

OSTRACODA FROM AUSTRALIAN INLAND WATERS—
NOTES ON TAXONOMY AND ECOLOGY

BY P. DE DECKKER

Zoology Department, University of Adelaide, Adelaide, S.A.
(Present address: Department of Biogeography and Geomorphology, Research School of Pacific Studies,
Australian National University, Canberra, A.C.T. 2601)

ABSTRACT: One new ostracod genus, *Ampullacypris*, and ten new species of ostracods are described: *Candonocypris incosta*, *Cypricerus salinus*, *C. unicornis*, *Heterocypris vatia*, *Ilyodromus amplicolis*, *I. candonites*, *I. dikrus*, *Kapcypridopsis asymmetra*, *Limnocythere dorsosicula*, *L. milta*. Three other species are re-described, namely *Candonocypris novaezelandiae* (Baird 1843), *Cyprretta baylyi* McKenzie 1966 and *Ampullacypris oblongata* (Sars 1896); 2 cosmopolitan species *Eucypris virens* (Jurine 1820) and *Sarscypridopsis aculeata* (Costa 1847) are recorded for the first time in Australia. Ecological notes for these species as well as for *Limnocythere mowbrayensis* Chapman 1914 are presented.

INTRODUCTION

Knowledge of the taxonomy and ecology of ostracods from Australian inland waters is poor compared to that of other microcrustaceans, although ostracods are quite common in a variety of habitats. This paper presents new data on non-marine ostracods for use in future ecological studies and for studies of Quaternary material. Since ostracod shells are readily fossilized these data may be useful in palaeolimnological studies (see De Deckker 1981b).

Material for this study is deposited in the Department of Crustacea, National Museum of Victoria under the registry numbers: J1134-J1162. The following abbreviations are used in the text: C = carapace, H = height, L = length, LV = left valve, RV = right valve.

SYSTEMATICS

Subclass OSTRACODA Latreille 1806
Order PODOCOPIDA Müller 1894
Superfamily CYTHERACEA Baird 1850
Family LIMNOCYTHERIDAE Klie 1938
Subfamily LIMNOCYTHERINAE Klie 1938

Genus *Limnocythere* Brady 1867

TYPE SPECIES: *Limnocythere inopinata* (Baird 1843).

Limnocythere dorsosicula n. sp.

Figs 1, 2a-j

DIAGNOSIS: Member of *Limnocythere* with three to six small posterodorsal spines on the right valve; two small dorsal bosses separated by a main depression in the middle and never higher than the hinge in lateral view. Outline of hemipenis as in Fig. 1H.

DESCRIPTION: CARAPACE (External)—Rectangular, faintly reticulated, and pitted to smooth; three main depressions on each valve: one in the centre where a vertical column of four muscle scars is often visible, another just above and a third in front just below the hinge line; greatest height at about one quarter to one

fifth of length from anterior; greatest width at about 0.6 of length from anterior; right valve with three to six small spines along its edge posterodorsally; in dorsal view, anterior narrow and pointed; two small dorsal bosses, separated by the main depression in the middle, smooth, never higher than the hinge line in lateral profile. Sexual dimorphism pronounced—length:height ratio of valves greater in males.

(Internal)—Hinge with a broad tooth in right valve and a matching depression in the left one at both ends; inner lamella broadest anteriorly and peripheral selvage faint; radial pore canals numerous and straight from which many hairs protrude at a distance from the outer lamella anteriorly.

ANATOMY (Antennula)—(Fig. 1A) Six-segmented; length: width ratio of the last five segments: 2:1, 1:1, 1:1.3, 2:1, 4.2:1, longest distal seta bifid at about mid-length.

(Antenna)—(Fig. 1B) Two pectinate distal claws and another thinner and barren; distal segment small and squarish.

(Mandible)—(Fig. 1D) Mandibular coxale with seven teeth; palp with distal segment very small and squarish and with three thin setae; distal seta on penultimate segment thicker than the other three and pectinate.

(Maxillula)—(Fig. 1C) Distal palp elongate with three setae; 3rd lobe with three others, two of which are biramous.

(Maxilla)—(Fig. 1F) Short and stocky; no setae on 1st segment.

(Thoracopoda I)—(Fig. 1G) Longer than maxilla; distal end of 1st segment with two unequal setae; one at proximal end; another at mid-length.

(Thoracopoda II)—(Fig. 1E, J) Longer than thoracopoda I with distal claw almost twice its length and three times that of the maxilla claw; in female, setae pectinate but barren in male where the distal seta on the 2nd segment has a bifid tip.

(Hemipenis)—For outline see Fig. 1H.

(Genitalia)—For outline see Fig. 1I.

(Furca)—(Fig. 1H, I) One small and barren setae near the reproductive organs.

