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A NEW TROGLOBITIC PLANTHOPPER SPECIES (HEMIPTERA: FULGOROIDEA: MEENOPLIDAE) FROM WESTERN AUSTRALIA

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ABSTRACT

A new troglobitic meenoplid species, *Phaconeura proserpina* sp.nov., is described from a limestone cave in the Cape Range peninsula. This represents the second known cavernicolous meenoplid species from Western Australia. Notes on its ecology and generic position are given.

INTRODUCTION

Recent faunistic surveys of Australian caves have disproven the long-held belief of the continent's apparent paucity of terrestrial troglobites (obligate cavernicolous species). A remarkably rich obligate cavernicolous arthropod fauna has been discovered, especially in limestone caves and lava tubes of tropical North Queensland (Howarth 1988; Howarth and Stone 1990). As rhizophageous primary consumers (Howarth 1981), planthoppers (Hemiptera: Fulgoroidea) pose a significant element of this fauna. In the caves, they are represented by the families Cixiidae (genera *Undarana* Hoch and Howarth: two species, Hoch and Howarth 1989a, and *Solonaima* Kirkaldy: six species, Hoch and Howarth 1989b) and Meenoplidae (genus *Phaconeura* Kirkaldy: four species, Hoch 1990). From Western Australia another troglobitic meenoplid species has been described: *Phaconeura pluto* Fennah, Nambung National Park (Fennah 1973). In the epigean fauna of Australia, Meenoplidae are so far known with eight species and one subspecies of the genera *Phaconeura* and *Nisia* Melichar, both belonging to the subfamily Kermesiinae (Kirkaldy 1906; Woodward 1957; Fennah 1963).

Since 1987 intensive biological research has been conducted in Western Australia, in the Cape Range karst area (Humphreys 1991) and revealed the existence of a comparably diverse troglobitic fauna, as in Queensland. Among the many cave-adapted arthropod species is a previously unknown meenoplid species which is described here.

Outside Australia, cavernicolous Meenoplidae are so far known from Western Samoa (*Suva oloimoa*: Hoch and Asche 1988) and the Canary Islands (*Meenoplus cancavus*: Remane and Hoch 1988).

SYSTEMATICS

Family Meenoplidae
Genus *Phaconeura* Kirkaldy, 1906

Remarks

The monophyly of neither meenoplid genus occurring in Australia, *Phaconeura* and *Nisia*, has

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been discussed, and appears, at least for *Phaconeura*, questionable. *P. proserpina* is tentatively placed in *Phaconeura* although it lacks a diagnostic character of the genus, namely a median frontal carina. It cannot be decided yet, whether the lack of a median carina on the frons is a character shared with the ancestral species, or whether it has been lost during cave adaptation. The gradual reduction of carination of head and thorax as a result of the evolution of troglomorphies (e.g., reduction of compound eyes, and wings) has been observed in species of the cixiid genus *Solonaima* which display varying degrees of cave adaptation (Hoch and Howarth 1989b). Within the genus *P. proserpina* appears rather isolated. There is strong evidence that *P. proserpina* represents a separate evolutionary line that has adapted to caves, independently from the cavernicolous *Phaconeura* species of Queensland and from *Phaconeura pluto* from Western Australia. The configuration of its male and female genitalia vaguely resembles species of the *P. smithi* Woodward-group occuring in Queensland (Woodward 1957). However, the similarity does not seem sufficient to confirm a close phylogenetic relationship of *P. proserpina* with any other cavernicolous and surface dwelling *Phaconeura* species in Australia.

Phaconeura proserpina sp. nov.

Figures 1 - 13

Holotype

Male: Western Australia: North West Cape peninsula, Cave C-215 (22°01'40"S; 113°55'55"E), 31 May 1990, J. Waldock, Western Australian Museum (WAM 93/45).

Paratypes

One male: same data as holotype; one male, two females: same location as holotype, and 19 May 1991, R.D. Brooks, W.F. Humphreys and R.D. Brooks; one male, same location as holotype, and 5 July 1989, R. Wood, Western Australian Museum (WAM 93/46-50).

One male, same data as holotype, Zoological Institute and Zoological Museum, University of Hamburg.

Additional material

One nymph (V. instar): same location and data as holotype, three nymphs (V. instar): same location as holotype, and 15 July 1989, R.D. Brooks, R. Wood, and W.F. Humphreys, Western Australian Museum (WAM 93/51-54).

