

THE FATE AND STATUS OF THE SUPPOSED FOSSIL TICK *IXODES TERTIARIUS* SCUDDER, 1885

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ABSTRACT — A fossil described as *Ixodes tertiaris* Scudder, 1885 from Wyoming, USA represents the only non-amber record of a tick (Acari: Ixodida) from the Eocene. The original illustration does not include characters indicative of any particular modern tick genus; or even Ixodida in general. Unfortunately, efforts to track down the type specimen were unsuccessful and it is almost certainly lost. Confusion about the original place of publication is addressed, and given that there is an illustration associated with the original mention of the name it is not a *nomen nudum*. However, since it is impossible to verify the accuracy of this illustration against a type specimen – and given the absence of convincing taxonomic features in the figure – *Ixodes tertiaris* is considered here a *nomen dubium* which should be excluded from the tick fossil record.

KEYWORDS — Acari; Ixodida; fossil; Wyoming; Eocene; *nomen dubium*

INTRODUCTION

Fossil parasitiform mites are surprisingly rare. While a few opilioacarid and gamasid mites are known (e.g. Witaliński 2000; Dunlop et al. 2010), nine of the fifteen currently valid fossil species in the literature are ticks (Ixodida). These include Cretaceous records from the ca. 100 Ma Myanmar (Burmese) amber (Poinar and Brown 2003; Poinar and Buckley 2008) and the slightly younger, 90 – 94 Ma, Raritan (or New Jersey) amber (Klompen and Grimaldi 2001). From the Eocene there are records from the 45 – 49 Ma Baltic amber (Weidner 1964; Fuente 2003) and from the Miocene from the ca. 16 Ma Dominican Republic amber (Poinar 1985; Lane and Poinar 1986; Keirans et al. 2002; Fuente 2003). The dataset also includes essentially modern tick

species or genera found as subfossils in, for example, the ear canal of a fossil rhinoceros (Schille 1916), coprolites of cats (Guerra et al. 2003), or a fossilised owl pellet (Sanchez et al. 2010). Reviews of the tick fossil record – and their wider evolutionary origins – can be found in, e.g., Klompen et al. (1996), Fuente (2003) and Mans and Neitz (2004).

There is another enigmatic fossil assigned to a living genus of ticks: *Ixodes tertiaris* Scudder, 1885 from the Eocene Green River Formation of Wyoming, USA. For a recent account of this well known (ca. 50 Ma) lake deposit, which has yielded insects and arachnids – as well as vertebrates including fish, birds and bats – see Smith et al. (2008) and references therein. Note that citations to an Oligocene (ca. 30 Ma) age are erroneous. *Ixodes ter-*

tiarius was originally named and figured in the German paleontological textbook *Handbuch der Palaeontologie*. However this consists of a drawing (reproduced here as Fig. 1) and a name only, and lacks a formal description in the text. The isolated figure was reproduced (Scudder 1887) in the French volume *Traité de Paléontologie*. Scudder (1890: 47) again reproduced his earlier drawing, but this time included a formal description, in which he stated "...its general appearance and size make it tolerably evident that it belongs to the Ixodidae or Ricini and probably to *Ixodes* proper." The fossil was described as having a length of 3.5 mm and a width of 1.75 mm; although significantly the hypostome [as "rostrum"] was believed to be missing while the shape and disposition of the legs appear to have been the main features which led Scudder to propose ixodid affinities. A weakly-defined scutum [as "frontal shield"] was alluded to in the text, but was "... (not represented in the plate and perhaps illusory) ...".

Scudder's species was briefly mentioned in a surprisingly large number of later works (see synonymy list below) but, apart from some hints that its affinities might be questionable (Schulze 1929; Vitzthum 1942), generally without detailed comment on its validity. Given that oldest part of the Green River formation marginally predates Baltic amber, *Ixodes tertiaris* has occasionally been explicitly listed as the oldest putative record of the family Ixodidae (cf. Petrunkevitch 1955; Selden 1993). Most recently, in their discussion of problematic tick names Guglielmone et al. (2009: 307) suggested that *I. tertiaris* could be a *nomen nudum* – see also Guglielmone and Nava (2011) – but concluded that they had not seen the original material and that: "It would be worthwhile to locate this fossil, whose study may shed light on tick evolution." In light of this – and as part of a wider project to stabilise fossil arachnid nomenclature – an attempt was made to track down Scudder's type specimen; unfortunately without success as documented below.

MATERIALS AND METHODS

Scudder (1890) stated that the original specimen – presumably the holotype and only known exam-

ple – derived from the A. S. Packard collection. Alpheus Spring Packard (1839-1905) was a well-known entomologist and paleontologist, who held a professorship in zoology and geology at Brown University, Rhode Island, USA from 1878 onwards. Enquires at the geological museum at Brown University did not turn up any record of Packard's material (Douglas Morse, pers. comm.). However, it was suggested that the specimen could have found its way to the Museum of Comparative Zoology (MCZ) at Harvard University; the largest major museum in the vicinity.

Indeed Laura Leibensperger (MCZ) confirmed that there is an empty box in their collections with a label which reads "*Ixodes tertiaris* Scudder. Zittel, Handb. 1885, 1, th 2, /733, fig. 906". There is also an entry in the database – probably from the retired curatorial associate Ardis Johnston (L. Leibensperger, pers. comm.) – which reads: "Type was A. S. Packard specimen no. 258. MCZ only has label for specimen, in Henshaw's handwriting. Prof. Frank Carpenter found that the Packard specimens of Scudder's types were in the introductory paleontology teaching collection at Brown University. When he checked specimens remaining at Brown, most of the Scudder types were missing. He took the insect types. It is possible that other types are still at Brown. Fossil insects of North America, vol. 2: 47."

