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The first fossil spider (Araneae: Palpimanoidea) from the Lower Jurassic (Grimmen, Germany)

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Abstract

The first Lower Jurassic (Lias) spider is described as *Seppo koponeni* n. gen. & n. sp. from a single female specimen from Grimmen, Germany. It most likely belongs to the Palpimanoidea, on account of the presence of cheliceral peg teeth and other features consistent with palpimanoid families, though its familial placement is uncertain. Its presence in the region at that time concurs with ideas about the more widespread presence of palpimanoids across the world in the early Mesozoic, before the break-up of Pangaea.

Key words: Fossil-Lagerstätte, Lias, Mesozoic, *Seppo koponeni*, new genus, new species

Introduction

Spiders are generally rather rare components of Mesozoic terrestrial fossil assemblages, and especially so in strata older than the earliest common occurrences of organic inclusions in amber of Cretaceous age. Few localities containing Jurassic spiders are known, and these include the famous Fossil-Lagerstätte of Daohugou, Inner Mongolia, China (Hong 1984; Selden & Huang 2008, 2010; Selden *et al.* 2011, 2013), localities renowned for their fossil insect fauna in Russia (Eskov 1984) and Kazakhstan (Eskov 1987)), and the Talbragar Fish Bed of New South Wales, Australia (Selden & Beattie 2013). All of these are Middle or Upper Jurassic, so the specimen described here, from the Lower Toarcian, is the first Lower Jurassic (=Liassic) spider to be described.

Here, we report on a single specimen of a new spider species from another locality known for its fossil insects: Grimmen, near Greifswald, Germany. The specimen was figured in a preliminary report on the entomofauna of the Lower Toarcian (Lower Jurassic) of Europe by Ansorge (2003), but identified only as a spider. The specimen is fairly complete but presents only a ventral view, and is a mixture of internal and external moulds, with some organic material (e.g. setae) preserved in adjacent matrix. Enough information is preserved to describe it as a new genus and species, *Seppo koponeni* n. sp., and suggest its identity as a palpimanoid (*sensu* Wood *et al.* 2012*a*), but its familial placement is uncertain.

Material and Methods

The single specimen (part only) is preserved in a sliver of calcareous nodule from the grey-green claystone, which comes from the now-closed opencast clay pit of Klein Lehmhagen, near Grimmen, Western Pomerania, Germany (Ansorge 1996, 2007). The preservation is curious, being one of only a few examples of spiders preserved in calcium carbonate (another is the Late Eocene Insect Limestone of the Isle of Wight, England: Selden 2001, 2014). Some parts are preserved as external moulds, and these show setation and spination (e.g. Fig. 3C). Most of the specimen, however, is an internal mould of calcium carbonate. This presents the animal nicely in three dimensions,

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(though this has not been observed in palpimanoids), as are severe storms, hurricanes, and tornadoes. Moreover, occasionally terrestrial biota is carried far out to sea, on floating vegetation for example. A terrestrial mite was discovered in the Lower Jurassic marine Oxford Clay (Selden *et al.* 2008*a*), in which much driftwood and even dinosaur bones have been found. Similarly, dinosaurs are known from the German Lias sites (Ansorge 2007).

Seppo n. gen. shows a rather unusual morphology, with large (but not elongated), porrect chelicerae, especially long, robust legs I, and short legs III. The robust, well-armed legs I, directed forwards, suggest they were prey-capture appendages. Such a morphology is typical of a sit-and-wait predator. Short legs III is typical of web spiders, especially orbweavers although also found in some palpimanoids, but not in substrate dwellers, whose legs are more equal in length. This suggests the spider was not a habitual ground dweller, and the armoured front legs could be related to capturing dangerous prey. Many palpimanoids today are araneophages, for example.