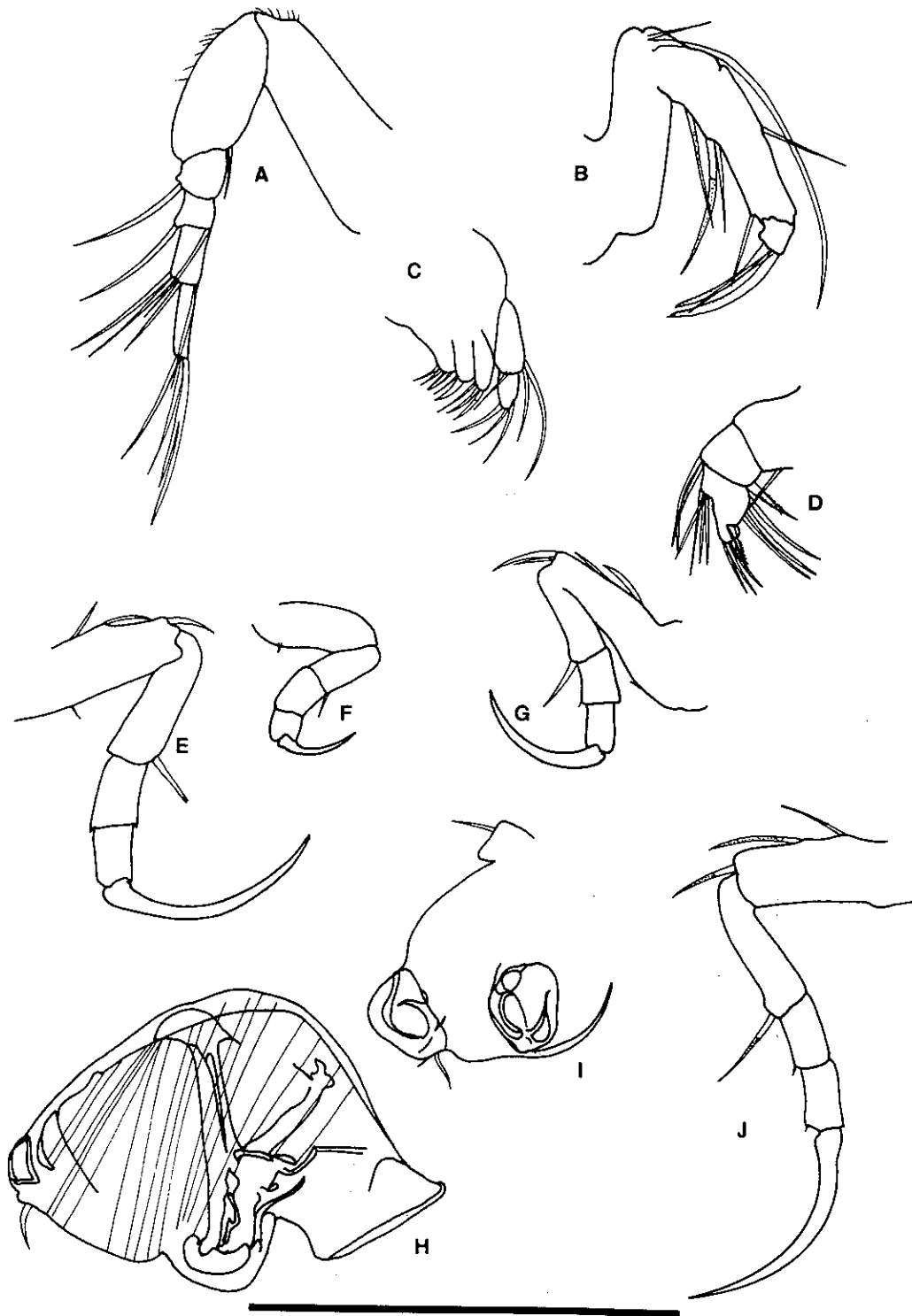


Fig. 1—*Limnocythere dorsosicula* n. sp. Lake Terangpom, Vic. A, B, E-H are drawn from the holotype adult male and C, D, I, J from the paratype female. Scale = 100 μ . A, antennula. B, antennna. C, maxillula-palp and lobes. D, mandible-palp. E, thoracopoda II. F, maxilla. G, thoracopoda I. H, hemipenis. I, genitalia. J, thoracopoda II.

COLOUR OF SHELL Light brown to transparent.

SIZE:		L	H		L	H
holotype adult						
male	LV	410 μ	230 μ	RV	410 μ	230 μ
paratype adult						
female	LV	450 μ	230 μ	RV	450 μ	230 μ

TYPE LOCALITY: Lake Terangpom, west of Lake Corangamite, western Victoria.

DERIVATION OF NAME: From Latin *dorsum* (= black) and *sicula* (= small spine) for the diagnostic posterodorsal spines on the right valve.

ECOLOGY AND DISTRIBUTION: Only two collections of this species are known to me, one from Lake Terangpom in water of 2.03‰ salinity and the other from South Nerrin Nerrin Lagoon in water of 1.96‰ salinity, both in western Victoria. At first glance, it appears that this species is indicative of freshwater (<3‰) despite the fact that some species of *Limnocythere* live in saline waters (see *L. milta* n. sp. below and De Deckker 1981c). However, *L. dorsosicula* which has been recovered in many samples of a core from Lake George (see De Deckker 1981b), is found in some of these samples co-occurring with other ostracod species indicative of either fresh water or water of salinity <10‰.

REMARKS: *L. dorsosicula* is easily distinguishable from *L. notodonta* Vavra 1906 from west Java since the latter species has a maximum of four posterodorsal spines on the right valve. The anterior of the shell of the former species is narrow and pointed whereas in the latter species, the shell is much broader and rounded at both extremities. *L. dorsosicula* differs from *L. mowbrayensis* Chapman 1914 as the latter has broad alae, which are rounder or pointed and curved backward at about mid-height near the centre of the shell. Dorsal spines have also been noticed on one fossil juvenile specimen of *L. mowbrayensis* from Pillie Lake, S. A. (De Deckker 1981b), whereas this feature appears common on specimens from Pulbeena Swamp illustrated by Brehm (1939) for *L. percivali* (later synonymized to *L. mowbrayensis* by Hornibrook (1955) and Deevey (1955)). Hornibrook (1955), however, did not mention any spines on his specimens from the same locality. In addition, *L. mowbrayensis* is characterized by a dorsal boss at mid-length which extends above the hinge line when seen in lateral view. *L. stationis* Vavra 1891, which inhabits European waters, also possesses posterodorsal spines but only on the left valve.

Limnocythere milta n. sp.

Figs 2k-r, 3

DIAGNOSIS: Member of *Limnocythere* with faintly reticulated valve; with a vertical depression above the central muscle scars separating a small smooth boss anteriorly from the broad posterior; depression above and in front of the boss; row of fine denticles along the posteroventral margin of left valve. Maxilla and thoracopoda I and II with three long, pectinate setae on the inside of the 1st segment.

