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THE BASAL PSEUDOSCORPION FAMILY *FEAELLIDAE* ELLINGSEN, 1906 WALKS THE EARTH FOR 98.000.000 YEARS: AN NEW FOSSIL GENUS HAS BEEN FOUND IN CRETACEOUS BURMESE AMBER (PSEUDOSCORPIONES: FEAELLIDAE)

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Abstract. The fossil *Protofeaella* (gen. nov.) specimen from Cretaceous Burmese amber here described represents the most ancient species known of the Feaellidae (Pseudoscorpiones).

Samenvatting. Het fossiele *Protofeaella* (gen. nov.) exemplaar uit Birmaanse amber (Krijttijdperk) dat hier beschreven wordt vertegenwoordigt de oudst bekende soort van de familie Feaellidae (Pseudoscorpiones).

Key words. Pseudoscorpiones, *Protofeaella peetersae* gen. nov., sp.nov., Burmese amber.

INTRODUCTION

The Fealloidea ELLINGSEN, 1906 represent the most basal clade of pseudoscorpions (MURIENNE et al, 2008). It is a superfamily with two distinct families, the Feaellidae with a single genus and the Pseudogarypidae, with two. The extant and fossil genus *Feaella* (Feaellidae) is morphological very characteristic: 'cephalothorax with wide cucullus, 2 rows of protuberances, surface of body course granulated, 4 eyes, pleural plates of the cephalothorax not with wing shaped pleural plates, hinge-joint like connection between cephalothorax and abdomen, abdomen rounded, much wider than cephalothorax, abdominal pleural plates present in a dorsal and a ventral row, anus ventral positioned, embedded in the smaller anal segment and fused 10th sternite and tergite' (ELLINGSEN, 1906). Very typical are the 'monstrous' pedipalps with the very small hands and the broad coxa. The pedipalp shape and some of the other peculiarities of the Feaellidae were now recognised on a fossil in Burmese amber, wich is described here as a new species in a new genus, because of some distinguishing characteristics.

The Feaellidae are known from extant scattered populations that reflect an ancient, Gondwanan distribution (HARVEY, 1989), also a fossil species in Baltic amber has been described: *Feaella groehni* HENDERICKX, H., 2014 (HENDERICKX & BOONE, 2014).

MATERIALS AND METHODS

The holotype of the new feaellid is a fossil inclusion in a transparant, yellow piece of Burmese amber, 19 x 19 x 9 mm (Fig. 2a), from northern Myanmar. The amber sample was obtained from a reliable dealer, it's authenticity was also confirmed by the typical blue fluorescence in UV light and the presence of a co-inclusion spider of the family Psilodercidae, wich exclusively occurs in Burmese amber (WÜNDERLICH, 2012) (identified by Jan Bosselaers). Another specimen of this species was obtained from the 'BURMITEAMBERFOSSIL' company, in an egg-shaped piece of Burmese amber (24 x 14 mm). This specimen is designated as paratype. Although this paratype is only partially visible and more deformed as the holotype it shows the same characteristics.

Burmese amber has been dated on the earliest Cenomanian with a minimum age of 98.79 ± 0.62 million years (SHI et al., 2012) derives from the Hukawng Valley of the Kachin State in northern Myanmar (CRUICKSHANK & KO, 2003).

The amber piece studied here (holotype) was remodelled, polished and epoxy coated with respect for the original matrix shape conform the procedure described in HENDERICKX, CNUUDE, MASSCHAELE, DIERICK, VLASSENBOECK and VAN HOOREBEKE (2006). It was then micro-CT-scanned and virtually reconstructed in the UGENT according the improved methods described in HENDERICKX, BOSSELAERS, PAUWELS, VAN HOOREBEKE & BOONE (2013) (Fig. 2d,e). Visual observation of the pseudoscorpion was hampered by a dorsal methane bubble containing a transparent crystal (Fig. 2b,d) and partial surface darkening. A piece of a leaf, a mite and a spider (Fig. 2b) are co-inclusions. The inclusions have a slightly dehydrated appearance, typical for most inclusions in Burmese amber. The extremities (legs, pedipalps) of the feaellid inclusion are saturated with amber and can be observed well with conventional light microscopy but less with micro-CT scan. The opisthosoma is filled with crystals, and could be reconstructed with micro-CT scan. A combination of these techniques made a whole body reconstruction possible.

Optical examination and measurements have been carried out with an Olympus stereomicroscope, observations of the obscured parts are based on dynamic micro-CT scan reconstructions, macroscopic pictures were taken with a Canon EOS 5D Mark III.

All measurements are in mm; (length=L x width=W), the ratio is the length/width index of an article.