The combination of characters shown by *Seppo* n. gen. suggest Palpimanoidea, although the discovery of further material would be most helpful to confirm this determination. A recent study by Wood *et al.* (2012b), incorporating fossil and extant palpimanoids, came to the conclusion that Palpimanoidea is an ancient group, with diversification of major lineages occurring before the break-up of Pangaea; i.e. in the Permo-Trias. During the Toarcian, the geography of present-day central Europe was dominated by an epicontinental sea with scattered islands, on the western edge of the opening Tethys ocean, created by rifting caused by the break-up of Pangaea (Scotese 2004). At this time there was a widespread marine extinction event (the Toarcian oceanic anoxic event) recorded, for example, in the coeval Posidonia shales found in southern Germany. This event was connected to a global warming episode, resulting in a warm temperate climate in the region at the time (Brański 2012), and hence ideal conditions for palpimanoids, assuming they had similar ecological preferences then as today. The presence of *Seppo* n. gen. in this region at that time reflects the likely widespread occurrence of the superfamily as suggested by Wood *et al.* (2012b). Given the mosaic distribution of characters exhibited by extant and extinct palpimanoids, as well as those genera (*Seppo* n. gen., *Sinaranea* Selden, Huang & Ren, 2008) not assigned to family, it is possible that we see today remnant lineages of a former larger, more diverse, and widespread group of Mesozoic spiders.

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References

Ansorge, J. (1996) Insekten aus dem oberen Lias von Grimmen (Vorpommern, Norddeutschland). *Neue Paläontologische Abhandlungen*, 2, 1–132.

Ansorge, J. (2003) Insects from the Lower Toarcian of Middle Europe and England. *Acta Zoologica Cracoviensia*, 46 (suppl. - Fossil Insects), 291–310.

Ansorge, J. (2007) Liastongrube Grimmen. *Biuletyn Państwowego Instytutu Geologicznego*, 424, 37–41.

Bode, A. (1951) Ein liassischer Scorpionide. *Paläontologische Zeitschrift*, 24, 58–65. http://dx.doi.org/10.1007/BF03044552

Brański, P. (2012) The mineralogical record of the Early Toarcian stepwise climate changes and other environmental variations (Ciechocinek Formation, Polish Basin). *Volumina Jurassica*, 10, 1–24.

Dalla Vecchia, F. & Selden, P.A. (2013) A Triassic spider from Italy. *Acta Palaeontologica Polonica*, 58, 325–330.

Dunlop, J.A., Kamenz, C. & Scholtz, G. (2007) Reinterpreting the morphology of the Jurassic scorpion *Liassoscorpionides*. *Arthropod Structure & Development,* 36, 245–252. http://dx.doi.org/10.1016/j.asd.2006.09.003

Eskov, K.Y. (1984) A new fossil spider family from the Jurassic of Transbaikalia (Araneae: Chelicerata). *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte*, 1984, 645–653.

Eskov, K.Y. (1987) A new archaeid spider (Chelicerata: Araneae) from the Jurassic of Kazakhstan, with notes on the so-called «Gondwanan» ranges of recent taxa. *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen*, 175, 81–106.

Hong, Y. (1984) Arachnida. *In*: *Palaeontological Atlas of North China II. Mesozoic Volume*, Beijing, pp. 185–187. [In Chinese]

Jocqué, R. & Dippenaar-Schoeman, A.S. (2006) *Spider families of the world*. Royal Museum for Central Africa, Tervueren,