DESCRIPTION: CARAPACE (External)—Subrectangular and finely reticulated all over except for the anterior boss above and in front of the central muscle field and along the anterodorsal margin; this boss is separated from the posterior of the shell by a vertical groove just above the central muscle field; there is a depression adjacent to the boss dorsally which gives it a bilobate appearance in dorsal view; greatest height at about one quarter to one third of length from the anterior; mouth region concave and at about mid-length; dorsum gently curved; in dorsal view shell narrow, anterior pinched and pointed; greatest width at about 0.66 of length from the anterior; left valve slightly longer than right one posteriorly; shell compressed posteroventrally where the inner lamella is broad.

(Internal)—Inner lamella broad anteriorly in both valves and of almost similar width posteroventrally; posteriorly at mid-height and above, selvage absent; numerous straight radial pore canals from which many hairs protrude anteriorly at a distance from the outer margin; central muscle field with a vertical row of four scars; two narrow horizontal ones in the middle separated by two circular to oval ones; one antennal scar in front of the row at the level of the top scar and an additional scar above the vertical row of four; all these scars are met by depressions on the outside of the shell. Four to six minute spines along the margin of the left valve posteroventrally; hinge with broad tooth at both ends in the right valve with matching socket in the left valve; the posterior tooth is the largest.

ANATOMY (Antennula)—(Fig. 3A) Six-segmented; length width ratio of last five segments: 2:1, 1.2:1, 1:2, 1:1, 5:1; longest seta bifid at 1/3 from its base.

(Antenna)—(Fig. 3B) Three barren distal claws; distal segment almost rectangular.

(Mandible)—(Fig. 3C, D) Mandibular coxale with seven teeth, the inner two acicular; palp with distal segment almost squarish; at the distal end of the 1st segment, thick seta (α bristle?) stout, pointed and pilose; on 2nd segment there are four setae, two long ones and two pectinate and shorter (one is a β bristle?); distal end of third segment with one long and barren seta and another half its length and pectinate (γ bristle?); three unequal setae on distal end of last segment.

(Maxillula)—(Fig. 3E) Epipod with 14 long and one small plumose Strahlen plus a shorter barren one; palp two-segmented with distal segment rectangular; for chaetotaxy see Fig. 3E.

(Maxilla)—(Fig. 3F) Distal claw stout and curved; three thick and pectinate setae on inner side of 1st segment and a longer pectinate one near its base outside.

(Thoracopoda I)—(Fig. 3G) Similar to maxilla but larger.

(Thoracopoda II)—(Fig. 3H) Similar to thoracopoda I but larger and with no basal seta on the outside of the 1st segment.

(Genitalia)—Weakly chitinized (see Fig. 3I).

(Furca)—(Fig. 3I) Single barren seta.

(End of body) (Fig. 3J) With tuft of hairs and one biramous short seta.



Fig. 2— a-j, *Limnocythere dorsosicula* n.sp. Lake Terangpom, Vic. a, e, g, i, j female paratypes; b-d, f male paratypes; h male holotype. a, C showing RV. b, RV external. c, LV external. d, C showing RV. e, C dorsal. f, C dorsal. g, RV internal. h, LV internal. i, LV internal. j, anterior detail of i. k-r, *Limnocythere milta* n. sp. Small lake N.W. of Lake Werowrap, Vic. k, l, o-r female paratypes; m, n female holotype. k, C showing RV. l, LV external. m, LV internal. n, RV internal. o, RV external. p, C showing LV. q, C dorsal. r, C ventral. (Scales: 1 = 200 μ for a-i, = 35 μ for j; 2 = 200 μ for k-r.)



Fig. 3—*Limnocythere milta* n. sp. Small lake NW of Lake Werowrap, Vic. Drawn from holotype adult female. Scale = 100 μ . A, antennula. B, antenna. C, mandible—palp. D, mandible—coxale. E, maxillula. F, maxilla. G, thoracopoda I. H, thoracopoda II. I, genitalia. J, end of body.

COLOUR OF SHELL: Yellow to light brown.

SIZE: L H L H

Holotype adult

female LV 545 μ 310 μ RV 540 μ 310 μ

TYPE LOCALITY: Small lake north-west of Lake Werowrap, Red Rock area, near Colac, western Victoria (38°15'23"S, 143°29'35"E).

DERIVATION OF NAME: From Greek *milto* meaning red earth for the Red Rock area.

ECOLOGY AND DISTRIBUTION: *L. milta* is known only from the type locality where salinity was 15.42‰ and pH 9.5. This lake is known to dry up occasionally. No males have yet been found.

REMARKS: *L. milta* differs from *L. aspera* Henry 1923, as the latter does not possess the typical posteroventral spines along the margin of the left valve.

Limnocythere mowbrayensis Chapman 1914

1914 *Limnocythere mowbrayensis* Chapman p. 60.

1955 *Limnocythere sicula*; Hornibrook p. 268.

1955 *Limnocythere mowbrayensis*; Hornibrook, p. 268.

1978 *Limnocythere mowbrayensis*; McKenzie, p. 181.

1980 *Limnocythere* sp., De Deckker & Geddes, p. 691.

1981 *Limnocythere mowbrayensis*; De Deckker, p. 37.

DIAGNOSIS: Member of *Limnocythere* with almost straight dorsum and deeply concave ventrum; two large dorsal bosses, which, in lateral view, extend above the hinge line, are separated by a vertical groove which is situated above a vertical row of four muscle scars; in front of the row, there is a broad lateral process which, on most occasions, is pointed and curved backwards.

DISCUSSION: *L. mowbrayensis* has recently been described by De Deckker (1981a). *Limnocythere* sp., briefly described by De Deckker and Geddes (1980) from an ephemeral salt lake near the Coorong Lagoon, is here considered to be *L. mowbrayensis* as it is almost identical to the specimens of *L. sicula* described by Chapman (1919), later synonymized by Hornibrook (1955) to *L. mowbrayensis*, as it has poorly developed lateral processes.

