

Baltorussus total makeover: rejuvenation and sex change in an ancient parasitoid wasp lineage (Hymenoptera: Orussidae)

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The Orussidae is an obscure group of parasitoid wasps that emerge as sister group to the Apocrita in most recent comprehensive treatments of hymenopteran phylogeny (e.g., Sharkey et al. 2012; Klopstein et al. 2013). Their fossil record is correspondingly poor, a total of four fossil taxa being unequivocally assigned to the family, all described from amber inclusions. *Baltorussus velteni*, the first known orussid from Baltic amber, was recently described by Schedl (2011) from a single, allegedly female specimen.

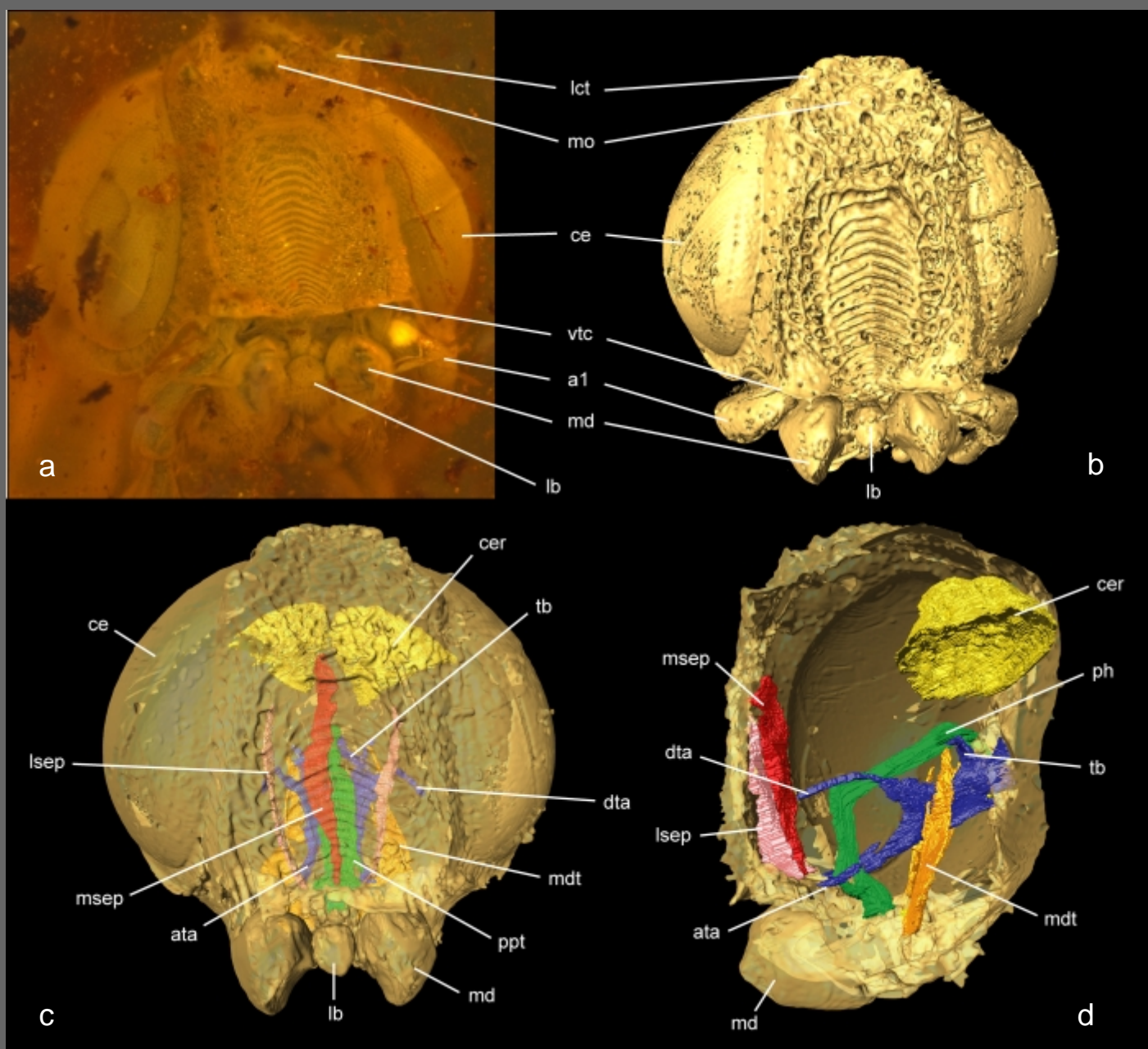


Fig. 1. *Baltorussus velteni*, holotype, head frontal view, brightfield (a), surface rendering (b), 3D reconstruction (c); head lateral view, 3D reconstruction (d).

