The Habitat of *Tetrilus macrophthalmus* (Kulczynski) in Leicestershire and Nottinghamshire (Araneae: Agelenidae)

J. Crocker
66 Outwoods Drive,
Loughborough LE11 3LU

Introduction

Tetrilus macrophthalmus (Kulczynski, 1897) is a very rare spider in Britain, generally associated with ancient woodland and various species of ants. It is particularly interesting due to the remarkable development of the male palpal style and lamella and the corresponding complexity in the female sperm duct. Locket & Millidge (1967) have shown the importance of this species in an understanding of the evolutionary development of the genitalia of this and closely allied genera.

Little is known of the biology of the genus *Tetrilus*, most records and observations being from isolated specimens collected by zoologists working on other groups of invertebrates. The discovery of a well established colony of *T. macrophthalmus* on Bardon Hill, Leicestershire enabled a more detailed account to be made of this species than has hitherto been possible.

Fig. 1: *Tetrilus macrophthalmus* (Kulcz.) male.

Synonomy

A certain amount of controversy exists regarding the status of *Tetrilus arietinus* and *T. macrophthalmus*. Thorell (1871) first described *T. arietinus* (= *Cryphoeca arietina*) and Kulczynski (1897) then described *T. macrophthalmus* (= *Tuberta arietina* var. *macrophthalma*) as a variety of the former, mainly on the basis of differences in size and arrangement of eyes. Jackson (Donisthorpe, 1927) was of the opinion that they were the same species, whilst Simon (1937) considered them as quite separate species. Bristowe (1939) recognises *T. macrophthalmus* (Kulcz.) as a sub-species of *T. arietinus* (Thor.), without any intermediates, and remarks that there appears to be no difference in their habits or distribution in Britain; ". . . both live mainly in ants' nests and both have been found away from them, but usually in such sheltered spots as under stones or beneath bark of trees." Locket & Millidge (1953) prefer to regard them as separate species, ". . . at least until intermediate forms are recorded." However, Lehtinen (1964) has recorded intermediate forms from Finland, from the inner parts of the nests of the ant *Formica rufa*. Donisthorpe (1927) gives British records of "*T. arietinus*", between 1892 and 1926, listed separately as *Cryphoeca diversa* O.P.-C., 1893 (= *Tetrilus arietinus* (Thor.)), *Tetrilus arietinus* O.P.-C. 1900 (= *T. macrophthalmus* (Kulcz.)) and *Tetrilus recisa* Jackson, 1913 (= *T. macrophthalmus* (Kulcz.)). Examination of Donisthorpe's specimens in the Jackson collection confirms this synonomy.

It is not the purpose of this paper to discuss these taxonomic implications, but to show the type of habitat in which the large-eyed form known as *Tetrilus macrophthalmus* (Kulcz.) has been found, with particular reference to those from Charnwood Forest and Sherwood. All specimens taken in Leicestershire (Charnwood Forest and Donington Park) and Nottinghamshire (Sherwood Forest) have been *T. macrophthalmus.*

Distribution

T. arietinus is widely distributed throughout Europe and Scandanavia: Sweden, Finland, Denmark, Britain, Holland, Belgium, France, Germany, Spain, Italy, Switzerland, Austria, Czechoslovakia, Hungary and the Balkan peninsula. *T. macrophthalmus* appears to be more restricted; records existing only from Hungary, France and Britain.

There are three other known species within the genus; *T. strandi* Caporiacco from Italy, *T. lucifugus* Simon from France and *T. japonicus* Simon from Japan; all are very rare.

In Britain, *T. arietinus* is recorded from Surrey,

Berkshire, Durham and Cumberland, and *T. macrophthalmus* from Nottinghamshire, Leicestershire, Glamorgan, Somerset, Surrey and Berkshire.

Donisthorpe first recorded *T. macrophthalmus* for Leicestershire as *Cryphoeca recisa*, two adult females under a heavy stone over a nest of *Formica fusca* ants in Bradgate Park, on 3 May 1909. More recently the spider has been re-discovered in Bradgate Park (Crocker, 1962) and also found at five other Leicestershire sites (Fig. 2), all but one of these being within Charnwood Forest. In Sherwood Forest, Jackson found it commonly under bark of old oak trees in Birklands and Bilhaugh during June 1912 (Carr, 1916). On 26 April 1971 small colonies were re-discovered (both sexes, sub-adults, immatures and juveniles, also egg cocoons on pieces of old dry wood) amongst twigs and dead wood inside hollow oak trees at Bilhaugh (Old Buck Gates, SK 639693, 61m A.O.D.). Donisthorpe also refers to an adult female swept off heather in Sherwood in 1902, attributing this unusual record to Carr. However, Carr (1916) does not mention this and credits G. W. Chaster with the first Nottinghamshire specimens (2♀, 12-13 June 1904).