ECOLOGY AND DISTRIBUTION: *L. mowbrayensis* cannot swim: it is usually found crawling among filamentous algae. It is a fresh water species which can tolerate slightly saline waters up to 6‰. This upper record refers to the *Limnocythere* sp. of De Deckker and Geddes (1980) mentioned above, and is not surprising as some other *Limnocythere* species can inhabit saline waters (e.g. *L. milta*; see De Deckker 1981c).

L. mowbrayensis has also been recorded at 2.8‰ in Fresh Dip Lake, near Robe, S. A. Apart from the ephemeral locality near the Coorong Lagoon where *L. mowbrayensis* was collected only once, all other localities are permanent; this species has never been found in temporary pools.

L. mowbrayensis has been recorded from southern Australia (even Kangaroo Island) and as fossil from north-western Tasmania (from where it was originally described) and New Zealand.

Superfamily CYPRIDACEA Baird 1845

Family CYPRIDIDAE Baird 1845

Subfamily HERPETOCYPRIDINAE Kaufmann 1900

Genus *Candonocypris* Sars 1896

TYPE SPECIES: *Cypris candonioides* King 1855 (= *Candonocypris novaezelandiae* (Baird 1843)).

DIAGNOSIS: Adult with smooth elongated shell and with broad inner lamellae anteriorly; selvage prominent and raised posteroventrally in the right valve. Two jointed sensory seta on the 2nd segment of the antennula. Thoracopoda II with two setae at mid-length on the last segment.

REMARKS: The opinion held by Sars (1894) that the well defined selvage placed far away from the edge of the right valve anteriorly was a diagnostic feature of *Candonocypris* species is no longer valid as this feature is not present in *C. incosta* which, on other features of the shell and anatomy, is considered here to be a true *Candonocypris*.

Two Australian species are included in *Candonocypris* namely, *C. incosta* n. sp. and *C. novaezelandiae* (Baird 1843). *Herpetocypris caledonica* Méhes 1939, from New Caledonia, definitely represents a *Candonocypris* species since he illustrated the distal segment of thoracopoda II with two setae at mid-length. No type material could be examined, as it has not been deposited in the Natural History Museum in Basle, Switzerland contrary to Méhes' (1939) indication. (C. Stocker pers. comm. 26 Jan. 1981).

Candonocypris incosta n. sp.

Figs 4, 5

1914 *Candona lutea*; Chapman, p. 59, fig. 6.

1971b *Ilyodromas* cf. *smaragdinus*; McKenzie, p. 396.

1977 *Ilyodromus* cf. *smaragdinus*; Danielopol & McKenzie, p. 309.

DIAGNOSIS: Member of *Candonocypris* with peripheral selvage anteriorly in both valves and broad and near the outer margin in the posterior of the right valve.

DESCRIPTION: CARAPACE (External)—Smooth and elongated, ellipsoid shell with dorsum arched and with ventrum flat except in front of the middle where it is slightly concave. Both ends of the valves tapering but posterior more pointed. Greatest height at about mid-length. Shell narrow in dorsal view. Obvious overlap of the left valve antero- and posterodorsally.

(Internal)—Inner lamellae similar in both valves anteriorly and approximately twice as broad anteriorly compared to the posterior area. Selvage peripheral anteriorly and only prominent posteroventrally in the right valve. This selvage is met by a depression in the left valve where the selvage is peripheral.

ANATOMY: The species fully described by McKenzie (1971b) as *Ilyodromus* cf. *smaragdinus* from New Guinea is here synonymized to *C. incosta*. Its diagnostic anatomical features are the short third segment of the antennula with a length width ratio of about 1.6:1 (Fig. 5A), strongly arched palps on the male maxilla (Fig. 5I,