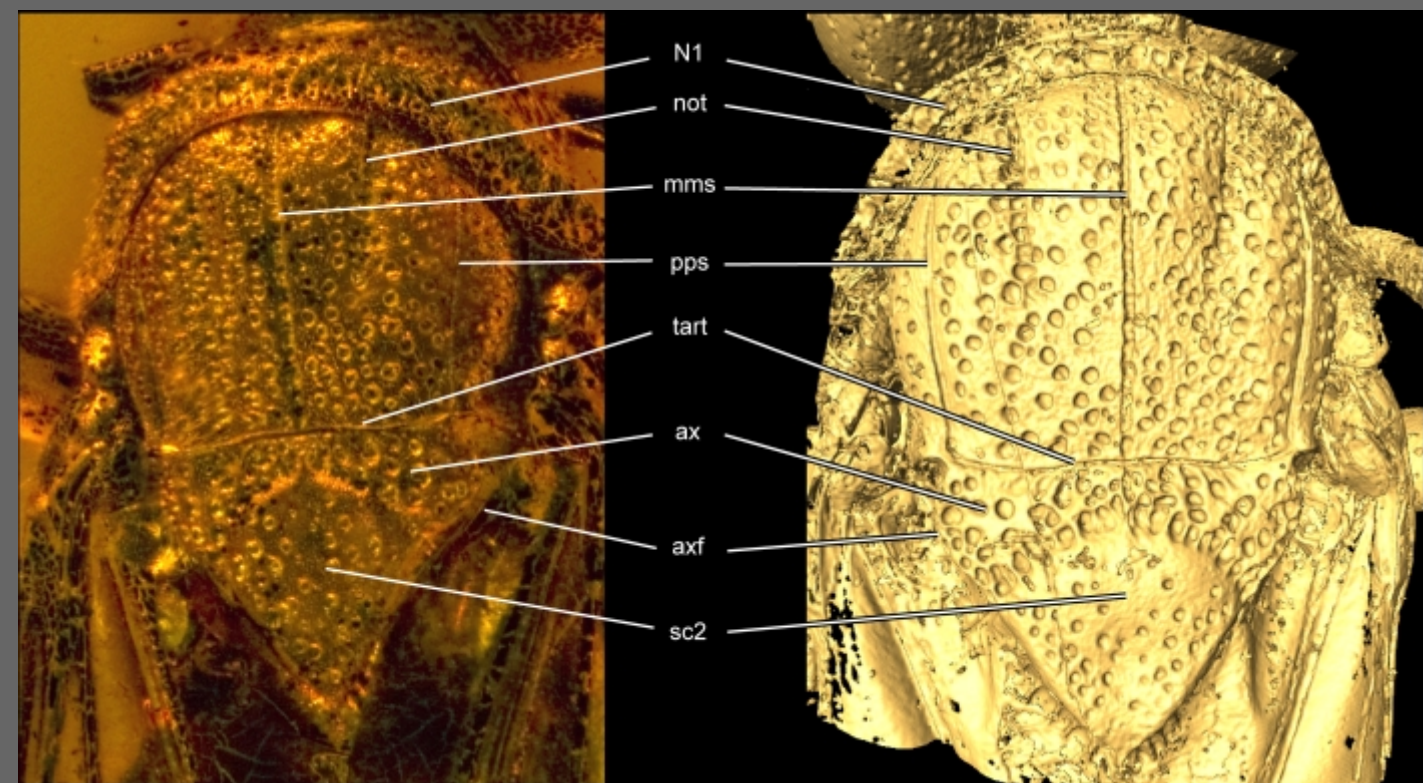


Fig. 2. *Baltorussus velteni*, mesonotum dorsal view, non-type, brightfield (a), holotype, surface rendering (b).

