

Proposed taxonomic changes to the British pseudoscorpion fauna (Arachnida)

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Summary

Doubt is cast upon the presence of *Chthonius* (*Ehippochthonius*) *tetrachelatus* (Preysslner, 1790) *sensu stricto* in Britain. *Chthonius kewi* Gabbutt, 1966 is considered to be a good species, but close to *tetrachelatus*. The division of the Chernetidae Beier, 1932 into two subfamilies is examined. The subfamilies are redescribed and the family reorganised to include *Lamprochernes*, *Allochernes* and *Pselaphochernes* in the Lamprochernetinae and *Dinocheirus*, *Chernes* and *Dendrochernes* in the Chernetinae. Redescriptions of the genera *Lamprochernes*, *Allochernes* and *Pselaphochernes* are given and *A. dubius* (O. P.-Cambridge) is tentatively transferred to *Pselaphochernes*.

Introduction

During a study of the European Chernetidae and the production of a new Linnean Society Synopsis of the British Fauna: Pseudoscorpions, a number of taxonomic irregularities within the families Chernetidae and Chthoniidae became apparent. The occurrence of taxonomic difficulties is not surprising in the light of our knowledge of the order. During the recent past several authors have critically examined and redefined a number of taxa (Muchmore, 1972, 1974, 1975; Mahnert, 1976, 1978; Astley, 1979; Heurtault-Rossi, 1963).

Many species have been described from but a few specimens and the descriptions have been largely based on external morphological characters (see Beier, 1932a,b, 1963), and have often relied on too few characters (Muchmore, 1975). The separation of some taxa using these criteria alone is extremely difficult, consequently the use of other characters has been sought. Male and female pseudoscorpions possess relatively complex internal genitalia (Vachon, 1938; Legg, 1971, 1974a,b,c, 1975), which reflect their function: the production and deposition of spermatophores and their reception. Vachon (1938) made a comprehensive study of the genitalia of a number of species. Later, the same author (1957) commented on the use of certain aspects of the genitalia in taxonomy and produced a simple key using these and other features to help separate British chernetid pseudoscorpions. Other authors, notably Muchmore (1974, 1975), have commented on the difficulties within the European fauna. In the course of functional and comparative studies of the genitalia of the British species (Legg, 1971, 1974a,b,c, 1975) the taxonomic significance of these characters and their limitations in this context were further realised.

The genitalia of the families Chernetidae, Cheliferidae and Neobisiidae are particularly useful as important taxonomic tools, but are of more limited use in the Chthoniidae. Astley (1979) made a detailed

morphometric study of the British Chernetidae using a wide variety of characters including several associated with the genitalia, and his conclusions closely follow the results from an independent study by the present author.

Family Chthoniidae Daday, 1889

Cosmopolitan, but not found in the extreme northern or southern hemispheres. Spiracles transverse, with a guard sclerite not differentiated from the sternite. Tracheal trunks rarely extend anteriorly beyond second and third coxae. Intercostal tubercle present (British species) and with setae. Cephalothorax smooth (never rugose or tuberculate) and only sparsely covered with setae, often with an epistome or serrated anterior margin. Genital plates weakly differentiated. Male genitalia with a distinctive and deeply cleft posterior operculum exposing the internal genitalia, including the rounded half-moon shaped diverticula that mould the protective "cup" of the spermatophore. Female genitalia with a weakly developed lateral apodeme frame supporting the median diverticulum of the genital atrium, and elongated lateral diverticula (Legg, 1971).

Genus *Chthonius* C. L. Koch, 1843

Four eyes present, posteriors sometimes reduced. Less than six large and sometimes one or two (rarely more) small lateral setae on posterior margin of cephalothorax. Not more than four marginal setae on third and fourth tergites. Pedipalpal teeth clearly separated, not blunt (often long) and set on a thin lamina.

The *Chthonius tetrachelatus/kewi* problem

Within the British fauna five species have been recognised, grouped into two subgenera: *Ehippochthonius* and *Chthonius*. The former subgenus contains *C. tetrachelatus* (Preysslner, 1790) and *C. kewi* Gabbutt, 1966. *Chthonius kewi* was first recorded from Colne Point in Essex. Later, the species was found by the present author further north in Essex, and also in Sussex. Other collectors have found it in Norfolk, Suffolk, Kent, Dorset and Nottinghamshire.

