Aquatic Insects, Vol. 15 (1993), No. 3, pp. 159-167 0165-0424/93/1503-0159$25.00

A New Genus and Species of Leptophlebiid Mayfly (Ephemeroptera: Leptophlebiidae: Atalophlebiinae) from Tropical Australia

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A new monotypic genus, *Kalbaybaria* gen. n. (Ephemeroptera: Leptophlebiidae: Atalophlebiinae), and species, *Kalbaybaria doantrangae* sp. n., are described from tropical streams in northern Queensland, Australia. The genus is unusual among the Atalophlebiinae in that the nymphs possess large mandibular jaws, a feature previously known only from the subfamily Leptophlebiinae.

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INTRODUCTION

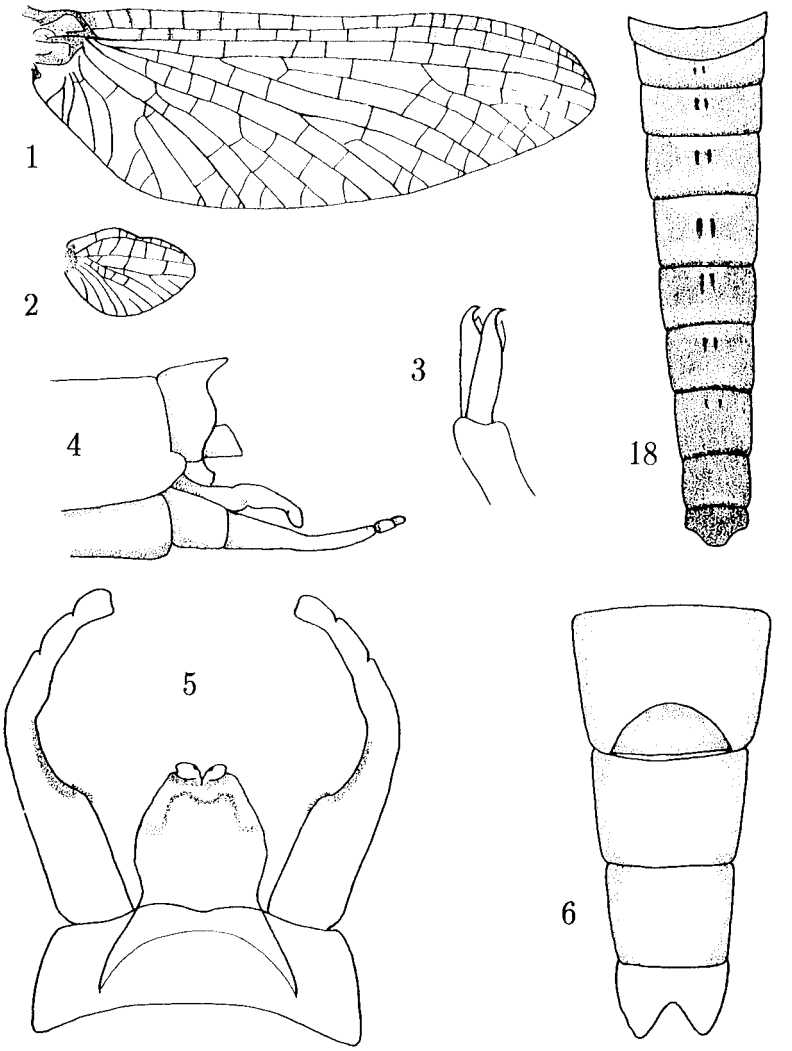
The insect fauna of tropical Australia is still comparatively poorly known. Most of the studies carried out on Australian mayflies have been restricted to southern Australia (e.g. Tillyard 1933, Harker 1954, Suter 1986, Dean 1987, 1988, Campbell and Suter 1988) and, although Ulmer (1916) published descriptions of several tropical Australian species, and there have been several recent papers on tropical Australian mayflies (e.g. Skedros and Polhemus, 1986, Campbell and Peters, in press) there are many genera and species still to be described from this region. This contribution describes an unusual new monotypic genus of leptophlebiid mayfly which occurs in the rainforest streams of northeastern Australia.

