

# The first species described from Cape York amber, Australia: *Chaetogonopteron bethnorrissae* n.sp. (Diptera: Dolichopodidae)

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**Abstract:** Amber has been found along Coral Sea beaches on northern Cape York Peninsula, Australia. The geological source and age of this amber remains unknown. Both Cape York and Baltic amber are distinguished by having their major occurrence as pieces found washed up on beaches. Cape York amber has many biological inclusions and *Chaetogonopteron bethnorrissae* (Diptera: Dolichopodidae) is newly described from an inclusion found at Temple Bay, Queensland. *Chaetogonopteron* is a large extant Old World genus, which also occurs in Australia. The genus probably arrived in Australia from the north as the Australian Plate drifted northward during the Tertiary period, suggesting a maximum early Tertiary age for the amber.

**Key words:** Diptera, Dolichopodidae, *Chaetogonopteron*, Cape York amber, Australia.

**Santrauka:** Gintarų rasta Koralų jūros pakrantėse (Coral See) šiauriniame Keip Jorko (Cape York), pusiasalyje, Australijoje. Šių gintarų geologinė kilmė ir amžius kol kas nežinomi. Tiek Keip Jorko tiek ir Baltijos gintarų gabalų daugiausia randama jūros pakrantėse. Keip Jorko gintare yra gausu biologinių inkluzijų. *Chaetogonopteron bethnorrissae* (Diptera: Dolichopodidae) yra naujai aprašoma rūšis iš Temple Bay įlankoje, Kvinslende (Queensland), rasto inkluzio. *Chaetogonopteron* – didžiulė dabar gyvenanti Senojo Pasaulio gentis, kuri taip pat aptinkama ir Australijoje. Ši gentis tikriausiai Australiją pasiekė iš šiaurės, kada Australijos plokštė dreifavo į šiaurę terciaro periode. Todėl šis gintaras gali būti vėliausias iš ankstyvojo terciaro laikotarpio.

**Raktiniai žodžiai:** Diptera, Dolichopodidae, *Chaetogonopteron*, Keip Jorko gintaras, Australija.

## Introduction

Until recently, Australia was not known to have amber deposits, apart from small amounts associated with Tertiary coal in the state of Victoria. However, since 2003, pieces of amber have been found along the high-tide mark on the eastern or Coral Sea shoreline of northern Cape York Peninsula, from Cape Grenville to Temple Bay (Fig. 1). This area is remote wild country and can only readily be reached by boat, which may account for its rather late discovery (Figs 2, 3).

Hundreds of pieces have been collected, ranging from a few millimetres to almost 200 mm in diameter, and with colour from pale yellow to an opaque deep brown and dark red (Figs 4, 5, 6). COLCHESTER et al. (2006) subjected samples of the fossilized Cape York resin to standard mineralogical testing, including FTIR and gas-chromatography mass spectrometry. Specimens were found to represent both copal and true amber resin. They also showed the Cape York resins to be broadly similar to Baltic amber and Kauri gum (copal)

but sufficiently different in finer detail to have their own distinctive signature. The botanical origin of the Cape York amber is yet to be determined. However, the similarity of its mineralogical signature to that of New Zealand kauri copal suggests it also is derived from an *Agathis* species, of which there are four extant species in Queensland.

The geological source of the amber has not been discovered. However, amber pieces are possibly washed down creeks to the coast during monsoonal rains, and then redeposited and/or carried alongshore by currents. Therefore, Cape York amber joins Baltic amber as being the second major occurrence where most pieces have been found as flotsam on beaches.

Some 300 arthropod inclusions have been found so far in Cape York amber. These include ants, spiders, wasps, beetles, flies, termites, flies, mites, and other taxa. As well, there is abundant plant material, including pollen and blossom fragments. This should allow a reconstruction of the vegetation, especially to deter-



**Fig. 1:** Map, Cape York Peninsula, Australia. Arrow indicates location of Temple and Weymouth bays.



**Fig. 2:** Cape York amber site, Weymouth Bay, Queensland (photo B. NORRIS).

mine if similar biotopes still exist in Australia. This paper describes the first insect species, a fly, from Cape York amber.

## Methods

The position of features on elongate structures such as leg segments is given as a fraction of the total length, starting from the base. The relative lengths of the podomeres should be regarded as representative ratios and not measurements. The ratios for each leg are given with the following formula and punctuation: trochanter + femur; tibia; tarsomere 1/ 2/ 3/ 4/ 5. The following abbreviations and terms are used: MSSC – Male secondary sexual character(s), non-genital characters found only on the male body; I, II, III: pro-, meso-, metathoracic legs.

## Taxonomy

### Genus *Chaetogonopteron* DE MEIJERE

*Chaetogonopteron* is a diverse genus found only in the Old World Afrotropical, Oriental, and Australasian regions. Although most species occur in the moist tropics, species are known from more arid, higher latitudes, such as central Algeria and the Canary Islands in Africa, and southern Australia. Some 69 species have been referred to the genus (YANG et al. 2006), but the fauna is certainly much larger, and most species are undescribed. Samples I have seen from montane tropical forests of New Guinea, the Philippines and Borneo indicate rich endemic *Chaetogonopteron* faunas, and one must assume most species have not yet been collected.