Diagnosis

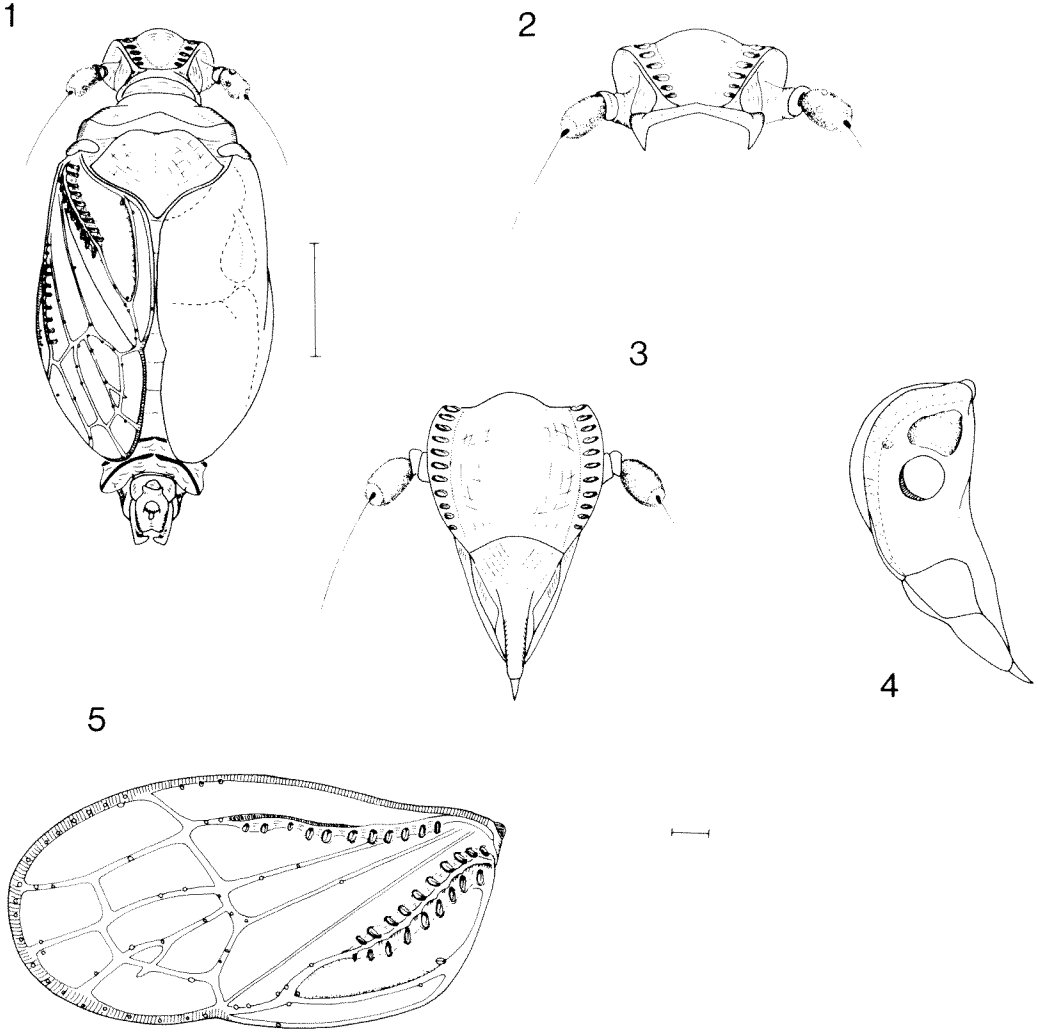
Cavernicolous. In general appearance resembling the Western Australian *Phaconeura pluto* with eyes, tegmina and bodily pigmentation reduced, hind wings vestigial. Differing from this and the other congeners mainly by characters of the male and female genitalia. Male: aedeagus with 2 stout laterobasal spinose processes (Figures 10, 11, b), arising on each side of an unpaired dorsal projection. Female: ventral valvula globular bearing a short spine; anal segment laterally with an ear-shaped projection (Figures 12, 13).