METHODS

Material was prepared by the methods of Edmunds *et al.* (1976), and illustrations were prepared either with the aid of a drawing tube attached to a stereomicroscope, or with a microprojector. Morphological terms and conventions are consistent with those used by Towns and Peters (1978). All types are preserved in alcohol with wings, genitalia, legs and nymphal mouthparts of some of the series mounted on slides. Unless indicated otherwise all material was collected by I. Campbell. Nymphs were associated with adults by rearing. Types have been lodged at the Museum of Victoria (NMV) and the Australian National Insect Collection (ANIC).

Kalbaybaria gen. n.

Imago. Eyes of ♂ meeting on meson, portions distinct with lower *ca* 0.6 x diameter of upper. Forewings (Fig. 1) width *ca* 0.35 x length, with vein Rs forked at *ca* 0.3 distance from base to margin, vein MA forked symmetrically at *ca* 0.6 distance from base to margin, vein MP not forked, MP_2 attached by crossvein to MP_1 at *ca* 0.25 distance from base to margin, vein ICu_1 linked to vein CuA by



Figs. 1-6 and 18. *Kalbaybaria doantrangae*, imago: 1. forewing; 2. hindwing; 3. tarsal claw; 4. ♂ genitalia, lateral view; 5. ♂ genitalia, ventral view; 6. ♀ sternites VII-X; 18. pattern on abdominal tergites.

crossvein, vein ICu_1 linked to vein ICu_2 which may have up to 2 veins to the wing margin. Crossveins in costal space usually simple, those in basal third shaded. Hindwings (Fig. 2) length *ca* 0.25 forewings length, with apex acute, rounded, costal margin convex, with apex of convexity 0.3 distance from base to apex, vein Sc *ca* 0.9 x length of wing. Forelegs of ♀ with ratios of segment lengths 0.8 : 1.0 (2.6 mm): 0.06 : 0.3 : 0.3 : 0.3 : 0.15, tarsal claws (Fig. 3) of a pair alike, both hooked with an opposing flange. Male genitalia (Figs 4-5) with penes fused, broadly flattened forming slight medial hook ventrally, and with a pair of apical tubercles. Forceps 3 segmented, basal segment *ca* 5 x length of segment 2, segment 3 *ca* 0.75 x length of segment 2. Width of styliger plate *ca* 3 x length. Sternum VII of ♀ (Fig. 6) with rounded projecting egg guide. Terminal filament and cerci long, delicate, similar length.

Nymph. (Fig. 7). Head prognathous, antennae *ca* 2 x head length. Mouthparts:

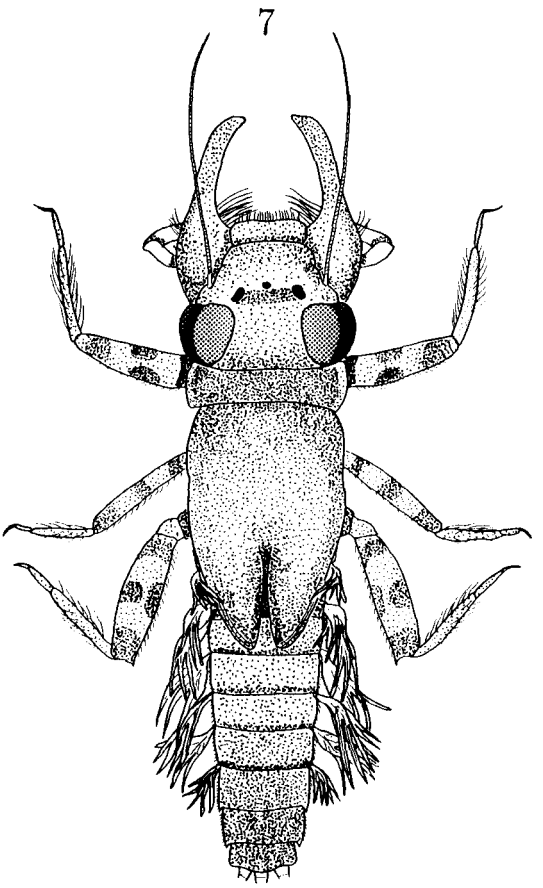


Fig. 7. *Kalbaybaria doantrangae*, nymph.