**Fig. 3:** Cape York amber site, Weymouth Bay, Queensland; note abundance of washed up pumice (photo B. NORRIS).



*Chaetogonopteron* is a member of the subfamily Sympycninae (Diptera: Dolichopodidae). It is separated from other members of the subfamily (see MEUFFELS & GROOTAERT 1997) by two related synapomorphies found on leg III:

a) leg III tarsomere 1 is shorter than tarsomere 2 (both sexes); in other genera of the Sympycninae, leg III tarsomere 1 is usually longer than tarsomere 2.

b) Male leg III tarsomere 2 has an elongate projection, known as a „clidium“ or vermiform appendage. The clidium is a male secondary sexual character and often has diagnostic species characters, primarily its length, shape (if bent, branched, etc.) and setation (modified setae are often present). Possibly the clidium has some function in species recognition during mating. Females lack this structure.

The new species described below is clearly a member of *Chaetogonopteron*. It has a well-developed clidium, and all the other characters are in accord with extant members of the genus.

#### *Chaetogonopteron bethnorrissae* n.sp. (Figs 7, 8)

**Type material:** Holotype, ♂, Australia: Queensland, Cape York Peninsula, Temple Bay, in amber piece collected on beach, B. NORRIS & D. WICKS (Queensland Museum, QMF53558).

**Etymology:** This species is named in honor of Beth NORRIS. Without her persistence, both in collecting the remote beaches of Cape York Peninsula and carefully sorting her finds, this remarkable Australian amber and its biota would remain unknown.

**Description:** ♂: length: 2.6 mm; wing: 2.2 x 0.8 mm.

Head: head setae black; strong verticals, strong diverging ocellars present; face narrowed to small silvery triangle beneath antennae and eyes joined along face; palp yellowish, short, rounded; antenna yellowish; first flagellomere short subtriangular; arista dorsal, slightly shorter than head height.

Thorax: mostly dark metallic color; setae black; acrostichal setae short, apparently biseriata; 5 strong dorsocentral present; 1 postalar, 2 supra-alar (anterior weak), 1 humeral, and 2 notopleural setae visible; strong median scutellar seta present, lateral scutellars apparently absent.

Legs: coxae and remainder of legs mostly brown; leg I: 2.9; 2.6; 2.2/ 1.2/ 1.0/ 0.6/ 0.6; femur and tibia I and TI without major setae; tarsus I unmodified; leg II: 3.9; 5.1; 2.5/ 1.3/ 1.1/ 0.5/ 0.3; femur II with short anterior preapical seta; tibia II with offset ad-pd setal pair near 1/6, pd seta at 1/3 and 3/5, av seta at 1/4, and with apical, ad and pd seta; leg III: 4.1; 5.0; 0.3/ 0.4/ 1.4/ 0.5/ 0.3;



**Fig. 4:** Cape York amber in place along strandline, with pumice and flotsam (photo B. NORRIS).

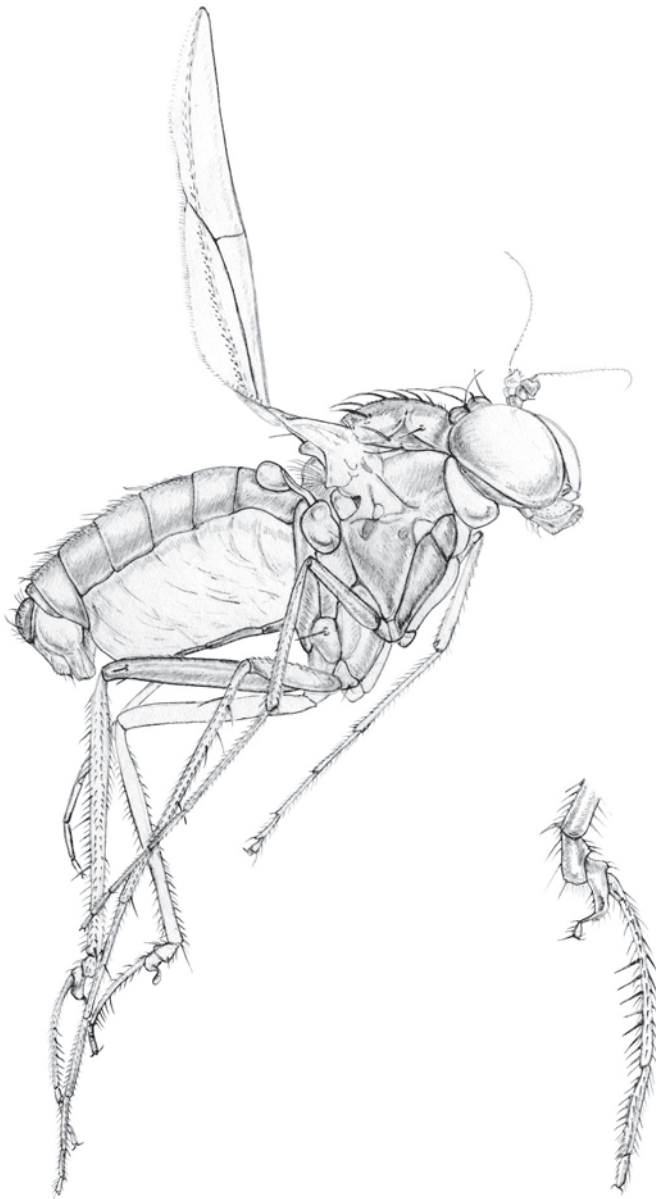
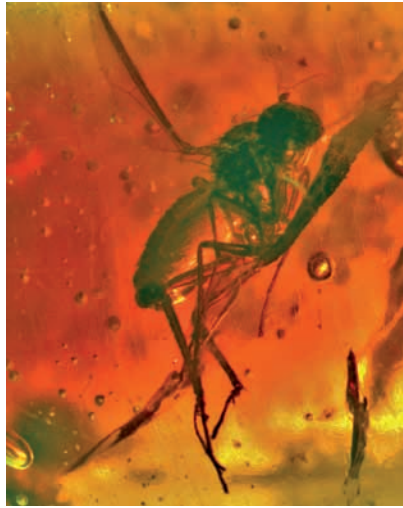