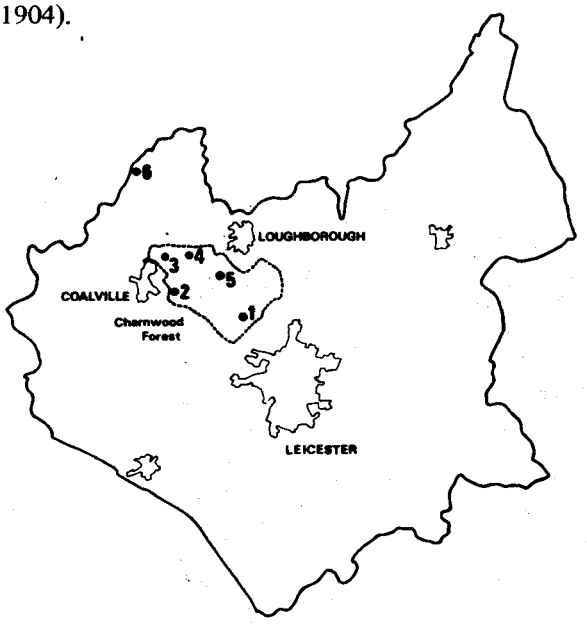


Fig. 2: Known distribution of *Tetrilus macrophthalmus* in Leicestershire.
1 Bradgate Park; **2** Bardon Hill; **3** High Sharpley and Gun Hill; **4** Ives Head; **5** Beacon Hill; **6** Donington Park.

Habitat

The Birklands and Bilhaugh sites (Plate IA) in Sherwood are typical old Royal Forest with open canopy resulting from overgrazing by rabbits and deer. At least four generations of oaks are present, the most ancient being quite hollow and probably well over 600 years old. Both *Quercus robur* and *Quercus petraea* occur, together with hybrids, and other than *Betula verrucosa*, few shrub layer plants are present. The ground flora is characteristic of acid oakwoods, dominated by *Pteridium aquilinum* and *Deschampsia flexuosa* with *Holcus mollis, Argostis tenuis, Galium saxatile, Teucrium scordonia* and *Calluna vulgaris* locally sub-dominant. This habitat is typical of sites 1 and 6 (Fig. 2) and is somewhat better preserved than the equivalent Leicestershire sites.

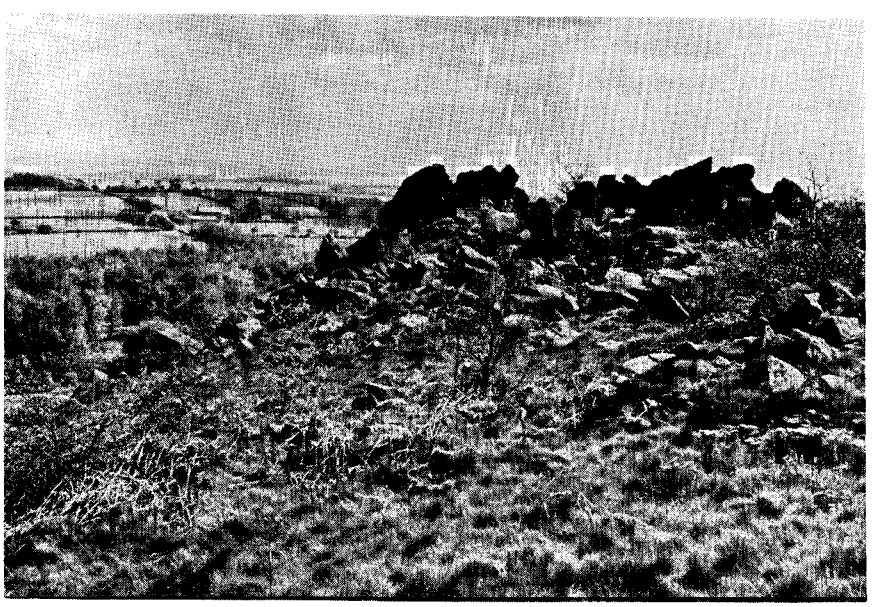
In contrast to the sheltered nature of the ancient oakwood habitat, Bardon Hill SK 460133 (site 2, Fig. 2; Plate IB) is elevated rocky terrain, long since denuded of old woodland and is typical of sites 3, 4 and 5.