labrum (Fig. 8) narrower than clypeus, lateral margins slightly divergent, anterior margin straight, denticles absent; mandibles (Figs 9-10) greatly enlarged with flattened spathulate jaws projecting anteriorly, multi-dentate outer canines, those on the right mandible with broad denticles posteriorly, prosthecal spine of left mandible enlarged, flattened, multidentate, prosthecal spine of right mandible spinose; lingua of hypopharynx (Fig. 11) with well developed lateral processes, superlingua with dense row of hair along apical margin, lateral processes blunt; maxillae (Fig. 12) with apical half of galea-lacinea expanded medially, sub-apical pectinate setae absent but with a field of hairs and bristles medioapically; maxillary palps long, *ca* 0.9 x headwidth, clearly visible in dorsal view (Fig. 7), length of segment 2 0.9 x segment 1, length of segment 3 0.9 x segment 2, segment 3 bearing comb of spines medially and dense long hair; labial palpi (Fig. 13) with segments 2 and 3 extremely hairy and segment 3 with numerous stubby spines distally, segment 2 forming a right-angle bend, segment 3 elongated, longer than segments 1 and 2 combined, glossae curved over ventrally, submentum with well developed marginal setae. Hair absent from lateral margins of abdominal segments. Legs (Figs 14-15) with long tarsal claws bearing 7-8 denticles. Abdominal gills (Fig. 16) on segments I-VII alike, each with a pair of similar tridigitate lamellae, with prominent tracheation, lamellae increasing in size from I-III then decreasing in size posteriorly. Posterolateral spines present on segments VIII-IX, increasing in size posteriorly. Terminal filament longer than the cerci.

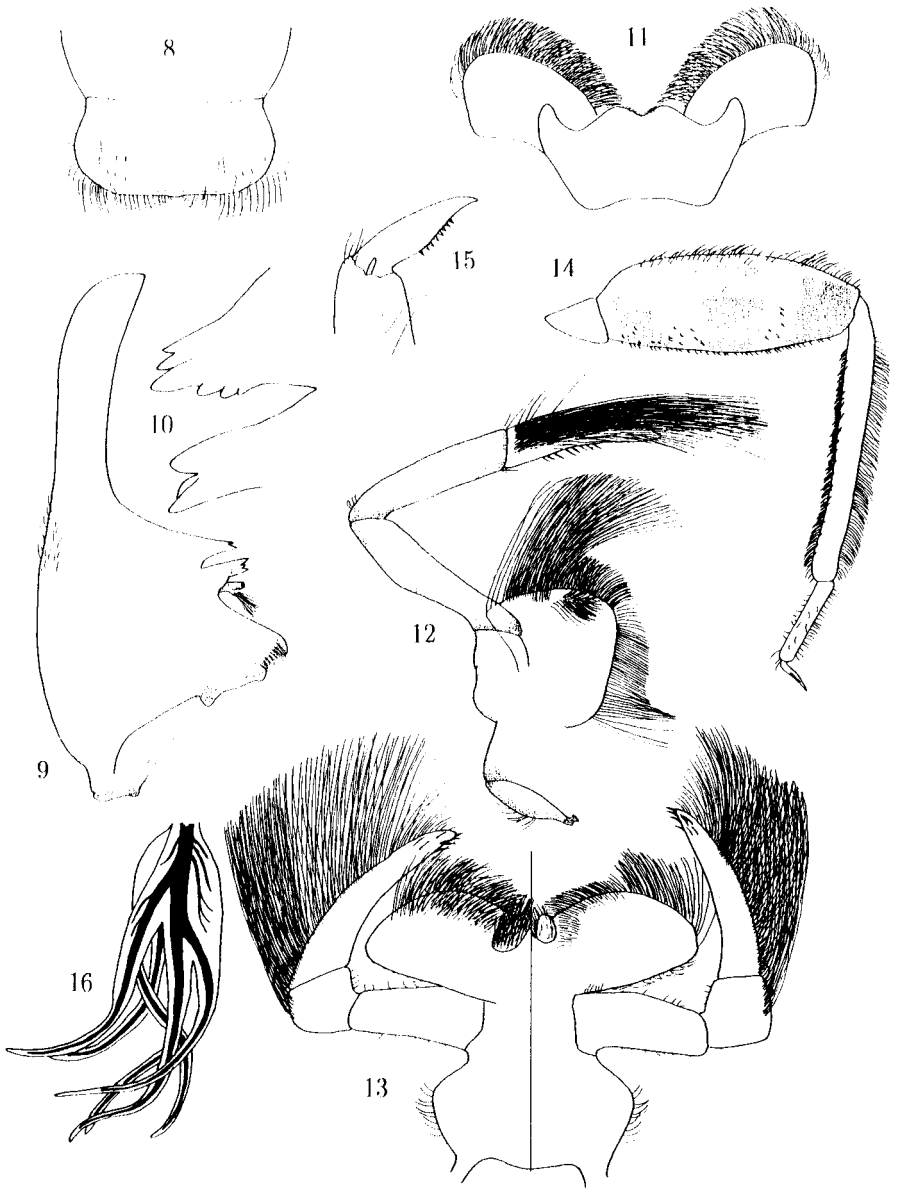
Egg. (Fig. 17). Ovoid, *ca* 160 μm x 110 μm, chorion finely sculptured with several micropyles.