The description of *C. tetrachelatus sensu stricto* included, as a diagnostic character, the presence of two large setae in the posterior cephalothorax row. The significant morphological character which distinguished *C. kewi* from *C. tetrachelatus* is the presence of two, additional, microsetae in this row of setae. Vachon (1941) in his description of *C. tetrachelatus* recounts finding a "spécimen anglais" with two large + one small (micro) setae in the posterior row (locality details not given).

More recently, Lazzeroni (1969) examined a wide selection of material identified as *C. tetrachelatus* taken from many localities in Italy. In the light of these studies he considered that the additional setae present in *C. kewi* and *C. beieri* Lazzeroni, 1966, were abnormalities. He concluded that both *C. kewi* and

C. beieri were atypical and aberrant forms of *C. tetrachelatus* and consequently synonymised them with that species.

During a study of the British species (Legg, 1971), the author found it impossible to obtain British *C. tetrachelatus* and as a consequence had to resort to examining material verified as this species and collected in France (near Paris by Max Vachon). Apart from the differences in the presence or absence of the microsetae, small, but significant genitalic differences also occurred between the two species; consequently Legg (1971, 1975) concluded that *C. kewi* was a good species. This interpretation was based on British *C. kewi* and the French *C. tetrachelatus*. Careful re-examination of older British material previously identified as *C. tetrachelatus* has shown that most, if not all, of the material was *C. kewi*. As an example, Pickard-Cambridge (1892) mentions in his description of the distribution of *C. tetrachelatus* in Britain that it was found at Portland (Dorset), but recently many specimens were collected from there and were, by Gabbutt's definition, found to be clearly *C. kewi*. It has been impossible to obtain what is for certain *C. tetrachelatus* from Britain, despite the fact that records have been received (see Jones, 1980). All the "tetrachelatus" and "kewi" collected quite extensively in recent years by several collectors, showed a high proportion of individuals with the "kewi" complement of posterior marginal setae, i.e. two large + two small setae. It would appear that specimens of this species are extremely variable, notably in the "key" character, i.e. the number of setae on the posterior margin of the cephalothorax, which can vary from two to five within any single population. Gabbutt (1966) mentions that specimens with three (two large and one small) setae were not uncommon in the samples he collected from Colne Point in Essex, but does not mention the existence of specimens with the *C. tetrachelatus* complement of setae, i.e. two large setae only; whilst others have predominantly 2 + 2 (1-3) posterior setae. The microsetae are easily dislodged and lost and as a result specimens can appear to have the *C. tetrachelatus* complement of setae, which probably accounts for many of the so-called *C. tetrachelatus* records given in the Provisional Atlas (Jones, 1980).

It is therefore possible that *Chthonius tetrachelatus sensu stricto* does not occur in Britain and the animal found here should be regarded as *C. kewi*.

Within the European fauna (Gabbutt, 1966) *C. kewi* was placed with *C. vachoni* Heurtault-Rossi, *C. catalonicus* Beier and *C. tuberculatus* Hadzi (Heurtault-Rossi, 1963). In this group of the subgenus *Ephippiochthonius*, *C. tetrachelatus* is by definition excluded. If, as proposed here, *C. kewi* is accepted as being distinct from *C. tetrachelatus* then our understanding of the group is further complicated. On the one hand *C. kewi* is linked with *C. vachoni*, *C. catalonicus* and *C. tuberculatus*, and on the other with *C. tetrachelatus*. The need for a further, more detailed multivariate analysis of the group is evident.

Chthonius (Ephippiochthonius) tetrachelatus (Preysler, 1790) *sensu stricto*

Length 1.3-1.9 mm, colour uniform yellow-brown; cephalothorax square, only very slightly tapering posteriorly, glossy, with 18 setae, two of which are on posterior margin; setal formula $4 + 6 + 4 + 2 + 2 = 18$; eyes large, two pairs about one diameter apart; anterior eyes distinct and half a diameter from anterior margin of cephalothorax; posterior eyes less well developed and about same distance from anterior eyes as the latter are from front of cephalothorax; epistome absent; anterior margin of cephalothorax with small serrations; pedipalpal hand with a distinct dorsal depression; hand elongate, dorsum almost level with finger and not rounded; fingers a little longer than hand; teeth of pedipalpal fingers triangular and widely separated; anterior genital operculum of male bearing 10-12 setae; posterior male operculum with 16-18 setae; no holes in dorsal apodeme; female anterior genital operculum bearing 9-10 setae; posterior operculum with 7-8 setae; lateral apodeme frame incomplete (Legg, 1975). Types not available for examination.