Description

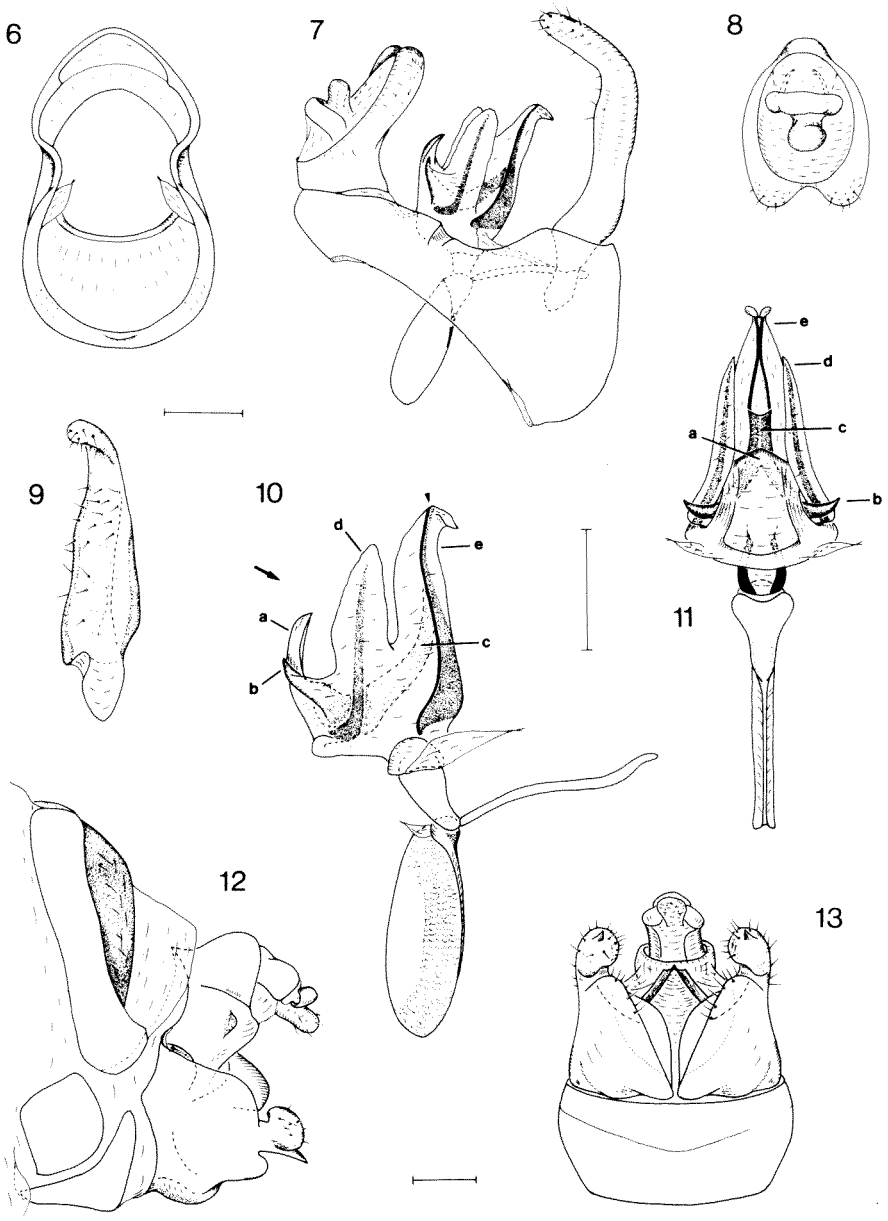
Body length (equals distance between apex of head and tip of abdomen; measurements taken from specimens preserved in ethanol): male 2.0 - 2.25 mm (2.18 ± 0.103 mm; n=5); female 2.8 - 2.85 mm (n=2). Body and legs pale yellow; tegmina shallowly tectiform (Figure 1); tegmina translucent, yellowish, with venation pale yellow. Head (Figures 1-4): vertex slightly longer medially than wide at base (1.1-1.2 : 1), continuously rounded onto frons; posterolateral areolets indistinct. Compound eyes and median frontal ocellus absent, lateral ocelli strongly reduced. Former position of the compound eyes marked by a slightly vaulted area. Lateral margins of vertex

and frons strongly ridged, produced laterad, each bearing a row of oval sensory pits which ends slightly above frontoclypeal suture. Vertex, frons and clypeus smooth, strongly vaulted, without median carina. Frons in frontal aspect with lateral margins shallowly convex (maximum width of frons at level of antennae), frons slightly wider than long medially (1.1-1.2 : 1), about as long as post- and anteclypeus together; transition frons-clypeus at frontoclypeal suture slightly notched (Figures 3, 4). Lateral carinae of postclypeus distinct. Rostrum elongate, slightly surpassing posttrochanters. First antennal segment short, ring-like, second antennal segment subcylindrical, ovoid, length ca. 1.2-1.3 x width; antennal sense organs indistinct, pustulate, irregular in number.