Etymology. Named for the form of the nymphal mandibles from "kalbay", long, "bari", jaw, in the language of the Kuku-Yalanji people of the Bloomfield River area (Hershberger and Hershberger, 1982), whose tribal lands contain the type locality of the type species; feminine.

Type Species: Kalbaybaria doantrangae sp. n.

Comments

The genus *Kalbaybaria* appears to belong to the *Hapsiphlebia — Zephlebia cruentata* lineage as delineated by Peters and others (Towns and Peters, 1980, Pescador and Peters, 1980). The other Australian genera placed in the lineage include *Atalomicria* Harker, *Jappa* Harker, *Atalophlebia* Eaton and *Ulmerophlebia* Demoulin (Pescador and Peters, 1980). *Kalbaybaria* shares the following character states with the lineage: labrum narrower than clypeus, labrum with sides subparallel, mandibles with straight outer margin, right mandible with outer incisor with broad denticles on the inner margin. However, *Kalbaybaria* lacks setae laterally fringing the abdomen. It appears to share a number of characters with several Australian species of *Atalophlebia*, including the form of the nym-



Figs. 8-16. *Kalbaybaria doantrangae*, nymph. 8-13 mouthparts: 8. labrum; 9. left mandible; 10. enlargement of canine area of right mandible; 11. hypopharynx; 12. left maxilla; 13. Dorsal (left) and ventral (right) views of labium. 14. foreleg; 15. tarsal claw; 16. Gills III.

phal gills which are similar to the gills of the *Atalophlebia* australis Tillyard, and the shape of the penes which appear generally similar to *A. albiterminata* Tillyard.

Kalbaybaria may be distinguished form the other Australian genera in the Hapsiphlebia lineage by the following combination of characters. In the imago: (1) vein MP_2 of forewings attached by a crossvein to vein MP_1 at *ca* 0.25 x distance from base to margin (Fig. 1), (2) costal margin of hindwings with apex of convexity at *ca* 0.3 x distance from base to apex (Fig. 2), (3) vein Sc in hindwings *ca* 0.9 x length of wings, (4) tarsal claws alike, hooked with opposing flange (Fig. 3), (5) penes of ♂ fused, broad with shallow medial hook ventrally and apical tubercle on each (Fig. 5). In the nymph: (1) clypeus wider than labrum (Fig. 8), (2) glossae of labium curved over ventrally (Fig. 13), (3) labial palpi with length of segment 3 equal to or longer than that of segments 1 and 2 combined (Fig. 13), (4) total length of maxillary palpi *ca* 0.9 x headwidth (Fig. 12), (5) mandibles extended anteriorly forming large spathulate jaws (Figs 7 and 9), (6) tarsal claws with 7-8 denticles (Fig. 15).

Kalbaybaria doantrangae sp. n.

Material Examined: North Queensland. Annan River near Helenvale, 15°43'S 145°13'E, 3V'88 holotype ♂ imago, ♂ subimago; 5V'88 allotype ♀ imago; 30XI'89, 20 nymphs (NMV). Romeo Creek upstream of Annan River; 8V'82, 5 nymphs, coll. R. Pearson; 13IV'88 ♂ imago, 2 ♀ imagines (NMV), 15V'88 2 ♂ imagines, 3 ♀ imagines, 1 ♀ subimago; undated ♂ imago, ♀ imago (ANIC). Palmer River, 20VI'71, 2 ♂ imagines, 26 nymphs, coll. E.F. Riek (ANIC). Millstream Falls west of Ravenshoe, 25VI'71, 11 nymphs, coll. E.F. Riek (ANIC).