Leicestershire is predominently lowland country, mostly below 125m and is highly agriculturalised with considerable industrial development. The rolling eastern uplands are of quite different character to the rugged eminences of Charnwood Forest, in the north west. Pre-Cambrian rocks of the Charnwood Forest outcrop through Triassic sediments, forming a horse-shoe of craggy hills between Leicester, Loughborough and Coalville; the highest point in Leicestershire being Bardon Hill, 278m A.O.D., lying on the south west edge of Charnwood.

Bardon Hill was emparked prior to the 14th century and has, over the years since, received little attention from historians. What is known about the Hill biologically, is also rather insignificant, but the recent discovery here of such interesting spiders as *Porrhomma egeria* Simon, *Oreonetides firmus* (O.P.-C.), *Asthenargus paganus* (Simon), *Evansia merens* O.P.-C., *Tigellinus furcillatus* (Menge), *Euophrys erratica* (Walck.) and *Tetrilus macrophthalmus* (Kulcz.), has caused a more critical appraisal to be made of the area as a Site of Special Scientific Importance.

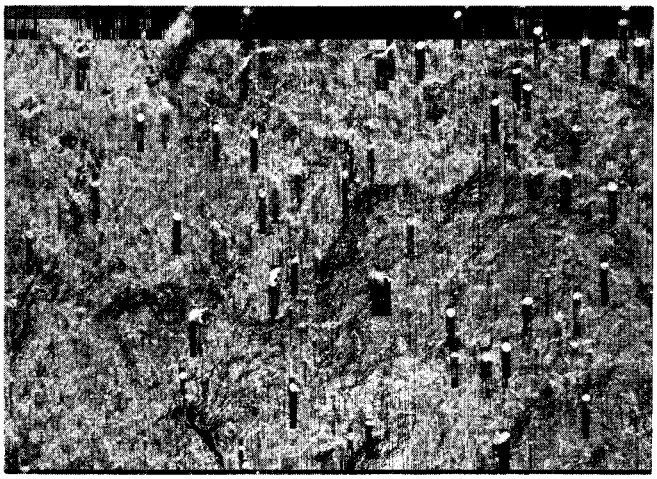
The Bardon rocks are intrusive 'porphyroids' and slate agglomerate with deposits of Keuper marl on the lower flanks. The hard rocks are being extensively

A - Ancient oak, Sherwood Forest (typical of areas 1 and 6, Fig. 2).



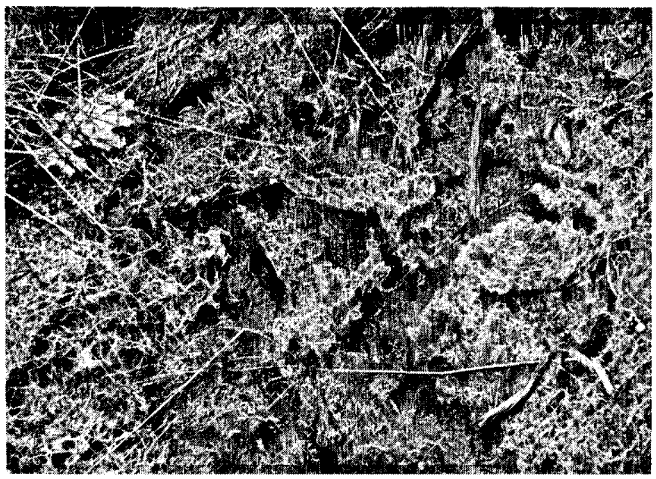
B - Bardon Hill, showing exposed terrain (typical of areas 2, 3, 4 and 5, Fig. 2).