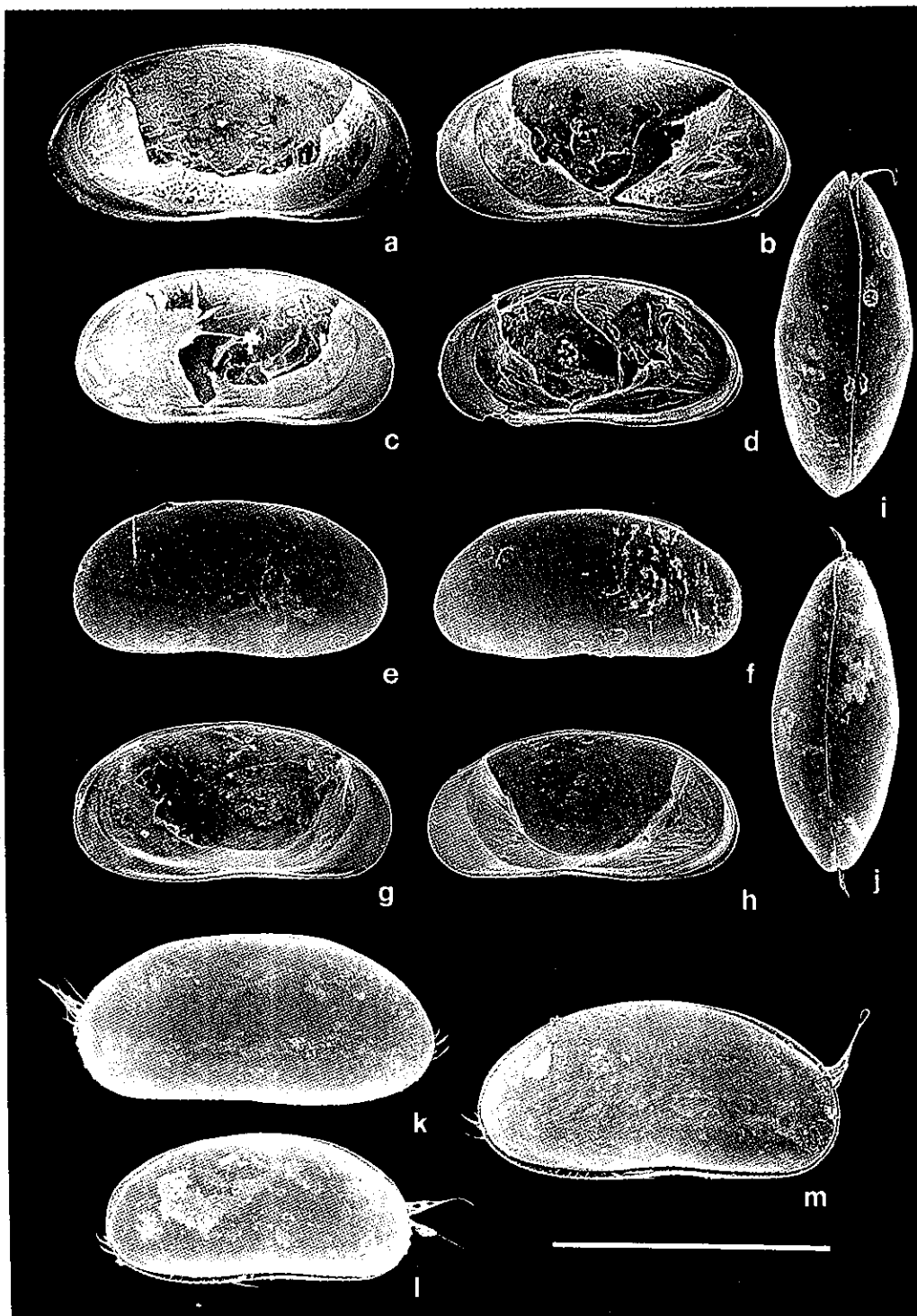


Fig. 4—*Candonocypris incosta* n. sp. Spring at base of limework quarry at Pulbeena Swamp, Tas. Scale = 1 000 μ . a, b, i, k, m female paratypes; c, d male holotype; e-h, j-l male paratypes. a, LV internal. b, RV internal. c, LV internal. d, RV internal. e, RV external. f, RV external. g, LV internal. h, RV internal. i, C dorsal. j, C dorsal. k, C showing LV. l, C showing RV. m, C showing RV.