SYSTEMATICS

Systematic Paleontology

Family Feaellidae ELLINGSEN, 1906

The new species belongs to the Feaellidae, based on the characteristics 'cephalothorax much narrower than abdomen, cephalothorax and abdomen granulated, coxa of the palps

narrow, the palps of small size, hand very much reduced' (ELLINGSEN, 1906).

New genus: type species

Protofeaella HENDERICKX, gen. nov.

Type specimen

Protofeaella peetersae HENDERICKX sp. nov.
Figs. 1a,b; 2a,b,d,e

Diagnosis

The new genus can be recognised by the following unique combination of characters: Pleural membrane with 2 lateral ridges with only traces of lateral sclerotization (Fig. 2d,e), no lateral platelets as in *Feaella*. Carapace very narrow (Figs. 1a; 2b) with traces of pointed frontal tubercles, one central ridge over the complete length of the carapace (Figs. 1a; 2e). Fingers of the chela hand extremely long compared to the hand (Fig. 1a,b)

Protofeaella shares the disk shaped abdomen with divided tergites with *Feaella*, as well as the plate that surrounds the anus, moved to a ventral position, which is formed from fused tergite XI and sternite XI. It also shares with *Feaella* the unique short hand and broad pedipalpal femur.

Etymology

The new genus-group name refers to an archetype of the Feaellidae, Burmese amber contains a lot of predecessors of extant invertebrates. The species epithet is a patronym in honour of Marijke Peeters (Balen-Wezel, Belgium) for unremitting support and help with the amber and pseudoscorpion research.

New species

Protofeaella peetersae HENDERICKX sp. nov.
Figs. 1a,b; 2a,b,d,e

Specimen provenance and deposition

The holotype in Burmese amber was purchased from the AMERICAN-THAI TRADING company in February 2015 and coated by the first author with a thick layer of Araldite epoxy for conservation and better observation. After examination it is deposited in The Natural History Museum London,

Dept of Earth Sciences, catalogue number NHMII3115.

Diagnosis

As for the genus (see above).

Description

Reconstructed habitus Fig. 1a,b.

Pedipalp (Fig. 1a,b): trochanter 1.81x, femur 1.90x, tibia 3.00x, chela (with pedicel) 5.20x, hand 1.25x, fixed finger 18.5x, movable finger 17.00 times longer than broad.

No medio-dorsal femoral protuberance. Trochanter with anterior pointed projection, femur irregular outlined due to coarse granulation, with trace of low antero-basal blob, with dorso-anterial ridge.

No large chelal teeth observed, no large teeth present on the internal side of the movable finger, basal tooth (thorn) missing on both fingers. Movable finger much longer than hand slightly longer than fixed finger.

Chelicera large, details obscured.

Carapace (Fig. 1a,b) darkened, hard to observe. It is very narrow, 2.93 times longer than broad. Eyes not observable, a single dorsal medial ridge present, as well as traces of small pointed frontal protuberances.

Legs slender.

Abdomen subovate, 1.25 times as long as broad, tergite XI and sternite XI fused to a plate that surrounds the anus. Pleural membrane with 2 lateral ridges, no massive lateral platelets present. Coxa and sternites: Fig. 1b., legs: Fig. 1b.

Dimensions in mm (index between parentheses): Body length 1.64, width 0.87. Pedipalp: trochanter (not including protuberance) 0.20x0.11 (1.81), femur 0.42x0.22 (1.90), tibia 0.33x0.11 (3.00), chela (with pedicel) 0.47x0.09 (5.22), hand 0.10x0.08 (1.25), movable finger 0.34x0.02 (17.00).

Chelicera 0.08x0.02 (4.00); carapace 0.47x0.16 (2.93), eyes, cucullus and chaetotaxy not observable. Legs slender. Leg I: trochanter 0.07x0.06 (1.16), basifemur 0.12x0.06 (2.00), telofemur 0.13x0.03 (4.3), tibia 0.11x0.03 (3.66), tarsus 0.18x0.03 (6.00). Leg IV: trochanter 0.17x0.09 (1.88), basifemur 0.08x0.04 (2.00), telofemur 0.17x0.06 (2.83), tibia 0.19x0.04 (4.75), tarsus 0.25x0.04 (6.25).

Coxa of pedipalps: 0.25x0.06 (4.16); coxa of leg I: 0.12x0.07 (1.72), coxa II: 0.12x0.08 (1.50), coxa III: 0.12x0.06 (2.00), coxa IV 0.17x0.07 (2.42).