PLATE I



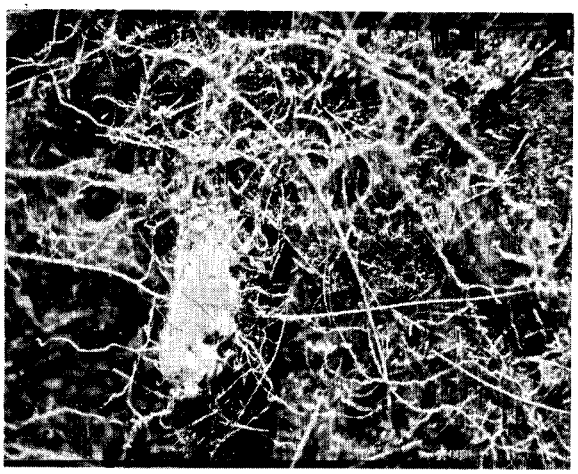
A

B



C

E



D

A - Underside of rock with new and old *Tetrilus* cocoons.
B - Fresh cocoon, showing bluish silk covering.
C - Area under rock (A) with webs and cocoons of *Tetrilus* in ant galleries.
D - Enlarged detail of *Tetrilus* webs.
E - Bits of vegetable matter caught up in *Tetrilus* web on underside of rock; both sexes often present together inside these messy webs.

PLATE II

exploited for road stone, and quarrying activities around the summit give some concern for the future of this habitat. The overlying acidic soil is shallow, rather poor and well drained on the higher ground, with a poor flora. *Deschampsia flexuosa* is dominant on the summit with *Agrostis tenuis, Festuca ovina* and *Pteridium aquilinum* sub-dominant. *Aira praecox, Nardus stricta, Sieglingia decumbens, Calluna vulgaris, Vaccinium myrtillus, Teucrium scorodonia* and *Corydalis claviculata* are local with patchy distribution. A substantial shrub layer of regenerating *Quercus robur* and *Betula pendula* is present on the south side, below the summit ridge; much of the oak originating from the stools of first and second generation trees felled in 1946. The site would appear to have had a discontinuous history of tree cover, as is suggested by the presence of *Q. robur,* normally found on richer base soils.

Bardon Hill has a much greater amount of loose rock lying around on the surface than sites 3, 4 and 5, and this is one of the main characteristics of this habitat. High Sharpley Rocks SK 447170 (198m) and Gun Hill SK 453169 (182m) site 3, are of similar structure to Bardon Hill, whilst Ives Head SK 478170 (200m) site 4, and Beacon Hill SK 508148 (249m) site 5, are grits and hornstones with relatively small amounts of loose rocks scattered around the outcrop. Each colony of *Tetrilus macrophthalmus* found at these exposed sites has been under rocks on the southern flank of the main outcrop, usually, but not always, in the nests of the ant *Formica fusca.*

Though this spider appears to prefer embedded rocks, it has been established that they will tolerate some degree of disturbance (i.e. loosening of the rocks). Over a period of time, continued disturbance seems to affect the ant more than the spider. An ants nest partially excavated (17 August 1968) was abandoned by the ants and the following year only immature *Tetrilus* were present. To what degree *Tetrilus* is dependent upon *Formica fusca* hereabouts has not been established, but the spider would seem to have a marked environmental association with this ant, and on Bardon Hill is very well established over a small area (0.4 ha) where *F. fusca* is particularly abundant. Elsewhere (Bradgate Park, Donington Park, Gun Hill and Sherwood) *Tetrilus* has been found without the ant, mostly as single specimens, and with no evidence that they have formed well established colonies away from ants nests.

Breeding

Adult females, sub adults, immatures and juveniles have been taken throughout the year from April to November, and adult males between April and October. Both sexes have been taken together in the same web in April, May and October, and fresh egg sacs recorded between April and October. These observations were made in Leicestershire between April 1962 and October 1972, no investigations being carried out during any December or March. However, sub adults of both sexes have been taken in January and February. The life cycle is unknown.

Bradgate Park SK 527099 (120m) covers c.360 ha, most of which is open ground dominated by *Pteridium,* burned over annually as part of the management policy for this area. The area of ancient oaks remaining, is limited to c.60 ha, mostly in the south east corner of the Park. There is no shrub layer, and even here the trees are widely spaced. Elsewhere, old trees have been burned down during 'controlled' burning or felled, leaving only solitary specimens standing. It is significant that although Donisthorpe found *Tetrilus* under stones in Bradgate Park before burning took place, recent investigations have failed to confirm that it is still established in these conditions here. All recent records from Bradgate Park are of single specimens, inside, under bark or around the base of old oak trees. Breeding colonies have not been found here, though it seems likely that they would be found in the root cavities underground.