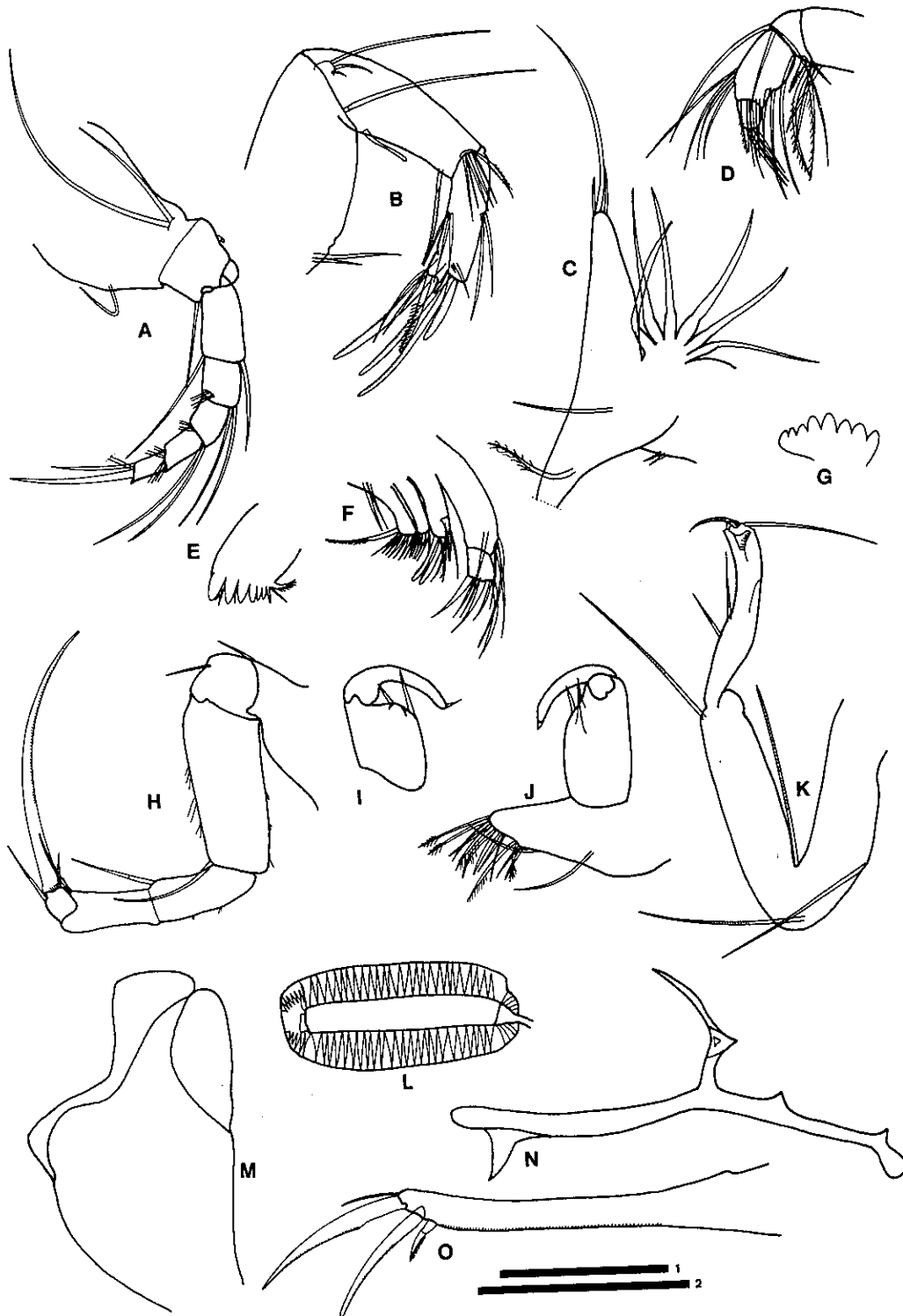


Fig. 5—*Candonocypris incosta* n. sp. Spring at base of limework quarry at Pulbeena Swamp, Tas. C, F, K are drawn from a paratype adult male, the remainder from the holotype adult male. Scales: 1 = 100 μ for A-F, H-O; 2 = 50 μ for G. A, antennula. B, antenna. C, maxilla. D, mandible-palp. E, mandible-coxale. F, maxillula-palp and lobes. G, rake-like organ. H, thoracopoda I. I, maxilla-endopodite. J, maxilla. K, thoracopoda II. L, Zenker organ. M, hemipenis. N, furcal attachment. O, furca.

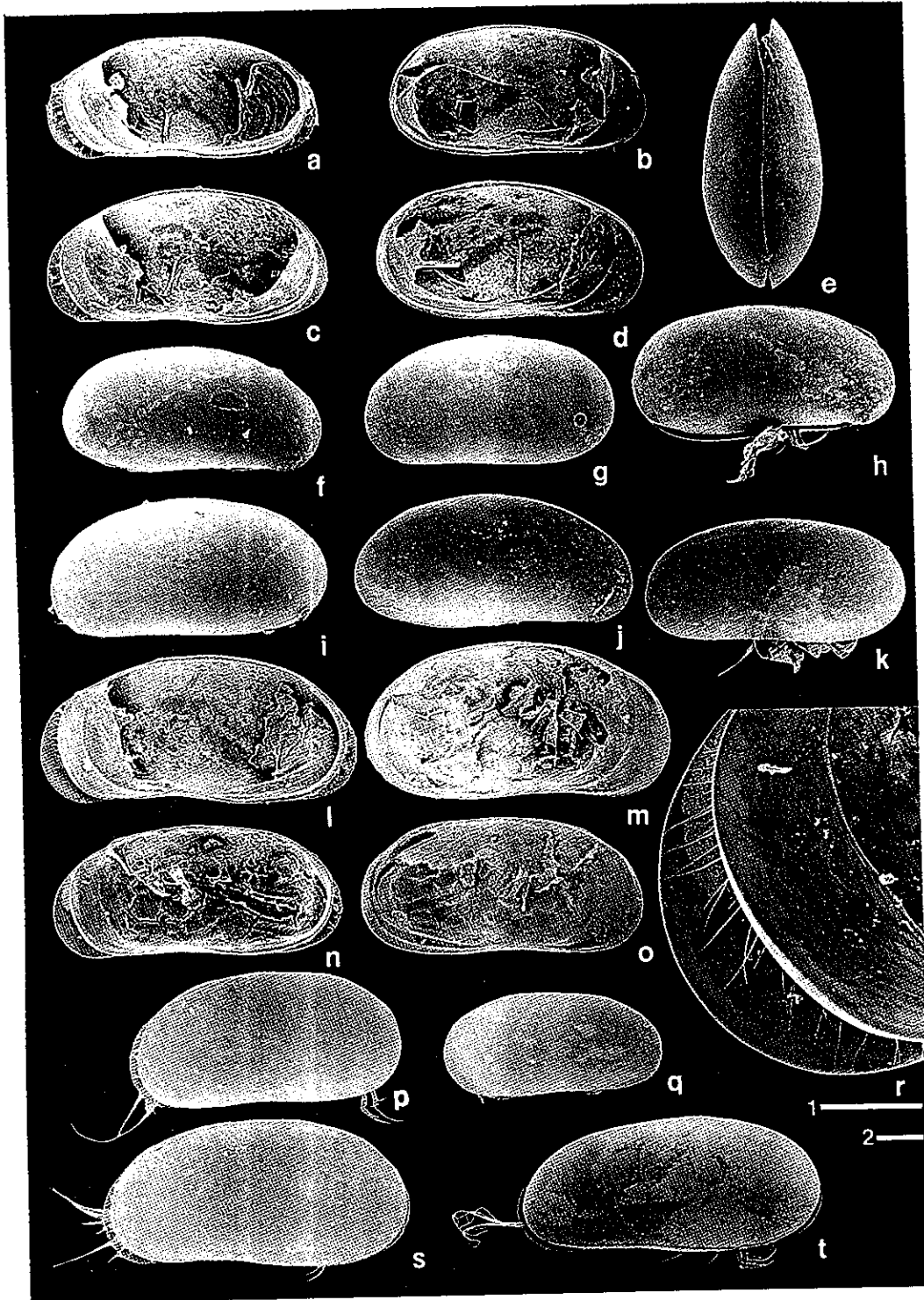


Fig. 6—*Candonocypris novaezelandiae* (Baird 1843). a-d, Kangaroo Creek Reservoir, Adelaide, S.A. e-k, Millbrook Reservoir, Adelaide, S.A. l-s, Small farm dam near Gilmandyke Creek, S. of Bathurst, N.S.W. Scales: 1 = 500 μ for a-l, s, t; 2 = 50 μ for r. a, b, f-h, k: adult male; c-e, i, j, l, m, s, t adult female; n-p, r juvenile female; q juvenile. a, RV internal. b, LV internal. c, RV internal. d, LV internal. e, C dorsal. f, RV external. g, LV external. h, C showing RV and hemipenis. i, LV external. k, C showing LV and hemipenis. l, RV internal. m, LV internal. n, RV internal. o, LV internal. p, C showing LV. q, C showing LV. r, RV internal, anterior detail of n. s, C showing LV. t, C showing LV.