Abbreviations: a1 = first antennomere; axf = axillar flange; ata = anterior tentorial arms; ax = axillae; ca = carina; ce = compound eye; cer = cerebrum; cu = cupula; cus = cuspis; di = digitus; dta = dorsal tentorial arm; gfc = gonoforceps; lb = labrum; lct = lateral coronal tooth; lsep = lateral septum; md = mandible; mdt = mandibular tendon; mms = median mesoscutal sulcus; mo = median ocellus; msep = median septum; N1 = pronotum; not = notaulus; ph = pharynx; pps = parapside; ppt = prepharyngeal tube; pv = penisvalvae; prj = projection; S9 = sternum 9; sc2 = mesoscutellum; T9 = tergum 9; tb = tentorial bridge; tart = transscutal articulation; vtc = ventral transverse frontal carina.

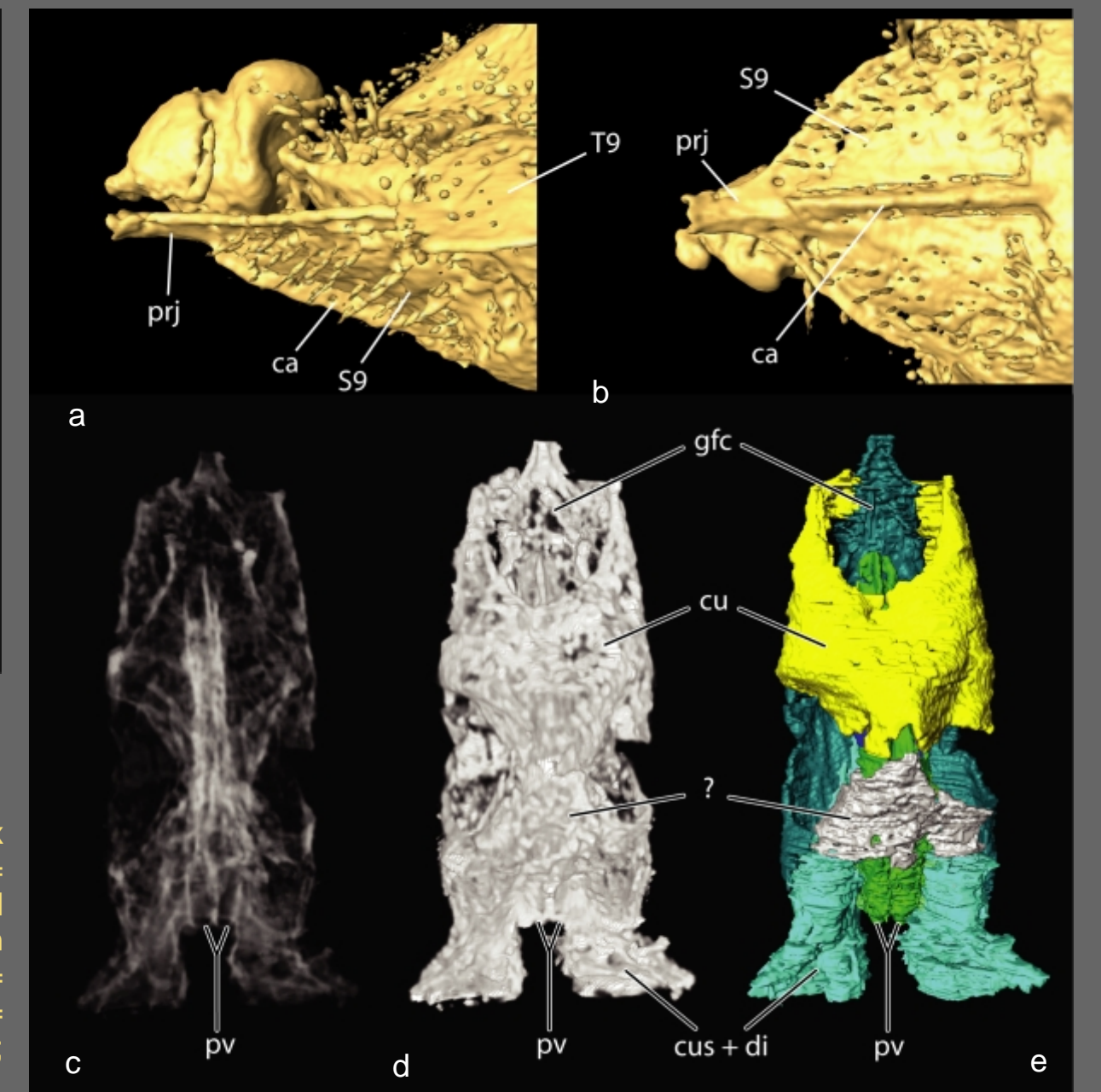


Fig. 3. *Baltorussus velteni*, holotype, male S9 lateral view (a), ventral view (b), internal genitalia dorsal view (c-e); surface rendering (a, b), volume rendering (c, d), 3D reconstruction (e).