Belgium, 336 pp.
Lehtinen, P.T. (1980) Trichobothrial patterns in high level taxonomy of spiders. *Proceedings of the VIIIth International Arachnological Congress, Vienna*, 1980, 493–498.
Roth, V.D. & Roth, B.M. (1984) A review of appendotomy in spiders and other arachnids. *Bulletin of the British Arachnological Society*, 6, 137–146.
Scotese, C.R. (2004) Cenozoic and Mesozoic paleogeography: changing terrestrial biogeographic pathways. *In*: Lomolino, M.V. & Heaney, L.R. (Eds.), *Frontiers of biogeography: new directions in the geography of nature*, Sinauer, Sunderland, Massachusetts, pp. 9–26.
Selden, P.A. (2001) Eocene spiders from the Isle of Wight with preserved respiratory structures. *Palaeontology*, 44, 695–729. http://dx.doi.org/10.1111/1475-4983.00199
Selden, P.A. (2012) A redescription of *Juraraneus rasnitsyni* Eskov, 1984 (Araneae: Juraraneidae), from the Jurassic of Russia. *Bulletin of the British Arachnological Society*, 15, 315–321. http://dx.doi.org/10.13156/arac.2012.15.9.315
Selden, P.A. (2014) Spiders (Arachnida: Araneae) from the Insect Limestone (Bembridge Marls, Late Eocene) of the Isle of Wight, southern England. *Earth and Environmental Science Transactions of the Royal Society of Edinburgh*, 104, 1–8.
Selden, P.A., Anderson, H.M. & Anderson, J.M. (2009) A review of the fossil record of spiders (Araneae) with special reference to Africa, and description of a new specimen from the Triassic Molteno Formation of South. *African Invertebrates*, 50, 105–116. http://dx.doi.org/10.5733/afin.050.0103
Selden, P.A. & Beattie, R.G. (2013) A spider fossil from the Jurassic Talbragar Fossil Fish Bed of New South Wales. *Alcheringa*, 37, 203–208. http://dx.doi.org/10.1080/03115518.2013.735072
Selden, P.A. & Gall, J.C. (1992) A Triassic mygalomorph spider from the northern Vosges, France. *Palaeontology*, 35, 211–235.
Selden, P.A. & Huang, D. (2008) Palpimanoid spiders from the Jurassic of China. *Journal of Arachnology*, 36, 306–321. http://dx.doi.org/10.1636/CA07-106.1
Selden, P.A. & Huang, D. (2010) The oldest haplogyne spider (Araneae: Plectreuridae), from the Middle Jurassic of China. *Naturwissenschaften*, 97, 449–459. http://dx.doi.org/10.1007/s00114-010-0649-z
Selden, P.A., Anderson, J.M., Anderson, H.M. & Fraser, N.C. (1999) Fossil araneomorph spiders from the Triassic of South Africa and Virginia. *Journal of Arachnology*, 27, 401–414.
Selden, P.A., Baker, A.S. & Phipps, K.J. (2008a) An oribatid mite (Arachnida: Acari) from the Oxford Clay (Jurassic: Upper Callovian) of South Cave Station Quarry, Yorkshire, UK. *Palaeontology*, 51, 623–633. http://dx.doi.org/10.1111/j.1475-4983.2008.00769.x
Selden, P.A., Shih, C. & Ren, D. (2011) A golden orb-weaver spider (Araneae: Nephilidae: *Nephila*) from the Middle Jurassic of China. *Biology letters*, 7, 775–778. http://dx.doi.org/10.1098/rsbl.2011.0228
Selden, P.A., Shih, C. & Ren, D. (2013) A giant spider from the Jurassic of China reveals greater diversity of the orbicularian stem group. *Naturwissenschaften*, 100, 1171–1181. http://dx.doi.org/10.1007/s00114-013-1121-7
Wood, H.M. (2008) A revision of the assassin spiders of the *Eriauchenius gracilicollis* group, a clade of spiders endemic to Madagascar (Araneae: Archaeidae). *Zoological Journal of the Linnean Society*, 152 (2), 255–296. http://dx.doi.org/10.1111/j.1096-3642.2007.00359.x
Wood, H.M., Griswold, C.E. & Gillespie, R.G. (2012a) Phylogenetic placement of pelican spiders (Archaeidae, Araneae), with insight into evolution of the 'neck' and predatory behaviours of the superfamily Palpimanoidea. *Cladistics*, 28, 598–626. http://dx.doi.org/10.1111/j.1096-0031.2012.00411.x
Wood, H.M., Matzke, N.J., Gillespie, R.G. & Griswold, C.E. (2012b) Treating fossils as terminal taxa in divergence time estimation reveals ancient vicariance patterns in the palpimanoid spiders. *Systematic Biology*, 62, 264–284. http://dx.doi.org/10.1093/sysbio/sys092
Wunderlich, J. (2008) On extant and fossil spiders (Araneae) of the RTA-clade in Eocene European ambers of the families Borboropactidae, Corinnidae, Selenopidae, Sparassidae, Trochanteriidae, Zoridae s.l., and of the superfamily Lycosoidea. *Beiträge zur Araneologie*, 5, 470–523.