DISCUSSION

Inclusions in Burmese amber are often more or less deformed, probably due to high pressure, temperature changes or volcanic activity after the formation of the fossilized resin. JUDSON (2000) notices strong folding of trochanters and femora in *Electrobisium acutum* COCKERELL, 1917. The shape of the holotype specimen of *Protofeaella peetersae* sp. nov. in general and especially of the pedipalps seems however well preserved, the specimen is symmetrical and shows no multiple contour shapes. Also, the measurement ratios of the peculiar pedipalpal chela of the holotype (5.20x) with very long fingers are in the same range of the paratype (right: 5.00x; left: 6.00x) (Fig. 2b,c). The lacking of pleural platelets and presence of a central ridge over the narrow carapace confirms further the conspecificity of the paratype.

The paratype has irregularities in the left pedipalpal femur and tibia (two overlaying contour shapes), therefore the first specimen was chosen as holotype.

BIOLOGY

The biology of the new species is unknown. The presence in amber (fossilised tree resin) suggests a tree bark biotope more than a soil or litter habitat (both habitats are possible for Feaellidae, see HENDERICKX, 2009 and HEURTAULT-ROSSI & JEZEQUEL, 1965).

The slender fingers and large chelicera suggest specialised feeding.

DISTRIBUTION

Only known from Cretaceous Burmese amber from northern Myanmar.

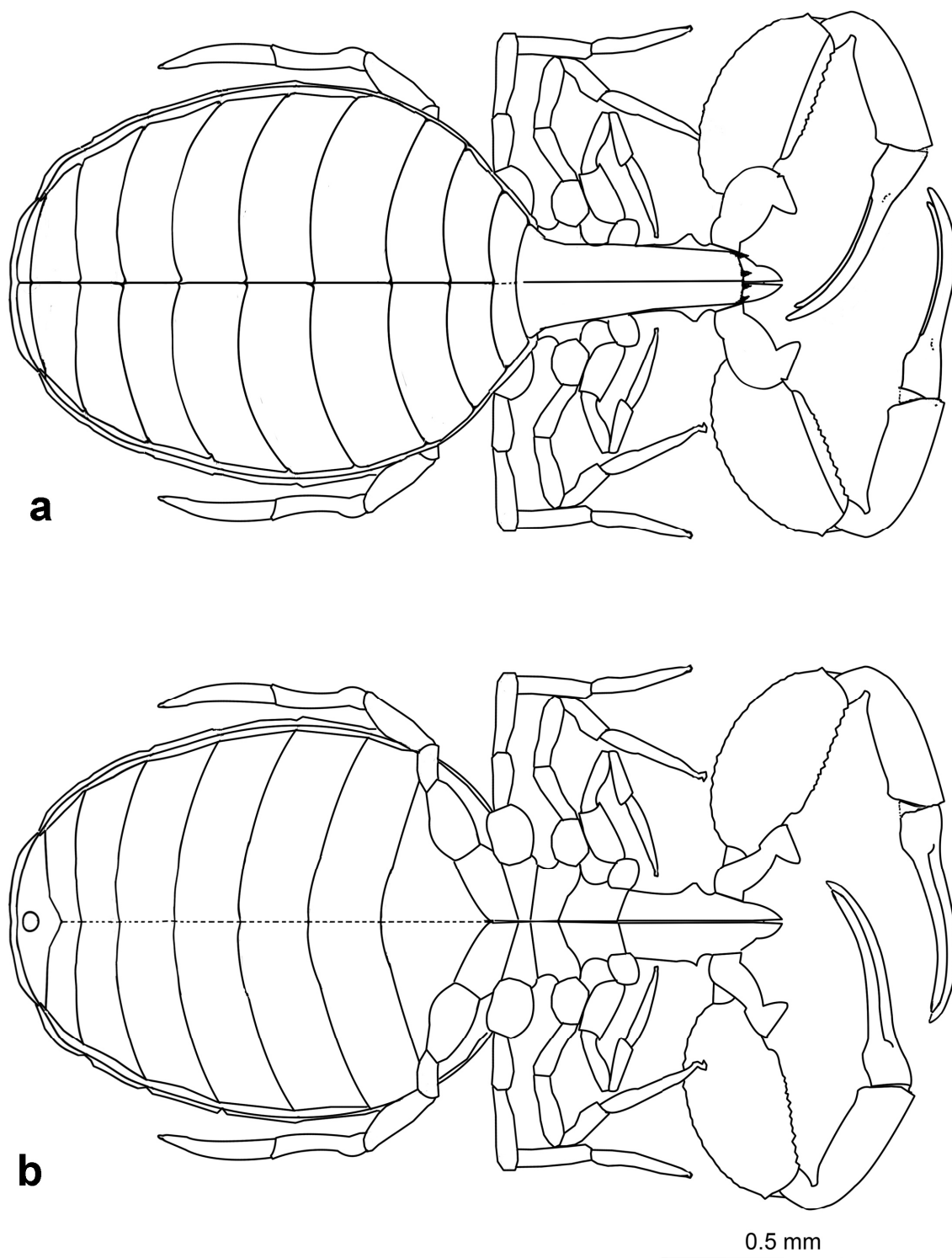


Fig. 1. *Protofeaella peetersae* sp.nov., holotypus: a: habitus dorsal; b: habitus ventral.