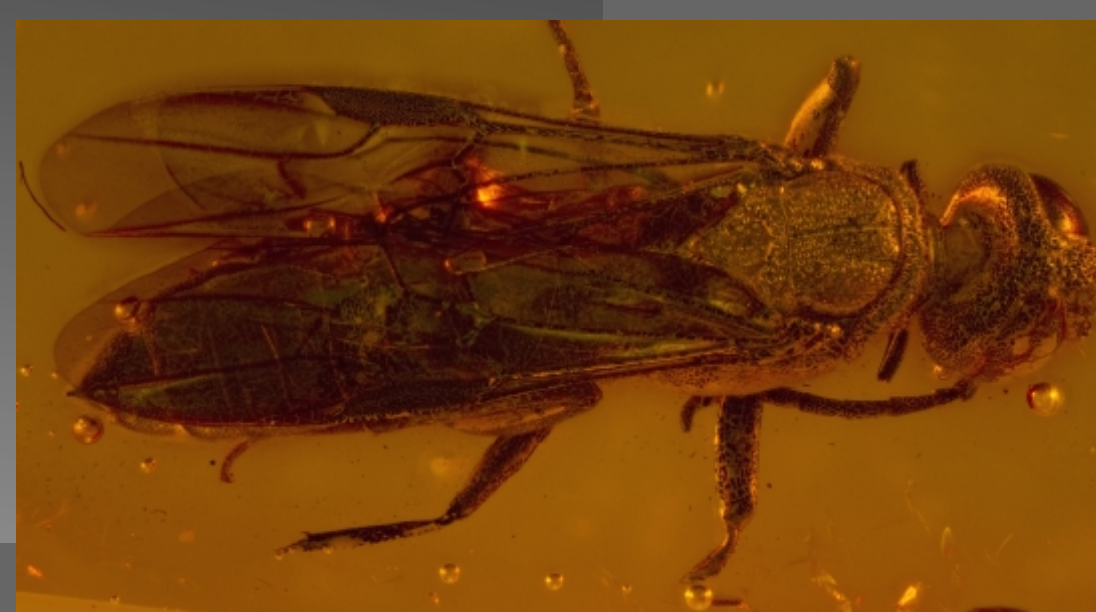
By applying micro-CT scanning to the specimen we have been able to reveal a number of details not reported in the original description. Approximately 60% of the characters for the data set assembled by Vilhelmsen (2003) for extant Orussidae could be scored, enough to confidently place *Baltorussus* within the phylogeny of the family.

Plesiomorphic features

- 1) The absence of ventral coronal teeth
- 2) Ventral transverse frontal carina not developed medially
- 3) Postocular and occipital carinae absent
- 4) Median mesoscutal sulcus extending the length of mesoscutum
- 5) Medioventral margins of hind coxa not angled
- 6) Dorsal tentorial arms fully developed

Apomorphic features

- 1) Subantennal groove present
- 2) Axillar flanges present, distinct
- 3) Lateral carina on mid coxa distinct
- 4) Pegs on hind tibia

