

**PARACYCLOPS WAIARIKI N. SP. (COPEPODA:
CYCLOPOIDA) FROM THERMAL WATERS IN
ROTORUA**

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ABSTRACT

Paracyclops waiariki n.sp. is described. Although it does not conform precisely to the generic description, reasons for placing it in *Paracyclops* are given: short antennules, structure of the fifth leg, and the presence of a short transverse row of spinules above the base of the lateral seta on the caudal ramus. The species appears to be confined to thermal waters in the Rotorua district of the North Island of New Zealand, the type locality having a temperature of around 30°C and a pH of 3.0.

INTRODUCTION

Although, as a group, the freshwater cyclopoids show a wide variety of habitat and feeding preferences, very few species (approximately 13) have so far been recorded from New Zealand, with Kiefer (1928a & b, 1931) performing the major groundwork. Of these, only two are endemic: *Microcyclops* (*Metacyclops*) *monocanthus* Kiefer, and *Acanthocyclops* (*Diacyclops*) *crassicaudoides* Kiefer. Further collecting in open-water systems will probably not expand this list greatly, although there are definitely more species yet to be described from damp, mossy situations in swamps, bogs, and damp forest, as well as alongside streams. These latter are all small, belonging to the genus *Bryocyclops* and its near relatives. However, one open-water species of the genus *Paracyclops* has recently been discovered in the Rotorua district, its two known localities both being at sites of thermal activity.

The animals were dissected and mounted in polyvinyl lactophenol, with chlorazol black as a stain. Examination was made with phase-contrast microscopy and diagrams were done with the aid of a camera lucida.

DESCRIPTIONS

Family CYCLOPIDAE G. O. Sars 1913

Subfamily EUCYCLOPINAE Kiefer 1929

Genus *Paracyclops* Claus 1893***Paracyclops waiariki* n.sp.**

Figs 1-3

FEMALE: Anterior part of body only very slightly flattened dorsoventrally. Prosome narrow (Fig. 1a). Posterior angles of third, fourth, and fifth thoracic somites project slightly backward; fourth and fifth somites each with a lateral group of short bristles at the posterior angle, those of the fifth somite being a little larger. Genital somite wide in comparison with rest of urosome. Caudal rami approximately 3.5 times as long as wide; outer margins lacking spinules except for a small, transverse row of two or three in front of the base of the lateral seta; this latter attached at a point equal to two thirds the length of the ramus (Fig. 1b). Antennules short, reaching approximately the middle of the cephalothorax and each with twelve segments, the division between segments five and six not as distinct as the rest (Fig. 1d). Antennae (Fig. 2a) four-segmented, fourth segment equal in length to the third. Mandible (Fig. 2b) with small palp bearing two long setae. Exopodites and endopodites of legs 1-4 three-segmented (Figs 3a-d), outer margins of exopodite segments not strongly armed with spinules as are those of most other species of this genus; spine formulae, of terminal segments of exopodites of these legs 3.4.3.3, spines on leg 4 comparatively small. Fifth pair of legs each in the form of a flat plate with a strong inner spine and two outer setae, longer than the spine, of approximately equal length (Fig. 3e). Eggs large; usually from 4-7 in each sac. A small species; length, excluding caudal setae, 0.7-0.8 mm.

MALE: Prosome narrower than that of female and more flattened dorsoventrally. Caudal rami (Fig. 1c) shorter than in female, approximately 2.7 times as long as broad. Antennules short, thick and strongly geniculate (Fig. 1e). Sixth pair of legs with an inner spine and two outer setae, the outermost the shorter, the inner only slightly shorter than the spine. Length 0.6-0.7 mm.

TYPE MATERIAL: The holotype female, dissected and mounted in polyvinyl lactophenol, together with several whole paratypes of both sexes, preserved in alcohol, are deposited in the National Museum, Wellington (Catalogue numbers Z.Cr. 1928; Z.Cr. 1929).

TYPE LOCALITY: The type specimens were netted in shallow water (up to 50 cm depth) along the roadside edge of Lake Rotowhero, beneath Rainbow Mountain, about 15 miles from Rotorua, just beyond the junction of State Highways 30 and 38, Grid Reference: NZMS 1 Sheet N85; 835 817. The water temperature at the time was 27°C.

PRESENT KNOWN DISTRIBUTION: Lake Rotowhero, 6 July 1966, numerous males and females (coll. M. H. L. and M. A. Chapman); warm swamp alongside Soda Springs, Lake Rotoehu, 6 February 1968, 2 females.