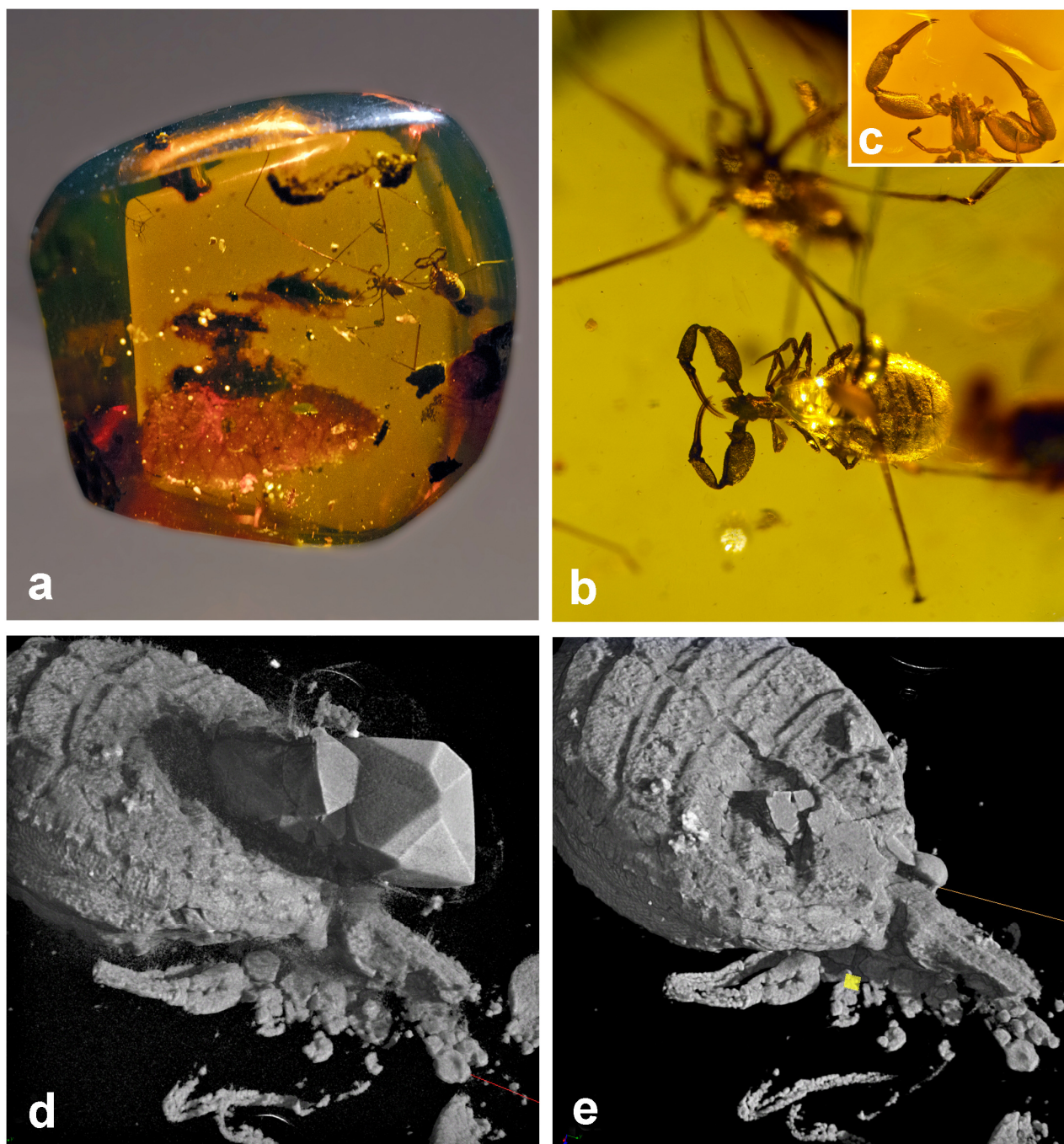


Fig. 2. *Protofeaella peetersae* sp.nov., Fig 2a,b,d,e: **holotypus** :

a: in amber matrix,

b: dorsal view with co-inclusion Psilodercidae;

d: micro-CT scan reconstruction, dorsal view with crystal,

e: micro-CT scan reconstruction, dorsal, crystal omitted in the reconstruction.

c: **paratypus**, ventral view of pedipalps.

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