sclerotization variable from isolated knobs to an entire shield covering large parts of the dorsum and including Dgl-3–5; a well sclerotized transverse frontal shield between Dgl-1

coxal field: with extended border of secondary sclerotization, sexual dimorphism

I-L: little modified; setae S-1/2 closely together, S-1 slightly curved inwards, with blunt tip, S-2 with pointed, stiletto-like tip

excretory pore: smooth; Vgl-1: fused to Vgl-2

palp: no remarkable sexual dimorphism; P-4 with straight ventral and equally curved dorsal margin, 3 : 2 : 2, sword seta pointed, between ventral hairs, P-5 without cheeks

Male

Holotype, holotype of *A. scutatus*:

genital field: with convex, medially protruding border of secondary sclerotization or fused to the caudally extending border of secondary coxal sclerite; genital setae: 42

idiosoma L/W 610/480; glandularia 42

coxal field L 324; Cx-3 W 363; Cx-1 + 2 mL 128, IL 234, W 266

I-L-5 dL 142, vL 114, dL/vL 1.25, HA-HC 29, 34, 38, dL/HB 4.18

S-1 L 44, L/W 14.7, S-2 L 53, L/W 13.3, interspace 6, L S-1/2 0.83

I-L-6 L 114, HA-HC 23, 25, 26, dL/HB 4.56; L I-L-5/6 1.25

genital field L/W 114/134, Ac-1–3 L 26, 23, 33

gnathosoma vL 193; chelicera L 277, L/H 9.6, bS/claw 2.79

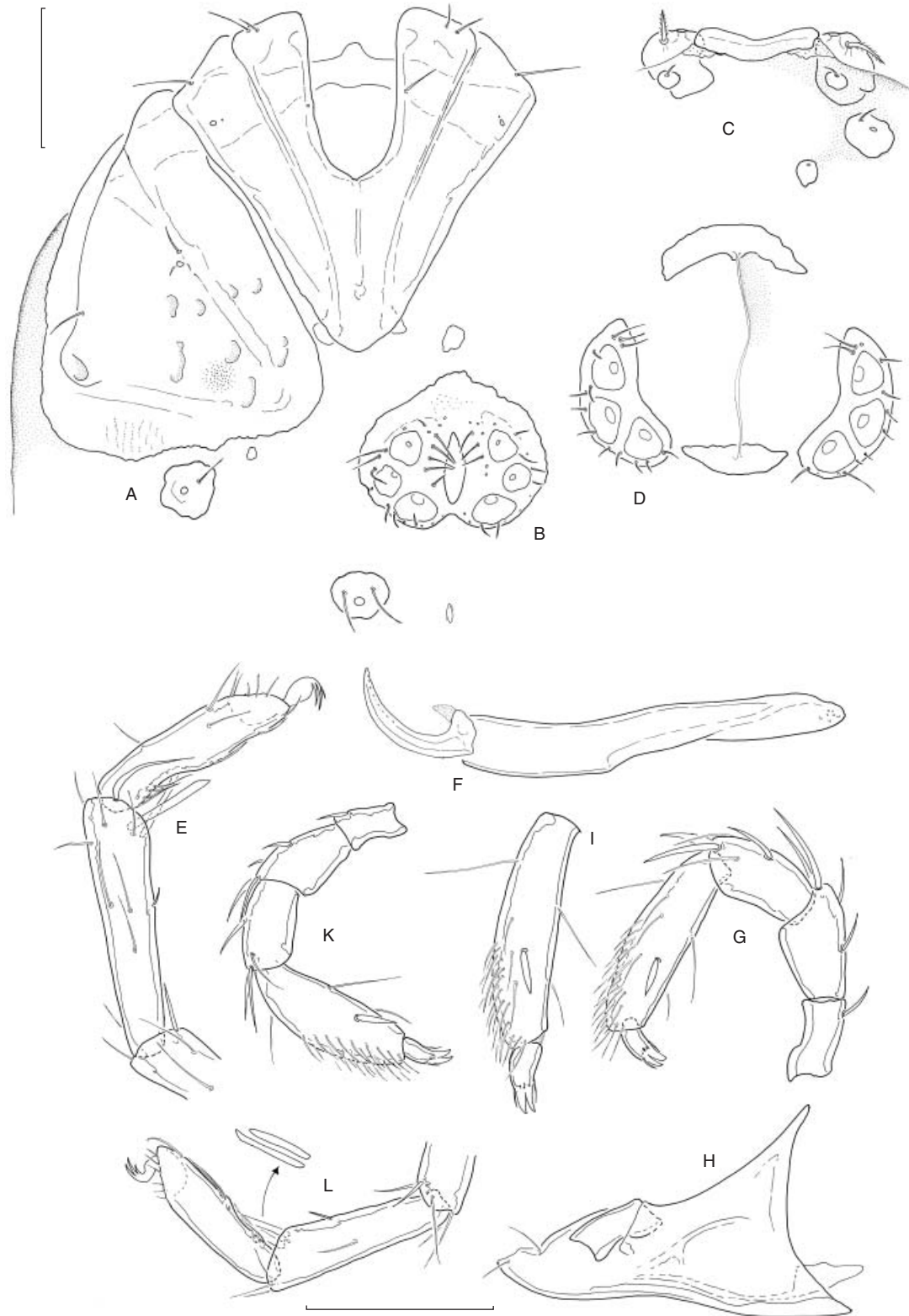


Figure 86. A–I *Atractides lacustris*, A–C, E–H, holotype ♂ SMNH; D, I paratype ♀. SMNH. A, ♂ coxal field; B, ♂ genital and postgenital field, partial view; C, ♂ frontal platelet with Dgl-1/2 and prefrontalia; D, ♀ genital field, E, ♂ I-L-5 and -6; F, ♂ chelicera; G, ♂ palp, medial view; H, ♂ gnathosoma, lateral view (with left P-1 *in situ*, directed rostrally), I ♀ P-4/5. K, L *Atractides ibericus* ♀ Gerecke E113. K palp, medial view, L I-L-5 and -6. Scale bars = 100 μm.

palp	P-1	P-2	P-3	P-4	P-5
L/W	41/23	64/35	61/29	111/32	32/12
(ratio)	1.78	1.83	2.10	3.47	2.67
rel.L	13	21	20	36	10
total L:	P-2/4 0.58				
	309				

Lundblad erroneously depicts in his figure 13 an additional pair of setal sclerites lateral to Dgl-3, where in reality a pair of slit organs is situated. In the holotype, D-1 has fused together with the postocularia to a claviform sclerite, all other dorsal muscle attachments knob-shaped platelets not fused to other dorsal sclerite elements, and the Vgl free in the membranous integument. In the holotype of *A. scutatus* (syn. to *A. lacustris*), an extended shield covering most of the dorsum, including pref, postoc, D-1–4, and Dgl-3–5; all coxae fused to form a unique coxal shield, and the border of secondary sclerite at the posterior margin of Cx-4 including also Vgl-3 + 4. Leg claws with a dorsal clawlet.

Females

Paratype:
genital field: genital plates bean-shaped
idiosoma L/W 1030/860; glandularia 42
coxal field L 409; Cx-3 W 592; Cx-1 + 2 mL 99, IL 277, W 362
I-L-5 dL 178, vL 140, dL/vL 1.27, HA-HC 38, 41, 50, dL/HB 4.34
S-1 L 55, L/W 13.8, S-2 L 61, L/W 10.2, interspace 6, L S-1/2 0.90
I-L-6 L 146, HA-HC 26, 25, 34, dL/HB 5.84; L I-L-5/6 1.22
genital field L/W 184/228, Ac-1–3 L 33, 35, 30
gnathosoma vL 274; chelicera L 403, L/H 10.6, bS/claw 2.84

palp	P-1	P-2	P-3	P-4	P-5
L/W	61/26	79/41	79/35	128/31	38/14
(ratio)	2.35	1.93	2.26	4.13	2.71
rel.L	16	21	21	33	70
total L:	P-2/4 0.62				
	385				

The secondary sclerite border of the coxae clearly visible, but less extended than in males; anterior and posterior coxal plates separate from each other. Leg claws as in males.

Discussion: A detailed redescription of this species was provided by Biesiadka (1972a). The presence of sclerotized muscle attachments distinguishes *A. lacustris* from *A. pavesii*, the only valid species of the subgenus known at that time. Further differences are found in both sexes in the presence of dorsal clawlets on leg claws, S-1 and -2 on I-L-5 shorter with narrower interspace, chelicera with relatively short claw, sword seta on P-4 thickened and inserted proximal to the distoventral hair, and absence of ‘cheeks’ at P-5. No swimming hairs have been observed so far in specimens of *A. lacustris*. This character should be investigated in future studies as the species is found nearly exclusively in standing water. In *Tympanomegapus* specimens, swimming hairs are often masked by terminal leg segments, or lost during preparation.

Habitat: Standing and slow running water.

Distribution: Sweden, Ireland, the Netherlands (14, 17).

ATRACTIDES SCUTATUS (LUNDBLAD, 1925)

Megapus lacustris scutatus Lundblad, 1925

Syn. to *A. lacustris* (Lundblad, 1925): Besseling, 1954

Type series: Holotype ♂ SMNH 771, labelled as paratype ♀ of *A. lacustris* ... 771 Typ (242). State of conservation: good, dorsum/ventrum separate, gnathosoma separate, lateral, both I-L separate, Gsk isolated, anterior.

Discussion: The holotype of this taxon was collected together with the paratype female of *A. lacustris*. Lundblad introduced the name of this ‘variatio’ in view of the dorsal sclerotization, strongly extended compared with that of *A. lacustris*. The whole set of idiosoma and gnathosoma measurements agrees without any notable deviation with the values given for the holotype male of that species. This observation supports the viewpoint of Besseling (1954), who suggested after studying specimens from the Netherlands that the differences in dorsal sclerotization be considered as resulting from individual variability. Lundblad (1962) accepted this proposal.

ATRACTIDES LONGIROSTRIS (WALTER, 1925)

(FIG. 87A–G)

Megapus longirostris Walter, 1925

Type series: Holotype ♀, NHMB *Megapus longirostris* Walter ♀ ov. Algerien 15.4.1924 coll. Gauthier; Typus; leg. Gauthier, Algérie. Oued Bou Saâda 15.IV.1924; XIII/42. Overpasted label: Pr. 1942 Typ. ♀ ov. State of conservation: good, due to folding of integument genital field in oblique position; right I-L and gnathosoma (with all appendages detached) separate.

Material examined: ♂ NHMB *Megapus longirostris* ♂ Walt. Nord-Afrika 14.9.25 Coll. Gauthier 15. XXIX/19 (collecting site Oued Boudouaou, en aval de l’Alma (Alger), 14 septembre 1925; Walter, 1928b). State of conservation: only idiosoma, left I-III-L and right I-L-5 and -6 absent, partly desiccated (probably, as usual in coll. Walter, a further slide existed bearing I-L and mouthparts, now lost); ♂ SMNH 3136 Allotyp; *Megapus longirostris* Walt. ♂ Algeriet El Kantara 4.4.1931 leg. G. Notini. Not part of the type series, mounting medium with numerous droplets hampering detailed view, genital field and mouthparts in oblique position, measurements impossible.

Description:

General features

dorsal integument: striated (7/10); muscle attachments: smooth
coxal field: sexual dimorphism?

I-L: setae S-1/2 distanced, S-1 with roundish, S-2 with pointed tip
excretory pore: smooth – sexual dimorphism?; Vgl-1: fused with Vgl-2
palp: slender, P-4 sword seta hair-like, ventral margin 2 : 1 : 1, P-5 with cheeks

Males

SMNH 3136, measurements in parentheses from Lundblad (1942b):

genital field: with weakly indented anterior, and more deeply indented posterior margin; genital setae: 42

palp: P-4 thickened, with strongly convex dorsal margin

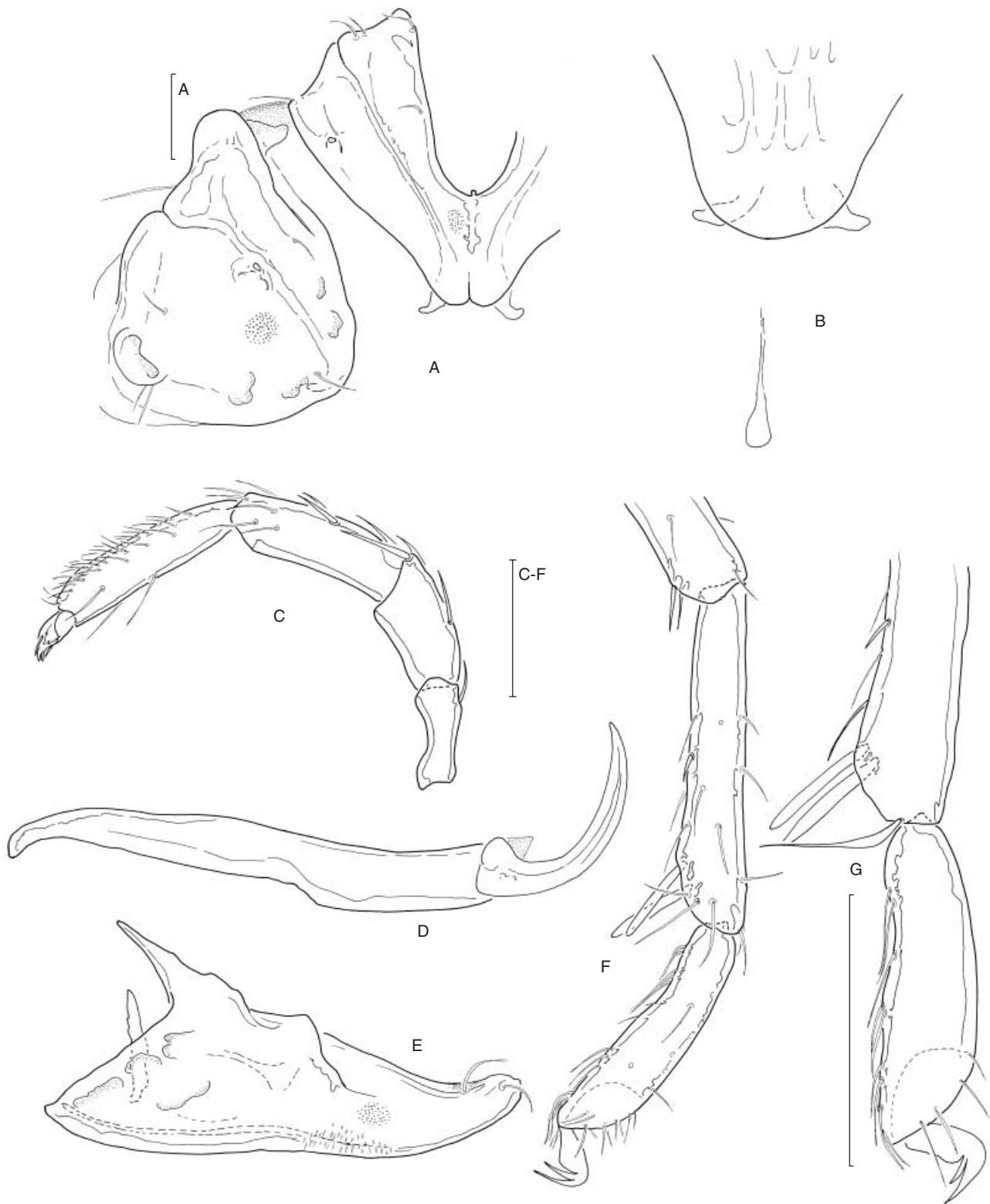


Figure 87. *Atractides longirostris*. A, C–F holotype ♀ NHMB; B; G, ♂, Algeria (uncertain attribution) SMNH 3136. A, ♀ coxal field; B, ♂ mediocaudal margin of Cx-1 + 2; C, ♀ palp, medial view; D, ♀ chelicera; E, ♀ gnathosoma lateral view; F, ♀ I-L-5 and -6; G, ♂ I-L-5 and -6 partial view. Scale bars = 100 μm.

idiosoma L/W 640/470; glandularia 26
 coxal field L 338; Cx-3 W 365; Cx-1 + 2 mL 126, IL 220, W 256
 I-L-5 dL 152, vL 119, dL/vL 1.28, HA-HC 29, 37, 43, dL/HB 4.11
 S-1 L 48, L/W 12.0, S-2 L 48, L/W 8.0, interspace 4, L S-1/2 1.0
 I-L-6 L 121, HA-HC 28, 26, 33, dL/HB 4.65; L I-L-5/6 1.26
 genital field L/W (112)/139, Ac-1-3 L 30, 25, 25
 gnathosoma vL 489; chelicera L 278, L/H -, bS/claw 1.99

palp	P-1	P-2	P-3	P-4	P-5
L/W	(41/-)	(61/-)	(75/-)	(103/-)	(34/-)
(ratio)	-	-	-	-	-
rel.L	13	19	24	33	11
total L:	P-2/4 0.59				
	314				

Posteriorly from the caudal margin, a drop-shaped sclerite in the membranous integument might represent a muscle attachment normally (and also in the female holotype) lying medially on Cx-1 + 2, but shifted far caudally in this specimen. Sclerotization of excretory pore extended, but restricted to its anterior edge.

Females

Holotype, measurements in brackets from original description:
 genital field: pregenitale narrow, genital plates bean-shaped
 palp: P-4 more slender than in males
 idiosoma L/W 1590/1275; glandularia?
 coxal field L 493; Cx-3 W 751; Cx-1 + 2 mL 117, IL 311, W 446
 I-L-5 dL 256, vL 198, dL/vL 1.29, HA-HC 40, 52, 72, dL/HB 4.92
 S-1 L 67, L/W 9.6, S-2 L 69, L/W 9.9, interspace 14, L S-1/2 0.97
 I-L-6 L 184, HA-HC 34, 34, 45, dL/HB 5.41; L I-L-5/6 1.39
 genital field L/W 202/243, Ac-1-3 L -
 gnathosoma vL 338; chelicera L 500, L/H 11.1, bS/claw 2.27

palp	P-1	P-2	P-3	P-4	P-5
L/W	67/36	100/54	130/41	153/35	40/16
(ratio)	1.86	1.85	3.17	4.37	2.50
rel.L	14	20	27	31	08
total L:	P-2/4 0.65				
	490				

Mediocaudal margin of Cx-1 + 2 slightly indented, coxal plates without secondary sclerotization.

Discussion: In his original description, based on the single female holotype, Walter compared *A. longirostris* with the poorly known *A. spinirostris*, here considered a synonym of *A. pavesii*. He regarded the following characters to be distinctive in the females: larger coxal field, indented mediocaudal margin of Cx-1 + 2 with little projecting apodemes, Cx-3 with an extended medial margin anteriorly only slightly diverging from the median line, and Ac arranged in a weakly curved line rather than in triangular formation.

Unfortunately, in his first description of the male, Walter (1928b) provided no figures, and the mouthparts and legs of the specimen on which this description was based are lost. He stated that there were only a few differences between the sexes: dimensions, shape of coxae (mediocaudal margin Cx-1 + 2 more projecting, not indented) and mouthparts (P-4 slightly more inflated). Furthermore, he explicitly stated that

the excretory pore is unsclerotized, a character which, in the damaged specimen, is no longer clear. This feature, as well as the fact that Walter did not mention sexual differences in the I-L, suggests that his attribution to *A. longirostris* was correct.

Overlooking Walter's (1928b) paper, Lundblad (1942b) believed that he was the first to give a description of the male of *A. longirostris* from new Algerian collections. Compared with the specimen from NHMB, Lundblad's male has a smaller palp, but agrees in shape and chaetotaxy of P-4, and also in most idiosomal measurements. It differs in the presence of a large excretory pore sclerite and clearly shorter and stouter I-L-5 and -6, with S-1 and -2 more slender and arranged more closely together. If this specimen were conspecific with *A. longirostris*, this would be an uncommon case of intraspecific variability of characters normally found stable within species. While this problem awaits solution, the description of the male of *A. longirostris* is based here on Lundblad's specimen, but with a question mark.

A. longirostris is very similar to *A. pavesii* in nearly all features and measurements, including the relatively strong cheliceral claw, hair-like sword seta on P-4, and the ventral setae of this segment shifted distally. It can be distinguished in females from the indented mediocaudal margin of Cx-1 + 2, Vgl-1 + 2 fused, and more slender palp, and in both sexes in the Ac arranged in a slightly curved line. If Lundblad's attribution is correct, males additionally differ in minor dimensional aspects, a more slender I-L-5, a lower L ratio I-L-5/6, and the possible presence of an excretory pore sclerite. *A. longirostris* differs from *A. lacustris* among others in the absence of sclerotized muscle attachments, and the sword seta on P-4 hair-like, not enlarged, arranged proximal to the distoventral hair. In view of the minute differences to the females of *A. pavesii*, and the rather distinct features of the male ascribed to this species by Lundblad, it would be not surprising if future studies demonstrated *A. longirostris* to be a synonym of *A. pavesii*, and the male in question a still undescribed species.

Habitat: Rhithrobiont.

Distribution: Algeria (x).

ATRACTIDES MONIEZI (MOTAŞ, 1927) (FIG. 88A-F)

Megapus moniezi Motaş, 1927

Syn. *Atractides virginalis* Tuzovskij, 1977: syn. nov.

Type series: Missing. **Locus typicus:** canal d'aménée du lac Saint-André aux Marches, près de Chambéry (Savoie), le 6 aout 1926, 1 ♀ ovigère [...] Leg. C. Angelier. This site is at 300 m asl, records of three further females were published by Motaş (1928) from Lac Saint-André and Lac Clair.

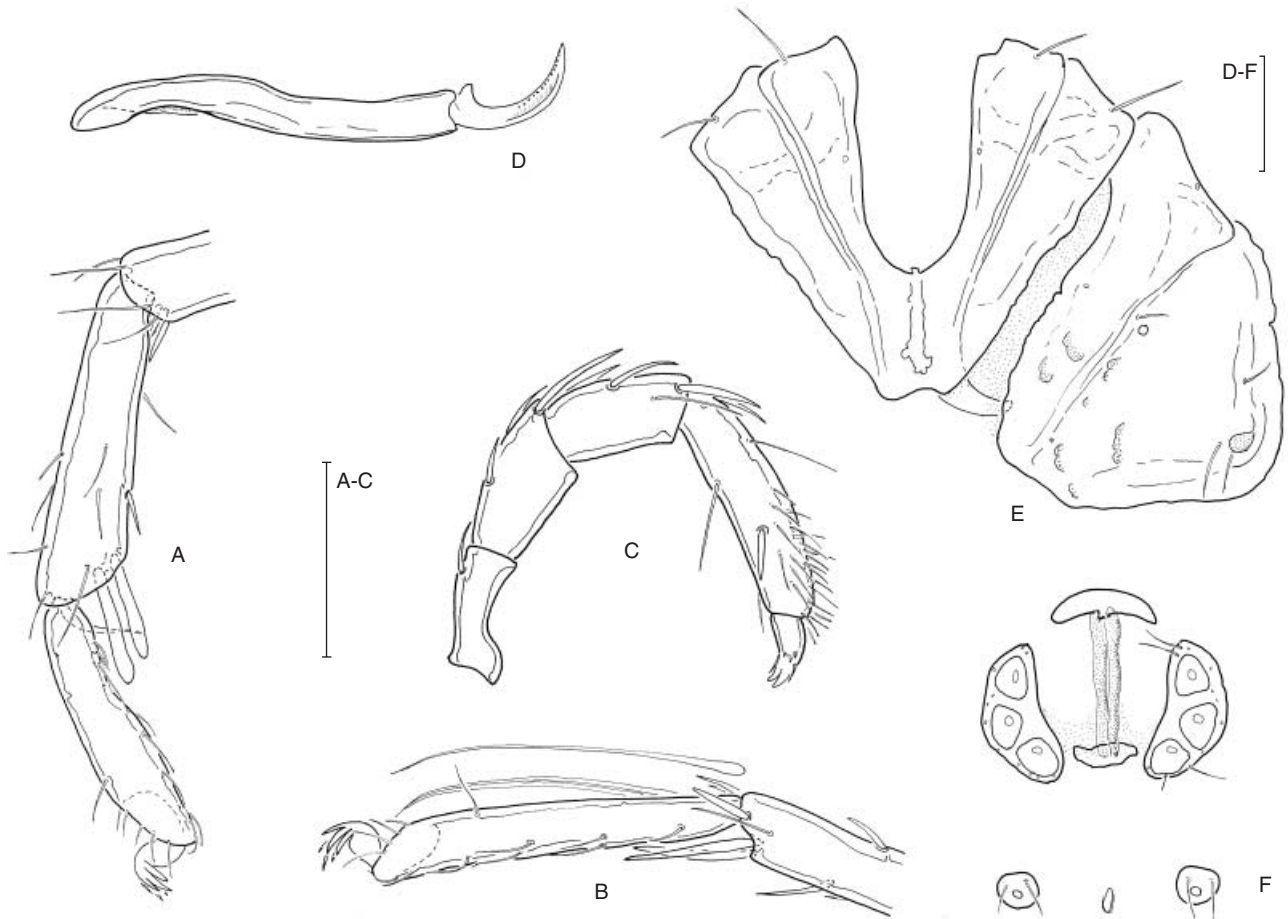


Figure 88. *Atractides moniezi*, ♀ Germany SMF KOViets 2353. A, I-L-5 and -6; B, III-L-5 and -6 partial view; C, palp, medial view; D, chelicera; E, coxal field; F, genital and postgenital field. Scale bars = 100 µm.

Material examined: SMF KOViets 2353 *A. pavesii* ♀ Großer Stechlin See Westbucht, 80 cm, 29.10.1960 Mothes leg.; NHMB *Atractides moniezi* ♀ Rotzloch, Vierwaldstättersee Coll. Rohrer 1972. State of conservation: good (after remounting; original mounting fluid dark and dirty), some setae lacking (also the swimming hairs of III-L which were observed before remounting!), one I-L and one IV-L lacking, the other IV-L without terminal segment.

Description:

General features

Original description, male unknown
 dorsal integument: striated, with lines of fine pores in the lower integument layers; muscle attachments: smooth
 coxal field: mediocaudal margin of Cx-1 + 2 bluntly pointed, without indentation, coxae with borders of secondary sclerite
 I-L: S-1 and -2 little distanced from each other, S-1 pointed, S-2 thicker and distally rounded
 excretory pore: smooth; Vgl-1: fused with Vgl-2
 palp: slender, P-4 ventral margin 1 : 1 : 1, sword seta little enlarged, but not hair-like, inserted between the ventral hairs, nearer to the distoventral hair, P-5 without 'cheeks'

Females

Original description, partly calculated from figures, dates from SMF 2353 in parentheses
 genital field: pregen with extended border of secondary sclerite, Ac in a curved line

ideosoma L/W 1023/825 (780/650); glandularia 42
 coxal field L 413 (400); Cx-3 W (530); Cx-1 + 2 mL (100), IL (280), W (370)
 I-L-5 dL 177 (180), vL 148 (145), dL/vL 1.20 (1.24), HA-HC 41 (37), 47 (45), 50 (52), dL/HB 3.77 (4.00)
 S-1 L 56 (57), L/W (11.4), S-2 L 61 (62), L/W 8.9, interspace 7 (7), L S-1/2 0.92 (0.92)
 I-L-6 L 135 (145), HA-HC 26 (25), 28 (25), 33 (32), dL/HB 4.82 (5.80); L I-L-5/6 1.31 (1.24)
 genital field L/W 147/182 (158/203); Ac-1-3 L 39 (35), 30 (40), 30 (30)
 gnathosoma vL 302 (300); chelicera L 411 (423), L/H 8.85 (12.1), bS/claw 3.37 (2.92)

palp	P-1	P-2	P-3	P-4	P-5
L/W	68/- (65/27)	83/47 (82/45)	88/42 (85/37)	127/35 (132/27)	38/- (45/15)
(ratio)	(2.41)	1.77 (1.82)	2.10 (2.30)	3.63 (3.57)	(3.00)
rel.L	17 (16)	21 (20)	22 (21)	31 (32)	09 (11)
total L:	P-2/4 0.65 (0.62)				
	404 (409)				

Following Motaş: integument thick, finely shagreenate and with porosity, sclerites blue-green in colour; antenniformia strong (but rather long and not flattened), diameter of their platelets 68 µm; border of secondary sclerotization 26–33 µm wide; total L of legs: I-L 785, II-L 703, III-L 805, IV-L 1270 µm, without swimming

hairs, I-L-6 nearly straight, leg claws with dorsal and ventral clawlet; L/W genital plate 135/52 µm, gonoporus L 135 µm, distance genital to excretory pore 164 µm, excretory pore to posterior margin 99 µm; P-5 with 'cheeks' (misinterpreted: 'petite expansion chitineuse à la partie distale du 4. article'). At distal margins of III/IV-L-5 each, a pair of setae is modified to form long swimming hairs with their tips reaching nearly the distal edge of the terminal segments; these setae characteristic in their 'swollen' basal part.