Male Imago. Eyes: upper lobe light brown, lower lobe dark grey. Body length 8 mm. Pro- and meso-thorax dark brown with pale furrows; each sternite black anteriorly shading to brown posteriorly. Forewings (Fig. 1) length 7-9 mm, width 2-3.5 mm, generally hyaline, veins dark brown, pterostigma grey, cross veins in basal third of costal and subcostal spaces shaded dark brown with shading increasing basally. Hindwings (Fig. 2) length 2.1 mm, width 1.4 mm, entirely hyaline. Forelegs: yellow with three dark bands on the femur, one proximally, one distally and one at midlength, tibial length 2.3-2.9 mm, tarsal claws (Fig. 3) with 7-8 denticles. Abdomen (Fig. 18) dark brown with a pattern of two parallel elongate medial patches noticeable on tergites I-VII. Genitalia (Figs 4-5) dark brown, penes fused, broad, forceps 3 segmented. Cerci and caudal filament long, subequal, pale with dark bands at the segment junctions, alternating between narrow and broad bands, the broad bands becoming broader distally.

Female Imago. As for ♂, except that eyes in meson of head separated by 5 x diameter, abdominal sternite VII (Fig. 6) with a raised egg guide.

Nymph. (Fig. 7). General colour brown, no conspicuous colour pattern. Mouthparts: labrum (Fig. 8) width 2.1 x length; mandibles produced anteriorly to