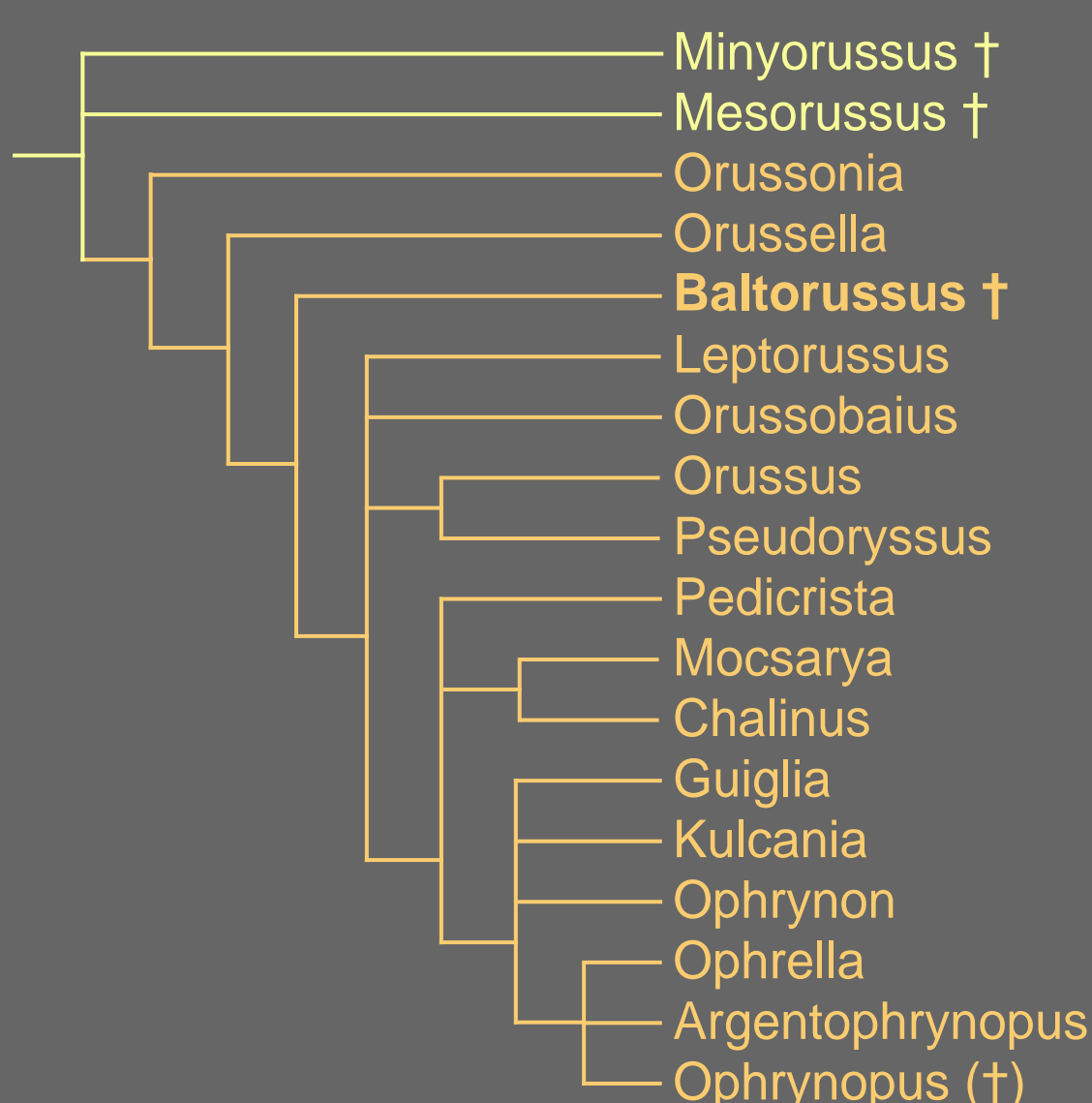


A second specimen of *Baltorussus velteni*, also a male, has been discovered this year.

Is the holotype of *Baltorussus velteni* really a female?

Closer examination reveals the specimen to differ from other female orussids in a number of ways:

- Presence of 11 antennomeres
- Distalmost antennomere not reduced in size
- Fore legs not modified as in other female Orussidae
- No functional spiracle discernible on tergum 8
- Median longitudinal structure observed on the postero-ventralmost abdominal sclerite is a carina, not an ovipositor
- Inside the posterior end of the abdomen structures present which appear to be male genitalia



Baltorussus is placed inside the extant members of the family as a separate, basal lineage being the sister to a large clade comprising all the extant genera except *Orussonia* and *Orussella*. This is in contrast with the two Cretaceous fossils *Mesorussus* and *Minyorussus*, which are stem group orussids, and *Ophrynopus peritus* from the Miocene, which is placed in an extant genus within the derived ophrynopine clade.

Phylogeny,
Age &
biogeography



The age of the basal splitting events based on the distributional history was hitherto overestimated. The radiation of crown group Orussidae is now inferred to have occurred from the mid Cretaceous (100 Mya) onwards rather than in the Early Jurassic (180 Mya) as suggested by Vilhelmsen (2004). The geographic provenance of *Baltorussus* disproves that the earliest splitting events among extant Orussidae were restricted to southern hemisphere continents.