Discussion: Many of the differences to the other *Tympanomegapus* species listed by Motaş may be explained by the different age of the specimens being compared. His affirmation that the P-4 sword seta is not present in the compared species is incorrect. *A. moniezi* is similar to *A. lacustris*, a species unknown to Motaş in 1927. Common features, diagnostic for both species when compared with *A. pavesii* and *A. longirostris*, are the presence of dorsal clawlets on leg claws, a relatively short cheliceral claw (L < 140 µm, basal segment/claw > 2.5), the enlarged sword seta on P-4, and the absence of 'cheeks' on P-5. From a comparison of the information published by Motaş with the data given here, the additional differences are as follows: both *A. pavesii* and *A. longirostris* females have a larger genital field, a longer and more slender I-L-5 (L > 220 µm, L/HB > 4.1), a longer I-L-6 (L > 150 µm), and a longer, more slender palp (total L > 440 µm, L/H P-3 > 2.70). *A. lacustris* females differ from *A. moniezi* in the absence of swimming hairs, slightly minor palp dimensions (total L 385 µm) and more slender P-4 (L/H 4.13) and I-L-5 (L/H 4.34). It is possible that these differences will be invalidated after additional population variability studies. Swimming hairs are easily lost or overlooked, and the measurement differences could well fall within the variability range of one species. This problem cannot be addressed before more males are detected over a wider geographical range.

With regard to most characters, the specimen from Lake Stechlin (SMF 2353) fits the original description. The only differences of consequence concern minor idiosomal dimensions (L/W 780/650), a more slender I-L-6, and longer cheliceral claw (although distinctly shorter than in the compared species). In view of the fact that all information on *A. moniezi* is based on measurements from the literature, or from the drawings of the original description, the agreement of the German specimen is considerable, and it can be attributed to *A. moniezi* with a high degree of certainty. The specimen preserved under this name in NHMB differs in having a strongly thickened sword seta on P-4.

Habitat: Known from the riparian zone of lakes and slow moving rivers.

Distribution: France (Savoie), Germany (Brandenburg, published by Mothes (1964) under the name of *A. pavesii*, first record for the country), Russia (Jaroslavl, *A. virginalis* Tuzovskij, 1977 = syn. to *A. moniezi*, first record for the country), Switzerland (first record for the country) (4, 14, 16).

ATRACTIDES ACUTIROSTRIS (MOTAŞ & C. ANGELIER, 1927) (FIGS 84A–C, 89A–G)

Megapus acutirostris Motaş & C. Angelier, 1927

Syn. *A. elongatus* (Halbert, 1944): syn. nov.; *A. longipes* (Halbert, 1944): syn. nov., *A. magnirostris* (Motaş & Tanasachi, 1948): syn. nov.; *A. acutirostris gibberimarginatus* K. Viets, 1955: syn. nov.

Type series: Missing. **Locus typicus:** France, Massif Central, ruisseau de la Clamouze (Puy-de-Dôme), 17 juillet 1927, T. 10°; sur un fond herbeux, 1 ♀ portant 21 oeufs [...] 1300 m (Leg. C. Angelier).

Material examined: British Isles: coll. Gledhill (partly labelled as *A. magnirostris* or *A. pavesii*). Ireland: Trib. of Bandon Bridge nr. P. O. Derrynacaheragh Dunmannway. Co Cork. 24. 188560 coll. 3.11.82. 2 ♂, 1 ♀; Dirty River. Dunmannway. Co Cork. 3.11.82. 1 ♀; Glantrasna River. Lauragh Bridge, Lauragh, W. Cork. coll. 1.11.82. 1 ♂. United Kingdom: River Swate, Yorks. Site 1. 1 SW D S coll. Jane Ingram 6.7.94 1 ♂; R. Coln, Fairford, SP.149032 coll. 29.3.79 2 ♂, 2 ♀; R. Tummel, Pittochry, Perthshire. NN.568542. Interstitial. Scotland 5 coll. 27.9.72 1 ♂; R. Frome. Moreton. coll. 19.6.78 Sample 4. Gravel Core, 1 ♀. Germany: D 448 Bayern (GAP), Uffing, Ach u. Staffelsee SE Heimgarten, 680 m, 16.5.1993 2 ♀, Gerecke. Greece: SMF 6011 ♀ *A. pavesii*; Griechenland Yliki See b. Theben, 7.9.42 Laskar coll. (K. Viets, 1950). Israel: SMF KOViets 7246 ♀ *A. pavesii*; Israel Nahal Ortal 26.7.1979 IES 1627 Aca 1148 (unpubl.). Italy: SMF 7204 ♀ *A. pavesii*; Italien, Iesi, Esino FL, 30.7.1951 Moretti coll. (K. Viets, 1954 *partim*); Sicily, Gerecke: I 179, Iblei (SR), Sortino, Anapo near Staz. ENEL, WB 055 109, 163 m, 18.09.1985, 3 ♂, 3 ♀; I 465, Ribera (AG), Calamonaci, F. Verdura near C. Tragaleggi, UB 47 56, 95 m, 22.08.1986, 4 ♂, 15 ♀.

Description:

General features

Original description, Motaş 1928, in parentheses specimen from Sicily, 179 dorsal integument: striated; muscle attachments: smooth
coxal field: caudal margin of Cx-1 + 2 with sexual dimorphism, extended borders of secondary sclerite
I-L: setae S-1/2 longish, with rounded tips, insert-ing side by side, without interspace in lateral view
excretory pore: smooth; Vgl-1: separate from Vgl-2
palp: slender, P-4 club-shaped, ventral margin 4 : 1 : 2, sword seta hair-like, P-5 with 'cheeks'

Males

Attribution to this species uncertain, see below; Szalay 1935b, partly calculated from his figures, in parentheses specimen from Sicily, I 179
genital field: anteriorly with rounded margin of irregular secondary sclerite, occasionally in the middle slightly extending, posterior margin with an indentation that in older specimens is filled with secondary sclerite; genital setae: 42
coxal field: caudal margin of Cx-1 + 2 medially tongue-shaped, covering the indentation formed by the medially touching apodemes of Cx-2
palp: P-4 with dense dorsal hair cover, this area may be inflated or crushed idiosoma L/W 617/417 (625/490); glandularia 50 (40)
coxal field L 350 (330); Cx-3 W 363 (370); Cx-1 + 2 mL 150 (118), IL 225 (225), W 250 (255)
I-L-5 dL 150 (132), vL 129 (112), dL/vL 1.16 (1.18), HA-HC 33 (40), 38 (42), 43 (45), dL/HB 3.95 (3.14)
S-1 L 57 (52), L/W (13.0), S-2 L 57 (52), L/W (13.0), interspace 0, L S-1/2 1.0 (1.0)

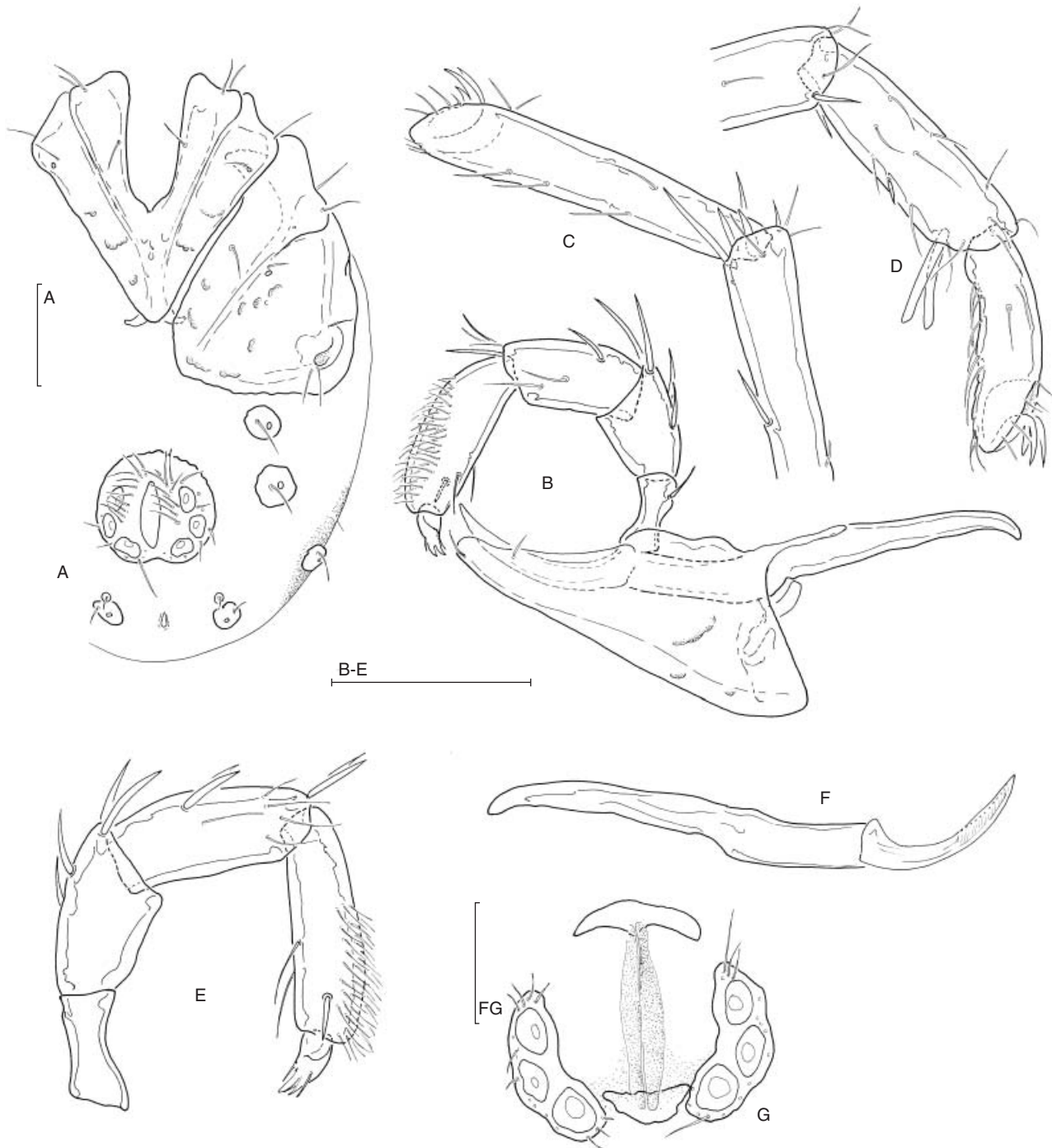


Figure 89. *Atractides acutirostris*, Sicily, Gerecke I 179. A, ♂ ventral idiosoma, partial view; B, ♂ gnathosoma with left palp and chelicera, lateral view; C, ♂ IV-L-5 and -6 partial view; D, ♂ I-L-5 and -6; E, ♀ palp, medial view; F, ♀ chelicera; G, ♀ genital field. Scale bars = 100 µm.

I-L-6 L 117 (120), HA-HC 26 (30), 26 (28), 33 (36), dL/HB 4.50 (4.29); L I-L-5/6 1.28 (1.10)
genital field L/W 125/141 (108/122), Ac-1-3 L (25, 27, 27)
gnathosoma vL 200 (192); chelicera L 258 (282), L/H 7.6, bS/claw 2.44 (2.13)

palp	P-1	P-2	P-3	P-4	P-5
L/W	41/– (37/20)	67/33 (62/41)	67/30 (72/35)	100/35 (98/30)	25/– (30/10)
(ratio)	–/1.85	2.03/1.51	2.23 (2.06)	2.86 (3.20)	–/(3.00)
rel.L	14 (12)	22 (21)	22 (24)	33 (32)	08 (10)
total L:	P-2/4 0.67 (0.65)				
	300 (297)				

Dgl-1 setae short, lanceolate. There is strong disagreement between Szalay's measurements and drawings. In contrast to measurement values, the proportions of the palp in his figure 10 agree with those of the specimen from Sicily, and the cheliceral basal segment/claw ratio calculated from this figure is 2.26 (L/H 8.0).

Females

Original description, partly calculated from figures, in parentheses specimen from Sicily, I 179

genital field: genital plates bean-shaped, Ac in a curved line, Ac-2 rather longish

coxal field: caudal margin of Cx-1 + 2 medially indented between the medially touching apodemes of Cx-2

palp: hair cover of P-4 less dense

idiosoma L/W 1089/808 (1200/900); glandularia 47 (34)

coxal field L 363 (440); Cx-3 W (600); Cx-1 + 2 mL 120 (138), IL (295), W (380)

I-L-5 dL 179 (193), vL 147 (152), dL/vL 1.22 (1.27), HA-HC 38 (50), 42 (56), 49 (60), dL/HB 4.26 (3.51)

S-1 L 60 (62), L/W (12.4), S-2 L 60 (60), L/W 12.0, interspace 0, L S-1/2 1.00 (1.03)

I-L-6 L 135 (152), HA-HC 33 (38), 30 (35), 36 (45), dL/HB 4.50 (4.34); L I-L-5/6 1.33 (1.27)

genital field L/W 182/208 (178/205), Ac-1-3 L (40), (36), (38)

gnathosoma vL 235 (270); chelicera L 322 (440), L/H 10.4 (12.6), bS/claw 2.64 (2.26)

palp	P-1	P-2	P-3	P-4	P-5
L/W	42/– (55/30)	73/42 (90/50)	88/29 (105/40)	102/31 (120/35)	29/– (40/17)
(ratio)	–(1.83)	1.74 (1.80)	3.03 (2.63)	3.29 (3.43)	–(2.35)
rel.L	13 (13)	22 (22)	26 (26)	31 (29)	09 (10)
total L:	P-2/4 0.72 (0.75)				
	334 (410)				

Dgl-1 setae as in males, 37 µm in length. The specimen on which the first description was based had strong secondary sclerotization, probably also affecting the glandular sclerites (as suggested by their considerable diameter). Following Motaş, the tip of the gnathosomal rostrum less bent upwards than in *A. moniezi*, his indications concerning the chelicera contradictory and confusing. Basal segment/claw ratio calculated from his figure 167 (as indicated by the palps, clearly taken from a gnathosoma in plane lateral position) 2.1, from his figure 168, 2.4 (probably the result of a chelicera in distorted position), but from his measurement values, 3.6. Most probably, the length of the claw was 140 instead of 70 µm, resulting in a ratio of 2.3.

Discussion: After a preliminary publication of this species in Motaş & Angelier (1927), Motaş (1928) discussed in detail the following differences of the species known at that time compared with *A. acutirostris*. *A. pavesii* and *A. longirostris* are similar in the hair-like sword seta on P-4, but have a less slender palp, especially P-3, and *A. pavesii* differs also in having a longer gnathosoma and chelicera. Apart from the enlarged sword seta on P-4, *A. moniezi* differs in having dorsal leg clawlets. Further characters discussed by Motaş, extension of secondary sclerite and proportions of the idiosoma, are of no taxonomic value. *A. lacustris*, a species not yet discussed by Motaş, differs from *A. acutirostris* in sclerotized muscle attachments, a stouter P-3 but more slender P-4, and the absence of 'cheeks' on P-5. It is most easily distinguished from all other species of the subgenus known at that time in the arrangement of S-1 and -2 side by side. In rare cases, these setae can also be placed one behind the other, but without a measurable distance when viewed laterally.

Notwithstanding the fact that in the first description of the male, Szalay (1935b) refers to a specimen collected far distant from the *locus typicus*, most of the available information suggests that it is indeed conspecific. As often in Szalay's descriptions, there are contradictions between measurements and the corresponding figures. Furthermore, some doubt remains about the particularly long median suture Cx-1 + 2 in Szalay's specimen, a character found neither in any of the compared Sicilian males, nor in the specimen described by Lundblad (1956; fig. 101A) from France. The observations of the latter author concerning the relatively long P-2 in *A. acutirostris* is confirmed by my data (P-2/4 L ♂ 0.65–0.67, ♀ 0.66–0.75, in *A. longirostris* ♂ 0.59, ♀ 0.65).

The females from Italy, Greece and Israel (SMF) differ from the original description in having generally higher measurement values and slightly stouter palp and I-L segments, while the Sicilian males are generally smaller than the specimen described by Szalay from Hungary. For the time being they should all be considered as representatives of *A. acutirostris*, in this concept a species with a considerable variability range in size. E. Angelier (1954) provided records of *A. pavesii* from Corsica, reporting that he could not find characters to distinguish it from *A. acutirostris*. His sketchy figures suggest that he was examining females of the latter species (S-1 and -2 close together).

Distribution: Central and southern Europe, scattered areas; here for the first time recorded from the British Isles, Greece and Israel (3, 6–10, 12, 13, 17, 18, y).

ATRACTIDES ELONGATUS (HALBERT, 1944)*Megapus elongatus* Halbert, 1944syn. to *A. lacustris* (Lundblad, 1925)?: (Lundblad, 1962b); rejected synonymy*Species dubia*: Gledhill & K. O. Viets, 1976Syn. to *A. acutirostris* Motaş & Angelier, 1927: syn. nov.

Type series: Holotype ♀, MNHD ♀ Type *Megapus elongatus* n. sp. Halb. Type Straffan R. Liffey L. 51 (IV) J.N.H. (transferred to glycerine jelly January 82 T. Gledhill). State of conservation: coxal area heavily damaged, longitudinally broken, all legs separate, mostly single segments remaining, only one I-L-4/5 preserved, but lacking S-1 and -2, gnathosomal base and chelicera lacking, both palps lacking P-1. Halbert knew of more than one specimen from the collecting site, but this is no longer available (Gledhill, 1986a).

Discussion: Halbert considered this species to be similar to *A. pavesii* and *A. spinirostris*, mainly on the basis of age-dependent characters such as shape of idiosoma, extension of coxae, and relative position of genital field and excretory pore. He overlooked the presence of 'cheeks' on P-5 and considered their absence as distinctive. Instead, judging from his figure 22b, *A. elongatus* differs from *A. pavesii* in having a narrower setal interspace on I-L-5 and smaller palp dimensions (L/H P-2 78/45, P-3 96/36, P-4 112/31, P-5 34/13 µm). The presence of a dorsal leg clawlet (as given in Halbert's fig. 22b) cannot be confirmed from the remnants of the preparation. Probably, the figure represents the tip of the second claw.

Lundblad's suggestion that *A. elongatus* might be a synonym of *A. lacustris* was based on Halbert's erroneous statement concerning the absence of 'cheeks' on P-5 and must be rejected. *A. lacustris* differs also in the enlarged sword seta on P-4 and wider setal interspace. Gledhill (1986a,b) provided detailed redescriptions for this and the following two species published from Ireland, and considered them *species dubiae*. The holotype (and only available specimen) is badly damaged, and the original description is scanty. In the arrangement of S-1 and -2 it agrees with *A. acutirostris*, and as far as measurements can be taken, they lie within, or close to, the variability range of that species. As the presence of *A. acutirostris* in Ireland is now confirmed by additional collections, there is good reason to consider *A. elongatus* its junior synonym.

ATRACTIDES LONGIPES (HALBERT, 1944)*Megapus longipes* Halbert, 1944*Species dubia*: Gledhill & K. O. Viets, 1976Syn. to *A. acutirostris* Motaş & Angelier, 1927: syn. nov.

Type series: Holotype ♀, MNHD *Megapus longipes* n. sp. ♀ ovig. Type. R. Flesk, Killarney (E Bullock) April 42. State of conservation: idiosoma *in toto*, flattened, Cx-1 + 2 damaged, gnathosoma *in toto* laterally, all legs complete, mounting fluid in good condition.

Discussion: Halbert considered *A. longipes* to be similar to *A. acutirostris*. Indeed, both species agree, and differ from all species of the subgenus known at that time, in the narrow setal interspace. A revision of several specimens from a wide geographical area demonstrated a certain variability of the position of these setae (normally side by side, but occasionally on one of the legs shifted against another); their position one behind the other in the holotype of *A. longipes* is therefore not taxonomically significant. *A. elongatus* is probably a juvenile, and *A. longipes* a more advanced adult of the same species. After the first description, *A. longipes* has been recorded once more from an Irish river (Conroy, 1978), but without discussion of morphological details.

ATRACTIDES PACHYDERMIS (HALBERT, 1944)*Megapus pachydermis* Halbert, 1944Syn. to *Atractides lacustris* Lundblad, 1925: syn. nov.

Type series: Holotype ♀ MNHD (1) *Megapus pachydermis* n. sp. TYPE L. Derg VI.21. J.N.H. [idiosoma, Glycerine Jelly, January 82 T. Gledhill]; (2) *Megapus pachydermis* n. sp. Palps ♀ River Shannon F.W.N. [Glycerine Jelly, January 82 T. Gledhill]. State of conservation: both slides remounted by Gledhill (1986b) after heavy damage. The problem of the different slide labels remains unsolved; at least the two sites of the mouthparts and idiosoma belong to the same catchment.

Discussion: Halbert used for the diagnosis of this species age-dependent characters such as thickness of integument and relative extension of idiosomal sclerites. He compared it with *A. moniezi* and *A. pavesii* only. Instead, all measurements and important morphological details are in good agreement with *A. lacustris*: I-L-5 with wide setal interspace, Vgl-1 + 2 fused, chelicera with relatively small claw (basal segment/claw 2.76), palp rather slender (e.g. P-4 L/H 3.94), P-4 with an enlarged sword seta, P-5 without 'cheeks'. *A. pachydermis* is probably a synonym of *A. lacustris*. However, in view of the bad state of the specimen, this record of *A. lacustris* from Ireland needs confirmation from future collections.

ATRACTIDES MAGNIROSTRIS (MOTAŞ & TANASACHI, 1948)*Megapus (Rhynchomegapus) magnirostris* Motaş & Tanasachi, 1948*Species dubia*

Type series: Missing. *Loci typici*: Romania, Vallée du Sadul (Dép. de Sibiu), affluent droit du Cibin (bassin de l'Olt), le 7/X/1948 [...], 1 ♀; Vallée de la Bughea à Câmpu-Lung (dép. de Muscel), affl. du Râu-Târgului (Bassin de l'Arges), le 21/IV/1948, 1 ♂, 1 ♀, le 27/X/1948, 2 ♀, le 25/X/1948, 1 ♂, 1 ♀

Discussion: The only diagnostic difference mentioned in the nonillustrated preliminary description concerned the palp (stronger than in *A. moniezi*). In the

more detailed redescription (Motaş *et al.*, 1958), no mention is made at all of differences to other species of the subgenus. *A. magnirostris* differs from *A. pavesii* and *A. longirostris* in the narrow setal interspace, and from *A. lacustris* and *A. moniezi* in the rather strong cheliceral claw (basal segment/claw 2.1). These characters, as well as some additional features (Vgl-1/2 not fused, P-5 bearing 'cheeks', sword seta on P-4 only slightly thickened) are similarly found in *A. acutirostris*. An important character of that species is S-1 and -2 placed side by side, while they are illustrated as staggered in figure 4 of Motaş *et al.* (1958). However, the segment is obviously not in a horizontal position, and the effect could be reinforced by the authors' drawing technique. The few measurement data available for *A. magnirostris* do not differ remarkably from the values given here for *A. acutirostris*, but there are none at all for the taxonomically important first legs. Under these conditions, *A. magnirostris* must be designated a *species dubia*, possibly a synonym to *A. acutirostris*.

ATTRACTIDES GRACILIROSTRIS K. VIETS, 1949

nov. nom. pro *A. spinirostris* (Thor, 1923), not necessary

ATTRACTIDES GIBBERIMARGINATUS
(K. VIETS, 1955)

Atractides acutirostris gibberimarginatus K. Viets, 1955a

Syn. to *Atractides acutirostris* Motaş & Angelier, 1927: syn. nov.

Type series: Holotypus ♂ SMF 7704 *Atractides acutirostris gibberimarginatus* ♂ Viets Type; Harz Okertal Düsterntal 8.10.52 Husmann coll. 7704.

Material examined: CSM, Donauversickerung Möhringen 11.9.60 1 ♂, 1 ♀, '19.7.1960' 1 ♂. In all three specimens mouthparts badly crushed and desiccated, but idiosoma well conserved.

Discussion: Viets positioned this taxon as a subspecies to *A. acutirostris*, a species described from France, but in the male sex known only from Hungary at that time (Szalay, 1935b), and provided a table with the characters which were, in his opinion, diagnostic. In fact, *A. gibberimarginatus* agrees in most important features with *A. acutirostris*. A dorsal inflation of P-4 and P-5 (after which the taxon is named) can also be observed in specimens belonging to the Sicilian population of *A. acutirostris*. The dorsal margin of these two segments may be inflated, mainly in juvenile, slightly sclerotized specimens. Several further characters, such as the shape of the posterior idiosoma margin, the thickness of the integument, and minor differences in measurements, are surely age-dependent and of no taxonomic value. The apodemes

of Cx-2 are in fact directed more caudally in the type of *A. gibberimarginatus* and more laterally in *A. acutirostris*. However, the three specimens published by Schwoerbel under the name of *A. gibberimarginatus* agree from this point of view with Szalay's description of *A. acutirostris*. One of the I-L of the holotype of *A. gibberimarginatus* is misshaped: apart from the strange asymmetric extension at the base of one I-L-6 mentioned by Viets, the duplication of S-1 and -2 on I-L-5 is a developmental aberration. Therefore, the quite distal position of the ventral seta (distance insertion to distal edge 22 µm) of this segment cannot be considered as taxonomically relevant. In fact, the other I-L is normal in this regard (distance 36 µm). The differences in the dimensions of the genital field (relatively long in *A. acutirostris*) are surely due to its nonhorizontal position in the type of *A. gibberimarginatus*. Last but not least, the diverging measurements of palp segments (in *A. acutirostris* L P-2 = P-3, in *A. gibberimarginatus* L P-2 < P-3) are the result of Szalay's measurement errors – in his figures, P-2 is clearly shorter than P-3. There is no serious taxonomic basis to this taxon, and *A. gibberimarginatus* is considered a junior synonym of *A. acutirostris*.

ATTRACTIDES IBERICUS (LUNDBLAD, 1956)
(FIG. 86K,L)

Atractides lacustris ibericus Lundblad, 1956

Type series: Holotype ♂ SMNH 4551, *Atractides lacustris f. ibericus* ♂ Typus, Portugal, Santa Gomba, Bäck, 2.9.1935.

Material examined: Gerecke E 113, Andalusia, Parque Los Alcornocales, Jimena de la Frontera, Rio Hozgarganta, 40 m, TF 79 34, 01.04.1994 1 ♂.