DISCUSSION

The systematic position of this species is a little problematical. Unlike most members of the genus *Paracyclops*, the cephalothorax of the female is not markedly flattened, nor are there rows of small spinules on the outer margins of the exopodites of the swimming legs. However, when making comparisons with other closely related genera,

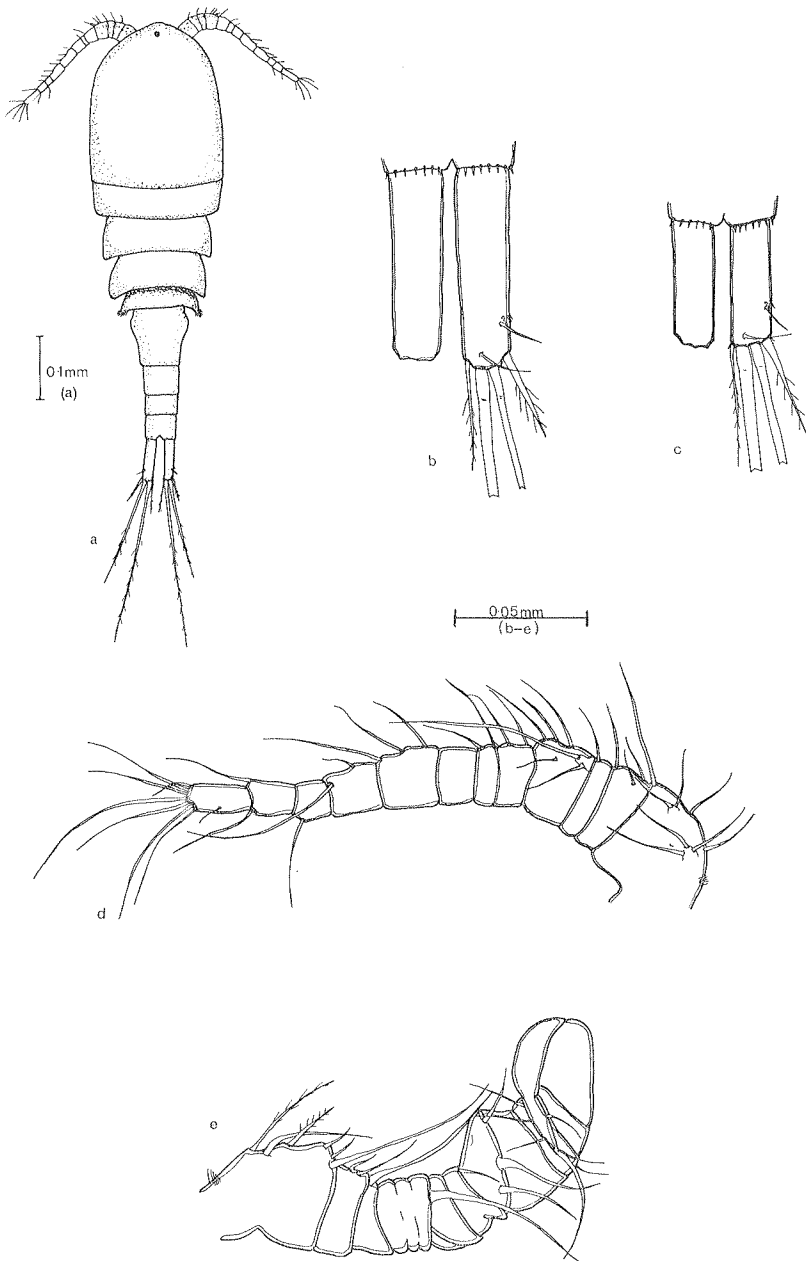


FIG. 1—*Paracyclops waiariki* n.sp.: a — dorsal view, female; b — caudal ramus, female; c — caudal ramus, male; d — antennule, female; e — antennule, male.