Donington Park SK 414268 (61m) is similar to Bradgate, except that the old oaks, of about the same age, have not been burned inside, like many of the hollow trees at Bradgate. The litter inside these trees is therefore much more interesting, and similar to that found at Sherwood, where breeding populations of *Tetrilus* were found inside the tree.

Observations of breeding populations at Ives Head, Sharpley Rocks (Gun Hill), Beacon Hill and Bardon Hill indicate that rocky terrain with no old trees is as acceptable a habitat as ancient woodland, providing there are well established ant colonies. Donisthorpe's observations have shown *Tetrilus* to have very definite associations with ants. Egg sacs have been found on the carton walls of the cells in *Lasius*

fuliginosus and *L. umbratus* nests; attached to wood in the galleries of *L. brunneus* nests in trees; in the underground passages in the nests of *Formica rufa* and *L. umbratus*, and fastened to bits of wood in the lower part of a rotten gatepost inhabited by a colony of *L. fuliginosus*.

Breeding pairs of *Tetrilus macrophthalmus* have been found on Bardon Hill between April and October, on the underside of embedded rocks (c.0.01 m^3 to the largest size one can lift, c.0.20 m^3), the underside of the rock having many egg cocoons attached thereto (Plate IIA). Fresh cocoons have a bluish silken covering (Plate IIB), which seems to disappear after a few days. Cocoons are also attached to the walls of the ant galleries beneath the rock (Plate IIC) and also right inside the heart of the nest. Several new egg cocoons were collected on 31 May 1972 from the underside of rocks and in ant galleries on Bardon Hill. In a number of cases the female *Tetrilus* was also taken for confirmation of identity. The eggs hatched inside the cocoon in June and were released as 2nd instar juveniles 7 August. The cocoons were c. 4 mm dia. each containing between 3 to 5 eggs (0.8 mm dia.). Compact groups of up to 5 cocoons were noted, and some rocks had quite a high density of individual cocoons attached to them. A number of these were undoubtedly those of *Evansia merens* O.P.-C., which has been commonly found co-habiting *F. fusca* nests with *T. macrophthalmus*. The webs are of fine bluish silk (c. 19 mm across), spun within the ant galleries with typical tunnel formations (Plate IID), or on the underside of the rock over the galleries. Males and females, presumably courting pairs, have been found frequently in sheet webs spun over depressions on the underside of rocks, the web being 'decorated' with small pieces of bracken and bits of leaves (Plate IIE) or minute pieces of dry grass. The spiders were usually between the web and the rock face, but disturbance caused them to make short excursions away from the web. Several courting pairs have been found on the underside of the same rock, together with females and sub adults in independent webs, the spiders being between the rock face and the sheet web.

Extracts from notes

The following extracts from my notes are of some significance.

Bardon Hill SK 460132

12-8-68 Three separate courting pairs with several other single females, males and numerous sub adults, immatures and juveniles, mostly in ants nests, but not exclusively.

17-8-68 Nest of *Formica fusca* under two adjacent embedded rocks, excavated to a depth of 31 cm. Underside of smaller of the two rocks, *Tetrilus* juveniles in small webs; on underside of other rock, one female, sub adult males and females, and juveniles in small webs; also many egg cocoons on underside of rocks. Below a third rock, buried beneath the other two, and surrounded by ant galleries, 31 cm below the surface, another *Tetrilus* female, 6 empty egg sacs and numerous juveniles; also both sexes of *Evansia merens* in ant galleries.

14-10-68 Under large boulders on south side of summit ridge, in nests of *F. fusca*, both sexes of *Tetrilus* also *E. merens* female. Six boulders were turned over, in an area not previously disturbed. Of these three had ants nests, and *Tetrilus* present either on underside of boulder or inside the ant galleries. Of the others, without ants, one had a pair of *Tetrilus* and a separate female in typical sheet webs beneath boulder. The other two boulders were in hard packed ground and had neither ants nor spiders.

29-4-69 Ants nest excavated 17-8-68, with only a few wandering ants and several immature *Tetrilus*. On south side of summit under embedded rocks, several *F. fusca* nests each with *Tetrilus* males and females together on underside of rocks in little sheet webs covered with minute bits of dry grass. Immatures also present in same type of webs. The largest nest contained clusters of spent egg cases of *F. fusca* with lenticular spider egg cocoons attached to them. 6♂, 5♀ *Tetrilus* and 2♂, 4♀ *Evansia merens* under three rocks.