Description:

General features

Holotype, female unknown

dorsal integument: striated; muscle attachments: extended dorsal shield including postoc and Dgl-3-5, extended ventral shield including genital field, all ventralia and Vgl, but excluding the excretory pore

coxal field: completely fused

I-L: setae S-1/2 slightly distanced, distally truncate

excretory pore: smooth; Vgl-1: fused with Vgl-2

palp: P-4 ventral margin 3 : 2 : 2, sword seta enlarged, between ventral hairs, P-5 without cheeks

Male

Holotype

genital field: included into ventral shield; genital setae: 26

idiosoma L/W 460/363; glandularia –

coxal field L 286; Cx-3 W 306; Cx-1 + 2 mL 117, IL 204, W 231

I-L-5 dL 108, vL 85, dL/vL 1.27, HA-HC 26, 32, 35, dL/HB 3.38

S-1 L 38, L/W 12.7, S-2 L 42, L/W 10.5, interspace 4, L S-1/2 0.9

I-L-6 L 99, HA-HC 23, 23, 26, dL/HB 4.3; L I-L-5/6 1.09

genital field L/W 85/114, Ac-1-3 L ca. 20, 20, 20

gnathosoma vL 149; chelicera L 219, L/H 9.5, bS/claw 2.42

palp	P-1	P-2	P-3	P-4	P-5
L/W	32/20	53/32	50/29	93/34	16/12
(ratio)	1.60	1.66	1.72	2.74	2.17

rel.L 13 21 20 37 10
total L: P-2/4 0.57
254

Discussion: Lundblad designated *A. ibericus* as a 'variatio' of *A. lacustris*. Later, in his inventory of the Swedish fauna (1968), he listed the specimen under the latter name, with the remark 'f. iberica' in parentheses, while he did not again mention the other 'variatio' he had introduced for this species, 'scutatus'. *A. ibericus* is similar to *A. lacustris* in sharing the following: presence of dorsal and ventral shields, leg claws with dorsal clawlet (apart from these two species found only in *A. moniezi*), arrangement of S-1 and -2 on I-L-5, setation of the palp, and absence of 'cheeks' on P-5. However, apart from the less extended (but considerably variable) dorsal and ventral shields, *A. lacustris* differs from *A. ibericus* in the following important measurements and proportions: idiosoma and most sclerites and appendages larger (e.g. idiosoma L 602–610, coxal field L 312–324, palp 302–309, I-L-5/6 L 140–142/114–117 µm), cheliceral claw relatively short (basal segment/claw 2.79–2.84), palp and I-L-5 and -6 more slender (L/H P-3 2.10, P-4 3.38–3.47, I-L-5 dL/HB 4.00–4.18, I-L-6 dL/HB 4.56–5.09) and I-L-6 relatively short (L ratio I-L-5/6 1.20–1.25). In view of these different proportions, *A. ibericus* should be regarded as a separate species.

Habitat: Rhithrobiont.

Distribution: Portugal, Spain (first record for the country) (1).

ATRACTIDES VIRGINALIS TUZOVSKIJ, 1977

Syn. to *A. moniezi* Motaş, 1927: syn. nov.

Type series: Holotype ♀, prep. 1292 in coll. Russ. Institute Hydrobiol., 22.10.1975 river Sit near village Sit-Pokrowskoje, district Breitowsk, Jaroslavl. Paratypes: 2 ♀, same site, one ♀ 8.7.1975, one ♀ in coll. Gerecke, 10.10.74 PeuTb 4267 *Atractides virginalis* ♀. State of conservation: desiccated and crushed, right III/IV-L damaged, with distal segments lacking, one chelicera lacking (all details were depicted, then the specimen remounted, separating both I-L, the gnathosoma, chelicera (damaged) and palps).

Discussion: Tuzovskij (1977) compared *A. virginalis* with *A. lacustris* and *A. rectipes* (Sokolow, 1934), and found differences in the shape of the gnathosomal bay (in *A. virginalis* oviform, with maximum width on the level of the centre of the anterior coxal plates, and rostrally considerably narrowed). This character is a preparation artefact, often observed in *Atractides* specimens crushed during mounting (see E. Angelier 1954b; fig. 98, for *A. pavesii*). When the two median lobes of the Cx-1 flanking the gnathosoma, normally directed dorsally, become bent medially, a characteristic 'oviform' shape of the gnathosomal bay is produced. *A. virginalis* agrees from all important points of view with my redescription of *A. moniezi*: narrow setal inter-

space, all leg claws with dorsal clawlets, II-IV-L-5 bearing paired, long swimming hairs, chelicera with relatively short claw (basal segment/claw ratio calculated from Tuzovskij's fig. b: 3.0), P-4 with an enlarged sword seta, P-5 lacking 'cheeks', but with a strong, long claw.

SUBGENUS *POLYMEGAPUS* K. VIETS, 1926

Diagnosis: Integument with a robust, irregular lineation, dorsum and ventrum with sclerotized muscle attachments; I-L-5 ventrally projecting (vL > dL), its distal margin calyciform, setal interspace narrow, S-1 and -2 strongly heteromorphic and partly embracing each other; whip-like seta long and fine; I-L-6 stout, very thick at its base, with distally strongly converging dorsal and ventral margins; Cx-4 with triangular laterocaudal extensions of secondary sclerite, Ac minute, 3–10 pairs; excretory pore sclerotized; gnathosoma short and robust, palp without ventral extensions on P-2 and -3, sword seta on P-4 very strong, finger-like, inserting proximal to proximoventral hair, P-5 long and slender.

Discussion: In the definition presented here, *Poly-megapus* is a rather isolated taxon not connected by intermediate species with *Atractides* s.s. Future studies of larval morphology and behaviour should make clear if its placement as a subgenus in *Atractides* reflects phylogenetic relationships, or whether *Poly-megapus* has evolved independently from *Atractides*-like ancestors. Because of their position on the same level, S-1 and S-2 cannot be recognized with certainty. As S-1, in most species of the other subgenera placed more proximally, is generally the longer and more slender one, in all species of the subgenus *Poly-megapus* the longer and more slender seta is designated S-1.

ATRACTIDES POLYPORUS (K. VIETS, 1922) (FIGS 84D–F, 90A–D)

Megapus polyporus K. Viets, 1922

Type series: Lectotype ♂, here designated, slide-mounted together with 3 paralectotype ♀, SMF 2768, *Atractides polyporus* (Viets) ♂ ♀ Type; Vogler Breitegrund 59/60 Quelle 21.7.1920 [= Vogler 4] Viets leg. 2768. State of conservation: mounting fluid with precipitations, lectotype idiosoma *in toto*, gnathosoma separate, laterally, left palp, both chelicerae and right I-IV-L separate, genital skeleton lacking. Further paralectotypes: SMF 2758 *Atractides polyporus* (Viets) ♂ ♀ Type Vogler Quelle i. Kohlhai 65/66 20.7.1920 [= Vogler 3] Viets leg. 2758 4 ♂, 2 ♀. Further *loci typici*: Vogler 2, zw. Riehenberg 55 u. Kohlhai 65 290 m 9.4°C 20.7.1920; Vogler 5 Sickerquelle Breitegrund 61 – Fisenke 62, 10.0°C, 300 m, 21.7.1920 (*Niphargus*); Vogler 11 Quelle (Ausfluß der unterirdischen Entwässerung einer höher gelegenen Weide) an der Chaussee Oelkassen-Scharfeldendorf, 11°C, 23.7.1920; Vogler 12 Sickerquelle Kohlhai 65 Abhang nach dem Hüttebach, gegenüber Fuchsloch, 68/69, 250 m, 14°C 24.7.1920; Ith 2, 1.5 km E Dielmüssen im Forst am Ithallhange (Vordere Ith 32/33 – Mittl. Ith 34) 220 m, 13°C, 23.7.1920; Ith 3 Quelle im Eschengrund, Vord. Ith 32/33, 220 m, 10.7°C–11.5°C, 23.7.1920; Ith 4, Quelloch Chaussee Scharfeldendorf-Kapellenhagen zw. km 3.9 µ 3.8, 250 m, 13°C, 23.7.1920; Ith 5, Qu. unterh. Rotherstein-Höhle, 260 m, 11.5–13°C, 23.7.1920, Hüttebach, 20.7.1920.

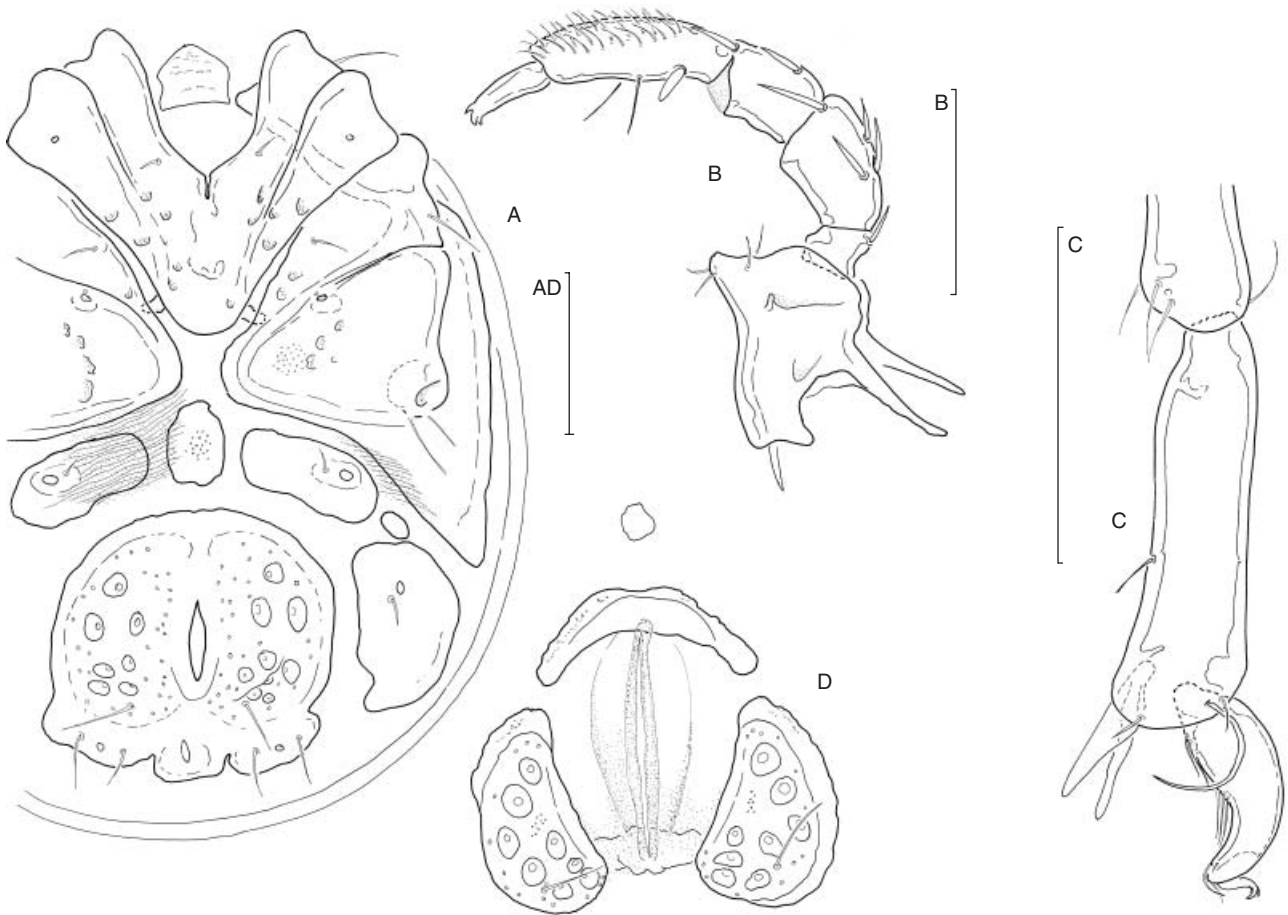


Figure 90. *Atractides polyporus*, A, B, lectotype ♂ SMF 2768; C, D, paralectotypes SMF 2768, 2758. A, ♂ ventrum, partial view; B, ♂ gnathosoma and right palp, medial view; C, ♂ I-L-5 and -6; ♀ genital field. Scale bars = 100 µm.

Material examined: (in coll. Gerecke) Italy, Peloritani (ME), DePietro & LaRocca: Idp48, Frascianida, Sta Venera del Bosco, 450 m, WC1909, 23.06.1995 1 ♀, Idp67, Gualtieri Sicaminò, sorgente pressi Cascate Cataolo, 210 m, WC2920, 29.05.1996 2 ♂, 4 ♀ (SEM).

Description:

General features

Lectotype, in parentheses paralectotype

dorsal integument: striated; muscle attachments: sclerotized, prefr, postoc, Dgl-3 and D-1 on paired triangular plates, D-2, -3, and -5 as extended, paired irregular plates, D-4 medially fused to a rhombic medial plate, Dgl-4, -5, and -6 with extended sclerite margins; ventrally a round median plate anterior from the genital field, V-1 fused with Vgl-3, V-3 with Vgl-4, V-2 separate

coxal field: mediocaudal margin Cx-1 + 2 equally rounded, Cx-3 medially pointed, medial margin of Cx-3 + 4 formed exclusively by Cx-4

genital field: with 14–20 acetabula

I-L: S-1 distally ending in a fine, flagellum-like tip

excretory pore: sclerotized; Vgl-1: fused to Vgl-2

palp: ventral margin P-4 3 : 1 : 3

Males

Lectotype, in parentheses paralectotype

genital field: with extended secondary sclerite; anterior margin equally rounded, excretory pore sclerite and Vgl-1 + 2 fused to the posterior margin; genital setae: 58

idiosoma L/W 480/400 (460/360); glandularia 40

coxal field L 246 (238); Cx-3 W 302 (293); Cx-1 + 2 mL 100 (108), IL 172 (193), W 237 (238)

I-L-5 dL (110), vL (116), dL/vL (0.95), HA-HC (31, 43, 43), dL/HB (2.56)

S-1 L (48), L/W (8.0), S-2 L (47), L/W (3.9), interspace 0, L S-1/2 (1.02)

I-L-6 L (61), HA-HC (23, 13, 10), dL/HB (4.69); L I-L-5/6 (1.80)

genital field L/W 128/161 (123/165), Ac L 9–20

gnathosoma vL 100; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	29/27 (31/25)	67/45 (67/40)	56/36 (58/36)	96/31 (94/40)	43/13 (45/13)
(ratio)	1.07 (1.24)	1.49 (1.68)	1.56 (1.61)	3.10 (2.35)	3.31 (3.46)
rel.L	10 (11)	23 (23)	19 (20)	33 (32)	15 (15)
total L:	P-2/4 0.70 (0.71)				
	291 (295)				

At the frontal margin of the idiosoma a pentangular sclerite plate. In most cases, Ac placed in three groups; their number may be different on right and left genital plates of one specimen.

Females

Paralectotype, in parentheses specimen from Sicily Idp48

genital field: pregen very robust, with extended secondary sclerite, genital plates halfmoon-shaped, rostrally more pointed, caudally more rounded, laterally with extended secondary sclerite

idiosoma L/W 650/560 (600/500); glandularia 50

coxal field L 298 (288); Cx-3 W 370 (365); Cx-1 + 2 mL 118 (108), IL 202 (198), W 288 (276)

I-L-5 dL (128), vL (138), dL/vL (0.93), HA-HC (45, 50, 54), dL/HB 2.56
S-1 L (82), L/W (11.7), S-2 L (52), L/W (4.3), interspace 0, L S-1/2 (1.58)
I-L-6 L (70), HA-HC (30, 15, 12), dL/HB (4.67); L I-L-5/6 (1.83)
genital field L/W 189/207 (182/205), Ac L 10–18
gnathosoma vL 130; chelicera L 204, L/H 5.1, bS/claw 2.24

palp	P-1	P-2	P-3	P-4	P-5
L/W	34/31 (33/32)	90/54 (92/–)	74/45 (79/–)	12/34 (112/–)	56/16 (17/–)
(ratio)	1.10	1.67	1.64	3.29	3.50
rel.L	09 (09)	25 (25)	20 (21)	31 (30)	15 (15)
total L:	P-2/4 0.80 (0.82)				
	366 (373)				

Sclerite plates of idiosoma generally smaller than in males.

Discussion: *A. polyporus* has hitherto remained distinguishable from the other western Palaearctic species due to the increased number of acetabula. It differs from *A. octoporus*, the only species with more than three pairs known at that time, not only in the higher number, but in all diagnostic characters of the subgenus *Polymegapus*. Like *A. octoporus*, the only further polyacetabulate species known from the western Palaearctic, *A. heversi*, is a representative of *Atractides* s.s. In both species, I-L-5 is not ventrally projecting, and I-L-6 is normal in shape, not extremely shortened and basally thickened.

Habitat: Crenobiont

Distribution: Central and southern Europe, North Africa (x, 1–4, 7, 9, 13)

ATRACTIDES RUTAE (LUNDBLAD, 1941)
(FIG. 91A–F)

Megapus (Allomegapus) rutae Lundblad, 1941

Type series: Holotype ♂, SMNH 2906. Typ.; *Megapus rutae* Ldbl. ♂. Madeira, Rabaçal. Levada. 17.7.1935. Leg. O. Lundblad. state of conservation: mounting fluid with many precipitated droplets partly covering surfaces of the specimen, dorsum/ventrum separate, genital skeleton isolated, in posterior position, gnathosoma *in situ*, both I-L (only segments 5/6 remaining) and palps separate, lateral. Paratype ♀ SMNH 2907 Allotyp; *Megapus rutae* Ldbl. ♀ Madeira, Rabaçal, Bäckgöl. 19.7.1935. Leg. O. Lundblad. In his detailed report on this species, Lundblad (1942a, p. 84) reports on numerous further collecting sites from the Rabaçal, Paúl da Serra, and Caramujo areas in Madeira.

Material examined: SMNH, Madeira, Rabaçal, coll. Lundblad, undissected specimens: 1 ♂, 1 ♀ dissected, in Hoyer's fluid; 2 ♂, 2 ♀ mounted for SEM investigation.

Description:

General features

dorsal integument: striated, with thick, irregularly undulating lines; muscle attachments: sclerotized, prefr and postoc on large, roundish, separate platelets; D-1 not visible as distinct platelet, or fused to one of the neighbouring seta-bearing platelets, or reduced, all other dorsalia free, not fused to neighbouring glandular platelets, D-4 adjacent to each other at the median line, but not fused.

coxal field: in mature specimens with an irregular border of secondary sclerite, posteromedian margin Cx-1 + 2 equally rounded, apodemes Cx-2 short, directed laterally, medial margin Cx-3 + 4 forming an acute angle.

I-L: whip seta long and fine, S-1 ending in a fine tip, but not extended to a terminal flagellum.

excretory pore: sclerotized; Vgl-1: fused to Vgl-2

palp: no sexual dimorphism, P-2/3 with slightly convex ventral margins, P-4 2 : 1 : 3, with fine denticles near insertions of ventral hairs and strong sword seta inserting proximally from proximoventral hair, P-5 long and slender

Males

Paratype SMNH

genital field: anterior margin equally rounded, posterior margin slightly indented medially; genital setae: 50

idiosoma L/W 530/400; glandularia 45

coxal field L 126/173; Cx-3 W 320; Cx-1 + 2 mL 126, IL 207, W 247

I-L-5 dL 123, vL 141, dL/vL 0.87, HA-HC 35, 51, 51, dL/HB 2.41

S-1 L 70, L/W 11.7, S-2 L 53, L/W 5.3, interspace 0, L S-1/2 1.32

I-L-6 L 76, HA-HC 24, 15, 14, dL/HB 5.07; L I-L-5/6 1.62

genital field L/W 126/173, Ac L 35, 31, 33

gnathosoma vL 117; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	31/27	81/52	69/43	110/36	49/16
(ratio)	1.15	1.56	1.60	3.06	3.06
rel.L	09	24	20	32	14
total L:	P-2/4 0.74				
	340				

Genital skeleton with very long, strongly curved brachia distalia.

Females

Paratype SMNH

genital field: genital plates halfmoon-shaped

idiosoma L/W 620; glandularia 45

coxal field L 350; Cx-3 W 383; Cx-1 + 2 mL 135, IL 229, W 315

I-L-5 dL 141, vL 152, dL/vL 0.93, HA-HC 40, 56, 56, dL/HB 2.52

S-1 L 76, L/W 9.5, S-2 L 59, L/W 4.5, interspace 0, L S-1/2 1.29

I-L-6 L 83, HA-HC 26, 21, 19, dL/HB 3.95; L I-L-5/6 1.70

genital field L/W 175/207, Ac L 31, 26, 34

gnathosoma vL 139; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	40/36	110/74	90/54	138/45	67/22
(ratio)	1.11	1.49	1.67	3.07	3.05
rel.L	09	25	20	31	15
total L:	P-2/4 0.80				
	445				

Integument structure with lines generally shorter than in males.

Discussion: Lundblad compared *A. rutae* with *A. polyporus* and two further species from India (Walter, 1928a; Lundblad, 1934) that display I-L-characters typical for the subgenus *Polymegapus*: *A. minutus* (Walter, 1928) and *A. proximalis* (Lundblad, 1934). *A. polyporus* and *A. minutus* differ from *A. rutae* in having a genital field provided with more than three pairs of acetabula. From this point of view, *A. rutae* agrees with *A. proximalis*. Some of the characters given for the latter species indicate that it might have been described from a juvenile specimen: dorsal muscle attachments unsclerotized apart from D-4, weakly developed secondary sclerite borders on coxae,

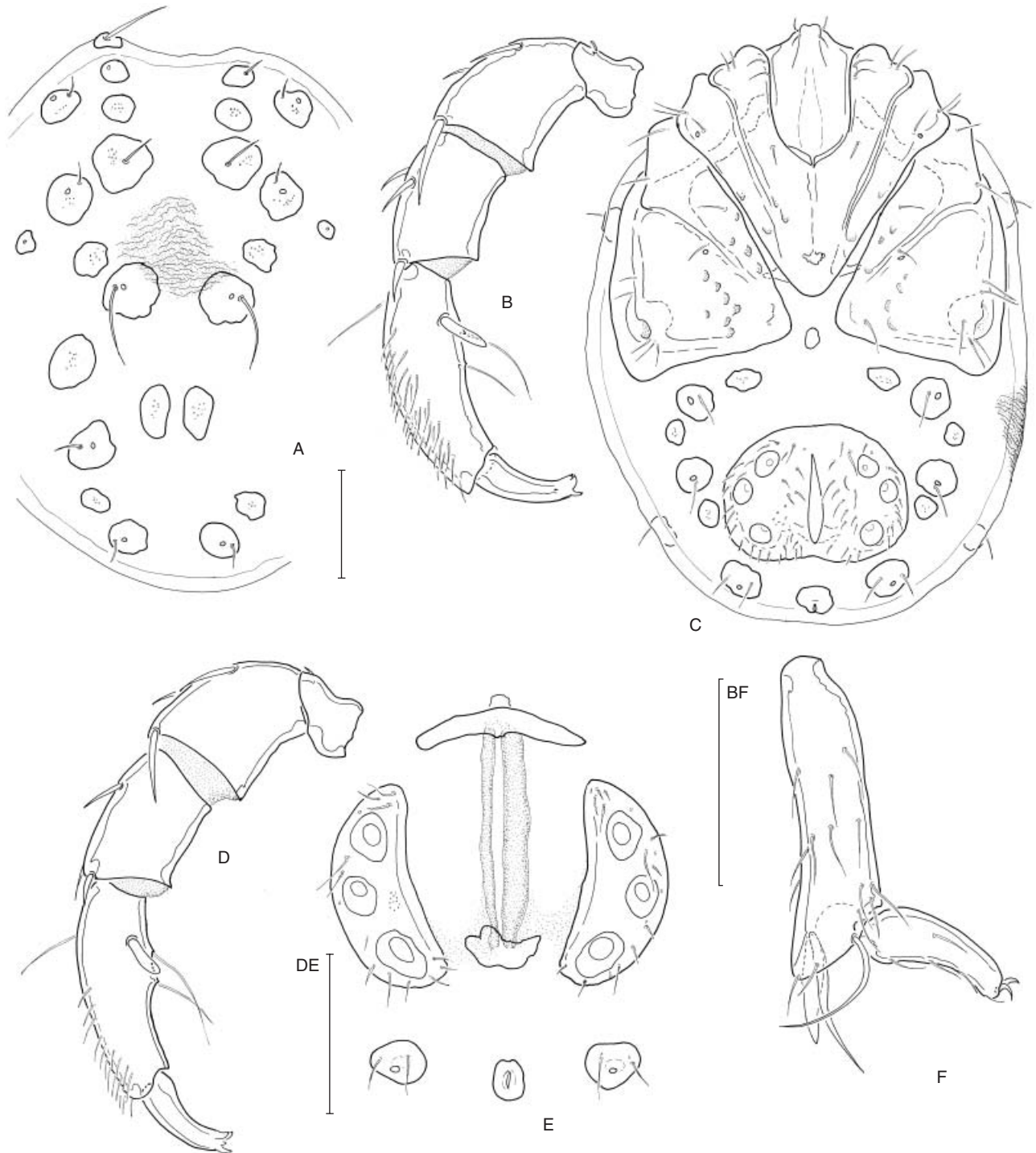


Figure 91. *Atractides rutae*. A–D, F, holotype ♂ SMNH 2906; D, E, paratype ♀ SMNH 2907. A, ♂ dorsum partial view; B, ♂ palp, medial view; C, ♂ ventrum; D, ♀ palp, medial view; E, ♀ genital and postgenital field; F, ♂ I-L-5 and -6. Scale bars = 100 µm.

acetabula relatively large, Vgl-1 not fused to Vgl-2, P-5 shorter and thicker. In any case, the species differs from *A. rutae* at least in one character that does not change with age: P-4 with sword seta and ventral hairs arranged in the proximal quarter of the segment – in *A. rutae* distinctly more distally.

Habitat: Crenophilous; inhabitant of springs and hydropetric habitats. On Madeira one of the most frequent water mite species, 900–1500 m asl, both at low and high flow velocities; possibly cold-stenothermous (Stauder, 1991).

Distribution: Madeira, Canary Islands (Lundblad, 1962a; Stauder, 1991) (1).

ATTRACTIDES ELEGANS (MOTAŞ & TANASACHI, 1948)
(FIG. 92A–H)

Megapus elegans Motaş & Tanasachi, 1948

Type series: Missing. *Locus typicus:* Romania, Carpates Méridionales: Vallée du Sadul, affluent droit du Cibin, tributaire de l'Olt (Dép. de Sibiu), le 8/X/1948, 1 ♂, 5 ♀.