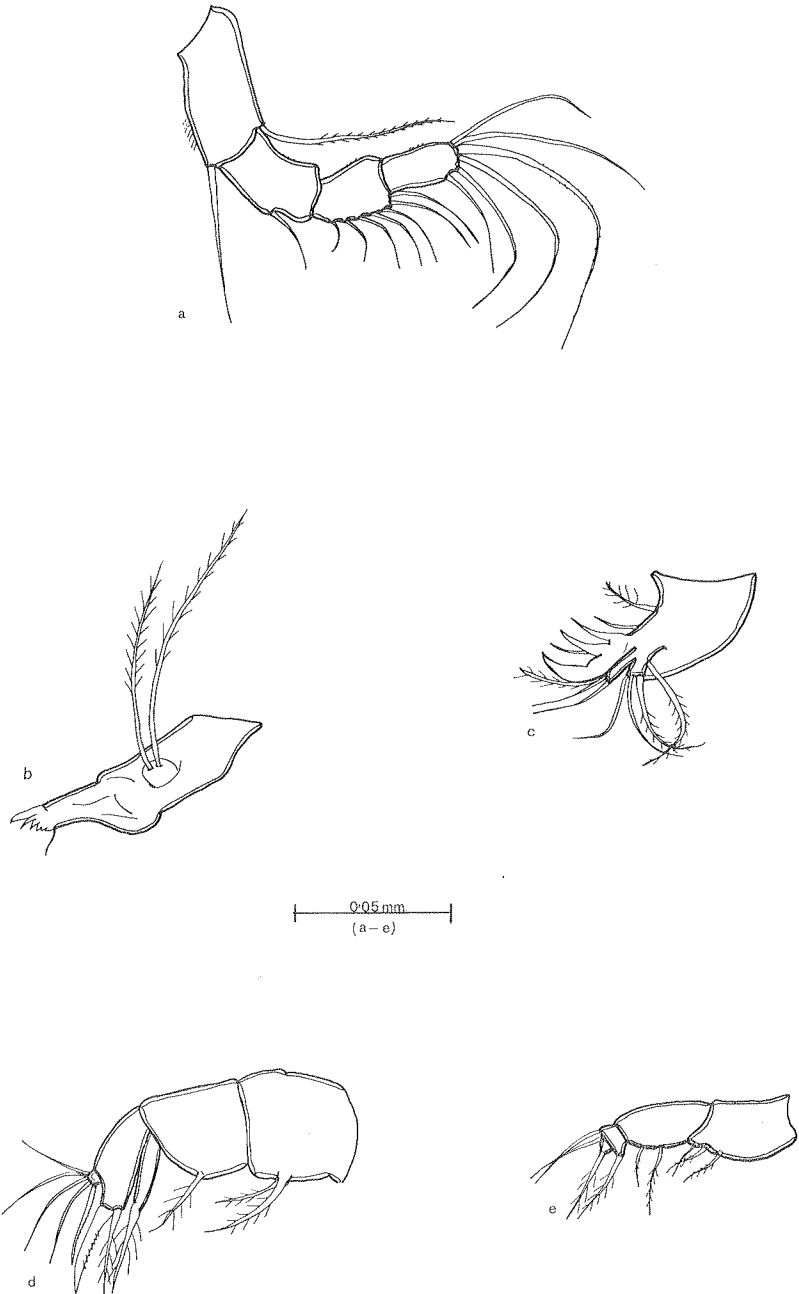


FIG. 2—*Paracyclops waiariki* n.sp.: a - antenna; b - mandible; c - maxillule; d - maxilla; e - maxilliped.