Fig. 7—*Candonocypris novaezelandiae* (Baird 1843). Kangaroo Creek Reservoir, Adelaide, S.A. I, J, drawn from adult female remainder from adult male. Scales: 1 = 100 μ for A-D, F-M; 2 = 50 μ for E. A, antennula. B, antenna. C, mandible-palp. D, maxillula-palp and lobes. E, rake-like organ. F, thoracopoda I. G, maxilla-endopodite. H, maxilla-endopodite. I, maxilla. J, thoracopoda II. K, hemipenis. L, furcal attachment. M, furca.

J), outer extremity of copulatory sheath at mid-length forming a broad hump with right angle (Fig. 5M), and furca with almost equal claws (Fig. 5O).

COLOUR OF SHELL: White to transparent.

SIZE:		L	H		L	H
holotype						
adult male	LV	1 220 μ	600 μ	RV	1 160 μ	560 μ
paratype						
adult						
female	LV	1 410 μ	700 μ	RV	1 390 μ	660 μ

TYPE LOCALITY: Spring at base of limework quarry at Pulbeena Swamp in north-western Tasmania.

DERIVATION OF NAME: From Latin *in* (= without) and *costa* (= ridge) for the absence of prominent selvage in the right valve anteriorly in comparison with *C. novaezelandiae*.

ECOLOGY AND DISTRIBUTION: This species has been collected from the type locality only once; it was found crawling on and within the topmost centimetre of sediment in freshwater. It is also recorded from Lake Peunde, near Mt. Wilhelm (about 3 750 m), Bismarck Range in New Guinea (McKenzie 1971b). A few specimens of *C. incosta* (labelled *Candona lutea*) are present in Chapman's (1914) slide of fossil specimens from Mowbray Swamp in north-western Tasmania. This species has since been re-collected at that site (De Deckker 1981b).

REMARKS: This species differs from *C. novaezelandiae* because of the absence of a prominent selvage at a distance from the edge of the shell in the right valve. This prominent selvage was originally thought to be characteristic of *Candonocypris* species but this is not the case. *C. incosta* has to be included in *Candonocypris* as it shares many other shell and anatomical features with the type species *C. novaezelandiae*. Both species, for example, possess the prominent selvage posterovertrally in the right valve. In the type lot thoracopoda II possesses the two typical setae at mid-length on the last segment (Fig. 5K). This feature is also found on specimens of *Ilyodromus* cf. *smaragdinus* described by McKenzie (1971b). As this feature is not found in *Ilyodromus* (verified from type material of *Ilyodromus smaragdinus*, held in the Oslo Museum), this alone justifies the transfer to *Candonocypris* of McKenzie's specimens. These are now synonymized to *C. incosta* as they have identical shell features and anatomies. Additionally, the outline of the hemipenis and the very short two-jointed sensory seta on the second segment of the antennula (in *Ilyodromus* species it is very long and three-segmented) in *C. incosta* and *C. novaezelandiae*, further justify the grouping of these two species under the same genus.

The only feature different in McKenzie's specimens is the broader extension of the copulatory sheath over the lateral lobe. This difference is not considered to be important. Comparison with the New Guinea material kept in the British Museum and the species described here indicates that all other details of the hemipenis are the same.

Candonocypris novaezelandiae (Baird 1843)

Figs 6, 7

- 1843 *Cypris Novae Zelandiae* Baird, p. 268.
 1855 *Cypris candonioides* King, p. 66.
 1855 *Cypris sydneya* King, p. 65.
 1889 *Herpetocypris stanleyana*; Sars, p. 35.
 1894 *Candonocypris assimilis* Sars, p. 36.
 1894 *Candonocypris candonioides*; Sars, p. 35.
 1919 *Candonocypris assimilis*; Chapman, p. 28.
 1955 *Candonocypris assimilis*; Hornibrook, p. 271.
 1956 *Candonocypris candonioides*; Hornibrook in Gill & Banks, p. 19.
 1969 *Candonocypris assimilis*; Hussainy, p. 305.
 1971 *Candonocypris novaezelandiae*; Eagar, p. 55.
 1975 *Candonocypris assimilis*; Okubo, p. 157.
 1976 *Candonocypris novaezelandiae*; Chapman & Lewis, p. 95.

1976 *Candonocypris assimilis*; Chapman & Lewis, p. 95.

DIAGNOSIS: Member of *Candonocypris* with prominent selvage in right valve usually half way between the outer and inner margins and following the curvature of the shell; posterovertrally in the right valve and near the inner margin, selvage is prominent.

DESCRIPTION: CARAPACE (External)—Smooth shell like a flattened ellipsoid with dorsal area slightly arched; overlap of left valve over right one ventrally and to a lesser extent dorsally at both extremities of the hinge area; right valve larger and like a flatter ellipsoid compared to left one.

(Internal)—Broad selvage all around and placed at a distance from the anterior edge of the right valve; in the left valve, it is faint and peripheral; in both valves, inner lamella twice as broad anteriorly; posteriorly in the right valve, the selvage is prominent, especially posterovertrally where it is near the inner margin: this area is met by a depression in the left valve where the selvage is faint.

ANATOMY: Characterized by a long third segment of the antennula with a length to width ratio of 2.2:1 (Fig. 7A); male maxillar palps differently arched (Fig. 7G, H); outer extremity of copulatory sheath at mid-length forming a narrow but prominent hump (Fig. 7K); furca with unequal claws (Fig. 7M).

COLOUR OF SHELL: Green to beige brown.

SIZE RANGE:	L	H
adult male	1 400-1 500 μ	700-800 μ
adult female	1 650-1 800 μ	750-850 μ

Note: LV narrower but taller than RV in both sexes.

ECOLOGY AND DISTRIBUTION: This freshwater species is usually found in farm dams and eutrophic waters, even sewerage lagoons. It is commonly found in high numbers crawling in among decaying vegetal matter and black organic muds, especially near lake shores. Hussainy (1969) was the first to describe the male of *C. assimilis* (synonymized here to *C. novaezelandiae*) from Lake Purrumbete. Males have since been found in a number of permanent waterbodies (e.g. Milbrook and Kangaroo Creek Reservoirs) but not in ephemeral waters or small waterbodies such as farm dams.