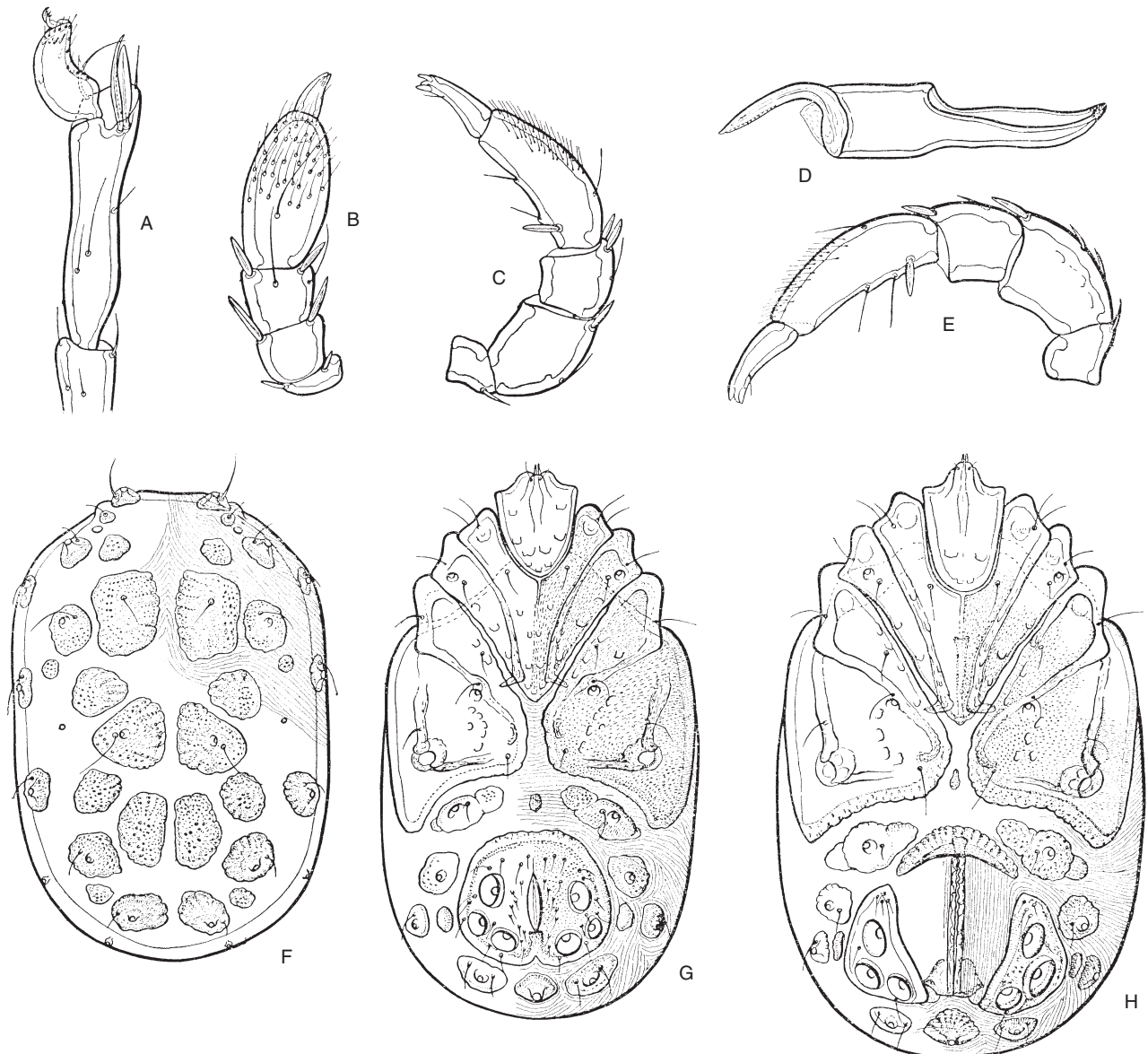


Figure 92. *Atractides elegans*. From Motaş *et al.*, 1958. A, ♂ I-L-5 and -6; B, ♂ palpus dorsally; C, ♂ palpus, medial view; D, ♀ chelicera; E, ♂ palpus, medial view; F, ♂ dorsum; G, ♂ ventrum; H, ♀ ventrum. No measurement scale bars available.

*Description:**General features*

dorsal integument: lineated, with strong, more or less irregular lines; muscle attachments: sclerotized, arrangement as described for *A. rutae*, but larger, with rather small membranous bridges separating Dgl-4/5 and D-3/4. V-1/2 fused with Vgl-3.

coxal field: with extended borders of secondary sclerite, medioposterior margin Cx-1 + 2 forming a rounded, acute angle, medial margin of Cx-3 + 4 rounded.

I-L: S-1 only little longer than S-2.

excretory pore: sclerotized; Vgl-1: fused to Vgl-2.

palp: ventral margins of P-2/3 straight or weakly concave, P-4 1 : 1 : 1, sword seta proximally from proximoventral hair.

Males

Original description

genital field: anteriorly rounded, with a secondary sclerite border, posteriorly medially indented; genital setae: 40

palp: ventral margin P-4 1 : 1 : 1

idiosoma L/W 420/250; glandularia –

coxal field L 294; Cx-3 W –; Cx-1 + 2 –

I-L-5 dL 117, vL –, dL/vL –, HA-HC –, 30, –, dL/HB 3.90

S-1/2 –, interspace 0

I-L-6 L 47, HA-HC 25, –, –, dL/HB –; L I-L-5/6 2.49

genital field L/W 118/137, Ac-1–3 L 26, 18, 24

gnathosoma vL 94; chelicera L 164, L/H 5.47, bS/claw 1.98

palp	P-1	P-2	P-3	P-4	P-5
L/W	22/21	56/35	36/33	75/27	38/14
(ratio)	1.05	1.60	1.09	2.78	2.71
relL	10	25	16	33	17
total L:	P-2/4 0.75				
	227				

Setae Dgl-1 long and fine, not pennate; P-4 in dorsal view inflated; measurements of I-L possibly influenced by oblique position of this leg, as is suggested by fig. 39 in the original description.

Females

Original description

genital field: genital plates subtriangular, weakly concave medially

palp: P-4 2 : 1 : 3

idiosoma L/W 440/322; glandularia –

coxal field L 317; Cx-3 W –; Cx-1 + 2 mL 117, IL –, W –

I-L-5 –

S-1/2 –, interspace 0

I-L-6 –

genital field L/W 166/200, Ac-1–3 L 35, 38, 25

gnathosoma vL 117; chelicera L 186, L/H 5.64, bS/claw 1.74

palp	P-1	P-2	P-3	P-4	P-5
L/W	28/27	64/41	43/35	86/29	42/14
(ratio)	1.04	1.56	1.23	2.97	3.00
relL	11	24	16	33	16
total L:	P-2/4 0.74				
	263				

Discussion: The authors of the first description of *A. elegans* gave particular weight to the extensive dorsal sclerotization of this species and compared it therefore not only to the related *A. polyporus*, but also to taxonomically distant species from the subgenus *Atractides* s.s. Furthermore, they mentioned the presence of a stout I-L-6 also in some species of the latter subgenus, but in these species – *A. walteri* (subnomina *A. borceai* and *A. coriaceus*), *A. panniculatus* (a

species with rather slender I-L-6), and *A. crassitarsis* Lundblad, 1942b from South America – this segment does not taper distally. Among the western Palaearctic species of subgenus *Polymegapus*, *A. elegans* is most similar to *A. rutae*, the only other species known at that time bearing only three pairs of acetabula. Judging from the available data and figures, *A. rutae* differs in its more rounded idiosoma, distinctly larger dimensions (total L ♂ > 500, ♀ > 600, palp total L ♂ > 300, ♀ > 400 µm), smaller dorsal sclerites and male acetabula, Ac-2 closer to Ac-1 than to Ac-3, female genital plates halfmoon-shaped, and sclerites V-1 and V-2 not fused with Vgl-3. The figures of the original description leave some doubt about the shape of I-L-5 and -6 (probably depicted in oblique position) and palp (surprising gender difference in ventral setation of P-4); information on the important measurements of I-L-5 and -6 is not available.

Habitat: Hyporheobiont.

Distribution: Romania, known only from the *locus typicus* (10)

ATTRACTIDES ORGHIDANI MOTAŞ & TANASACHI, 1960
(FIG. 93A–E)

Type series: Missing. *Locus typicus:* Romania, Région Autonome Magyare, Bassin du Virghis, commune Meresti, rayon Odorhei (7 VIII 1958 1 ♂, 1 ♀; 28 VIII 1959 9 ♂, 10 ♀).

Material examined: (in coll. Gerecke) Italy, Sicily, Peloritani (ME), coll. DePietro & LaRocca, I dp38 Limina, Aff. F.so Girasia pressi Portella del Vento, 570 m, WB 2098, 20.05.1995 1 ♂; I dp56, Antillo, F.so Girasia confluenza T. di Antillo, 260 m, WC 2301, 07.11.1996 1 ♀.

*Description:**General features*

Original description, in parentheses specimens from Sicily

dorsal integument: lineated, with strong, more or less irregular lines; muscle attachments: unsclerotized

coxal field: medioposterior margin of Cx-1 + 2 sharply curved, lateral and posterior margins of Cx-3 + 4 with extended secondary sclerite, distinctly projecting posteriorly at lateral edges.

I-L: distal margin I-L-5 with a protruding anterior sheath, and an indentation at the posterior edge, dorsally from insertion S-1, S-1 ending in a fine, pointed tip

excretory pore: sclerotized; Vgl-1: fused to Vgl-2

palp: no sexual dimorphism; ventral margin P-2/3 straight; P-4 1 : 1 : 1 (2 : 1 : 3), sword seta P-4 strong, proximally from proximoventral hair

Males

Original description, in parentheses specimen from Sicily

genital field: anterior margin equally round, posterior margin indented, filled with a narrow strip of secondary sclerite; genital setae: 38

idiosoma L/W 460/300 (490/400); glandularia (38)

coxal field L 270 (260); Cx-3 W (320); Cx-1 + 2 mL 98 (110), IL (183), W (253)

I-L-5 dL (125), vL 137 (132), dL/vL (0.95), HA-HC (37), 45 (42), (48), dL/HB (2.98)

S-1 L (50), L/W (7.1), S-2 L (50), L/W (4.2), interspace 0, L S-1/2 (1.0)

I-L-6 L 66 (75), HA-HC 22 (25), (15), (13), dL/HB (5.00); L I-L-5/6 (1.67)

genital field L/W 105/132 (108/125), Ac-1–3 L (20, 20, 20)

gnathosoma vL 104 (105); chelicera L 170, L/H 5.7, bS/claw 2.40

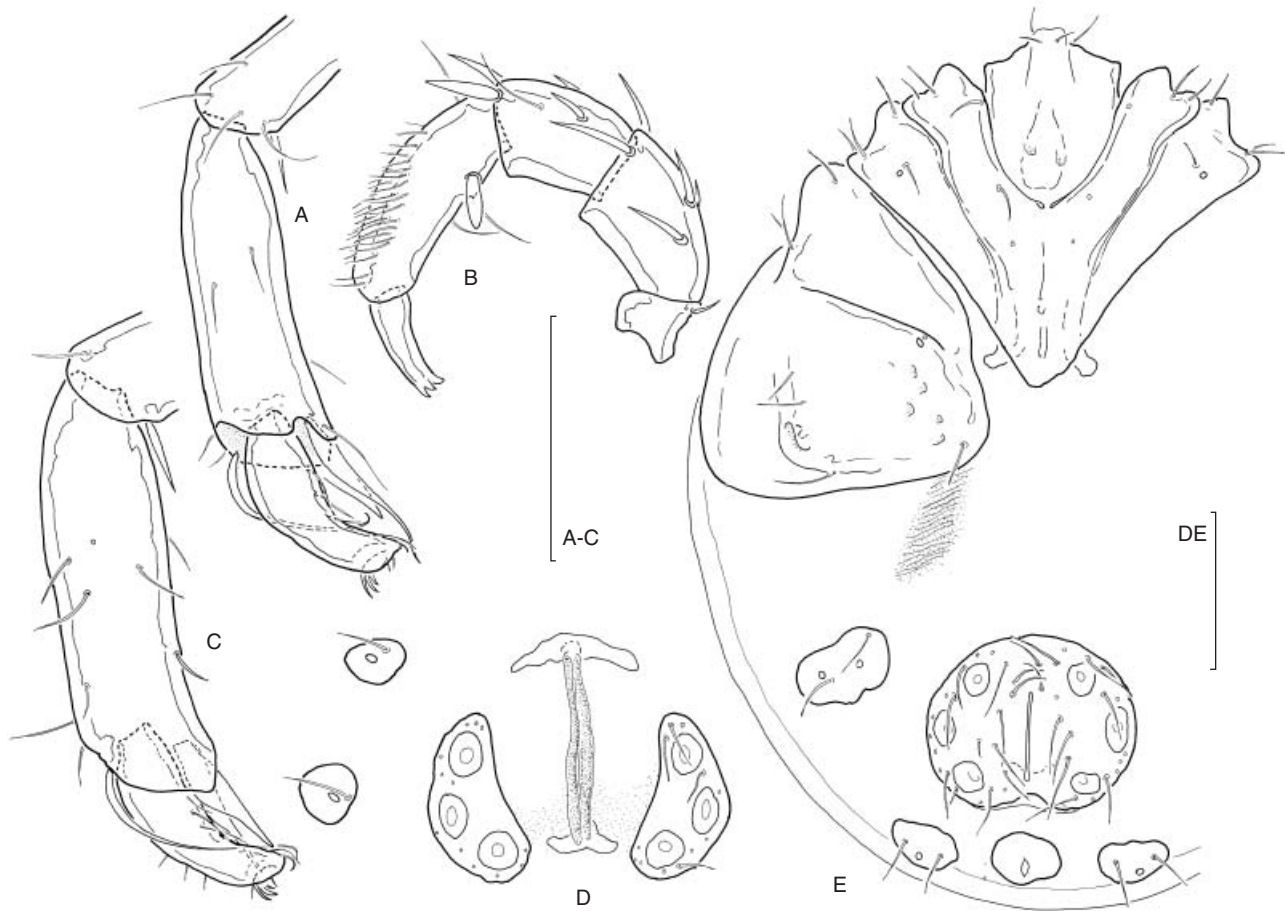


Figure 93. *Atractides orghidani*, Sicily. A, ♂ I-L-5 and -6, posteriorly; B, ♂ palp, medial view; C, ♀ I-L-5 and -6, anteriorly; D, ♀ genital field and right Vgl-3/4; E, ♂ ventrum, partial view. Scale bars = 100 µm.

palp	P-1	P-2	P-3	P-4	P-5
L/W	26/22 (30/27)	70/47 (73/42)	60/37 (66/38)	98/28 (100/33)	45/10 (45/15)
(ratio)	1.18 (1.11)	1.49 (1.74)	1.62 (1.74)	3.50 (3.03)	4.50 (3.00)
rel.L	09 (10)	23 (23)	20 (21)	33 (32)	15 (14)
total L:	P-2/4 0.71 (0.73)				
	299 (314)				

The male from Sicily from most points of view is in agreement with the original description, but the secondary sclerite margin of Cx-3/4 extends less caudally, gonopore extremely narrowed, the ventral setae of P-4 closer to each other. Fusion Vgl-3 + 4 obviously due to individual misshaping.

Females

Original description, in parentheses specimen from Sicily
 genital field: genital plates with weakly concave medial margins
 idiosoma L/W 650/480 (610/460); glandularia 35
 coxal field L 288 (265); Cx-3 W (366); Cx-1 + 2 mL (114), IL (198), W (276)
 I-L-5 dL (148), vL 152 (155), dL/vL (0.95), HA-HC (45, 48, 55), dL/HB (3.08)
 S-1 L (57), L/W (7.1), S-2 L (57), L/W (4.4), interspace 0, L S-1/2 (1.00)
 I-L-6 L 85 (82), HA-HC (26), 23 (17), (15), dL/HB 3.70 (4.82); L I-L-5/6 (1.80)

genital field L/W 166/209 (148/188), Ac-1-3 L 27, 30, 25
 gnathosoma vL 122 (124); chelicera L 210, L/H 5.38, bS/claw 2.23

palp	P-1	P-2	P-3	P-4	P-5
L/W	30/26 (37/30)	94/50 (92/70)	73/43 (85/55)	109/30 (115/42)	54/14 (57/18)
(ratio)	1.15 (1.23)	1.88 (1.31)	1.70 (1.55)	3.63 (2.74)	3.86 (3.17)
rel.L	08 (10)	26 (24)	20 (22)	30 (30)	15 (15)
total L:	P-2/4 0.86 (0.80)				
	360 (386)				

Discussion: The authors compared *A. orghidani* only with *A. elegans*, and found less extensive dorsal sclerotization (glandularia with rounded, not irregular borders), and a less extended coxal field as distinctive characters. The specimens from Sicily agree with the original description (and differ from *A. elegans*) in larger idiosoma (*A. elegans*: L/W ♂ 420/250, ♀ 440/320 µm) and palp dimensions (*A. elegans*: total L ♂ 117, ♀ 263 µm). The third European *Polymegapus* species with only three pairs of acetabula, *A. rutae* from Madeira, differs from *A. orghidani* in sclerotized muscle attachment sclerites more extended than in *A. ele-*

gans, in larger dimensions (e.g. palp total L ♂ > 330, ♀ 430 µm), and in the dorsal and ventral margins of I-L-6 more strongly converging, not subparallel in the distal third of the segment.

Pešić (in press d) provides further information on this species, based on a female from Montenegro. He observed in his specimen that S-1 was longer than in the original description. As this seta sometimes ends in a very fine, flagellum-like tip, this difference is best explained by damage or incorrect depiction in the original description. The Montenegrin female is more similar to the Sicilian one than to the one originally described, both in the slightly extended posterolateral secondary sclerotization of Cx-3 + 4, and in the ventral hairs of P-4 being closer to each other.

The European three-acetabulate *Polymegapus* species, *A. rutae*, *A. elegans* and *A. orghidani*, form a taxonomic complex that requires studying in more detail. The specimens of *A. orghidani* from Sicily are juveniles; muscle attachments and secondary sclerite borders might develop and extend with increasing age. More information is needed on measurements of I-L and palps, and on the individual variability of characters such as the shape of the male gonopore and the arrangement of the ventral setae on P-4. *A. elegans* differs distinctly from *A. rutae* in having much smaller measurements. *A. orghidani* has intermediate dimensions, and the study of more populations might demonstrate that there is considerable intraspecific variability in size.

Habitat: Running water (hyporheophile?)

Distribution: Romania, Montenegro (Pešić, in press d), Italy (Abruzzo: Di Sabatino & Cicolani, 2001; Sicily: new record) (3, 6, 10).

SUBGENUS *MADEROMEGAPUS* (LUNDBLAD, 1941)

Diagnosis: Integument lineated, muscle attachments unsclerotized; Cx-1 + 2 with truncated posterior margin and well developed, laterally directed apodemes of Cx-2; I-L-5 subrectangular, with more than one ventral seta at the centre of the segment, narrow setal interspace, strong, blunt I-L-6 with subparallel dorsal and ventral margin, weakly curved; genital field triacetabulate, excretory pore sclerotized, Vgl-1 separate from Vgl-2; palp with ventral projection on P-2 in both sexes and sword seta P-4 inserted between ventral hair insertions; secondary sexual characters in the shape of I-III-L, P-2 and P-4.

Males: I- and II-L-3/4 inflated and densely covered by long hairs, also III-L with thickened central segments; genital field anteriorly with a pit embraced by a horseshoe-shaped sclerite collar on a medial projection, medial setae restricted to the level of Ac-1, lateral setae at regular distances from the posterolateral edge

of Ac-1 until the caudal margin; mediocaudal margin weakly indented; P-2 with ventral projection strongly protruding, truncated, with irregular surface, P-4 thickened, ventral margin 1 : 1 : 1, sword seta strong, with a shallow longitudinal groove.

Females: I-L-3/4 thickened, but without particular setation, genital field with longish genital plates, P-2 projection much less projecting, and P-4 more slender than in males.

Discussion: For discussion of the significance of various character states for the subgeneric division of *Atractides* see 'Taxa above and below species level', above. As *Maderomegapus* is a monotypic taxon, the diagnosis includes several characters without phylogenetic significance, but useful for the taxonomic recognition of the only known species. Two characters found in males only, but highly distinctive, justify the taxon's separate placement: the extreme modification of I-III-L, and the presence of a deep pit at the anterior margin of the genital plate.

ATRACTIDES HYSTRICIPES (LUNDBLAD, 1941) (FIG. 94A–H)

Maderomegapus hystricipes Lundblad, 1941b

Type series: Holotype ♂ SMNH 2898. Typ. *Maderomegapus hystricipes* Ldbl. ♂. Madeira. Wattenfall vid 25 Fontes. 25.7.1935, leg. O. Lundblad. State of conservation: dorsum/ventrum separate, genital skeleton prepared, both I-L, and left II-IV-L separate, gnathosoma *in situ*, both palps separate, laterally, chelicerae *in situ*; mounting fluid in good state. Paratype ♀ SMNH 2899. Allotyp, labelled like holotype. State of conservation: dorsum/ventrum separate, one egg, both I-L, left II-L, right III/IV-L separate, gnathosoma and both palps separate, laterally, one chelicera missing, the other damaged; mounting fluid in good state.

Description:

General features

dorsal integument: lineated; muscle attachments: smooth
coxal field: medioposterior margin of Cx-1 + 2 truncated, no secondary sclerotization; suture line Cx-3 and -4 in its medial part directed posteriorly such that medial margin of the Cx-3 + 4 plate is made up only by Cx-3
I-L: sexual dimorphism in shape and setation of I-L-3/4; I-L-5 with more than one ventral seta and setae S-1/2 strong, little distanced; I-L-6 with dorsal and ventral margins subparallel, equally curved
excretory pore: sclerotized; Vgl-1: separate from Vgl-2
palp: P-2 with ventrodistal extension, P-4 1 : 1 : 1, sword seta between insertions of ventral hairs, sexual dimorphism in shape of P-2/4 and sword seta of P-4

Males

Holotype
genital field: anterior margin medially projecting, embracing a central pit anteriorly from the gonopore, gonopore and Ac rather large, posterior margin weakly indented; genital setae: 42, one medial group on the level of Ac-1, a further group regularly lined along the posteriolateral margin.

palp: projection of P-2 extended, truncate, with irregular surface, ventral margin P-4 with a basal concavity, at the insertion of ventral hairs (without denticles) convexly protruding, sword seta knife-like, distally flattened and with a longitudinal groove.

idiosoma L/W 616/426; glandularia –
coxal field L 325; Cx-3 W 336; Cx-1 + 2 mL 126, IL 243, W 270

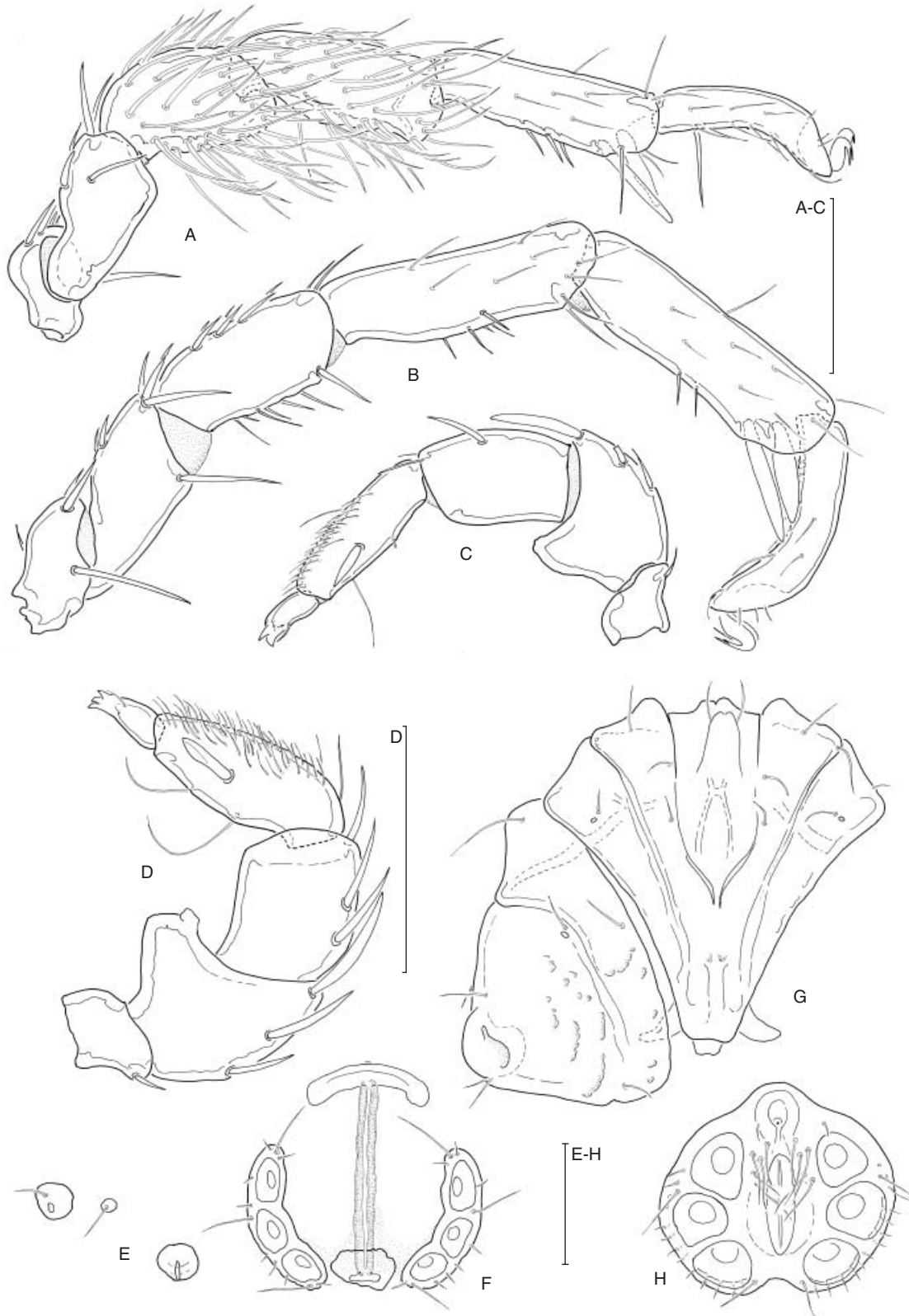


Figure 94. *Atractides hystriipes*. A, D, G, H, holotype ♂ SMNH 2898; B, C, E, F, paratype ♀ SMNH 2899. A, ♂ I-L; B, ♀ I-L; C, ♀ palp, medial view; D, ♂ palp, medial view; E, ♀ Vgl-1/2 and excretory pore; F, ♀ genital field; G, ♂ coxal field; H, ♂ genital field. Scale bars = 100 µm.

I-L-5 dL 132, vL 103, dL/vL 1.28, HA-HC 36, 43, 47, dL/HB 3.07
 S-1 L 65, L/W 9.3, S-2 L 51, L/W 5.7, interspace 8, L S-1/2 1.27
 I-L-6 L 108, HA-HC 24, 22, 23, dL/HB 4.91; L I-L-5/6 1.22
 genital field L/W 108/121, Ac-1-3 L 53, 45, 49
 gnathosoma vL 153; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	34/29	78/76	67/52	90/38	34/11
(ratio)	1.17	1.03	1.29	2.37	3.09
rel.L	11	26	22	30	11
total L:	P-2/4 0.87				
	303				

In the lower layers of the integument, an irregular pattern of rugose lines, partially arranged perpendicular to the surface lineation; I-L-3/4, II-L-3/4 and (to a minor extent) III-L-3/4 club-shaped and covered by dense setation.

Females

Paratype

genital field: genital plates longish, weakly curved
 palp: P-2 extension not truncated, P-4 more slender than in males, sword seta not flattened
 idiosoma L/W 900/600; glandularia –
 coxal field L 347; Cx-3 W 437; Cx-1 + 2 mL 153, IL 288, W 330
 I-L-5 dL 176, vL 134, dL/vL 1.31, HA-HC 47, 52, 61, dL/HB 3.38
 S-1 L 72, L/W 8.0, S-2 L 58, L/W 4.8, interspace 12, L S-1/2 1.24
 I-L-6 L 128, HA-HC 28, 24, 25, dL/HB 5.33; L I-L-5/6 1.38
 genital field L/W 193/202, Ac-1-3 L 38, 38, 38
 gnathosoma vL 157; chelicera –

palp	P-1	P-2	P-3	P-4	P-5
L/W	40/36	94/83	90/54	103/31	43/16
(ratio)	1.11	1.13	1.67	3.32	2.69
rel.L	11	25	24	28	12
total L:	P-2/4 0.91				
	370				

Segments of I/II-L generally stouter, and I/II-L-3 bearing more numerous setae than species of *Atractides* s.s. Genital plate L 139, gonopore L 176, pregen W 107 µm.

Discussion: In males, *A. hystricipes* is unique within the genus due to the shape of the genital field and the secondary sexual characters of the I-III-L. Also, the female is characterized by thickened segments 3 and 4 on I-III-L, but the shape of legs has not yet been studied in sufficient detail in most other *Atractides* species. Both sexes are furthermore characterized by the presence of more than one seta on the ventral surface of I-L-5, a character found in other species only exceptionally as an individual aberration.