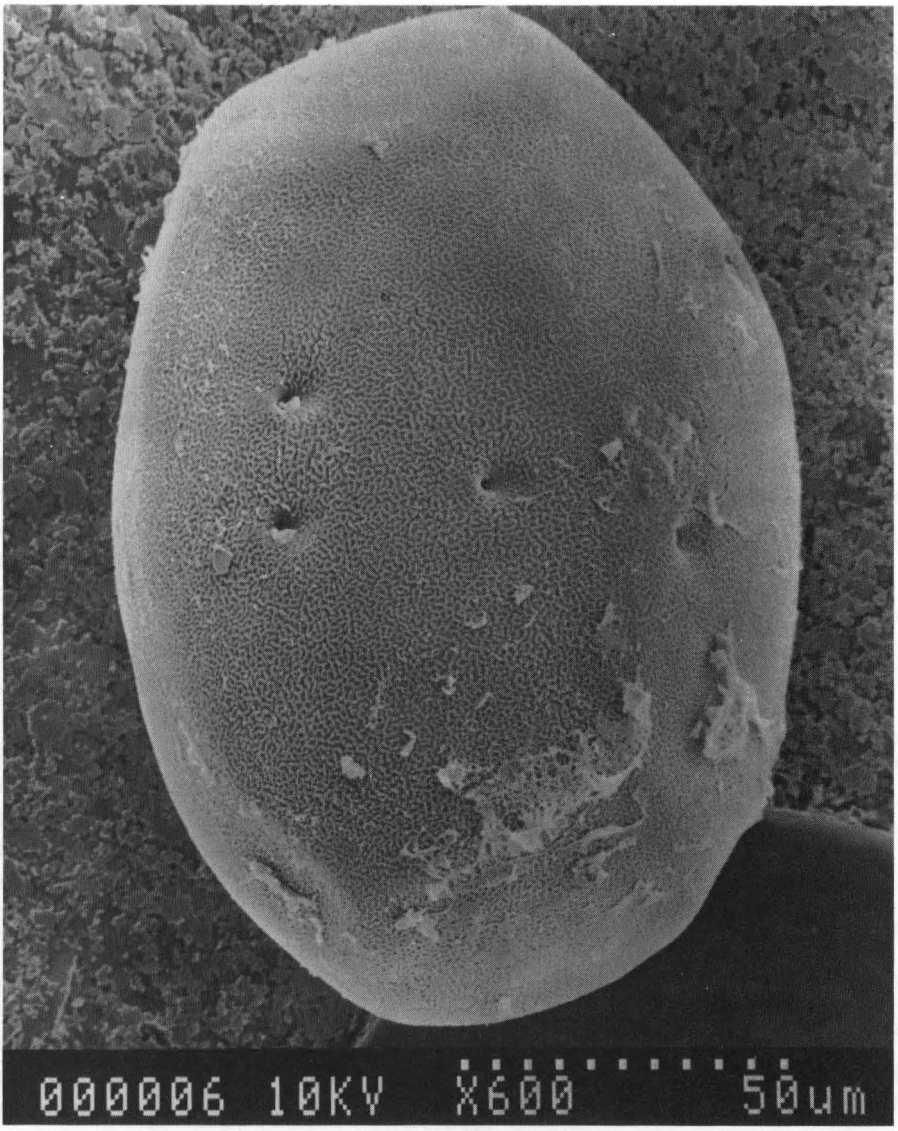


Fig. 17. *Kalbaybaria doantrangae*, SEM micrograph of egg.

form spathulate jaws (Figs 7 and 9), left mandible with three blunt denticles on posterior margin of outer incisor (Fig. 10); maxillae (Fig. 12) with galea-lacinea bearing a field of setae near anterior margin projecting posteromedially, pectinate setae absent, palpi total length *ca* 0.9 x headwidth, with segment lengths in the ratio 1.2 : 1 : 1; labial palpi (Fig. 13) with segment lengths in the ratio 1 : 0.5

: 1.5. Pronotum short (Fig. 7) width *ca* 4.5 x length. Legs with three dark bands on femur (Figs 7 and 14), tarsal claws (Fig. 15) with minute serrations, becoming more widely spaced distally. Gills (Fig. 16) grey, with both lamellae tridigitate, tracheation black and conspicuous. Abdomen with posterolateral spines on segments VII-IX, tergites IV-VI slightly paler colour than the others, terminal filament slightly longer than cerci, all three brown with a narrow dark band at the junction of each fourth segment on the cerci, and each second segment on the terminal filament.

Egg. As in Fig. 17. Strikingly similar to the egg of the oniscigastrid genus *Tasmanophlebia* (Peters and Campbell, 1991).

Etymology. Named for Doan Trang Nguyen.

Comments. Although the species was collected at the Millstream Falls and at the Palmer River, presumably at the Cooktown Road crossing, by Dr E. F. Riek in 1971, I was unable to collect any specimens at Millstream Falls on numerous visits in 1988, and collected only one small nymph at Palmer River after seven attempts. The sites on the Annan River and at Romeo Creek where I found the species to be quite abundant were both rainforest sites. The nymphs were collected in organic debris trapped amongst stones in fast riffle sections of the streams. It is possible that the nymphs collected by Riek had been washed down from rainforest sites upstream of his two collection sites. In the case of Millstream Falls the stream has apparently been significantly affected by catchment clearance and Salvinia molesta infestations since Riek collected there, so it is also possible that the changed conditions may have eliminated the species at the site. This does not appear to be the case for the Palmer River site where the river is a broad sandy stream flowing through semi-arid woodland. Fully grown nymphs collected by Riek were generally larger than fully grown nymphs at the Annan River and Romeo Creek, but similar in every other respect.

The nymphal mouthparts are unusual, and as far as I am aware are unique in the subfamily Atalophlebiinae. Enlarged nymphal mandibular jaws are not unusual in the Ephemeroptera. Within the Leptophlebiidae several species of the subfamily Leptophlebiinae, most notably species of *Paraleptophlebia* Lestage, do possess similar structures (Edmunds *et al.* 1976). In the case of *Kalbaybaria*, the flattened form of the mandibular jaws and the presence of the nymphs amongst leaf packs in the stream suggest that the jaws may be used as wedges to allow the nymphs to push between adhering leaves. A cursory examination of the gut contents of several nymphs indicated that they were detrital feeders, so the jaws do not appear to be used for the capture of prey.

ACKNOWLEDGEMENTS

The material collected by me was collected while on study leave at the Zoology Department, James Cook University. I am extremely grateful to Prof. Rhonda Jones, the Head of the Department, for use of departmental facilities. I am especially grateful to Dr Richard Pearson of that department, who pointed me towards the sites on the Annan River and Romeo Creek. I am also grateful to Ms Leanne Sommer who located the dictionary of the Kuku-Yalanji people and Ms Gunta Jaudzems took the scanning electron micrograph of the egg.

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