Chthonius (Ephippiochthonius) kewi (Gabbutt, 1966)

Length 1.4-1.8 mm, colour uniform yellow-brown; cephalothorax glossy and almost square, only very slightly tapering posteriorly, with 20 setae (excluding microsetae), four of which are on posterior margin; setal formula: $4 + 6 + 4 + 2 + (2 + 2 (1-3)) = 20 (19-21)$; eyes large, two pairs about one diameter apart; anterior eyes distinct and half a diameter from anterior margin of cephalothorax; posterior eyes less well defined and lensless; epistome absent; anterior margin of cephalothorax with small serrations; pedipalpal hand with a distinct dorsal depression; fingers a little longer than hand which is elongate, dorsum almost level with fingers and not rounded; teeth of pedipalpal fingers triangular and widely separated; anterior and posterior genital opercula of male both bearing 9-11 setae; no holes in dorsal apodeme; anterior genital operculum of female bearing 9-10 setae; posterior operculum with 11-13 setae; lateral apodeme frame incomplete (Legg, 1971, 1975). Types in British Museum (Natural History), collected at Colne Point, Essex: holotype male on four slides (1966.3.16.1 (A-D)), allotype female on four slides (1966.3.16.2 (A-D)), paratypes in alcohol (three males, 1966.16.3-5 and three females, 1966.3.16.6-8) together with tritonymphs (1966.3.16.9-11) and three deutonymphs (1966.3.16.12-14).

Family Chernetidae Menge, 1855; Chamberlin, 1931 *sensu stricto*

Virtually cosmopolitan, but reaching its greatest development in the Holarctic and Neotropical Regions. Poison apparatus well developed in movable finger of pedipalpal chela only, and weakly developed or absent in fixed finger. A few to many accessory teeth present internally and externally on fingers of pedipalpal chela in addition to main tooth series. Flagellum of three or four setae. Basal and sub-basal cheliceral setae never as well developed as interior and laminal setae and never

prominently clavate. Eyes two or absent. All legs monotsarate. Each tarsus with an elevated slit sensillum on outer margin proximad of middle. Tergites longitudinally divided. Genitalia of male with a complex ring-like lateral apodeme frame, and enlarged ejaculatory canal with associated diverticula and prominent atrium. Those of female with bifurcated spermatheca, either mushroom-T shaped or with short or long descending branches (M-shaped).

The division of the family by Beier (1932a,b) into the two subfamilies Lamprochernetinae and Chernetinae, and tribes Chernetini and Hesperochernetini, has been strongly criticised by Muchmore (1972, 1974) and is largely and erroneously based upon the form of the body setae, sculpturing of the cuticle and the number of setae in the flagellum (three or four). Studies on the setae using stereoscan electron microscopy revealed that the so-called "long, thin and pointed" setae of the Lamprochernetinae were in fact very similar to the "clubbed" or "tooth" setae of the Chernetinae (Klausen & Totland, 1977; Legg, 1971). The less well-defined setal teeth of the Lamprochernetinae represent one end of a range of degrees of tooth development and are probably of specialised morphoecological significance. Detailed studies involving many characters (Astley, 1979; Legg, 1971) including those associated with the genitalia, have provided what is believed to be a more realistic division of the family.

Subfamily Lamprochernetinae

Male genitalia with a circular lateral apodeme frame not indented or folded; female genitalia with T- or M-shaped spermatheca, the branches of which are either much less than the length of the stem (mushroom-shaped spermatheca), or with the branches equal to or slightly less than the length of the stem.