In the western Palearctic *Atractides* fauna, the presence of a pronounced ventrodistal extension of

P-2 in both sexes is known only from a few species of the subgenus s.s. In females of *A. samsoni* and *A. inflatipalpis*, this extension is less strongly developed than in *A. hystricipes*. Among others, *A. samsoni* differs in the more slender S-1 and -2 and the unsclerotized excretory pore, *A. inflatipalpis* in the sword seta on P-4 located distal to the distoventral hair. *A. madeirensis* is another Madeiran endemic with a ventrodistal extension on P-2 in both sexes. This species is also similar to *A. hystricipes* in the lineation of the integument, I-L-5 with strong S-1 and -2, and sclerotized excretory pore, but differs in a more slender and curved I-L-6, Vgl-1 and Vgl-2 not fused, and the sword seta on P-4 much more robust rather than knife-like and flattened in males.

Habitat: Hygropetric areas of streams.

Distribution: Madeira, known only from the type locality (1).

A REVISED KEY FOR THE DETERMINATION OF WESTERN PALAEARCTIC *ATRACTIDES* SPECIES

DISTINCTION OF SEXES

♂: The acetabula-bearing genital plates are fused to a circular sclerite completely surrounding the gonopore. They bear numerous setae, normally arranged in two lines: at the lateral margin of the plate, and parallel to the gonopore. Palp often rather stout, with a dense hair cover on P-4; many species with particular ventral extensions, mainly on P-2. In sclerotized species, secondary sclerite margins and muscle attachment sclerites more extended and more frequently fused compared with those of females.

♀: The acetabula-bearing genital plates lie as separate paired sclerites in the membranous integument flanking the gonopore which extends between a sickle-shaped pregenital, and a more irregular postgenital sclerite; on these plates, setae are restricted to the lateral margin. Palp generally slightly more slender, with a less dense hair cover on P-4, and only exceptionally with particular ventral extensions on P-2. In sclerotized species, secondary sclerite margins remain narrow, and muscle attachments are often small or completely absent.

KEY TO SUBGENERA

- 1 Gnathosomal rostrum strongly elongated, chelicera with long and slender basal segment; palp slender, P-1 by far longer than high and centrally narrowed, P-2 and -3 without ventral extensions, P-4 often clavate, P-5 with or without cheek-like lateral extensions. *Tympanomegapus* Thor, 1923; p. 362
- 1' Gnathosomal rostrum normal or only slightly elongated; cheliceral basal segment more stout; palp various in shape, P-1 normally shorter than high or subquadratic. 2
- 2 I-L-5 with ventral margin longer than dorsal margin, narrow setal interspace, S-1 and -2 slightly contorted, heteromorphic (S-1 strongly enlarged in the proximal part, distally narrowed to a rather fine tip, S-2 much more slender); I-L-6 extremely shortened, with a swollen base, but rapidly narrowed distally; idiosoma with strong sclerification due to sclerotized muscle attachments, enlarged secondary sclerite borders of coxae and glandularia. *Polymegapus* K. Viets, 1926; p. 363
- 2' I-L-5 with ventral margin shorter than dorsal margin, S-1 and -2 varying in shape, if interspace small, setae S-1/2 always homoiomorphic and never contorted; I-L-6 various in shape, but if shortened, equal in height from the base to the claw furrow; idiosoma with or without sclerotization. 3
- 3 In both sexes, P-2 with a strong, anteriorly directed ventrodiscal extension and I-L-5 with two or more ventral setae. Male (with a unique, roundish genital plate): I-L-3/4 extended, flattened, and bearing a dense setae cover unique in the genus; anterior margin of genital field protruding and embracing an anteromedial pit. Female (with paired, curved genital plates): I-L-3/4 slightly modified, I-L-3 with a group of slender ventral setae, I-L-5 S-1 and -2 strong and robust; (*A. maderensis*, the only *Atractides* s.s. species with a strong ventrodiscal projection on female P-2, differing in lineated integument, minor acetabula (diameter < 30 µm), the sword seta of P-4 inserting near the proximoventral hair on a distinct projection, with the distal ventral margin of this segment strongly concave.) Only known from Madeira. *Maderomegapus* Lundblad, 1941
only species: *Atractides (Maderomegapus) hystricipes* (Lundblad, 1941)
- 3' If a ventral extension of P-2 is present, in most cases it is found in the male sex only, I-L-5 normally with only one ventral seta (but occasionally multiplied as an individual aberration). Male (with a unique, roundish genital plate): I-L-3/4 not modified and without particular hair cover; if anterior margin of genital plate protruding, never embracing an anteromedial pit. Female (with paired, curved genital plates): I-L-3 without a distinct group of ventral setae, I-L-5 S-1 and -2 various in shape. *Atractides* Koch, 1837 s.s.; p. 351

KEY TO SPECIES: *ATRACTIDES* KOCH, 1837 S.S.

Key to males

- 1 I-L-5 with S-1 and -2 rather homoiomorphic (length ratio S-1/2 1.0–1.2) and small interspace (<10 µm, not exceeding the maximum diameter of S-1); sometimes the setae inserting side by side on the same level. I-L-6 in most cases rather stout and only weakly curved. 2
- 1' I-L-5 with S-1 and -2 more heteromorphic (length ratio S-1/2 > 1.2) and with greater interspace (>10 µm, exceeding the maximum diameter of S-1). I-L-6 various in shape. 39
- 2 Without extended sclerite surfaces and/or sclerotized muscle attachments on dorsal and/or ventrocaudal idiosoma. However, glandular platelets may be enlarged and muscle attachments characterized by small areas of granulated integument; in older specimens the whole integument may become thickened, leathery, and opaque in colour; Vgl-1/2 may be fused or separate. Attention should be paid to *A. separatus*, a species with extended ventrocaudal sclerotization: infrequently, individuals may be completely smooth, but in the study area they are distinguished from all other species of the subgenus by a small sclerite knob (not a complete sclerite ring) at the anterior edge of the excretory pore. 3
- 2' With sclerotized muscle attachments on the dorsal and/or ventrocaudal idiosoma. In doubtful cases, empty the idiosoma: in juveniles, sclerification may be very restricted and transparent, not visible in uncleared specimens. As sclerites are 'submerged' below the integument surface, they may even escape attention when viewed tangentially under strong illumination. If in older specimens the whole integument is thickened, leathery, and opaque in colour, sclerites become 'negatively' visible as cleared areas; Vgl-1 + 2 always fused. 24
- 3 IV-L-5 bearing a pair of long, rigid swimming hairs; S-1 and -2 rather heteromorphic (ratio 1.26); specimens with untypically small interspace could be keyed out here; lenitophilous; northern Europe. *A. ovalis* Koenike, 1883

3'	IV-L-5 without long, rigid swimming hairs (but in some interstitial dwelling species a single, long flagellar hair may be present at IV-L-5).....	4
4	Excretory pore surrounded by a distinct ring sclerite similar in diameter to the neighbouring glandular platelets.....	5
4'	Excretory pore smooth, at maximum surrounded by fine, lip-like lines, but never by a sclerite.....	8
5	Small dimensions (idiosoma L < 450, genital field L/W < 80, Ac diameter < 20, I-L-5/6 L 116/105 µm); about 20 genital hairs; Vgl-1 + 2 fused; I-L-6 nearly straight, L ratio I-L-5/6 1.10; palp with convex ventral margins of P-2 and P-3, sword seta on P-4 inserted proximal to proximoventral hair; subterranean; south-east Europe.	<i>A. cisternarum</i> (K. Viets, 1935)
5'	Larger dimensions (idiosoma L > 450, genital field L/W > 100); Vgl-1/2 unfused or fused; I-L-6 weakly curved, L ratio I-L-5/6 > 1.25; palp with straight or slightly concave ventral margins of P-2 and P-3, sword seta P-4 inserted between ventral hairs.....	6
6	Mediokaudal margin of Cx-1 + 2 narrowed and pointed; Vgl-1 + 2 fused, S-1 rather long (95 µm) and ratio S-1/2 rather high (1.27); specimens with untypically small interspace of this little known species could key out here; rhithobiont; Corsica.	<i>A. gracilipes</i> (E. Angelier, 1951)
6'	Mediokaudal margin of Cx-1 + 2 less narrowed, forming a right angle, S-1 shorter (<85 µm) and ratio S-1/2 lower.....	7
7	Integument finely striated; larger in dimensions (idiosoma L > 600, coxal field L > 330 µm); about 40 genital hairs; I-L-5 stouter (dL/HB 4.0), I-L-6 more slender (L/HB 5.0); rhithrobiont.....	<i>A. tener</i> Thor, 1899
7'	Integument lined; smaller in dimensions (idiosoma L < 500, coxal field < 300 µm); about 24 genital hairs; I-L-5 more slender (dL/HB 4.73), I-L-6 stouter (L/HB 4.46); hyporheobiont (?), Romania.....	<i>A. sokolowi</i> (Motaş & Tanasachi, 1948)
8	In the postgenital area, Vgl-1 + 2 fused on each side to a single platelet; this platelet circular or dumb-bell shaped, indicating origin from fusion of two neighbouring sclerite knobs.....	9
8'	In the postgenital area, Vgl-1/2 on distinct, separate platelets (in populations of <i>A. fonticolus</i> , this character is unstable; check 11).....	14
9	Dorsal integument striated, but with a papillate central area; papillosity more or less extended, occasionally restricted to a small frontal area between lateral eyes; very old specimens (with thick, leathery integument) may be completely devoid of papillae. I-L-6 relatively shortened (L ratio I-L-5/6 > 1.4); Ac diameter > 40 µm; crenobiont.....	<i>A. walteri</i> (K. Viets, 1925)
9'	Dorsal integument striated or lined all over the surface. I-L-6 relatively long (L ratio I-L-5/6 < 1.3); Ac diameter < 40 µm.....	10
10	I-L-6 extremely short compared with I-L-5 (dL I-L-5 150, I-L-6 71, ratio > 2.0), in mature specimens, all coxae fused to a unique coxal plate by secondary sclerotization; rhithrobiont; southern Germany.	<i>A. circumcinctus</i> Schwoerbel, 1956
10'	Proportions of I-L-5/6 less extreme, ratio I-L-5/6 < 1.9, coxae not fused to a unique coxal shield.....	11
11	Integument lined; palp with a distinct ventrodiscal projection on P-2; I-L-6 relatively short compared with I-L-5 (ratio > 1.5); crenobiont.....	<i>A. fonticolus</i> (K. Viets, 1920)
11'	Integument striated; palp without a distinct ventrodiscal projection on P-2; I-L-6 relatively long (I-L-5/6 ratio < 1.4). (The unknown male of <i>A. barbarae</i> Biesiadka 1972 (from Poland), following the original description, S-1 and -2 very long (>100 µm), but small interspace (10 µm), may require keying out.).....	12
12	Genital field larger (L/W > 100/100 µm) and trapeziform with nearly straight, caudally converging lateral margins on the level of Ac-2 and -3; Ac longish; glandularia diameter > 30 µm; hyporheobiont; southern Germany.	<i>A. trapeziformis</i> Schwoerbel 1961
12'	Genital field small (L/W < 100/100 µm) and round or oval in shape; glandularia diameter < 25 µm.....	13
13	Gonopore in a more anterior position on the genital field, Ac-3 flanking its posterior fifth only; I-L-6 relatively short (ratio I-L-5/6 1.3).....	<i>A. spinipes</i> (Koch, 1837)
13'	Gonopore in a more posterior position on the genital field, Ac-3 flanking its posterior third; I-L-6 relatively long (L ratio I-L-5/6 < 1.2).....	<i>A. oblongus</i> (Walter, 1944)
14	P-2 bearing a distinct ventrodiscal projection with a rugose or denticulated surface (untypical specimens of species in general having rather distant and heteromorphic S-1 and -2 and the unknown male of <i>A. dentipalpis</i> Walter, 1935 (Algeria), distinguished by the presence of a group of dents at the ventrodiscal edge of P-2, may require keying out.).....	15
14'	P-2 with a straight or slightly convex ventrodiscal surface, at maximum forming a smooth, round hump.....	17
15	P-3 with distinct ventral projection; integument lined.....	<i>A. inflatus</i> (Walter, 1925)
15'	P-3 without ventral projection; integument various.....	16

- 16 Integument lineated; I-L-5 relatively long (ratio I-L-5/6 > 1.6).....*A. legeri* (Motaş, 1927)
- 16' Integument striated; I-L-5 relatively short (ratio I-L-5/6 < 1.6)..... *A. nodipalpis* Thor, 1899
- 17 P-4 with both ventral hairs and the sword seta inserted in the distal third; mediocaudal margin of Cx-1 + 2 truncated and slightly indented, apodemes of Cx-2 directed caudally; subterranean; Luxembourg..... ***A. chelidon* sp. nov.**
- 17' At least the proximoventral hair of P-4 inserted in the proximal half of the segment; mediocaudal margin of Cx-1 + 2 various in shape but not indented medially, and apodemes of Cx-2 directed more laterally..... 18
- 18 Small dimensions: median suture Cx-1 + 2 < 70, genital field L < 85, Ac diameter < 20, I-L-5 dL < 100 µm; I-L-6 longer than I-L-5 and slightly curved; sword seta on P-4 near distoventral hair; subterranean; south-east Europe..... *A. subterraneus* (K. Viets, 1932)
- 18' Major dimensions: median suture Cx-1 + 2 > 80, genital field L > 85, Ac diameter > 20, I-L-5 dL > 110 µm; I-L-6 shorter than I-L-5, various in shape; insertion of sword seta on P-4 various. 19
- 19 I-L-6 relatively long (L ratio I-L-5/6 < 1.25). 20
- 19' I-L-6 relatively short (L ratio I-L-5/6 > 1.25)..... 22
- 20 Genital field small (L < 100, Ac diameter < 30 µm); I-L-5 slender (dL/HB > 5.0), S-1 and -2 with narrow interspace (<5 µm) and short (L < 40 µm); crenobiont; south-east Europe. *A. graecus* K. Viets, 1950
- 20' Genital field larger (L > 100, Ac diameter > 30 µm); I-L-5 stouter (dL/HB < 4.0), larger setal interspace (>5 µm) and setae longer (L > 50 µm). 21
- 21 Integument lineated; small dimensions: glandularia diameter < 30, coxal field L < 300, Cx-1 + 2 median suture < 120, genital field L < 120, Ac < 40, I-L-5 dL < 140, S-1/2 L < 60 µm; crenobiont. *A. protendens* K. O. Viets, 1955
- 21' Integument striated; larger dimensions: glandularia diameter > 30, coxal field L > 300, Cx-1 + 2 median suture > 120, genital field L > 120, Ac > 40, I-L-5 dL > 140, S-1/2 L > 60 µm; crenobiont; Poland (weakly defined species, possibly synonym to the former. Integument structure, as well as intraspecific variability of dimensions need re-examination)..... *A. gorcensis* Biesiadka, 1972
- 22 I-L-6 relatively long (L > 115 µm, ratio I-L-5/6 < 1.35) and slender (L/HB > 6.0); wider setal interspace (>8 µm); Ac diameter < 40 µm; P-2 with a ventrodiscal hump, P-4 with sword seta halfway between ventral hairs or closer to the proximoventral hair; rhithrobiont..... *A. neumani* (Lundblad, 1962)
- 22' I-L-6 short (L < 115 µm, ratio I-L-5/6 > 1.35) and stout (L/HB < 5.0), narrow setal interspace (<8 µm); Ac diameter > 40 µm; P-2 with straight or weakly convex ventral margin, P-4 with sword seta adjacent to the distoventral hair. 23
- 23 I-L-6 very short (L < 90 µm, ratio I-L-5/6 > 1.5), with converging dorsal and ventral margins; L S-1/2 < 60 µm; mature specimens with extended ventral sclerotization (all coxal plates may be fused to an entire shield, Vgl-3 fused with posterior margin of Cx-4); crenobiont. *A. vaginalis* (Koenike, 1905)
- 23' I-L-6 longer (L > 100 µm, ratio I-L-5/6 < 1.5), with dorsal and ventral margins parallel up to the base of the claw furrow; L S-1/2 > 60 µm; secondary sclerotization weak, never fusing all coxae to a coxal shield, Vgl-3 not fused to the posterior margin of Cx-4; crenobiont. *A. adnatus* (Lundblad, 1956)
- 24 Dorsal idiosoma without sclerotized muscle attachments, ventral idiosoma normally with a broad sclerite border extending caudally from the Cx-4 and including Vgl-4, Vgl-3, the genital field, often also Vgl-1/2 and the excretory pore. If in rare cases this sclerite shield is absent, specimens can be distinguished from all other species of the subgenus in the study area by the smooth excretory pore with a small sclerite knob at its anterior edge; crenobiont. *A. separatus* (K. Viets, 1931)
- 24' Sclerites restricted to the dorsum or present on both dorsal and ventral surface; ventrocaudal area never with a sclerotized shield including genital field and Vgl. 25
- 25 Dorsal muscle attachments fused forming an extended dorsal shield or two shields separated by a transverse suture in the centre of the idiosoma; chelicera with a long and fine, weakly curved claw, ratio basal segment/claw L < 1.8; genital field with > 50 setae, Ac diameter < 30 µm; excretory pore smooth; rhithrobiont. *A. subasper* Koenike, 1902
- 25' Dorsal muscle attachments variously arranged, but never fused, forming an extended dorsal shield; cheliceral claw shorter and more curved, ratio basal segment/claw L > 2.0; number of genital setae, Ac diameter and sclerotization of excretory pore various. 26
- 26 Excretory pore surrounded by a sclerite ring. The unknown male of *A. ubinicus* Tuzovskij, 1980 (from Russia, the Caucasus), characterized by the presence of prominent tubercles associated with the ventral hair insertions on P-4 may require keying out)..... 27
- 26' Excretory pore without a sclerite ring. 35

- 27 Genital field large (L/W > 140/150, Ac diameter > 50 µm); P-3 slender (L/H > 2.0); I-L-6 relatively short (I-L-5/6 > 1.4); rhithrobiont, krenophile. **A. brendle sp. nov.**
- 27' Genital field small (L/W < 130/130, Ac diameter < 40 µm); P-3 stouter (L/H < 2.0); I-L-6 relatively longer (I-L-5/6 < 1.4). 28
- 28 Ventral seta on I-1-5 in the proximal half of the segment; gonopore short, with posterior edge on the level of anterior margin of Ac-2. (The unknown male of *A. longiporus* Petrova 1968 (from Bulgaria) may need to be keyed out; females differ from *A. asticae* in major idiosoma dimensions, a shorter palp and a lower I-L-5/6 ratio). *A. asticae* Petrova, 1968
- 28' Ventral seta on I-L-5 in the distal half of the segment; gonopore various. 29
- 29 S-1 and -2 short (L < 40 µm), with blunt, knob-like tips, extending to 1/3 of I-L-6; P-2 with a slightly protruding ventrodiscal edge; P-4 with distinct projections near ventral hairs, sword seta in the distal half of the segment, near distoventral hair. *A. pumilus* (Szalay, 1946)
- 29' S-1 and -2 longer (L > 50 µm), their tips various in shape, extending to at least half of I-L-6; P-2 with a rounded ventrodiscal edge; ventral margin of P-4 various in shape, sword seta in the centre or in the proximal half of the segment, near proximoventral hair. 30
- 30 Cx-1 + 2 with elongated medial suture line (L > 90 µm, > 40% of total L of the coxal field), mediocaudal margin forming an acute angle. 31
- 30' Cx-1 + 2 with shorter medial suture line (L < 60 µm, < 40% of total L of the coxal field), mediocaudal margin forming a right or obtuse angle. 32
- 31 Genital plate more elongate, gonopore shorter, with caudal edge on the level of Ac-2; ventral margin P-4 without prominent projections, divided by ventral setae in sectors 1 : 1 : 1, sword seta between ventral hairs; I-L-6 relatively short (I-L-5/6 < 1.1) and stout (L/HB < 4.0); hyporheobiont. *A. phreaticus* (Motaş & Tanasachi, 1948)
- 31' Genital plate enlarged, gonopore longer, with caudal edge on the level of Ac-3; ventral margin P-4 with a prominent projection at insertion of proximoventral hair, divided by ventral hairs in sectors 3 : 2 : 1, sword seta near proximoventral hair; I-L-6 relatively long (I-L-5/6 > 1.1) and more slender (L/HB > 5.0); hyporheobiont. *A. latipalpis* (Motaş & Tanasachi, 1946)
- 32 Setae of Dgl-1 filiform; anterior margin of genital field centrally protruding; (following original descriptions, species with smooth ventral surface of palp segments P-2 and -3; in one authorized specimen of *A. similis* denticulation is present). 33
- 32' Setae of Dgl-1 willow leaf-shaped; anterior margin of genital field equally rounded. With or without denticulation on ventral surface of P-2 and -3. 34
- 33 Gonopore shorter, with posterior edge on the level of anterior margin of Ac-2; P-2 L < 100 µm; I-L-5/6 > 1.3; hyporheobiont. *A. prosiliens* (Motaş & Tanasachi, 1948)
- 33' Gonopore longer, with posterior edge on the level of anterior margin of Ac-3; P-2 L > 100 µm; I-L-5/6 < 1.3; hyporheobiont (weakly defined species, diagnostic characters deduced from published data only). *A. similis* (E. Angelier, 1949a,b)
- 34 Ventral surface of P-2 and -3 covered by a dense, fine denticulation (rather variable character sometimes visible only at strong magnifications); genital field L/W < 90/90; I-L-6 with a series of ventral hairs; hyporheobiont. *A. denticulatus* (Walter, 1947)
- 34' Ventral surface of P-2 and -3 smooth; genital field L/W > 100/100 µm; I-L-6 with one ventral hair only; hyporheobiont (weakly defined species, diagnostic characters deduced from published data only, I-L-6 character appears fantastic). *A. microphthalmus* (Motaş & Tanasachi, 1948)
- 35 S-1 and -2 long (>45 µm), and slightly interspaced (3–7 µm), with their tips reaching half-way up I-L-6; I-L-6 curved. The unknown male of *A. adenophorus* K. Viets, 1930 (Spain), characterized by the excretory pore sclerite restricted to the posterior edge of the pore, may require keying out.) 36
- 35' S-1 and -2 short (<45 µm), placed side by side, with their tips reaching 1/3 or less of the way up I-L-6; I-L-6 straight. 37
- 36 Genital field small (L/W < 110/120, Ac diameter < 35 µm); I-L-5 shorter (dL < 120 µm, I-L-5/6 < 1.35); crenobiont. *A. loricatus* Piersig, 1898
- 36' Genital field large (L/W > 120/130, Ac diameter > 35 µm); I-L-5 longer (dL > 120 µm, I-L-5/6 > 1.35); crenobiont. *A. macrolaminatus* Láska, 1956
- 37 Small dimensions (idiosoma L < 400, coxal field < 200, suture of Cx-1 + 2 < 80, genital field L/W < 70/70 µm); less than 30 genital setae; hyporheobiont. *A. pygmaeus* (Motaş & Tanasachi, 1948)
- 37' Larger dimensions (idiosoma L > 500, coxal field > 250, suture of Cx-1 + 2 > 100, genital field L/W > 90/90 µm); more than 30 genital setae. 38

38	I-L-5 longer (L > 120 µm, I-L-5/6 > 1.0), I-L-6 stout (L/H < 4.0); P-4 with sword seta near distoventral hair; rhithrobiont.....	<i>A. clavipes</i> Lundblad, 1954
38'	I-L-5 shorter (L < 120 µm, I-L-5/6 < 1.0), I-L-6 more slender (L/H > 4.5); P-4 with sword seta near proximoventral hair; crenobiont.....	<i>A. tenerifensis</i> Lundblad, 1962
39	Genital field with more than three pairs of acetabula.....	40
39'	Genital field with three pairs of acetabula.....	41
40	Genital field with more than four pairs of acetabula..... [A. <i>heversi</i> K. O. Viets, 1982, only female known (Israel)]	
40'	Genital field with four pairs of acetabula; I-L-5 strongly thickened, with enormous, digitiform S-1; gnathosomal rostrum elongated, chelicera with long, fine, slightly curved claw (basal segment/claw < 1.8); rheobiont.....	<i>A. octoporus</i> Piersig, 1904
41	IV-L-5 bearing a pair of long, rigid swimming hairs; genital field transverse (L/W 90/110); I-L-6 short and curved (I-L-5/6 1.6); palp simple, without sexually differentiated characters; lenitophilous; northern Europe.....	<i>A. ovalis</i> Koenike, 1883
41'	IV-L-5 without elongated swimming hairs; genital field, I-L, and palp various. The unknown males of the following species may require keying out: <i>A. gladisetus</i> (Husiatinschi, 1937; from Romania), characterized by unusually enlarged, feather-like dorsal setae on the palp, <i>A. magnipalpis</i> Rensburg, 1971 from Switzerland (combining a very large palp, L P-3 > 110 µm with fused Vgl-1 + 2), <i>A. angustiporus</i> K. Viets, 1930 from Spain (with large acetabula, diameter > 50 µm and striated integument) and three species in females with setal interspace > 40 mm: <i>A. cultellatus</i> K. Viets, 1930 (Spain), <i>A. diastema</i> (Szalay, 1935; Hungary), and <i>A. inflatipes</i> Lundblad, 1956 (France); a male attributed to the latter species in the original description is probably not conspecific.....	42
42	Both P-2 and P-3 with ventral projections.....	43
42'	P-3 without ventral projection; a projection may be present or absent on P-2.....	44
43	Integument striated; I-L-5 long (L > 200 µm, I-L-5/6 > 1.5), I-L-6 proximally thickened; Ac-3 elongated, drop-shaped.....	<i>A. gibberipalpis</i> Piersig, 1898
43'	Integument lineated; I-L-5 shorter (L < 200 µm, I-L-5/6 < 1.4), I-L-6 proximally not particularly thickened; Ac-3 round.....	<i>A. inflatus</i> (Walter, 1925)
44	Excretory pore surrounded by a sclerite ring or at least with a sclerite dot at its anterior edge; Vgl-1 + 2 fused.....	45
44'	Excretory pore unsclerotized; Vgl-1/2 separate or (rarely) fused.....	51
45	Dorsal and ventrocaudal muscle attachments sclerotized; gonopore short, <50% of the genital field in length, with posterior edge on the level of Ac-2; hyporheobiont (a weakly defined species, indications based on published data, probably related to the <i>A. denticulatus</i> group, with generally less distant S-1 and -2).....	<i>A. vandeli</i> E. Angelier <i>et al.</i> , 1963
45'	Without sclerotized muscle attachments; genital field various.....	46
46	I-L-5 strongly inflated like a longish disk, L/HB < 2.5; genital field with a deep posterior indentation, gonopore with posterior edge anterior from Ac-3; ventral margin of P-2 straight, without projections; hyporheophilous.....	<i>A. latipes</i> (Szalay, 1935)
46'	I-L-5 not strongly inflated, L/HB > 3.0; posterior indentation of genital field less pronounced or absent, gonopore with posterior edge on the level of Ac-3; ventral margin of P-2 various, with or without projections.....	47
47	P-2 with a strongly protruding ventrodiscal expansion, P-4 inflated near the insertion of the proximoventral hair, sword seta enormously thickened, finger-like; rhithrobiont; Madeira.....	<i>A. maderensis</i> (Lundblad, 1941)
47'	Ventral margin of P-2 straight or only with a minor extension distally, P-4 not particularly inflated near the proximoventral hair, sword seta smaller.....	48
48	Integument striated; setal interspace < 20 µm; L I-L-5 < 170, I-L-6 < 130 µm (published data only, re-examination of these species desirable).....	49
48'	Integument lineated; setal interspace > 20 µm; L I-L-5 > 170, I-L-6 > 130 µm.....	50
49	Palp relatively large (L P-3 > 80, P-4 > 110 µm), P-2 with a ventrodiscal projection; Cx-1 + 2 elongated, medial suture L > 150 mm, genital field large (L/W > 100/100 µm); rhithrobiont.....	<i>A. gracilipes</i> (E. Angelier, 1951)
49'	Palp relatively small (L P-3 < 80, P-4 < 100 µm), P-2 without a ventrodiscal projection; Cx-1 + 2 shorter, median suture L < 140 µm, genital field smaller (L/W < 100/100 µm); rheobiont.....	<i>A. gallicus</i> (E. Angelier <i>et al.</i> , 1963)