Thorax (Figures 1, 5): pronotum smooth, without distinct carination. Pronotum about half as



Figures 1-5 *Phaconeura proserpina*, holotype male: 1, habitus; 2, head, dorsal aspect; 3, same, ventral aspect; 4, same, lateral aspect; 5, tegmen. Scale line. Figure. 1: 0.5 mm, Figures 2-5: 0.1 mm.



Figures 6-11 *Phaconeura proserpina*, male genitalia, paratype: 6, genital segment, caudal aspect; 7, genital segment, anal segment, aedeagus, parameres, *in situ*, left lateral aspect; 8, anal segment, dorsal aspect; 9, left paramere, dorsal aspect; 10, aedeagus, left lateral aspect (arrow indicates aspect of Figure. 11); 11, same, dorsocaudal aspect. Figures 12-13. *Phaconeura proserpina*, female genitalia, paratype: 12, genital segment, anal segment, ventral valvifers and ventral valvulae, left lateral aspect; 13, same, ventral aspect. Scale line. Figures 6-9, Figures 10-11, Figures 12-13: 0.1 mm.

long as vertex medially, 2.6-2.9 times as wide as vertex at base; posterior margin shallowly excavated. Mesonotum nearly planate, with a faint median carina, lateral carinae reduced. Tegmina reduced in length, two times longer than maximum width (= slightly proximad of clavus), in repose reaching the anterior margin of genital segment; four to five apical cells; venation distad of nodal line individually variable; arrangements of sensory pits on tegmen as in other Kermesiinae. Hind wings strongly reduced, vestigial, not reaching the third abdominal segment. Posttibia as in other Meenoplidae laterally unarmed, distally with six to seven spines. Postbasitarsus distally with four to six, second posttarsal segment with four to five spines in a single row (partly individually asymmetrical). Postbasitarsus 2/3 the length of second and third posttarsal segments together. Pretarsal claws and arolia present.

Male genitalia (Figures 6-11): genital segment in caudal view figure-eight-shaped, in lateral aspect ventrally 2.75 times longer than dorsally. Anal segment in dorsal aspect longish ovate, apically produced into two bulbous lobes. Parameres longer than height of genital segment, in lateral aspect apical third bent dorsad, basal half slightly dilated; in ventral aspect inner margin smooth, shallowly convex. Aedeagus with sperm-conducting part directed straight caudad (Figure 10, 11, e), phallotrema apical, exposed to the dorsal side (Figure 10, e: small triangle); unpaired process dorsad of sperm-conducting part (Figure 10, a) flat, slightly curved ventrad, in dorsal view (Figure 11, a) apically obtusely triangular; two short and stout spines (Figure 10, 11, b) arising laterobasad of unpaired dorsal process, directed laterocaudad, their basal portions uniting to form a y-shaped structure (Figure 10, 11, c) thus connecting these laterodorsal spines (b) to sperm-conducting part (e). Ventrad of these spines (b), membrane connecting unpaired dorsal process (a) with sperm-conducting part (e) on each side produced in a tongue-shaped lobe: each directed caudad and supported by an integrated spinose sclerite (Figures 10, 11, d).

Female genitalia (Figures 12-13): as in other Meenoplidae strongly reduced; laterocaudal margin of ventral valvifer forming a distally rounded lobe, ventral valvula globular, apically with a short, minute spine (terminology *sensu* Woodward 1957). Laterobasal portion of anal segment with a small ear-shaped projection.

Etymology

The species is named from *Proserpina*, queen of the underworld in classical mythology.

DISTRIBUTION AND ECOLOGY

Phaconeura proserpina is known only from Cave C-215 in Cape Range on the North West Cape peninsula. Cave C-215 opens through Tulki Limestone just above the coastal plain and gives access to the coastal water table at a 24 m long stream passage (illustrated in Humphreys 1991). This cave is the only known location where elements of both the Cape Range terrestrial and the coastal aquatic fauna meet. Plant roots of an unidentified species hang from the roof of the stream passage into the water and *Phaconeura proserpina* specimens (adults and nymphs) were collected from the surface of the mud banks adjacent to the water. The collection point is in the (fresh air) dark zone, at an estimated altitude of 0.5 m (altitude of cave entrance is 21 m). The temperature is ca. 22.0°C, and the relative humidity ca. 89% (W.F. Humphreys, Western Australian Museum, pers. comm.). Due to its degree of troglomorphy (reduction of compound eyes, ocelli, tegmina, wings and pigment) *P. proserpina* is assumed to be restricted to underground habitats, and thus ecologically classifiable as obligate cavernicolous.

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