**Fig. 5:** Field collection, Cape York amber pieces (photo B. NORRIS).



**Fig. 6:** Assorted Cape York amber pieces (photo B. NORRIS).

**Fig. 7:** *Chaetogonopteron bethnorrissae*, photo of amber inclusion.



**Fig. 8:** *Chaetogonopteron bethnorrissae*, a). ♂ habitus, right lateral; b). ♂ tarsus III, posterior (Scale for tarsus = 1.0 mm).

femur III with short anterior preapical seta; tibia III with ad seta at 1/5 and 3/4, with 4-5 dorsal setae, and pd seta at 3/4 and subapically; leg III tarsomere 2 with bent clidium bearing short setae as figured (Fig. 8b); leg III tarsomere 3 with ventral row of 8-9 short erect setae along distal two-thirds.

Wing: hyaline; vein M with slight flexion just beyond crossvein dm-cu; veins  $R_{4+5}$  and M slightly diverging distally, and M ending at apex; CuAx ratio (length of dm-cu crossvein/ length distal section CuA): about 1.1; halter yellowish.

Abdomen: terga and stern apparently dark brown or metallic colored; hypopygium yellow except surstyli dark brown hypopygial foramen left lateral; surstyli rather short; cercus short and rounded.

♀: unknown.

**Remarks:** *Chaetogonopteron bethnorrissae* is represented by a well preserved and clearly visible male inclusion in a piece of Cape York amber. All diagnostic characters for species identification are visible. The important characters for placing it within a possible species group among extant species are: acrostichal setae biseriate, legs I and II without major modified male setae, and clidium simple, curved and without modified setae.

## Discussion

I have isolated 21 extant Australian species of *Chaetogonopteron* (of which only three are described) from major Australian collections. Most species are confined to the Australian tropics, the monsoonal North and the upland rainforests of northeastern Queensland, although three species occur in New South Wales subtropical rainforest. As well, two species have become adapted to semi-arid habitats and are found across much of the Australian interior.

Australia was part of the southern Gondwana „supercontinent“ prior to the Cretaceous period, but by the end of the Cretaceous, continental components rifted apart. As Australia drifted northwards during the Tertiary Period, biotic dispersal from Oriental/Papuan sources would have increased through time. This group of Australian biota has been defined as the „Asia Tertiary“ (MAIN 1981). Characteristically, Asia Tertiary taxa have strong links with extralimital Old World tropical groups, have radiated in northern tropical Australia, and/or show a marked decrease in species richness southwards. These northern elements often have penetrated southward along the eastern Australian ranges, but mostly in association with tropical and subtropical rainforests (BICKEL 1994).



*Chaetogonopteron* should be regarded as an „Asia Tertiary“ element in the Australian fauna, where it is primarily northern in distribution, although it has been on the continent long enough for some species to radiate into arid Australian habitats. Therefore, Cape York amber must have formed after the arrival of Oriental/Papuan terrestrial invertebrates in Australia, suggesting that it has a maximum early Tertiary (Oligocene) age.

## Zusammenfassung

Vor wenigen Jahren wurden die ersten Bernsteinfunde an Stränden der nordöstlichen Cape York Halbinsel (nordöstliches Australien) gemacht, wobei die geologische Herkunft und auch das Alter des Bernstein bislang nicht erforscht sind. Aus Cape York Bernstein der Temple Bay (Queensland), der reich an biologischen Inkluden ist, wird als erste Insektenart *Chaetogonopteron bethnorrisae* (Diptera: Dolichopodidae) neu beschrieben. *Chaetogonopteron* ist eine große rezente Gattung der Alten Welt, die Australien wahrscheinlich vom Norden her besiedelt hat, als sich die Australische Platte während des Tertiärs den südostasiatischen Landmassen annäherte. Dies deutet darauf hin, dass der Cape York Bernstein höchstens ein alttertiäres Alter hat.

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