- 50 Larger dimensions (coxal field $L > 350$, genital field $L/W > 100/130$, Ac diameter > 40 , P-2 > 90 , P-3 > 100 , P-4 > 120 , I-L-5 > 220 , I-L-6 $> 170 \mu\text{m}$); excretory pore sclerite not ring-shaped, restricted to the anterior edge; rhithrobiont; Madeira. *A. macaronensis* (Lundblad, 1941)
- 50' Smaller dimensions (coxal field $L < 350$, genital field $L/W < 100/110$, Ac diameter < 30 , P-2 < 90 , P-3 < 100 , P-4 < 120 , I-L-5 < 200 , I-L-6 $< 150 \mu\text{m}$); excretory pore sclerite ring-shaped; rhithrobiont. *A. anellatus* Lundblad, 1956
- 51 Dorsal muscle attachments sclerotized, fused forming an anterior and a posterior dorsal shield; I-L-5/6 stout, S-1 and -2 extremely heteromorphic (L ratio S-1/2 2.2); gnathosoma with long rostrum, chelicera with a long and fine, weakly curved claw (basal segment/claw 1.6); palp stout, P-2 with a long, digitiform ventrodiscal process, P-4 with maximum height in the centre, ventral hairs very long; rhithrobiont. *A. digitatus* Lundblad, 1954
- 51' Dorsum without sclerotization; I-L-5 and -6 more slender, S-1 and -2 more homoiomorphic, gnathosoma with short rostrum; chelicera basal segment/claw > 2.0 ; ventrodiscal projection on P-2, if present, never ending in a long, digitiform tip. 52
- 52 I-L-5 relatively long, I-L-6 short and thickened (I-L-5/6 > 1.5 , I-L-6 L/HB < 6.0); integument lineated; narrow setal interspace ($< 20 \mu\text{m}$); P-2 with a ventrodiscal projection. 53
- 52' I-L-5 and -6 with different proportions; if L ratio I-L-5/6 > 1.5 , then I-L-6 more slender and vice versa; integument, setal interspace and shape of P-2 various. 55
- 53 Ventrodiscal projection of P-2 strongly protruding and smooth; both ventral hair insertions of P-4 far proximally, dividing the segment into sectors 2 : 1 : 3; sword seta anterior to distoventral hair; genital field with 60–80 short setae; crenobiont. *A. pennatus* (K. Viets, 1920)
- 53' Ventrodiscal projection of P-2 blunt, with rugose-denticulated surface; distoventral hair of P-4 inserted in the distal half of the segment, insertion of sword seta various; genital setae fewer in number. 54
- 54 Genital field with convex anterior margin and relatively small acetabula (diameter $< 45 \mu\text{m}$), Ac-2 elongated; P-4 divided by ventral hair insertions in sectors 1 : 1 : 1, sword seta on the level of distoventral hair; crenobiont. *A. fonticolus* (K. Viets, 1920)
- 54' Genital field with concave anterior margin and relatively large acetabula (diameter $> 45 \mu\text{m}$), Ac-2 transverse; P-4 divided by ventral hair insertions in sectors 2 : 3 : 1, sword seta between ventral hairs; crenobiont. *A. legeri* (Motaş, 1927)
- 55 Anterior margin of genital field indented, a small medial extension may be present in the indentation like a notch in a bead. 56
- 55' Anterior margin of genital field convex, straight, or gently concave, but without a medial indentation. 59
- 56 Ventral margin of P-2 with a distinct, nose-shaped distal projection; P-4 with maximum height near proximoventral hair, sword seta strong, in the proximal half of the segment. 57
- 56' Ventral margin of P-2 distally rounded or forming a right angle, but without projection; P-4 not thickened near proximoventral hair insertion, sword seta rather fine, in the distal half of the segment. 58
- 57 Distal margins of IV-L-4/5 equally convex, only slightly extending laterally from the insertions of the following segments; sword seta on P-4 shorter than the maximum height of the segment, in most cases inserting on, or distally from, the level of the proximoventral hair. *A. nodipalpis* Thor, 1899
- 57' Distal margins of IV-L-4/5 forming pointed lateral sheaths that cover the insertion of the following segment; sword seta on P-4 as long as the maximum height of the segment, inserted proximal to the proximoventral hair. *A. robustus* (Sokolow, 1941)
- 58 P-4 club-shaped, equally thickened from the base to the level of the distoventral hair; I-L-6 proximally thickened, more stout; Ac in a curved line, Ac-1 and Ac-3 distanced from each other. *A. clavipalpis* (Lundblad, 1956)
- 58' P-4 with maximum height near the proximoventral hair, dorsal and ventral margins subparallel; I-L-6 more slender; Ac in triangular arrangement, Ac-1 and Ac-3 approaching each other; the Caucasus (a poorly documented species defined here based on the proposed synonymy of *A. dubius* (Sokolow, 1940)). *A. arcuatus* (Thor, 1914)
- 59 Vgl-1 + 2 fused; S-1 and -2 with wide setal interspace ($> 45 \mu\text{m}$); integument lineated; ventrodiscal edge of P-2 rounded, without projections; Madeira. In the morphological vicinity of this species the unknown males of *A. gomeræ* (Canary Islands) and *A. lunipes* (Spain) may be found; both species combine lineated integument, wide setal interspace and small acetabula. *A. insulanus* (Lundblad, 1941)
- 59' Vgl-1/2 separate; S-1 and -2 with narrower setal interspace ($< 45 \mu\text{m}$); integument various; P-2 various in shape. 60

60	P-2 with a ventrodiscal projection, or forming a nose-shaped acute angle, or with an irregular, rugose surface.	61
60'	P-2 without a ventrodiscal projection, at maximum protruding convexly.	66
61	Acetabula large (maximum diameter > 50 µm); I-L-5 relatively long (I-L-5/6 > 1.4).	62
61'	Acetabula small (maximum diameter < 40 µm); I-L-5 relatively short (I-L-5/6 < 1.4).	63
62	Integument lineated; I-L-5/6 large (L > 220/150 µm); genital field transverse (L/W 157/193), Ac in triangular arrangement; ventrodiscal projection P-2 weakly developed, with rugose surface (<i>A. longisetus</i> Pešić, 2002 is a sibling species of <i>A. fissus</i> characterized by very long ventral hairs on P-4).	<i>A. fissus</i> (Walter, 1927)
62'	Integument striated [?]; I-L-5/6 smaller (L < 210/140 µm); genital field round (L/W 105/105), Ac in a curved line; ventrodiscal projection P-2 pointed (little known species, many morphological details unclear); Corsica.	<i>A. corsicus</i> E. Angelier, 1954
63	Integument striated; I-L-6 weakly curved and relatively thick (L/HB < 6.0)	<i>A. samsoni</i> (Sokolow, 1936)
63'	Integument lineated; I-L-6 more strongly curved and more slender (L/HB > 6.0).	64
64	Suture lines Cx-2/3 indistinct, all coxae appearing to be fused to form a unique coxal shield; setal interspace > 20 µm; genital field with circular anterior and indented posterior margin, acetabula diameter > 30 µm; ventrodiscal projection P-2 with a rugose-denticulated surface, ventral margin P-4 divided by ventral hairs in sectors 1 : 1 : 2.	<i>A. remotus</i> Szalay, 1953
64'	Suture lines Cx-2/3 distinct, coxae in three groups; setal interspace < 20 µm; genital field with weakly convex anterior and slightly concave posterior margin, acetabula diameter < 30 µm; ventrodiscal projection of P-2 with smooth surface, ventral margin of P-4 divided by ventral hairs in sectors 1 : 1 : 1 or 2 : 2 : 1.	65
65	Median suture line Cx-1 + 2 shorter (<100 µm, c. 30% of coxal field L); P-3 longer (L 70 µm), P-4 divided by ventral hairs in sectors 1 : 1 : 1, sword seta halfway between ventral hairs.	<i>A. valencianus</i> (K. Viets, 1930)
65'	Median suture line Cx-1 + 2 longer (>100 µm, c. 45% of coxal field L); P-3 shorter (L 50 µm), P-4 divided by ventral hair in sectors 2 : 2 : 1, sword seta on the level of distoventral hair.	<i>A. inflatipalpis</i> K. Viets, 1950
66	Seta S-1 not pointed, apically thickened and truncated.	67
66'	Seta S-1 pointed, equally narrowed in the distal half.	68
67	Integument lineated; I-L-5/6 small (I-L-5 dL/vL < 150/100, I-L-6 L < 130 µm); S-1 shorter (L < 100) and less slender (L/W < 12.0), narrower setal interspace (<28 mm); I-L-6 stouter (L/HB < 9.0); palp shorter (total L < 240 mm), segment P-3 stouter (L/H < 1.8).	<i>A. allgaier</i> sp. nov.
67'	Integument striated; I-L-5/6 larger (I-L-5 dL/vL > 160/100, I-L-6 L > 160 µm); S-1 longer (L > 120 µm) and more slender (L/W > 15.0), wider setal interspace (>28 mm); I-L-6 more slender (L/HB > 9.0); palp longer (total L > 280 µm), segment P-3 more slender (L/H > 1.8).	<i>A. distans</i> K. Viets, 1914
68	Acetabula large, maximum diameter > 50 µm, in triangular arrangement (posterior edge of Ac-1 adjacent to anterior edge of Ac-3).	69
68'	Acetabula small, maximum diameter < 50 µm, in a curved line (posterior edge of Ac-1 distanced from anterior edge of Ac-3).	71
69	Integument striated; ventral margin of P-4 divided by ventral hairs in sectors 2 : 1 : 1, sword seta near proximoventral hair, in the centre of the segment (little understood species in need of revision).	<i>A. glandulosus</i> Walter, 1918
69'	Integument lineated; proximoventral hair on P-4 in the proximal half of the segment, sword seta in the distal third.	70
70	I-L-5/6 larger (L > 200/150 µm), S-1 and -2 longer (>100, > 80 µm) and wider interspace (>30 µm); I-L-6 more slender (L/HB > 7.5); P-3 more slender (L/H > 1.6); ventrodiscal hair on P-4 far distally (ventral margin divided by hair insertions 2 : 3 : 1); crenobiont.	<i>A. panniculatus</i> (K. Viets, 1925)
70'	I-L-5/6 smaller (L < 200/150 µm), S-1 and -2 shorter (<100, < 80 µm) and narrower interspace (<30 µm); I-L-6 stouter (L/HB < 7.5); P-3 stouter (L/H < 1.6); ventral margin P-4 divided by hair insertions 1 : 1 : 1; rhithrobiont.	<i>A. rivalis</i> Lundblad, 1956
71	Narrower setal interspace (<15 µm), S-1 and -2 rather homoiomorphic, P-6 stouter (L/HB < 7.0); median suture Cx-1 + 2 longer (>120 µm); genital field with convex anterior margin; sword seta P-4 on the level of the proximoventral hair; Sweden.	<i>A. neumani</i> (Lundblad, 1962)

- 71' Wider setal interspace ($>20\ \mu\text{m}$) S-1 and -2 more heteromorphic, I-L-6 more slender ($L/HB > 7.0$); median suture Cx-1 + 2 shorter ($<110\ \mu\text{m}$); genital field with straight or slightly concave anterior margin; sword seta P-4 on the level of the distoventral hair 72
- 72 Genital field larger ($L/W > 100/100$, Ac diameter $> 30\ \mu\text{m}$); I-L-5/6 larger (I-L-5/6 $> 200/150$, S-1/2 $> 100/80\ \mu\text{m}$, interspace $> 30\ \mu\text{m}$), L ratio I-L-5/6 > 1.3 (this and the alternative weakly defined taxa, perhaps representing a species complex).....*A. fluviatilis* (Szalay, 1929)
- 72' Genital field smaller ($L/W < 100/100$, Ac diameter $< 30\ \mu\text{m}$); I-L-5/6 smaller (I-L-5/6 $< 200/150$, S-1/2 $< 100/80\ \mu\text{m}$, interspace $< 30\ \mu\text{m}$), L ratio I-L-5/6 < 1.3 *A. algeriensis* (Lundblad, 1942)

Key to females

Classification of female *Atractides* is problematic for many species. Juveniles especially cannot be identified in many cases.

- 1 Gnathosoma with projecting, pointed rostrum; chelicera with long, weakly curved claw (basal segment/claw < 2.0); three or more pairs of acetabula; integument striated; palp and I-L-5 and -6 robust. 2
- 1' Gnathosoma with shorter rostrum, cheliceral claw relatively short and more curved (basal segment/claw > 2.0); never more than three pairs of acetabula; integument, palp, I-L-5 and -6 various. 5
- 2 More than three pairs of acetabula. 3
- 2' Three pairs of acetabula. 4
- 3 Four pairs of acetabula; I-L-5 and -6 more slender ($L/HB > 3.5/4.3$). *A. octoporus* Piersig, 1904
- 3' More than four pairs of acetabula; I-L-5 and -6 stouter ($L/HB < 3.5/4.3$). *A. heversi* K. O. Viets, 1982
- 4 S-1 and -2 rather homoiomorphic (L S-1/2 83/76), acetabula in a weakly curved line, maximum diameter $< 30\ \mu\text{m}$ *A. subasper* Koenike, 1902
- 4' S-1 and -2 strongly heteromorphic (L S-1/2 70/32), acetabula in triangular arrangement, maximum diameter $> 40\ \mu\text{m}$ *A. digitatus* Lundblad, 1954
- 5 Excretory pore with a distinct sclerite ring, or associated with a sclerite knob. 6
- 5' Excretory pore smooth, only surrounded by fine lips. 26
- 6 Excretory pore sclerite horseshoe- or knob-shaped. 7
- 6' Excretory pore sclerite ring complete. 9
- 7 Excretory pore sclerite at the anterior edge of the excretory pore; without sclerotized dorsal muscle attachments; Vgl-1/2 separate; I-L-5 relatively short (I-L-5/6 < 1.4). *A. separatus* (K. Viets, 1931)
- 7' Excretory pore sclerite at the posterior edge of the excretory pore; with sclerotized dorsal muscle attachments; Vgl-1 + 2 fused; I-L-5 relatively long (I-L-5/6 > 1.4). 8
- 8 Coxal field L < 250 , Cx-1 + 2 median suture L < 80 , palp total L < 300 , I-L-5/6 L $< 140/80$, S-1/2 L $< 70/60$, interspace $5\ \mu\text{m}$; I-L-6 more robust ($L/HB < 4.0$), ratio I-L-5/6 1.5; Spain (known only from a single female, male unknown). *A. adenophorus* (K. Viets, 1930)
- 8' Coxal field L > 250 , Cx-1 + 2 median suture L > 80 , palp total L > 300 , I-L-5/6 L $> 140/80$, S-1/2 L $> 70/60$, interspace 8–10 μm ; I-L-6 more slender ($L/HB > 4.0$), ratio I-L-5/6 1.6–1.7. ***A. brendle* sp. nov.**
- 9 I-L-5 inflated as a longish disk, $L/HB < 2.5$, integument striated, setal interspace $> 30\ \mu\text{m}$, acetabula maximum diameter $< 25\ \mu\text{m}$ *A. latipes* (Szalay, 1935)
- 9' I-L-5 more slender, $L/HB > 2.8$; integument, setal interspace and acetabula diameter various. 10
- 10 Setal interspace $> 30\ \mu\text{m}$; I-L-6 rather long and slender (L $> 170\ \mu\text{m}$, $L/HB > 9.0$); P-3 with a fine lamella on the distal half of the ventral surface; integument lined. 11
- 10' Setal interspace $< 30\ \mu\text{m}$; I-L-6 shorter and stouter (L $< 170\ \mu\text{m}$, $L/HB < 8.0$); P-3 and integument various. 13
- 11 Vgl-1 + 2 fused; I-L-5/6 shorter (L $< 240/200\ \mu\text{m}$), I-L-5 more slender ($dL/HB > 4.0$). *A. anellatus* Lundblad, 1956
- 11' Vgl-1/2 separate; I-L-5/6 longer (L $> 240/200\ \mu\text{m}$), I-L-5 stouter ($dL/HB < 4.0$). 12
- 12 I-L-5 more robust ($dL/HB < 3.2$), S-1 and -2 more thickened, interspace $> 60\ \mu\text{m}$, ratio I-L-5/6 < 1.2 ; Madeira. *A. insulanus* (Lundblad, 1941)
- 12' I-L-5 more slender ($dL/HB > 3.5$), S-1 and -2 more slender, interspace $< 50\ \mu\text{m}$, ratio I-L-5/6 > 1.2 ; Madeira. *A. macaronensis* (Lundblad, 1941)
- 13 Integument lined; Vgl-1/2 not fused; coxal field L $> 350\ \mu\text{m}$ 14
- 13' Integument striated; Vgl-1/2 and dimensions of coxal field various. 15
- 14 Palp larger (e.g. P-4 L $> 120\ \mu\text{m}$), simple in shape (without ventral projections on P-2/4, sword seta on P-4 not thickened); setal interspace $< 10\ \mu\text{m}$; Romania (little known species).....*A. sokolowi* (Motaş & Tanasachi, 1948)

- 14' Palp smaller (e.g. P-4 L < 100 µm), with ventral projections on P-2/4, sword seta on P-4 thickened; setal interspace > 20 µm; Madeira. *A. maderensis* (Lundblad, 1941)
- 15 Without sclerotized muscle attachments. 16
- 15' At least some muscle attachments sclerotized (note that sclerites in females may be reduced to minute pits, occasionally fused to neighbouring glandularia and recognizable only by the resulting asymmetric shape of glandular sclerites). 18
- 16 Small dimensions; idiosoma L < 450, coxal field < 250, palp total L < 300, setal interspace < 50 µm; genital plates relatively short, < 50% gonopore L. *A. cisternarum* (K. Viets, 1935)
- 16' Large dimensions: idiosoma L > 500, coxal field > 250, palp total L > 300, setal interspace > 50 µm; genital plates relatively long, > 50% gonopore L. (The unknown female of *A. gracilipes* E. Angelier, 1951; where the male has fused Vgl-1 + 2 and I-L-5/6 > 1.2, should be keyed out.) 17
- 17 Vgl-1 + 2 fused; ratio I-L-5/6 < 1.2 (little known species, data from original publication)..... *A. gallicus* (E. Angelier *et al.*, 1963)
- 17' Vgl-1/2 separate; ratio I-L-5/6 > 1.2..... *A. tener* Thor, 1899
- 18 Length of S-1/2 about 1/3 that of I-L-6, < 40 µm; prominent tubercles associated with ventral hair insertions on P-4, sword seta in the distal half of the segment. 19
- 18' Length of S-1/2 about half that of I-L-6, > 50 µm; ventral margin of P-4 at maximum with a denticle near ventral hairs, sword seta in the centre or the proximal half of the segment. (The unknown female of *A. vandeli* E. Angelier *et al.*, 1963 should be keyed out.) 20
- 19 I-L-5/6 longer (L > 100/100) and more slender (L/H > 3.5/4.5); palp larger (total L > 300 µm) (male unknown). *A. ubinicus* Tuzovskij, 1980
- 19' I-L-5/6 shorter (L < 100/100) and stouter (L/H < 3.5/4.5); palp smaller (total L < 300 µm)..... *A. pumilus* (Szalay, 1946)
- 20 I-L-6 very robust (L/HB < 4.0); sword seta of P-4 in the centre of the segment..... *A. phreaticus* (Motaş & Tanasachi, 1948)
- 20' I-L-6 more slender (L/HB > 4.0); sword seta of P-4 in the proximal half of the segment. 21
- 21 Ventral seta of I-L-5 in the proximal half of the segment..... 22
- 21' Ventral seta of I-L-5 in the distal half of the segment. 23
- 22 Smaller idiosoma (total L 400, Cx-1 + 2 medial suture 85 µm), but with a larger palp (total L 210 µm); ratio I-L-5/6 1.11; genital plates enlarged, triangular. *A. asticae* Petrova, 1968
- 22' Larger idiosoma (total L 500, Cx-1 + 2 medial suture 100 µm), but with a shorter palp (total L 175 mm); ratio I-L-5/6 1.26; genital plates narrow, bean-shaped (little documented species, male unknown). *A. longiporus* Petrova, 1968
- 23 Cx-1 + 2 with elongated medial suture line (L > 90 µm, > 40% of total L of the coxal field), mediocaudal margin forming an acute angle. *A. latipalpis* (Motaş & Tanasachi, 1946)
- 23' Cx-1 + 2 with shorter medial suture line (L < 80 µm, < 40% of total L of the coxal field), mediocaudal margin forming a right or obtuse angle (further research required; available information concerning measurements of coxae and denticulation of palp segments contradictory). 24
- 24 Setae of Dgl-1 filiform. (Weakly defined species; the only available authorized female specimen with a fine denticulation on P-2 and -3. The unknown female of *A. prosiliens* Motaş & Tanasachi (1948), a species where the males are very similar to *A. similis*, should be keyed out.)..... *A. similis* (E. Angelier, 1949)
- 24' Setae of Dgl-1 willow-leaf shaped; anterior margin of genital field rounded. With or without denticulation on ventral surface of P-2 and -3. 25
- 25 Ventral surface of P-2 and -3 covered by a dense, fine denticulation (rather variable character, sometimes visible only at strong magnification); I-L-6 with a series of ventral hairs; hyporheobiont..... *A. denticulatus* (Walter, 1947)
- 25' Ventral surface of P-2 and -3 smooth; I-L-6 with one ventral hair only; (weakly defined species, diagnostic characters deduced from published data only, the I-L-6 character appearing fantastic)..... *A. microphthalmus* (Motaş & Tanasachi, 1948)
- 26 S-1 and -2 very short and homoiomorphic (L < 50 µm, < 50% L I-L-6), small interspace or placed side by side. (The unknown female of *A. chelidon* sp. nov. should be keyed out. In males characterized by mediocaudal margin Cx-1 + 2 with a pointed indentation between the caudally directed apodemes of Cx-2, and P-4 with both ventral hairs and sword setae in anterior third of the segment, the latter character possibly subject to sexual dimorphism.)..... 27
- 26' S-1 and -2 longer (L > 50 µm, > 50% L I-L-6), wider interspace..... 32
- 27 I-L-6 more slender (L/H > 5.5, > 40% L I-L-6), S-1 and -2 pointed. *A. subterraneus* (K. Viets, 1932)

27'	I-L-6 stouter (L/H < 4.5, < 40% L I-L-6), S-1 and -2 truncated.....	28
28	Ventrodiscal edge of P-2 denticulated; I-L-6 thickened (L/HB < 3.3).....	<i>A. denticulatus</i> (Walter, 1935)
28'	Ventrodiscal edge of P-2 smooth; I-L-6 more slender (L/HB > 3.5).....	29
29	Small in size (coxal field < 220, median suture Cx-1 + 2 < 80, palp total L < 250, P-4 < 80, I-L-5/6 < 100/100); Vgl-1 + 2 fused; ventral hairs on P-4 further apart.....	<i>A. pygmaeus</i> (Motaş & Tanasachi, 1948)
29'	Larger dimensions (coxal field > 250, median suture Cx-1 + 2 > 90, palp total L > 280, P-4 > 90, I-L-5/6 > 120/100); Vgl-1/2 separate; ventral hairs on P-4 adjacent to each other.....	30
30	Medial suture Cx-1 + 2 short (<110 µm), mediocaudal margin equally rounded; maximum diameter of acetabula < 30 µm; I-L-5 relatively long (I-L-5/6 1.3).....	<i>A. graecus</i> K. Viets, 1950
30'	Medial suture Cx-1 + 2 long (>120 µm), mediocaudal margin acute-angled; maximum diameter of acetabula > 30 µm; I-L-5 relatively short (I-L-5/6 < 1.2).....	31
31	Muscle attachments sclerotized; I-L-5 shorter than I-L-6 (I-L-5/6 0.93), I-L-6 stout (L/HB < 4.0); sword seta P-4 near distoventral hair.....	<i>A. clavipes</i> Lundblad, 1954
31'	Muscle attachments smooth; I-L-5/6 > 1.1; I-L-6 more slender (L/HB > 4.0); sword seta P-4 near proximoventral hair.....	<i>A. tenerifensis</i> Lundblad, 1962
32	Muscle attachments sclerotized; S-1 and -2 interspace small (5–6 µm); Vgl-1 + 2 fused.....	33
32'	Muscle attachments unsclerotized; S-1 and -2 and Vgl-1/2 various.....	34
33	Dorsal sclerites larger, largest dorsal plates > 100 µm; acetabula diameter > 40 µm.....	<i>A. macrolaminatus</i> Láška, 1956
33'	Dorsal sclerites smaller, largest dorsal plates < 100 µm; acetabula diameter < 40 µm.....	<i>A. loricatus</i> Piersig, 1898
34	Dorsal integument in the centre with a papillate area, visible at least in the interocular region (very old specimens, with a thick and leathery integument can loose papillosity); S-1 and -2 short (< 65 µm) and narrow interspace (7 µm).....	<i>A. walteri</i> (K. Viets, 1925)
34'	Dorsal integument without papillae; S-1 and -2 various.....	35
35	S-1 and -2 very long (> 120 µm), but interspace narrow (10 µm); (data from original description, only one female known).....	<i>A. barbarae</i> Biesiadka, 1972
35'	If S-1 and -2 longer than 120 µm, interspace is > 20 µm.....	36
36	IV-L-5 bearing a pair of long, rigid swimming hairs; S-1 and -2 rather heteromorphic (ratio 1.26); I-L-6 relatively short (I-L-5/6 1.6); Vgl-1/2 separate.....	<i>A. ovalis</i> Koenike, 1883
36'	IV-L-5 without long swimming hairs; S-1 and -2, I-L-5/6, and Vgl-1 + 2 various.....	37
37	Vgl-1 + 2 fused (note that there are species with sexual dimorphism in this character. Occasionally, juvenile specimens of species with generally fused Vgl-1 + 2 may have platelets which are still separate. For three little known species, the state of this character is not documented: <i>A. gladisetus</i> Husiatinschi, 1937 (Romania), differing from all other known species in very enlarged, feather-like dorsal setae on the palp, <i>A. montanus</i> Halbert, 1911 (Ireland), a species that needs redefinition with material from the type area, and <i>A. corsicus</i> (Corsica), with wide setal interspace and acetabula).....	38
37'	Vgl-1/2 separate.....	44
38	Setal interspace > 40 µm, S-1 long and very slender (140 µm, L/W 20.4); I-L-6 slender (L/HB 12.0) and strongly curved; integument lined.....	<i>A. lunipes</i> Lundblad, 1956
38'	Setal interspace < 30 µm, S-1 short and thicker (<100 µm, L/W < 10.0); I-L-6 thicker (L/HB < 8.0) and less curved; integument striated.....	39
39	I-L-6 stout (L/HB < 4.0) and extremely short compared with I-L-5 (L I-L-5/6 > 2.0).....	<i>A. circumcinctus</i> Schwoerbel, 1956
39'	I-L-6 more slender (L/HB > 5.0) and less short compared with I-L-5 (L I-L-5/6 < 1.5).....	40
40	I-L, acetabula and palp large (L I-L-5/6 > 180/150, maximum Ac diameter > 40 µm, P-3 > 100, P-4 > 120 µm) (little documented species, male unknown).....	<i>A. magnipalpis</i> Rensburg, 1971
41'	I-L, acetabula and palp small (L-I-L-5/6 < 170/120, maximum Ac diameter < 40 µm, P-3 < 80, P-4 < 100 µm).....	42
42	Glandularia diameter > 30 µm.....	<i>A. trapeziformis</i> Schwoerbel, 1961
42'	Glandularia diameter < 30 µm.....	43
43	Acetabula in a weakly curved line, maximum diameter Ac-1 < Ac-3; slightly larger dimensions; setal interspace > 12 µm.....	<i>A. spinipes</i> (Koch, 1837)
43'	Acetabula in an obtuse triangle, maximum diameter Ac-1 > Ac-3; slightly smaller dimensions; setal interspace < 12 µm.....	<i>A. oblongus</i> (Walter, 1944)
44	Integument lined.....	45
44'	Integument striated.....	58