British genera: *Lamprochernes* Tömösvary, 1882

Allochernes Beier, 1932

Pselaphochernes Beier, 1932

Type genus *Lamprochernes* Tömösvary, 1882

Cephalothorax longer than broad, smooth or faintly granulate and with two grooves, the basal one indistinct; eyes indistinct or absent; body setae long, pointed, with very fine teeth at their tips; galea strongly developed, particularly in females; flagellum of three setae; fingers of pedipalp with accessory teeth; only movable finger with poison apparatus; trichobothrium *it* of fixed finger further from tip of finger than *ist* is from *isb*; trichobothrium of tarsus IV between base and middle of article; male genitalia with a prominent and thick cuticular frame deeply notched antero-medially and antero-laterally; female genitalia with an M-shaped spermatheca, the branches descending and equal to length of stem.

Allochernes/Pselaphochernes

Within the European fauna there is considerable confusion within the genera *Allochernes* and *Pselaphochernes*. In order to clarify matters alternative definitions of these two taxa are proposed here, which

include consideration of aspects of the male and female genitalia. Detailed studies (Klausen & Totland, 1977; Legg, 1971) have shown that several species are probably misplaced including, in the British fauna, *Allochernes dubius* (O. P.-Cambridge, 1892). Following comparative analyses of many characters of both genera it is proposed that *Allochernes dubius* be tentatively transferred to the genus *Pselaphochernes*.

Genus *Allochernes* Beier, 1932

Cephalothorax longer than broad with two distinct transverse grooves; eyes absent; body and palpal setae serrated and clubbed; flagellum of three setae; accessory teeth present on pedipalpal fingers; interior margin of movable finger with one accessory tooth; tarsus IV and tergite and sternite XI without trichobothria; male genitalia with a thick cuticular frame indented anteriorly by a wide notch; female genitalia with an M-shaped spermatheca, the descending outer arms of which are almost equal to three-quarters length of stem.

Genus *Pselaphochernes* Beier, 1932

Cephalothorax somewhat longer than broad, finely to coarsely granulate and with two distinct grooves, the posterior one being distinct to indistinct; eyes absent; body setae mildly to strongly toothed and clubbed (not fine and delicately toothed at tips); flagellum with three setae; pedipalpal finger longer than hand and with accessory teeth; tarsus IV with or without trichobothrium; tergite and sternite XI with trichobothria; male genitalia with a rounded cuticular frame deeply notched anteriorly; female genitalia with mushroom-shaped spermatheca, each "branch" being horizontal and equal to or less than half length of stem.

Pselaphochernes dubius (O. P.-Cambridge, 1892)

Length 1.3-1.7 mm, cephalothorax and opisthosoma green-brown, the latter tinged with red, pedipalps red-brown; cephalothorax longer than broad with two distinct transverse grooves, the posterior being indistinct; eyes absent; epistome absent; sternites (except II) and tergites divided into separate halves with tergite I carrying 12-16 setae and tergite VI 12-13 setae; tergite XI with one pair and sternite XI with two pairs of trichobothria, those on tergite 1.5 times longer than those on sternite; cheliceral galea of female well developed, with 4-5 distal processes; that of male less well developed; large accessory tooth at base of galea; flagellum of 3 setae; pedipalpal fingers longer than hand; femur about three times as long as broad; fixed pedipalpal finger with 6-7 outer accessory teeth; movable finger with 6-8 outer and 1 inner accessory tooth; trichobothrium *t* further from *st* than *sb*; tarsus IV without trichobothrium, but with a long distal seta; setae of pedipalps and body expanded distally, ridged and toothed; male anterior and posterior genital opercula carrying 13-15 and 13-16 setae; each operculum with two lyrifissures; genital atrium and armature complex: a rounded cuticular frame deeply notched anteriorly with attached lateral rods; large

ejaculatory canal and associated atrium and diverticula; female anterior and posterior opercula carrying 13-15 and 9-10 setae; each with two lyrifissures; genital atrium of female with T-shaped spermatheca, each branch of the T being horizontal and less than or about equal to half the stem in length (resembling a mushroom in shape). Types in the Hope Entomological Collections, University Museum, Oxford: holotype male 105 Glanville's Wootton, ex J. C. Dale "some years" before 1892 (O. P.-Cambridge, 1892), paratype female 106 O. P.-C., Sherborne ex F. O. P.-C.

Subfamily Chernetinae

Genitalia of male with a folded and indented circular cuticular frame; female genitalia with spermathecae that have descending branches much longer than the stem.

British genera: *Dinocheirus* Chamberlin, 1931
Chernes Menge, 1855
Dendrochernes Beier, 1932

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