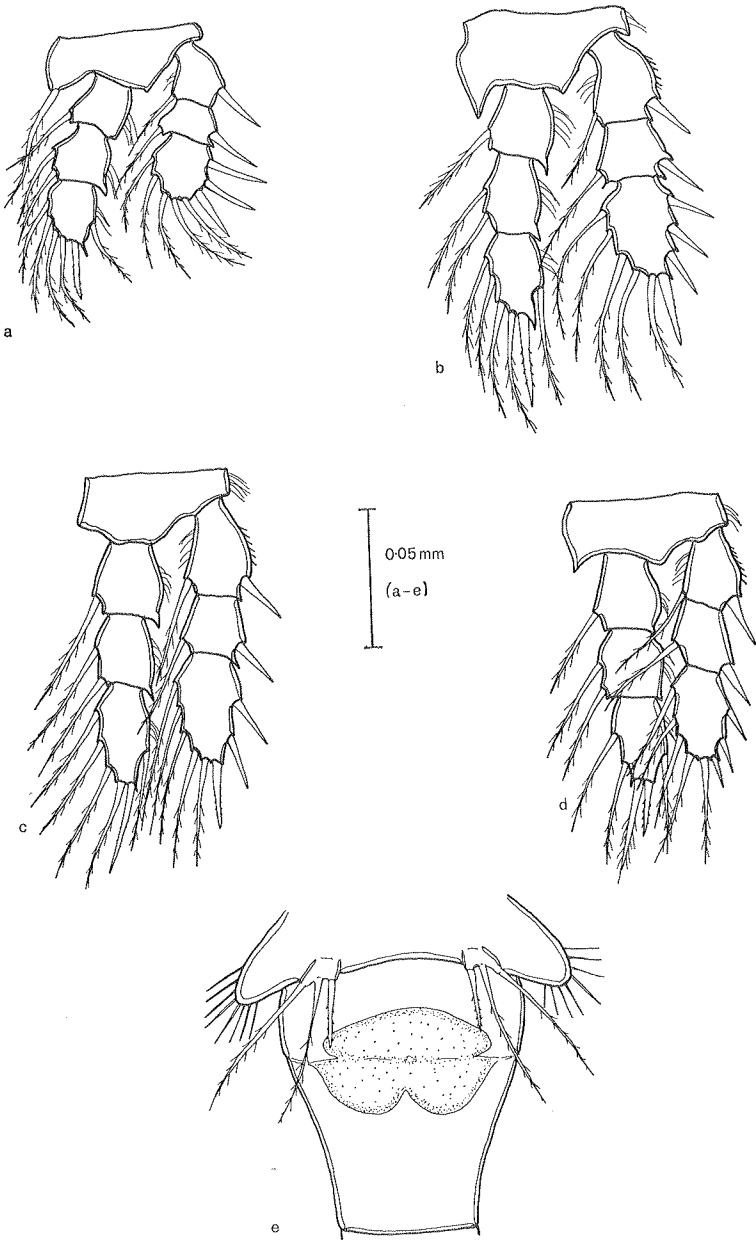


FIG. 3.—*Paracyclops waiariki* n.sp.: a-d—legs 1-4, female; e— fifth legs and genital segment, female.

the following points arise: the fifth leg does not have the central seta in an apical position (as is the case in *Eucyclops* and *Tropocyclops*), there are no spinules present along the length of the outer margins of the caudal rami (as in *Eucyclops*), and the antennules are very short, extending only half the length of the cephalothorax (these usually extend well beyond the cephalothorax in *Tropocyclops*). In addition there is present a small transverse row of spinules above the insertion of the lateral seta on the caudal ramus, a usual characteristic of *Paracyclops*. Because the antennules are composed of 12 segments, most cyclopoid keys will not work for this species (6–11 are the usual numbers quoted for *Paracyclops* – Harding & Smith 1960, Kiefer 1960, Dussart 1969, Yeatman 1959). However, there is a previously described species from Malaya, *P. eucyclopidoides* (Kiefer 1929), which also shows this feature. In his review of the genus, Lindberg (1958) lists this as the sole species with a 12-segmented antennule. Rylov (1948) points out that *P. eucyclopidoides* actually occupies an intermediate position between *Eucyclops* and *Paracyclops*, a factor reflected in Kiefer's (1929) choice of specific name.

Paracyclops waiariki differs from *P. eucyclopidoides* in the following aspects: it has only three spines on the terminal segment of the exopodite of leg 3 (four in *P. eucyclopidoides*), the two outer setae of leg 5 are of approximately equal length and about twice as long as the inner spine (these are both short in *P. eucyclopidoides*, the inner seta, in particular, being small and delicate), and there is a small transverse row of spinules in front of the base of the lateral seta on the caudal ramus (no such spinules are present on *P. eucyclopidoides*).

To the best of my knowledge, no species of the genus *Paracyclops* is restricted to thermal or highly acidic waters and most freshwater cyclopoid species show a fairly wide range of tolerance to both temperature and pH. Rylov (1948) lists *Paracyclops fimbriatus* as being euryionic, extremely adaptable to pH conditions and sometimes found at a pH "even lower than 4". He considers the genus to be a eurythermal one. This indicates that *P. waiariki* need not necessarily be restricted to waters of high temperature and low pH. *Paracyclops fimbriatus* is the only other species of the genus at present described from New Zealand.

Lake Rotowhero, the type locality, occupies one of the craters of the Ngapouri Fault. It is coloured a bright green by two small species of *Chlorella*. Edge temperatures at the point of sampling vary seasonally from 27–36°C. The lake is fed by hot springs on its north eastern shore. These are near to boiling point and discharge quantities of highly acid (pH 3.0) water, containing approximately 200 ppm of chloride ion (Lloyd 1959).

The specific name (*waiariki*) is the Maori word for hot springs.

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