45	I-L-6 relatively short (I-L-5/6 > 1.6).....	46
45'	I-L-6 relatively long (I-L-5/6 < 1.4).....	48
46	I-L-6 extremely short (I-L-5/6 2.0); (little documented species).....	<i>A. legeri</i> (Motaş, 1927)
46'	I-L-6 longer (I-L-5/6 < 1.8).....	47
47	Sword seta between ventral hairs; I-L-5 stout (L/HB < 4.3), S-1 and -2 short, in particular S-2 short and thick (S-1/2 L 80/60, L/W S-2 < 5.0), interspace < 15 µm; I-L-6 L < 150, stout (L/HB < 6.0).....	<i>A. fonticolus</i> (K. Viets, 1920)
47'	Sword seta near distoventral hair; I-L-5 more slender (L/HB > 4.3), S-1 and -2 longer, more homoiomorphic (S-1/2 L 105/90, L/W S-2 > 7.0), interspace > 15 µm; I-L-6 L > 150, more slender (L/HB > 6.5).....	<i>A. pennatus</i> (K. Viets, 1920)
48	Both P-2 and P-3 on the ventral surface with a gentle swelling covered by fine denticulation.....	<i>A. inflatus</i> (Walter, 1925)
48'	P-2 and P-3 without a ventral swelling covered by fine denticulation.....	49
49	S-1 and -2 adjacent and homoiomorphic (L S-1/2 74/71, interspace < 15 µm); I-L-5 relatively short (L I-L-5/6 < 1.2), I-L-6 stout (L/HB < 5.5), weakly curved, basally slender, considerably thickened at the base of the claw furrow.....	<i>A. protendens</i> K. O. Viets, 1955
49'	S-1 and -2 various in shape, interspace > 20 µm; I-L-5 and -6 various in shape, but ratio L/HB of I-L-6 always > 7.0 and in shape not as described for <i>A. protendens</i>	50
50	Segments I-L-5 and -6 equal in length (I-L-5/6 1.0); I-L-5 stout (dL/HB < 3.3), with relatively short ventral margin (dL/vL > 1.7); S-1 at the tip thickened and truncated.....	51
50'	I-L-5 longer than I-L-6 (I-L-5/6 > 1.10); I-L-5 more slender (dL/HB > 3.3), with relatively long ventral margin (dL/vL < 1.7); S-1 various in shape.....	52
51	Genital field (L/W > 130/130 µm) and acetabula (maximum diameter > 25 µm) large; sword seta on P-4 in the distal half of the segment.....	<i>A. allgaier</i> sp. nov.
51'	Genital field (L/W < 130/130 µm) and acetabula (maximum diameter < 25 µm) smaller; sword seta on P-4 in the proximal half of the segment.....	<i>A. gomerae</i> Lundblad, 1962
52	Genital field with acetabula in a weakly curved line, maximum acetabulum diameter < 40 µm.....	53
52'	Genital field with acetabula in triangular arrangement (posterior edge of Ac-1 and anterior edge of Ac-3 adjacent to each other), maximum acetabulum diameter > 40 µm.....	55
53	Medial suture Cx-1 + 2 L > 120, S-1 L > 145, setal interspace > 40 µm; sword seta P-4 between ventral hairs (little known species).....	<i>A. arcuatus</i> (Thor, 1914)
53'	Medial suture Cx-1 + 2 L < 120, S-1 L < 145, setal interspace < 40 µm; sword seta P-4 adjacent to distoventral hair.....	54
54	I-L-6 stouter (L < 180 µm, L/H < 8.0, I-L-5/6 > 1.30); sword seta P-4 slightly proximal to distoventral hair.....	<i>A. valencianus</i> (K. Viets, 1930)
54'	I-L-6 more slender (L > 180 µm, L/H > 9.0, I-L-5/6 < 1.30); sword seta P-4 on the level of the distoventral hair.....	<i>A. inflatipalpis</i> (K. Viets, 1950)
55	S-1 and -2 shorter (S-1/2 < 115/90), thicker, interspace < 30 µm; I-L-6 L < 165, L/HB < 8.0.....	<i>A. rivalis</i> Lundblad, 1956
55'	S-1 and -2 longer (S-1/2 > 115/90), more slender, interspace > 30 µm; I-L-6 L > 165, L/HB > 9.0.....	56
56	Distance of the ventrodiscal seta of P-4 from the apical edge of the segment less than length of sword seta; sword seta positioned proximal to the distoventral hair.....	<i>A. panniculatus</i> (K. Viets, 1925)
56'	Distance of the ventrodiscal seta of P-4 from the apical edge of the segment greater than length of sword seta, about 1/3 of the segment; sword seta positioned distal to the distoventral hair.....	57
57	Acetabula elongated; suture Cx-1 + 2 > 130, I-L-6 < 180 µm, more slender (L/H > 11.0).....	<i>A. remotus</i> Szalay, 1953
57'	Acetabula rounded; suture Cx-1 + 2 < 130, I-L-6 > 180 µm, stouter (L/H < 10.0) (<i>A. longisetus</i> Pešić, 2002 is a sibling species of <i>A. fissus</i> characterized by very long ventral hairs on P-4).....	<i>A. fissus</i> (Walter, 1927)
58	S-1 and -2 homoiomorphic, nearly equal in length, interspace < 12 µm; I-L-6 robust (L/HB < 5.0); acetabula in triangular arrangement (posterior edge Ac-1 and anterior edge Ac-3 close together; imaginary medial extensions of the sutures of Ac-2 and -3 would meet anteriorly from pregenital sclerite). (The unknown female of <i>A. gorcensis</i> Biesiadka 1972, characterized by I-L-5/6 nearly equal in L (ratio 1.1) should be keyed out.).....	59
58'	If S-1 and -2 homoiomorphic, wider interspace (>12 µm); I-L-6 more slender (L/HB > 5.5); position of acetabula various.....	60
59	I-L-6 with distally approaching dorsal and ventral margins, strongly shortened (<100 µm, I-L-5/6 > 1.6); suture Cx-1 + 2 < 120, maximum acetabulum diameter < 50 µm.....	<i>A. vaginalis</i> (Koenike, 1905)

59'	I-L-6 with parallel dorsal and ventral margins, absolutely and relatively long (>100 µm, I-L-5/6 < 1.5); suture Cx-1 + 2 > 120, maximum acetabulum diameter > 50 µm.	<i>A. adnatus</i> (Lundblad, 1956)
60	I-L-6 as long as I-L-5 (I-L-5/6 1.0); S-1 distally not narrowed, but with a slightly enlarged, truncated tip, L > 150 µm; setal interspace > 40 µm; I-L-5 thickened (L/HB < 3.2); I-L-6 very slender (L/HB > 12.0)	<i>A. distans</i> (K. Viets, 1914)
60'	I-L-6 shorter than I-L-5 (I-L-5/6 > 1.1); S-1 pointed, L of S-1 and proportions of I-L-5 and -6 various.....	61
61	Setal interspace > 35 µm, I-L-6 slender (L/HB > 10.0) and relatively long (I-L-5/6 < 1.3), acetabula in most species in a weakly curved line (posterior edge Ac-1 distanced from anterior edge Ac-3, imaginary medial extensions of the sutures of Ac-2 and -3 would meet on the level of, or caudally from, pregenital sclerite).	62
61'	I-L-6 various, but species with a setal interspace > 35 µm have relatively short I-L-6 (I-L-5/6 > 1.3) and acetabula in triangular arrangement.	66
62	Acetabula large (maximum diameter > 50 µm), their arrangement intermediate between a curved line and a triangle.	<i>A. fluviatilis</i> (Szalay, 1929)
62'	Acetabula small (maximum diameter < 40 µm), in a curved line.	63
63	Ventral margin P-4 divided by hair insertions in sectors 2 : 2 : 1, sword seta quite distal, on the level of the distoventral hair (little documented species, known only from a female in the original description).....	<i>A. diastema</i> (Szalay, 1935)
63'	Ventral margin P-4 divided by hair insertions in sectors 1 : 1 : 1, sword seta near the centre of the segment (three species in need of revision).	64
64	I-L-5 more robust (dL/HB < 3.1), S-1 less slender (L/W < 10.0).	<i>A. inflatipes</i> Lundblad, 1956
64'	I-L-5 more slender (dL/HB > 3.3), S-1 more slender (L/W > 10.0).	65
65	Cx-1 + 2 suture < 100 µm; sword seta P-4 thick, knife-like (a little-documented species, male unknown).....	<i>A. cultellatus</i> (K. Viets, 1930)
65'	Cx-1 + 2 suture > 120 µm; sword seta P-4 normal in shape.	<i>A. algeriensis</i> (Lundblad, 1942)
66	Acetabula in triangular arrangement (posterior edge Ac-1 and anterior edge Ac-3 nearly adjacent, imaginary medial extensions of the sutures of Ac-2 and -3 would meet anteriorly from pregenital sclerite).	67
66'	Acetabula in a weakly curved line (posterior edge Ac-1 at some distance from anterior edge Ac-3, imaginary medial extensions of the sutures of Ac-2 and -3 would meet on the level of, or caudally from, pregenital sclerite).	69
67	Seta S-1 not longer than S-2, < 100; Cx-1 + 2 mL < 100 µm; I-L-6 L/HB < 6.5. (a little documented species, male unknown).	<i>A. angustiporus</i> (K. Viets, 1930)
67'	Seta S-1 longer than S-2, > 100; Cx-1 + 2 mL > 100 µm; I-L-6 various in shape.	68
68	Large size (Cx-1 + 2 mL > 150, I-L-5 dL > 320 µm); sword seta P-4 very strong, near proximoventral hair.	<i>A. robustus</i> (Sokolow, 1940)
68'	Small size (Cx-1 + 2 mL < 150, I-L-5 dL < 320 µm); sword seta P-4 less strong, halfway between ventral hairs.....	<i>A. nodipalpis</i> Thor, 1899
69	I-L-5 longer and thicker, L > 220 µm, L/H < 3.3; I-L-6 relatively short, I-L-5/6 > 1.5.....	70
69'	I-L-5 shorter and more slender, L < 220 µm, L/H > 3.3; I-L-6 relatively long, I-L-5/6 < 1.4.	71
70	Glandularia diameter > 30 µm; acetabula maximum diameter > 40 µm; (little documented species in need of revision)	<i>A. glandulosus</i> (Walter, 1918)
70'	Glandularia diameter < 30 µm; acetabula maximum diameter < 40 µm.	<i>A. gibberipalpis</i> Piersig, 1898
71	Setal interspace > 20 µm; S-2 enlarged.	<i>A. clavipalpis</i> (Lundblad, 1956)
71'	Setal interspace < 20 µm; S-2 various.	72
72	S-1 and -2 homoiomorphic, both slender; I-L-5 dL > 200, more slender (L/HB > 4.0); I-L-6 L > 150, stouter (L/HB < 6.5), ratio I-L-5/6 < 1.3.....	<i>A. samsoni</i> (Sokolow, 1936)
72'	S-1 and -2 more heteromorphic, S-2 thickened; I-L-5 dL < 200, stouter (L/HB < 4.0); I-L-6 L < 150, more slender (L/HB > 6.5), ratio I-L-5/6 > 1.3.....	<i>A. neumani</i> (Lundblad, 1962)

SUBGENUS *TYMPANOMEGAPUS* THOR, 1923

1	Setal interspace on I-L-5 > 10 µm and S-1 and -2 relatively long (L > 65 µm), I-L-5 relatively long (dL ♂ > 180, ♀ > 220 µm, L ratio I-L-5/6 > 1.35); sword seta on P-4 fine, hair-like, both ventral setae of this segment in the distal sector; P-5 with lateral 'cheeks'; chelicera with a relatively long claw (ratio basal segment/claw < 2.3).....	2
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- 1' Setal interspace on I-L-5 narrow ($< 10 \mu\text{m}$, in one species S-1 and -2 on the same level) and shorter ($L < 65 \mu\text{m}$), I-L-5 relatively short (dL $\sigma < 180$, $\text{f} < 220 \text{ mm}$, L ratio I-L-5/6 < 1.35); sword seta on P-4, location of ventral setae of P-4 and shape of P-5 and cheliceral claw various. 3
- 2 Mediocaudal margin of Cx-1 + 2 rounded; Ac-1–3 in a more triangular arrangement; Vgl-1 + 2 fused; palp less slender (e.g. P-4 L/H σ 3.5, f 4.0) *Atractides (Tymanomegapus) pavesii* Maglio, 1905
- 2' Mediocaudal margin of Cx-1 + 2 indented; Ac-1–3 in a weakly curved line; Vgl-1 and Vgl-2 separate from each other; palp more slender (e.g. P-4 L/H f 4,4). (Only females are known that fit these characters; the male ascribed to this species by Lundblad probably represents a different species: excretory pore sclerotized, narrow setal interspace, I-L-5 relatively short (dL $152 \mu\text{m}$, I-L-5/6 1.26). The distinctive characters of the female are weak, and future studies could prove the synonymy with *A. pavesii*.) *Atractides (Tymanomegapus) longirostris* (Walter, 1925)
- 3 S-1 and -2 adjacent, in lateral view one insertion covering the other or at least touching it; leg claw without dorsal clawlets; Vgl-1/2 separate; sword seta on P-4 fine, hair-like, both ventral hairs of this segment located in the distal sector; P-5 with lateral 'cheeks'; chelicera with a relatively long claw (basal segment/claw σ 2.44, f 2.26); legs without swimming hairs. *Atractides (Tymanomegapus) acutirostris* (Motaş & Angelier, 1927)
- 3' Setal interspace at least $4 \mu\text{m}$; leg claws with dorsal clawlets; Vgl-1 + 2 fused; sword seta on P-4 thicker, proximoventral hair located in the proximal sector of this segment; P-5 without lateral 'cheeks'; cheliceral claw and leg setae various. 4
- 4 III-IV-L-5 each with a pair of long swimming hairs, their tips nearly reaching the distal edge of the terminal segments; dorsal muscle attachments unsclerotized; cheliceral claw relatively short ($L < 140 \mu\text{m}$, basal segment/claw > 2.5). No males known. (There is good reason to assume that this species will be found to be synonymous to *A. lacustris*, a species little documented from females; swimming hairs are easily lost and sclerotization of muscle insertions is highly variable in males of that species.) *Atractides (Tymanomegapus) moniezi* (Motaş, 1927)
- 4' Without swimming hairs on III/IV-L (they may well have escaped attention); dorsal muscle attachments more or less sclerotized; cheliceral claw various. 5
- 5 Dimensions of idiosoma and appendages larger (L idiosoma > 550 , coxal field > 300 , I-L-5/6 $> 120/110 \mu\text{m}$); cheliceral claw relatively short (basal segment/claw > 2.6); I-L-5 more slender (dL/HB > 3.8), I-L-6 relatively short (ratio I-L-5/6 > 1.15); ventrocaudal sclerites not fused to a unique plate. *Atractides (Tymanomegapus) lacustris* (Lundblad, 1925)
- 5' Dimensions [female unknown!] of idiosoma and appendages smaller (L idiosoma < 550 , coxal field < 300 , I-L-5/6 $< 120/110 \mu\text{m}$); cheliceral claw relatively long (basal segment/claw < 2.6); I-L-5 more slender (dL/HB < 3.5), I-L-6 relatively short (ratio I-L-5/6 < 1.15); ventrocaudal sclerites fused to a unique plate. *Atractides (Tymanomegapus) ibericus* (Lundblad, 1956)

SUBGENUS *POLYMEGAPUS* K. VIETS, 1926

- 1 Genital field with more than three (6–10) pairs of acetabula. *Atractides (Polymegapus) polyporus* (K. Viets, 1922)
- 1' Genital field with three pairs of acetabula. 2
- 2 Small dimensions (idiosoma $L < 500$, palp total $L < 300$, P-3 < 50 , P-4 $< 90 \mu\text{m}$). (a little documented species known only from the original description). *Atractides (Polymegapus) elegans* (Motaş & Tanasachi, 1948)
- 2' Larger dimensions (idiosoma $L > 500$, palp total $L > 300$, P-3 > 50 , P-4 $> 90 \mu\text{m}$). 3
- 3 Muscle attachments smooth, small size of idiosomal sclerites (coxal field $L < 280$, Cx-1 + 2 median $L < 120$, genital field L/W $\sigma < 120/130$, $\text{f} < 160/200$, σ Ac diameter $c. 20 \mu\text{m}$), I-L-5 more slender ($L/HB > 2.8$). *Atractides (Polymegapus) orghidani* (Motaş & Tanasachi, 1960)
- 3' Muscle attachments sclerotized, larger dimensions of idiosomal sclerites (coxal field $L > 280$, Cx-1 + 2 median $L > 120$, genital field L/W $\sigma > 120/130$, $\text{f} > 160/200$, σ Ac diameter $> 30 \mu\text{m}$), I-L-5 stouter ($L/HB < 2.6$). *Atractides (Polymegapus) rutae* (Lundblad, 1941)

RESULTS

THE OLD AND NEW SCENARIOS

When I started this revision, 154 names (species, subspecies, and 'forms' or 'varieties') had been used at least once for western Palaearctic *Atractides* species. This number includes five names referring to species that in reality belong to other genera: *Atractides setiger* Koch, 1837; *A. clavicornis* Koch, 1842, *A. sagulator* Koch, 1842, *A. dimidiator* Koch, 1842, *A. crassipes* Sokolow, 1957.

Among the remaining 149, two were preoccupied by species described from outside the study area: *A. affinis* (Szalay, 1946 *nec* Lundblad, 1927) and *A. rectipes* (Walter, 1947 *nec* Sokolow, 1934 = *dentiferus* *nom. nov.* K. Viets, 1949), both now synonymized with *A. latipalpis*. Two names have been used twice for species from inside the study area: *A. orchidani* Schwoerbel 1961 *nec* Motaş & Tanasachi, 1960 = *A. trapeziformis* Schwoerbel 1961, and *A. longipes* Schwoerbel 1961 *nec* Halbert, 1944 = *A. psammophilus* Schwoerbel, 1965. Four additional names (not included in the statistics) had been introduced due to a misunderstanding of the rules of zoological nomenclature: *A. africanus* K. Viets, 1949, *A. madericolus* K. Viets, 1949, *A. gracilirostris* K. Viets, 1949, and *A. simillimus* E. Angelier, 1953.

In the chapter dealing with water mites in the *Limnofauna Europaea*, K. O. Viets (1978) accepted 102 taxa at the species level and a further 23 at the subspecies level. The difference between the total number given above for Palaearctic species, and the number provided by Viets is explained as follows: he had excluded 13 names following the synonymization proposals of former authors, one (*A. nodipalpis neumani*) probably because it was introduced as a 'variety' after the most recent edition of the International Code of Zoological Nomenclature in 1961, and five because they were known only from geographical areas obviously not taken into consideration in his review (North Africa, Canary Islands); five additional species had been described since then. During the preparation of Figure 1, these and two other species from the Canary Islands were included, but the three *Tetramegapus* species (considered to be aberrant) and several further synonymizations not taken into consideration by Viets were excluded, resulting in a total number of 122.

This scenario has now changed considerably as a result of this revision. Out of the 21 synonymizations proposed by former authors, eight are not accepted:

- 1 *adenophorus* (K. Viets, 1930), not a synonym to *loricatus* Piersig, 1898;
- 2 *diastema* (Szalay, 1935), not a synonym to *distans* (K. Viets, 1914);
- 3 *elongatus* (Halbert, 1944), not a synonym to *lacustris* (Lundblad, 1925), but to *acutirostris*;

- 4 *firmus* (Walter, 1947), not a synonym to *barsiensis* (Szalay, 1929; *sensu* Motaş *et al.*, 1958), but to *loricatus* Piersig, 1898;
- 5 *inflatipes* (Lundblad, 1956), not a synonym to *distans* (K. Viets, 1914);
- 6 *microphthalmus* (Motaş & Tanasachi, 1948), not a synonym to *denticulatus* (Walter, 1947);
- 7 *montanus* (Halbert, 1911), *species dubia*, but not a synonym to *distans* (K. Viets, 1914);
- 8 *remotus* Szalay, 1953, not a synonym to *mitisi* (Walter, 1944).

The following 13 synonymization proposals are confirmed:

- 1 *barsiensis* (Szalay, 1929) = *loricatus* Piersig, 1898;
- 2 *coriaceus* (K. Viets, 1925) = *walteri* (K. Viets, 1925);
- 3 *dragonensis* K. Viets, 1949 *nov. nom.* pro *Atractides latipalpis affinis* (Szalay, 1946) = *latipalpis* Motaş & Tanasachi, 1946;
- 4 *dramensis* (Kotzias, 1931) = *pennatus* (K. Viets, 1920);
- 5 *granulatus* (K. Viets, 1930) = *inflatus* (Walter, 1925);
- 6 *palpalis* (Lundblad, 1956) = *tener* Thor, 1899;
- 7 *parviporus* (Besseling, 1933) = *nodipalpis* Thor, 1899;
- 8 *rectipes* (Walter, 1947) = *latipalpis* (Motaş & Tanasachi, 1946);
- 9 *remyi* (E. Angelier, 1951) = *latipes* (Szalay, 1935);
- 10 *scutatus* (Lundblad, 1925) = *lacustris* (Lundblad, 1925);
- 11 *spinirostris* (Thor, 1923) = *pavesii* Maglio, 1905;
- 12 *taeniolatus* (Maglio, 1928) = *legeri* (Motaş, 1927);
- 13 *tenuitarsus* (Komárek, 1921) = *nodipalpis* (Thor, 1914).

A further 34 synonymizations are proposed for the first time:

- 1 *borceai* (Motaş, 1927) = *walteri* (K. Viets, 1925);
- 2 *cerberus* Schwoerbel, 1961 = *oblongus* (Walter, 1944);
- 3 *dubius* (Sokolow, 1940) = *arcuatus* Thor, 1914;
- 4 *elongatus* (Halbert, 1944) = *acutirostris* (Motaş & Angelier, 1927);
- 5 *firmus* (Walter, 1947) = *loricatus* Piersig, 1898;
- 6 *franciscanus* Bader & Gerecke, 1996 = *separatus* (K. Viets, 1931);
- 7 *gibberimarginatus* (K. Viets, 1955) = *acutirostris* (Motaş & Angelier, 1927);
- 8 *hyporheicus* Schwoerbel, 1961 = *phreaticus* (Motaş & Tanasachi, 1948);
- 9 *laetus* Lundblad, 1962 = *samsoni* (Sokolow, 1936);
- 10 *limnicola* Schwoerbel, 1959 = *nodipalpis* Thor, 1899;
- 11 *longipes* (Halbert, 1944) = *acutirostris* (Motaş & Angelier, 1927);

- 12 *longitibialis* (Walter, 1927) = *pennatus* (K. Viets, 1920);
 13 *longus* (Walter, 1947) = *oblongus* (Walter, 1944);
 14 *losonensis* Rensburg, 1971 = *pumilus* (Szalay, 1946);
 15 *microcavaticus* Schwoerbel, 1961 = *nodipalpis* Thor, 1899;
 16 *mitisi* (Walter, 1944) = *panniculatus* (K. Viets, 1925);
 17 *moravicus* Láska, 1952 = *nodipalpis* Thor, 1899;
 18 *nitraensis* Láska, 1956 = *oblongus* (Walter, 1944);
 19 *obovalis* (Szalay, 1946) = *subterraneus* (K. Viets, 1932);
 20 *oviformis* Szalay, 195 = *vaginalis* Koenike, 1905;
 21 *pachydermis* (Halbert, 1944) = *lacustris* (Lundblad, 1925);
 22 *petkovskii* Schwoerbel, 1963 = *fonticolus* (K. Viets, 1920);
 23 *pilosus* Schwoerbel, 1961 = *tener* Thor, 1899;
 24 *placocallosus* Bader, 1994 = *walteri* (K. Viets, 1925);
 25 *primitivus* (Walter, 1947) = *pumilus* (Szalay, 1946);
 26 *psammophilus* Schwoerbel, 1961 = *oblongus* (Walter, 1944);
 27 *schlienzi* Schwoerbel, 1961 = *nodipalpis* Thor, 1899;
 28 *semidistans* (Husiatinschi, 1937) = *nodipalpis* Thor, 1899;
 29 *soproniensis* (Szalay, 1929) = *fonticolus* (K. Viets, 1920);
 30 *stygophilus* Schwoerbel, 1961 = *remotus* Szalay, 1953;
 31 *szalayi* (Motaş & Tanasachi, 1948) = *oblongus* (Walter, 1944);
 32 *tatrensis* Szalay, 1953 = *vaginalis* Koenike, 1905;
 33 *tividae* (Sokolow, 1926) = *nodipalpis* Thor, 1899;
 34 *virginalis* Tuzovskij, 1977 = *moniezi* (Motaş, 1927).

Fifteen species could not be identified and are considered *species dubiae*. They are treated in detail in the following section. The first description of one hitherto unknown sex is given for six species: *A. separatus* (♂, by synonymization with *A. franciscanus*); *A. latipes* ♂ from new material; *A. samsoni* (♀, by synonymization with *A. laetus*); *A. phreaticus* (♂, by synonymization with *A. hyporheicus*); *A. rivalis* (♂, description of unpublished material in coll. Lundblad); *A. clavipes* (♂ from new material).

Three species are described as new to science:

- 1 *A. allgaier*, found both during fieldwork in southwest Germany and in museum material from several parts of Germany, until now under the name of *A. distans*, from which it is split off;
- 2 *A. brendle*, for a long time confused with other species of the *loricatus* group, probably widely distributed in the mountains of Central Europe;

- 3 *A. chelidon*, recently detected in the interstitial habitat of a stream in Luxembourg.

All changes considered, this revision has brought the number of species of western Palearctic *Atractides* down to 89, which means a reduction by 30% compared with the starting point represented in Figure 1.

REMARKS ON THE *SPECIES DUBIAE*

Confronted with old, more or less damaged museum material and incomplete descriptions of lost specimens, taxonomy becomes a game of chance, and any kind of decision leaves a sense of uncertainty. Therefore I give a panorama of all species which are not considered in the determination table, as a tool for workers who encounter *Atractides* specimens that do not fit any of the species accepted here, and which might lead to the re-establishing of one of these *species dubiae*.

Eight species, based on obviously misshaped or juvenile specimens, with taxonomically insignificant characters, can be definitively left behind: *A. gabretae* Thon (1901); *A. quadruporus* Koenike 1901; *A. curvisetus* (Koenike (1911); *A. tuberosus* (K. Viets, 1919); *A. rossicus* (Thor, 1923); *A. abditus* (Walter) Bader (1955); *A. torrenticolus* Láska (1960) and *A. cagiallensis* Rensburg (1971).