2-5-70 Up to eight individual *Tetrilus* counted under each large rock with *F. fusca* nests. *Tetrilus* with freshly made cocoons on underside of rock and in webs in ant galleries. Males in webs on underside of rocks, with bits of rubbish attached to web. 6♂, 5♀, 13 sub adults and immatures noted. *E. merens*, both sexes, also present on underside of rocks with ants and *Tetrilus*.

31-5-72 Tiny juvenile *Tetrilus* noted just emerging from cocoon on underside of rock. Many fresh cocoons with bluish silk covering, several with female

Tetrilus standing against the newly made cocoon. Other cocoons present on the same rock appeared to be older, the silk covering having become dirty, or absent. In each of these types of cocoon, fresh eggs were found. *Coelotes atropos* (Walck.) female under rock *adjacent* to *F. fusca* nest, feeding on the ants; c. 48 ant corpses found at side of silk retreat tube. Circular egg cocoon (c. 100 eggs) of *Coelotes* attached to underside of rock, in a depression with a silk covering similar to, but larger than that of *Tetrilus.*

14-6-72 Underside of large rock previously examined on 17-5-72, when one female, three sub adults and several juveniles were noted, examined again. Pair of *Tetrilus* noted together inside web constructed along cleavage in rock. Also two sub adult females and several juveniles present in adjacent webs.

1-10-72 Same rock examined again. Male and female still present but not together, female with three newly made cocoons. Not necessarily same pair. Also several immatures. Not much ant activity.

Sharpley Rocks (Gun Hill) SK 453169

14-5-72 *Tetrilus* well established on south side of rock outcrop, in nests of *F. fusca*, under stones, but not numerous. Most specimens found singly, several females, immatures and juveniles. *Evansia merens* quite common, found in every sizable ants nest, but not *Tetrilus*; approximately one ants nest in four had *Tetrilus*. Lenticular cocoons present on underside of every rock over ants nests where *Evansia* found. One female *Evansia* on fresh egg cocoon, 'sitting' on fine web spun over the cocoon in a small depression on underside of the rock. Ants (*F. fusca*), and two *Tetrilus* females in fine bluish sheet webs formed inside the ant galleries, found 30 cm deep inside rotten tree stump among rocks.

Beacon Hill SK 508148

6-7-72 Well established colony of *F. fusca* with *Tetrilus* present below the outcrop of rocks to the south west of the summit. Away from this small area, *F. fusca* seems to be quite common but very few signs of *Tetrilus*. Of eight suitable rocks (20-80 cm across) lifted, in the main colony, seven had ants nests and four of these had *Tetrilus* females; single females under two rocks, two under each of the other two, all in small webs in detritus in the ant galleries. Spiders appeared to be gravid. Only two egg cocoons noted. Several immatures present on underside of rocks.

References

BRISTOWE, W. S. 1939: *The Comity of Spiders*, Ray Society, London. pp. 147, 163, 167

CARR, J. W. 1916: *The Invertebrate Fauna of Nottinghamshire*. Bell, Nottingham. p. 578

CHYZER, C. & KULCZYNSKI, L. 1897: *Araneae Hungariae* Vol. II. Budapest. pp.155-156

CROCKER, J. 1962: Two rare spiders from Leicestershire. *Bull.Br. Spider Study Gr.* No: 15 p.3

DONISTHORPE, H. St. J. K. 1927: *The Guests of British Ants*, Routledge. London. pp. 189-191

LEHTINEN, P. T. 1964: Additions to the spider fauna of Southern and Central Finland. *Ann.Zool.Fenn.* **1**, 303-305

LOCKET, G. H. & MILLIDGE, A. F. 1953: *British Spiders*, Vol. II. Ray Society London. pp. 22-25

LOCKET, G. H. & MILLIDGE, A. F. 1967: New and rare British spiders. *J.nat.Hist.* **1**, 177-184.

SIMON, E. 1937: *Les Arachnides de France*, Vol. 6 pt. 5. Paris. pp. 1023, 1044

THORELL, T. 1871: *Remarks on Synonyms of European Spiders* Pt. II. Upsala. p. 165