A further note from Ardis in the empty specimen box reads: "*Ixodes tertiaris* Scudder, 1885: The type specimen was part of the Packard fossil collection. At the time, Packard was the state entomologist for Massachusetts, but at a later date he went to Brown University as a professor, taking his fossil collection with him. Regrettably, after his death his collection, including type specimens, was used for about 40 years as student material in Brown's introductory paleontology labs. In the 1930's Dr. Carpenter discovered what had happened and he rescued what was left of the fossil insect type specimens. It is possible that Scudder's tick is still at Brown. The type label is in Henshaw's handwriting. Note: The above information was obtained in a conversation with Dr. Frank Carpenter, Sept. 1988. A. Johnston". Attempts to track the material down to another de-



FIGURE 1: Facsimile copy of a drawing of *Ixodes tertarius* Scudder, 1885 from the Eocene of Green River, Wyoming, USA; reproduced from Scudder (1890, Pl. VI, fig. 12). While possibly a mite, the illustration does not reveal any obvious characters of *Ixodes*, or of Ixodida in general. Since the type is missing, presumed lost (see text), the name is treated here as a *nomen dubium*.

partment of the MCZ were unsuccessful. Given that Brown University cannot trace it from their former teaching collection either, it seems highly likely that Scudder's type specimen has, unfortunately, been lost.

Ixodes tertarius Scudder, 1885 (*nomen dubium*) (Figure 1)

Ixodes tertarius Scudder, 1885: 733, fig. 906; Scudder, 1887: 732, fig. 922; Scudder, 1890: 47, pl. VI, fig. 12; Scudder, 1891: 269; Vitzthum, 1924: 732; Chodziezner, 1924: 527; Schulze, 1929: 745; Petrunkevitch, 1955: 97; Weidner, 1964: 144; Doss et al. 1974: 542; Doss and Anastos, 1977: 87; Lane and Poinar, 1986: 75; Sonenshine, 1991: 23; Selden, 1993: 310; Klompen et al., 1996: 146; Camicas et al., 1998: 167; Walter and Proctor, 1999: 16 [erroneously as an amber specimen]; Witaliński, 2000: 620; Klompen and Grimaldi, 2001: 10; Keirens et al. 2002: 61; Fuente, 2003: 333; Guerra et al., 2003: 181; Mans and Neitz, 2004: 2; Robbins and Robbins, 2004: 13 [au-

thorship incorrectly assigned to Weidner]; Guglielmone et al., 2009: 316-317; Dunlop et al., 2010: 67; Guglielmone and Nava, 2011: 60.

Material — Fish Cut, Green River, Wyoming, USA. Paleogene (Eocene). Originally part of the A. S. Packard collection, specimen no. 258; missing, presumed lost.

DISCUSSION

Scudder's (1885, 1887, 1890) illustration (Figure 1) does not reveal any obvious characters of hard ticks (Ixodidae), such as a characteristic capitulum (i.e. hypostome + pedipalps), a well defined scutum and/or marginal festoons. At least on the right side five or even six appendages are preserved which raises questions about which of them are walking legs; e.g. are the anteriormost limbs the pedipalps, in which case they seem to be unusually large and robust for a mite? The overall habitus could per-

haps fit better to the more amorphous dorsal body surface of a soft tick (Argasidae) – and as noted above, both bats and birds (as potential hosts) have been recorded from the Green River locality (Simmons et al. 2008; Weidig 2010) – but this is speculative, and again lacks explicit character support. Looking at the inflated anteriormost appendages, if these were leg 1, a case could be made for the fossil being something like a large velvet mite (Trombididae), but again this would be based on the outline appearance of the animal rather than diagnostic characters. While *Ixodes tertiaris* could conceivably be a mite of some description, in the absence of a type (see above), and in light of the equivocal nature of the drawing (see also comments in Vitzthum 1942), an exact assignment to any particular group now seems to be impossible.

With respect to the status of the name, Vitzthum (1942) inadvertently assigned authorship of *Ixodes tertiaris* to Scudder (1884) [as 1885] – a paper carefully checked by the present author and which is clearly restricted to Palaeozoic fossils with no mention of *I. tertiaris*, or any other Acari. Vitzthum's error was followed by other authors (e.g. Weidner 1964; Lane and Poinar 1986; Klompen et al 1996; Guglielmone et al. 2009), all of whom cite the wrong paper as the original description. Guglielmone et al. did, in fact, cite the oldest mention of the name by Scudder (1885) in the *Handbuch der Palaeontologie*. This is confirmed by Scudder (1891: 269) who catalogued all fossil arachnid names up until that time and cited the *Handbuch* entry from 1885 as the oldest occurrence of his own name, followed by Scudder (1887) [erroneously as 1886] and Scudder (1890).

Yet as Guglielmone et al. (2009) noted, Scudder (1885) consists of a named drawing without an accompanying diagnosis or text description and thus these authors suggested that the name is a *nomen nudum*. For this to be the case *Ixodes tertiaris* – published before 1931 – must fail to conform to Article 12 of the International Code of Zoological Nomenclature which states that the name must be accompanied by an "indication". Among the permissible indications, Article 12.2.7 lists "the proposal of a new genus-group name or of a new species group name in association with an illustration of the taxon

being named ...". For this reason, Scudder's (1885) inclusion of a drawing of the fossil does make his name available and it need not be treated as a *nomen nudum*. Nevertheless, the drawing is equivocal in a number of key features, and even the subsequent accompanying description by Scudder (1890) does not enable the fossil to be placed convincingly in any particular modern genus or even higher group of mites. In the interests of stability, and given the absence of a type specimen, *I. tertiaris* is probably best treated as a *nomen dubium* and should be excluded from further discussions of the tick fossil record and their evolution.

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