Instead, the following nine species, mainly from little known parts of the study area, merit attention during future faunistic work:

- 1 *A. montanus* (Halbert, 1911): Lectotype in NHMB. Known only from females, probably not identical with any of the species known at the time of description. Differing from *A. nodipalpis* in extended borders of secondary sclerite on coxae and genital plates, Ac arranged in a weakly curved line, and a thickened I-L-5. The taxon could be re-established after description of both sexes (Ireland: stream at Croaghpatrick and Bunowen stream at Louisburgh.)
- 2 *A. kaukasiensis* (Thor, 1914): Type material lost, original description providing no useful information for the definition of this taxon. The name might be taken in consideration when *nodipalpis*-like *Atractides* in the Caucasus are found to be different from the stem species (Georgia: Mingrelia, brook near Cageri).
- 3 *A. lobatus* (Szalay, 1935): Type material lost, original description lacking distinctive information. Some characters intermediate between *A. nodipalpis* and *A. fonticolus*. The name-giving irregular idiosoma contour line is a character without taxonomic significance, occasionally found in many *Atractides* species. Originally attributed as a sub-

- species to *A. angustiporus*, a little known taxon from Spain (Hungary: Bars, Bisztrica stream near Körmöcbánya).
- 4 *A. nondilatatus* (Sokolow, 1936): Type material missing. Several important character states unclear (integument structure, shape of glandularia and I-L, etc.), at least part of the morphological features due to malformations or juvenile age. However, some features suggest that *A. nondilatatus* might be redescribed and taxonomically established when populations will be found with a morphology including the following character states. Males: genital field with tongue-shaped anteromedial projection. Females: Ac in a weakly curved line, ventral margins of P-2 and P-4 straight (Russia: surroundings of St. Petersburg; stream in the Peterhof Park, river Tschornaja [Sapao-joki]; Gobzhinka stream, Gobzhitz. Sweden: Södermanland).
 - 5 *A. intermedius* (Soarec, 1939): Type material lost. Original description obviously based on juvenile specimens, containing many contradictions between measurements and figures; rather similar to *A. fonticolus*. If in the area of the type locality *A. fonticolus*-like populations with a very low L ratio I-L-5/6 (1.18) are found, this could be a reason for reanimating this name (Romania: eastern Carpathians, Pârâul Secu; Siret basin, Bistritza at Bicaz confluence; Secu Monastery; Vrancei and Harghita mountains, River Olt at Sfântul Gheorghe).
 - 6 *A. dentiferus* K. Viets, 1949 (*sub preocc. nom. A. reptipes* Walter, 1947), described from specimens collected in Switzerland, synonymized by Schwoerbel (1956) with *A. latipalpis* (Motaş & Tanasachi 1947) from Romania. As there are differences between Central European and Balkan populations, the name could be reanimated for the latter after a redescription of the Balkan species *A. latipalpis*.
 - 7 *A. bituberosus* (Sokolow, 1947): Type material missing. The only available information on this taxon concerns presence of a double ventral hump on male P-2, a character found in several species of the genus. If in the area of the type locality specimens of an undescribed species appear that display this character combined with other diagnostic features, they should bear this name (Armenia: Eriwan, River Zanga).
 - 8 *A. magnirostris* (Motaş & Tanasachi, 1948): Type material lost. Rather similar to *A. acutirostris* (Motaş & Angelier, 1927), but synonymization is problematic due to incomplete description (Romania: river basins of the Olt and Arges).
 - 9 *A. umbonipalpis* Szalay, 1954: Type material lost. Similar to *A. vaginalis*, but differing in the concave ventral margin of P-2, P-4 laterally inflated, and I-L-5 with more protruding ventrodiscal edge. These

characters should be kept in mind when the variability of *A. vaginalis*-like mites from Hungary are studied (north-eastern Carpathians: Máramaros snow mountains, Hoverla, stream at 1660 m asl).

SPECIES KNOWN ONLY FROM ONE SEX

In the course of population variability studies carried out for this revision, a series of characters proved to be reliable tools for relating sexes of one species to each other: integument structure, sclerotization in the postgenital field, proportions of I-L-5 and -6, and occasionally also shape and setation of palps. In six species, analysis of these characters allowed for the description of a male or female hitherto undescribed, in three cases by synonymization of 'species pairs' from males or females only. In any event, there are still unsolved problems. In *A. glandulosus* and *A. longirostris*, the attribution of sexes is doubtful, and in *A. inflatipes*, the 'allotype' obviously represents a different species.

According to the present state of knowledge, six of the recognized species are known from males only. Five of them are hyporheobionts and the corresponding females have been probably not yet detected due to the rareness both of the species and of the investigations in this habitat. Apart from *A. prosiliens* (Romania; two additional, uncertain records from Austria and southern France), they are all known only from single specimens: *A. gracilipes* (Corsica), *A. vandeli* (central France), *A. gorcensis* (Polish Carpathians), and *A. chelidon* (Luxembourg). *A. ibericus* probably prefers slow running water. The female of this species might be difficult to differentiate from the similar *A. lacustris* and *A. moniezi*, two species so far not recorded from the Iberian peninsula.

Among the 15 recognized species known only from females, *A. gladisetus* (known only from Hungary) is a doubtful taxon: the shape of the blade-like dorsal setae of the palp (after which the taxon is named) might have been figured in an exaggerated manner. Three species come from the interstitial habitat and are known only as single individuals: *A. longiporus* (Bulgaria), *A. magnipalpis* (Switzerland) and *A. barbarae* (Poland). *A. moniezi*, a species now recorded from several parts of Central Europe, could represent the female of *A. lacustris*. Both taxa are rare, mostly restricted to standing or slow running waters, and belong to the generally female-biased subgenus *Tympanomegapus*. In five of the remaining ten species, males should be easily recognized due to morphological particularities that in general are not subject to sexual dimorphism. These are: *A. dentipalpis* (denticulation on P-2, North Africa), *A. lunipes* (P-6 extremely slender, Spain), *A. gomerae* (S-1 and -2

short, truncate, homoiomorphic, La Gomera), *A. ubinicus* (P-4 with distinct projections associated with ventral hair insertions, the Caucasus), *A. heversi* (polyacetabulate, characters of the *octoporus* group of *Atractides* s.s., Israel). The other five species come from Hungary (*A. diastema*) and Spain (*A. cultellatus*, *A. angustiporus*, *A. adenophorus* and *A. inflatipes*), both areas where little fieldwork has been done so far. Faunistic inventories in the areas surrounding their type localities are necessary in order to obtain more insight into the taxonomic significance of the characters used for the definition of these species, and the morphology of the corresponding males.

CONCLUSIONS

The water mite genus *Atractides* has been characterized in terms of history of classification, bionomy, general morphology and phylogenetic position, and seasonal stability of morphological indices (based on an analysis of *A. nodipalpis* Thor). The western Palaearctic species have been revised, based mainly on type material and original descriptions, but in many cases also on variability studies with newly collected populations. Of the 149 taxonomic names available for taxa of this genus in the study area, 122 species and subspecies were accepted at the starting point of this revision, but only about 50% were documented by accessible, albeit sometimes heavily damaged type material. As a result of this study, the number of acceptable species is reduced by about 30% to 89.

The following changes are proposed:

- 1 The subgenera *Atractides* s.s., *Tympanomegapus* Thor, 1923, and *Polymegapus* K. Viets, 1924 are recognized, but with a new definition of diagnostic character states: *Maderomegapus* Lundblad, 1941 is reduced to subgeneric rank and included in *Atractides*; *Tetramegapus*, *Octomegapus*, and *Iranomegapus* are synonymized with *Atractides* s.s.; *Allomegapus* Lundblad, 1941 is a synonym of *Polymegapus* (syn. nov.) and *Rhynchomegapus* Motaş & Tanasachi, 1948 of *Tympanomegapus* (as proposed by Lundblad, 1956).
- 2 Of the 21 synonymizations proposed by former authors, eight are not accepted, 13 are confirmed.
- 3 A further 34 synonyms are introduced for the first time.
- 4 Due to synonymizations and the study of newly collected material, four species could be described for the first time from males, and one from females.
- 5 Fifteen species are designated as *species dubiae*.
- 6 Three species are described as new to science.

For the determination of the species accepted within the new taxonomic scenario, a dichotomic key is given.

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APPENDIX: INDEX

Genera, subgenera and species cited.

Bold names: recognized *Atractides* subgenera and species.

underlined page numbers: the taxon is treated with detail.

Allomegapus Lundblad (syn. to *Polymegapus*, subgen. in *Atractides*) 164, 165

Atractides

- abditus* (Walter) Bader, 1955 *species dubia* 280, 365
- acutirostris* (Motaş & Angelier, 1927) 248, 327, 328, 336–338, 339, 340, 364–366
- adenophorus* (K. Viets, 1930) 218–219, 297, 325, 364, 367
- adnatus* (Lundblad, 1956) 142, 184, 212, 271, 289–290
- affinis* (Szalay, 1946 nec Lundblad, 1927) (syn. to *latipalpis*) 247, 249, 364
- africanus* K. Viets, 1949, err. 242, 264, 364
- algeriensis* (Lundblad, 1942) 241–243
- allgaier* sp. nov. 186, 188, 321–323, 365
- anellatus* Lundblad, 1956 285–287, 307, 317
- angustiporus* (K. Viets, 1930) 216–218, 226, 288, 289, 308, 366, 367
- anomalous* Koch, 1842 (syn. to *Torrenticola anomala* [Koch, 1842]) 142
- arcuatus* (Thor, 1914) 188–190, 199, 208, 215, 216, 234, 243, 292, 306, 317, 364
- asticae* Petrova, 1968 312–314, 326
- baderi* Schwoerbel & Sepasgozarian, 1976 165
- barbarae* Biesiadka, 1972 315–317, 366
- barsiensis* (Szalay, 1929) (syn. to *loricatus*) 170–173, 212–213, 255, 256, 297, 364
- bituberosus* (Sokolow, 1947) *species dubia* 256, 366
- borceai* (Motaş, 1928) (syn. to *walteri*) 199, 208–209, 261, 346, 364
- brendle* sp. nov. 213, 323–325, 365
- cagiallensis* Rensburg, 1971 *species dubia* 314, 365
- cerberus* Schwoerbel, 1961 (syn. to *oblongus*) 244, 299–300, 364
- chelidon* sp. nov. 325–326, 365, 366
- circumcinctus* Schwoerbel, 1956 282–284
- cisternarum* (K. Viets, 1935) 225–228, 255, 257, 260, 265, 282, 308, 311, 313, 314, 326
- clavicornis* Koch, 1842 (syn. to *Piona clavicornis*) 142, 168
- clavipalpis* (Lundblad, 1956) 230, 293–295, 305, 364
- clavipes* Lundblad, 1954 278–280, 298, 308, 319, 365
- coriaceus* (K. Viets, 1925) (syn. to *walteri*) 199, 200, 201, 209, 218, 221, 261, 271, 275, 302, 346, 364
- corsicus* E. Angelier, 1954 270, 274–275
- crassipalpis* Koenike, 1908 143, 170
- crassipes* Sokolow, 1957, err. 298, 364
- crassitarsis* (Lundblad, 1942) 346
- cultellatus* (K. Viets, 1930) 188, 216–217, 229, 243, 292, 295, 367
- curvisetus* (Koenike, 1911) *species dubia* 184–185, 232, 365
- denticulatus* (Walter, 1947) 224, 253–255, 257, 258, 260, 265, 282, 311, 313, 314, 320, 364

- dentiferus* K. Viets, 1949 (syn. to *latipalpis*) 247, 252–253, 264, 364, 366
- dentipalpis* (Walter, 1935)** 223–224, 238, 248, 251, 266, 280, 282, 308, 319, 366
- diastema* (Szalay, 1935)** 188, 225–226, 243, 269, 271, 323, 364, 367
- digitatus* Lundblad, 1954** 164, 180, 182, 275–278, 319, 320
- dimidiator* Koch, 1842 (syn. to *Brachypoda versicolor*) 142, 168, 364
- distans* (K. Viets, 1914)** 185–188, 211, 216, 217, 225, 226, 233, 244, 248, 269, 271, 282, 291, 292, 298, 306, 323, 326, 364, 365
- dragonensis* K. Viets, 1949 (syn. to *latipalpis*) 247, 249, 264, 364
- dramensis* (Kotzias, 1931) (syn. to *pennatus*) 194, 221–222, 364
- dubius* (Sokolow, 1940) (syn. to *arcuatus*) 188, 189, 190, 234, 243, 364
- elegans* (Motaş & Tanasachi, 1948)** 345–346, 347, 348
- elongatus* (Halbert, 1944) (syn. to *acutirostris*) 336, 339, 364
- firmus* (Walter, 1947) (syn. to *loricatus*) 170, 224, 255–256, 300, 364
- fissus* (Walter, 1927)** 204–206, 215, 217, 244, 273, 274, 288
- fluviatilis* (Szalay, 1929)** 209–211, 217, 243, 269, 274, 275
- fonticolus* (K. Viets, 1920)** 193–194, 196, 203, 204, 206, 212, 226, 229, 232, 233, 234, 246, 252, 269, 272, 274, 299, 306, 308, 310, 365, 366
- franciscanus* Bader & Gerecke, 1996 (syn. to *separatus*) 218, 220, 221, 321, 364, 365
- gabretae* Thon, 1901 *species dubia* 143, 178, 191, 365
- gallicus* (E. Angelier, Decamps & Rey 1963)** 308–310, 317
- gassowskii* (Sokolow, 1934)** 188, 244, 292, 323
- gibberimarginatus* (K. Viets, 1955) (syn. to *acutirostris*) 336, 340, 364
- gibberipalpis* Piersig, 1898** 165, 173–174, 199, 211, 270, 295
- gladisetus* (Husiatinschi, 1937)** 231–233, 238, 366
- glandulosus* (Walter, 1918)** 189–192, 201, 202, 229, 271, 275, 302, 366
- gomeræ* Lundblad, 1962** 305–307, 323, 366
- gorcensis* Biesiadka, 1972** 315–317, 364
- gracilipes* (E. Angelier, 1951)** 269–270, 366
- gracilirostris* K. Viets, 1949, err. 340, 366
- gracilis* (Sokolow, 1934)** 188, 244, 292, 323
- graecus* K. Viets, 1950** 266–267, 280, 308, 319
- granulatus* (K. Viets, 1930) (syn. to *inflatus*) 197, 198, 213–214, 364
- heversi* K. O. Viets, 1982** 164, 180, 319–320, 343, 367
- hyporheicus* Schwoerbel, 1961 (syn. to *phreaticus*) 262, 302, 364, 365
- hystricipes* (Lundblad, 1941) nov. stat.** 156, 348–350
- ibericus* (Lundblad, 1956)** 331, 340–341, 366
- inflatipalpis* K. Viets, 1950** 266, 268–269, 282, 292, 293, 306, 350
- inflatipes* Lundblad, 1956** 291–292, 364, 366
- inflatus* (Walter, 1925)** 165, 174, 197–199, 208, 213, 214, 306, 364
- insulanus* (Lundblad, 1941)** 238–240, 242, 282, 287, 306
- intermedius* (Soarec, 1939) *species dubia* 233–234, 299, 366
- issajewi* (Sokolow, 1928)** 261, 271, 282, 305
- kaukasiensis* (Thor, 1914) *species dubia* 190–191, 365
- lacustris* (Lundblad, 1925)** 142, 213, 271, 330–332, 334, 336, 338, 339, 340, 341, 364, 365, 366
- laetus* Lundblad, 1962 (syn. to *samsoni*) 230, 231, 231, 303, 364, 365
- latipalpis* (Motaş & Tanasachi, 1946)** 246–248, 249, 252, 302, 313, 326, 364, 366
- latipes* (Szalay, 1935)** 228–229, 233, 246, 269, 292, 317, 326, 365
- legeri* (Motaş, 1927)** 164, 206–208, 209, 215, 238, 288, 364
- limnicola* Schwoerbel, 1959 (syn. to *nodipalpis*) 176, 298, 364
- lobatus* (Szalay, 1935) *species dubia* 217, 226, 365
- longipes* (Halbert, 1944) (syn. to *acutirostris*) 336, 339, 364
- longipes* Schwoerbel, 1961 nec Halbert, 1944 (*psammophilus* nom. nov. Schwoerbel 1965, syn. to *oblongus*) 300, 364
- longiporus* Petrova, 1968** 311–313, 314, 366
- longirostris* (Walter, 1925)** 332–334, 336, 338, 340, 366
- longisetus* Pešić, 2002** 206
- longitibialis* (Walter, 1927) (syn. to *pennatus*) 194, 203–204, 316, 365
- longus* (Walter, 1947) (syn. to *oblongus*) 224, 244, 245, 251–252, 295, 365
- loricatus* Piersig, 1898** 170–173, 212, 213, 218, 255, 256, 295, 297, 300, 311, 320, 321, 323, 325, 364, 365
- losonensis* Rensburg, 1971 (syn. to *pumilus*) 249, 314, 365
- lunipes* Lundblad, 1956** 292–293, 306, 366
- macaronensis* (Lundblad, 1941)** 240–242, 287
- macrolaminatus* Láska, 1956** 142, 150, 152, 157, 173, 295–297, 325

- maderensis** (Lundblad, 1941) 236–238, 240, 242, 287, 306, 307, 317
- madericolus** K. Viets, 1949, err. 236, 264, 364
- magnipalpis** Rensburg, 1971 314–316, 366
- magnirostris** (Motaş & Tanasachi, 1948) *species dubia* 336, 339–340, 366
- microcavaticus** Schwoerbel, 1961 (syn. to *nodipalpis*) 176, 303, 365
- microphthalmus** (Motaş & Tanasachi, 1948) 253, 255, 256–258, 260, 265, 282, 311, 313, 314, 364
- minutus** (Walter, 1928) 343
- mitisi** (Walter, 1944) (syn. to *panniculatus*) 201, 206, 243–244, 272, 274, 292, 365
- moniezi** (Motaş, 1927) 142, 327, 334–336, 338, 339, 340, 341, 364, 365
- montanus** (Halbert, 1911) *species dubia* 168, 185–186, 364, 365
- moravicus** Láška, 1952 (syn. to *nodipalpis*) 176, 270–271, 365
- neumani** (Lundblad, 1962) 215, 303–305, 364
- nitraensis** Láška, 1959 (syn. to *oblongus*) 244, 298, 365
- nodipalpis** Thor, 1899 141, 142, 146, 150, 152, 154, 155, 157, 159, 160, 161–163, 167, 176–178, 184, 185, 188, 190, 191, 192, 193, 195, 196, 197, 203, 208, 211, 217, 224, 226, 229, 230, 232, 233, 234, 236, 237, 242, 243, 256, 266, 268, 270, 271, 274, 289, 293, 295, 298, 299, 303, 305, 323, 364, 365, 367
- nondilatatus** (Sokolow, 1936) (*species dubia*) 229–230, 243, 295, 366
- oblongus** (Walter, 1944) 244–246, 251, 252, 257, 261, 282, 289, 292, 298, 299, 300, 302, 364, 365
- obovalis** (Szalay, 1946) (syn. to *subterraneus*) 222, 224, 248–249, 365
- octoporus** Piersig, 1904 154, 159, 160, 164, 180–182, 276, 278, 319, 320, 367
- odarkensis** (Sokolow, 1934) 188, 244, 292, 323
- orghidani** Motaş & Tanasachi, 1960 346–348
- orghidani** Schwoerbel, 1961, nom. nud., nec Motaş & Tanasachi, 1960, **trapeziformis**, nov. nom. Schwoerbel 1961 299–320, 364
- ovalis** Koenike, 1883 142, 143, 168–170, 191, 215, 234
- oviformis** Szalay, 1953 (syn. to *vaginalis*) 182, 271–272, 365
- pachydermis** (Halbert, 1944) (syn. to *lacustris*) 339, 365
- palpalis** Lundblad, 1956 (syn. to *tener*) 174, 285, 364
- panniculatus** (K. Viets, 1925) 142, 150, 152, 153, 157, 158, 201–203, 204, 206, 208, 215, 217, 230, 242, 243, 244, 271, 272, 273, 274, 275, 288, 292, 299, 346, 365
- parviporus** (Besseling, 1933) (syn. to *nodipalpis*) 176, 224, 308, 263, 364
- pavesii** Maglio, 1905 142, 164, 327, 329–330, 332, 334, 335, 336, 338, 339, 340, 341, 364
- pennatus** (K. Viets, 1920) 167, 194–196, 203, 206, 208, 221, 222, 233, 269, 273, 274, 306, 316, 364, 365
- petkovskii** Schwoerbel, 1963 (syn. to *fonticolus*) 193, 308, 365
- phreaticus** (Motaş & Tanasachi, 1948) 262–264, 270, 282, 302, 326, 364, 365
- pilosus** Schwoerbel, 1961 (syn. to *tener*) 174, 302–303, 365
- placocallosus** Bader, 1994 (syn. to *walteri*) 173, 199, 213, 320, 325, 365
- polyporus** (K. Viets, 1922) 164, 165, 238, 343–345, 346, 347, 348
- primitivus** (Walter, 1947) (syn. to *pumilus*) 224, 249, 250, 251, 253, 314, 365
- prosilienis** (Motaş & Tanasachi, 1948) 258–260, 265, 311, 313, 314
- protendens** K. O. Viets, 1955 280–282, 298, 317
- proximalis** (Lundblad, 1934) 343
- psammophilus** Schwoerbel, 1965 (syn. to *oblongus*) 244, 300, 311, 364, 365
- pumilus** (Szalay, 1946) 249–251, 253, 257, 266, 280, 287, 308, 311, 314, 319, 365
- pygmaeus** (Motaş & Tanasachi, 1948) 256–257, 266, 280, 282, 308, 311, 314
- quadruporus** (Koenike, 1915) *species dubia* 191, 365
- rectipes** (Sokolow, 1934) 341
- rectipes** (Walter, 1947 nec Sokolow, 1934; *dentiferus* nom. nov. K. Viets 1949, syn. to *latipalpis*) 247, 252–253, 264, 364, 366
- remotus** Szalay, 1953 272–274, 292, 299, 306, 364, 365
- remyi** (E. Angelier, 1951) (syn. to *latipes*) 228, 269
- rivalis** Lundblad, 1956 287–288, 308, 365
- robustus** (Sokolow, 1940) 230, 234–237, 295
- rossicus** (Thor, 1923) *species dubia* 197, 365
- rutae** (Lundblad, 1941) 164, 165, 238, 343–345, 346, 347, 348
- sagulator** Koch, 1842 (syn. to *Brachypoda sagulator*) 142, 168, 364
- samsoni** (Sokolow, 1936) 230–232, 282, 303, 305, 317, 350, 364, 365
- schlienzi** Schwoerbel, 1961 (syn. to *nodipalpis*) 176, 303, 365
- scutatus** (Lundblad, 1925) (syn. to *lacustris*) 271, 330, 332, 341, 364
- semidistans** (Husiatinschi, 1937) (syn. to *nodipalpis*) 176, 233, 365
- separatus** (K. Viets, 1931) 201, 218, 220–221, 321, 325, 365

- setiger* Koch, 1837 (syn. to *Hygrobates longipalpis*) 142, 168, 364
- similis** E. Angelier, 1949 264–265, 274, 282
- simillimus* E. Angelier, 1953, err. 264, 274, 364
- sokolowi** (Motaş & Tanasachi, 1948) 260–261, 287, 316, 317
- soproniensis* (Szalay, 1929) (syn. to *fonticolus*) 193, 212, 269, 289, 365
- spinipes** Koch, 1837 142, 143, 161, 165–168, 170, 174, 178, 186, 191, 199, 208, 234, 246, 252, 261, 292, 298, 299, 300, 302
- spinirostris* (Thor, 1923) (syn. to *pavesii*) 164, 330, 334, 339, 340, 364
- stygophilus* (Schwoerbel, 1961) (syn. to *remotus*) 272, 299, 365
- subasper** Koenike, 1902 178–180, 182, 201, 229, 261, 271, 275, 278, 284, 319, 327
- subterraneus** (Viets, 1932) 222–224, 228, 233, 248, 249, 257, 282, 302, 308, 326, 365
- subterraneus japonensis** Imamura, 1958 224
- szalayi* (Motaş & Tanasachi, 1948) (syn. to *oblongus*) 244, 246, 261, 299, 365
- taeniolatus* (Maglio, 1928) (syn. to *legeri*) 206, 207, 209, 364
- tatrensis* Szalay, 1953 (syn. to *vaginalis*) 182, 271, 272, 289, 365
- tener** Thor, 1899 174–176, 202, 232, 261, 285, 287, 302, 313, 364, 365
- tenerifensis** Lundblad, 1962 307–308, 319
- tenuitarsus* (Komarek, 1921) (syn. to *nodipalpis*) 176, 196–197, 364
- tivdiae* (Sokolow, 1926) (syn. to *nodipalpis*) 176, 203, 230, 243, 365
- torrenticolus* Láska, 1960 *species dubia* 299, 365
- trapeziformis** Schwoerbel, 1961 299–302, 364
- tuberipalpis** (K. Viets, 1913) 193
- tuberosus* (K. Viets, 1919) *species dubia* 192–193, 200
- ubnicus** Tuzovskij, 1980 317–319, 367
- umbonipalpis* Szalay, 1954 *species dubia* 275, 284, 366
- vaginalis** (Koenike, 1905) 182–184, 192, 212, 217, 222, 246, 271, 272, 275, 284, 365, 366
- valencianus** (K. Viets, 1930) 214–216, 243, 305, 306, 365, 366
- vandeli** E. Angelier, Decamps & Rey 1963 309–311, 366
- virginalis* Tuzovskij, 1977 (syn. to *moniezi*) 334, 336, 341, 365
- walteri** (K. Viets, 1925) 142, 150, 152, 153, 158, 192, 193, 199–201, 208, 209, 215, 261, 271, 284, 302, 320, 325, 346, 364, 365
- Australiobates* Lundblad, 1941 144
- Brachypoda sagulator* (Koch, 1842) 168
- Brachypoda versicolor* (Müller, 1776) 168
- Hygrobates* Koch, 1837 144, 154
- calliger* Piersig, 1896 188, 207
- fluviatilis* (Ström, 1768) 142
- longipalpis* (Hermann, 1804) 168
- nigromaculatus* Lebert, 1879 142
- Iranomegapus* Schwoerbel & Sepasgozarian, 1976 (syn. to *Atractides*) 164, 165
- Maderomegapus** Lundblad, 1941 (subgen. in *Atractides*) 164, 165, 348
- Megabates** K. Viets, 1924 (subgen. in *Atractides*) 164
- Megapodides* Lundblad, 1941, err. (syn. to *Atractides*) 164
- Megapoides* Lundblad, 1936 (syn. to *Atractides*) 164
- Megapus* Neuman, 1889 (syn. to *Atractides*) 142
- Mesobates* Thor, 1901 144
- Nesaea* Koch, 1836 142
- Octomegapus* K. Viets, 1926 (syn. to *Atractides*) 159, 164, 182
- Orthocladius* (v. d. Wulp) (Diptera Chironomidae) 178
- Paraschizobates* Lundblad, 1937 144
- Piona clavicornis* (Müller, 1776) 142, 168
- Polymegapus** K. Viets, 1926 (subgen. in *Atractides*) 154, 164, 165, 319, 328, 341, 343
- Polypedilum* Kieffer (Diptera Chironomidae) 178
- Rheocricotopus* Thienemann & Harnisch (Diptera Chironomidae) 178
- Rhynchomegapus* Motaş & Tanasachi, 1948 (syn. to *Atractides*) 164, 165
- Rusetria* Thor; 1897 142
- Taeniomegapus* Maglio, 1928 (syn. to *Atractides*) 164, 209
- Tetrabates* Thor, 1922 144
- Tetramegapus* K. Viets, 1926 (syn. to *Atractides*) 154, 164, 178, 299, 364
- Torrenticola* Piersig, 1896 142
- anomala* (Koch, 1837) 142, 327
- Tympanomegapus** Thor, 1923 (subgenus in *Atractides*) 164, 165, 213, 248, 280, 327, 328
- Unionicola crassipes* (Müller, 1776) 298