Adults of *C. novaezelandiae* are a benthic species and

have never been seen to swim. Juveniles, on the other hand, are good swimmers, having natatory setae of their antennae much longer than in adults.

REMARKS: Examination of the type material of *C. novaezelandiae* (empty valves only) kept in the British Museum confirmed the suggestion of Eagar (1971) that this species is synonymous with *C. candonioides*. Additionally, since in many collections taken in ephemeral waters, morphs representing both *C. candonioides* and *C. assimilis*, as illustrated by Sars (1894, Plate V.1 and 2), are found together, it is suggested here that they represent the same species: *C. candonioides* synonymized to *C. novaezelandiae*. For example, forms of *C. assimilis* as illustrated in Fig. 6 n-p from a small farm dam near Gilmandyke Creek, south of Bathurst in New South Wales are considered to be young specimens of *C. novaezelandiae* found in the same collection and illustrated in Fig. 6 l, m, s. There are no morphological differences in anatomy except that appendages of *C. novaezelandiae* are bigger. In the latter, the colour of the shell is green with yellow to brown diagonal bands caused by the ovaries, whereas shells of *C. assimilis* morphs are beige brown in colour with similar bands for the ovaries (Sars 1894).

The latter morph is smaller and has a slightly arched dorsum (the greatest height is at the middle) whereas the *C. novaezelandiae* morph is larger, more arched dorsally (greatest height at about 0.66 of length from the anterior) and with the right valve much larger than the left anteriorly and posteriorly. This synonymy is further confirmed by the fact that the anatomy of male specimens described by Hussainy (1969) from Lake Purumbete in Victoria for *C. assimilis* is identical to that of male specimens of *C. novaezelandiae* found in Milbrook Reservoir in South Australia. The presence of well formed ovaries in juveniles in some ostracod species is not uncommon in the family Cyprididae and this would therefore explain why previous authors have considered *C. assimilis* morphs to represent the last molt stage of the species.

From the original illustration and short description of *Cypris sydneya* King 1855, it appears that King's species represents the *C. assimilis* morph because of the outline and colour of the shell, limited ability to swim, and the habit of crawling on mud.

C. novaezelandiae is found in New Zealand (Sars 1894, Chapman 1963, Chapman & Lewis 1976), Australia (Sars 1894, 1896a, Henry 1923) and Japan (Okubo 1975). Originally Sars (1894) stated that this species was also present in South Africa as he had raised it in his aquaria from samples of dried mud collected at Knysna, Cape of Good Hope, but later (Sars 1924) suggested that this had been caused by contamination by Australian material in his aquaria.

Genus *Ilyodromus* Sars 1894

TYPE SPECIES: *Candona stanleyana* King 1855.

DIAGNOSIS: See Danielopol & McKenzie (1977, p. 305).

REMARKS: The genus *Ilyodromus* has recently been redescribed by Danielopol and McKenzie (1977) who

provided a diagnosis for *I. stanleyanus* and redescription of *I. varrovillius* (King 1855) from New Zealand specimens. Both species were originally described from Australia. These authors also discussed all the other *Ilyodromus* species and their geographical distribution.

Ilyodromus amplicolis n. sp.

Figs 8, 9 1-r

DIAGNOSIS: Member of *Ilyodromus* with striated shell; anterior and posterior ends broadly rounded; a slight concavity in front of the hinge anterodorsally; inner lamellae broad anteriorly and posteriorly; lateral lobe of hemipenis broad and rectangular in shape; maxilla palps of male similar to each other.

DESCRIPTION: CARAPACE (External)—Weakly calcified; elongated ellipsoid with joint striations all over; dorsum straight along the hinge line and slightly concave anterior to it; dorsally behind the hinge line it is flat and inclined; anterior and posterior broadly rounded but the latter is narrower; ventrum almost flat except in the middle of the mouth region where it is concave; greatest height at 0.33 of length from the anterior, left valve slightly larger.

(Internal)—Inner lamella very broad and similar in both valves; anteriorly, the width of the inner lamella is one-third of the length of the shell; there it is slightly broader and it extends all around the shell except in the hinge area dorsally; selvage faint and peripheral in both valves.

ANATOMY (Antennula)—(Fig. 8A) Seven-segmented; length width ratio of the last six segments: 1.2:1, 1.6:1, 1.2:1, 1.6:1, 2:1, 2:1; natatory setae as long as last five segments; 3-segmented sensory organ on second segment with distal end pointed.

(Antenna)—(Fig. 8B) Natatory setae short: two longest ones shorter than the penultimate segment and two minute ones reaching the proximal end of the same segment.

(Mandible)—(Fig. 8I) Mandibular coxale with seven teeth; palps with α bristle short, barren and slim, β bristle stout, pointed and densely pilose, γ bristle thick, slightly longer than the last segment and pilose in the distal half.

(Rake-like organ)—(Fig. 8C, D) Seven to nine teeth with an additional bifid one on the inner side.

(Maxillula)—(Fig. 8E) Distal palp trapezoid and two smooth Zahnborsten on third lobe.

(Maxilla)—Sexually dimorphic; in male (Fig. 8 G, H) palps strongly and similarly arched and one slightly narrower in the proximal 0.33 of its length; in female (Fig. 8F) three plumose setae, the middle one being twice the length of the other two which are equal; in both sexes, epipod with five long and a shorter plumose Strahlen; for chaetotaxy of protopod, see Fig. 8L.

(Thoracopoda I)—(Fig. 8J) Third segment well divided; inner distal seta of second segment shorter than half the length of the 3rd segment and outer seta on distal segment 0.2 of the length of the claw.

(Thoracopoda II)—(Fig. 8N) Three-segmented with large distal pincers; distal setae unequal: shorter one

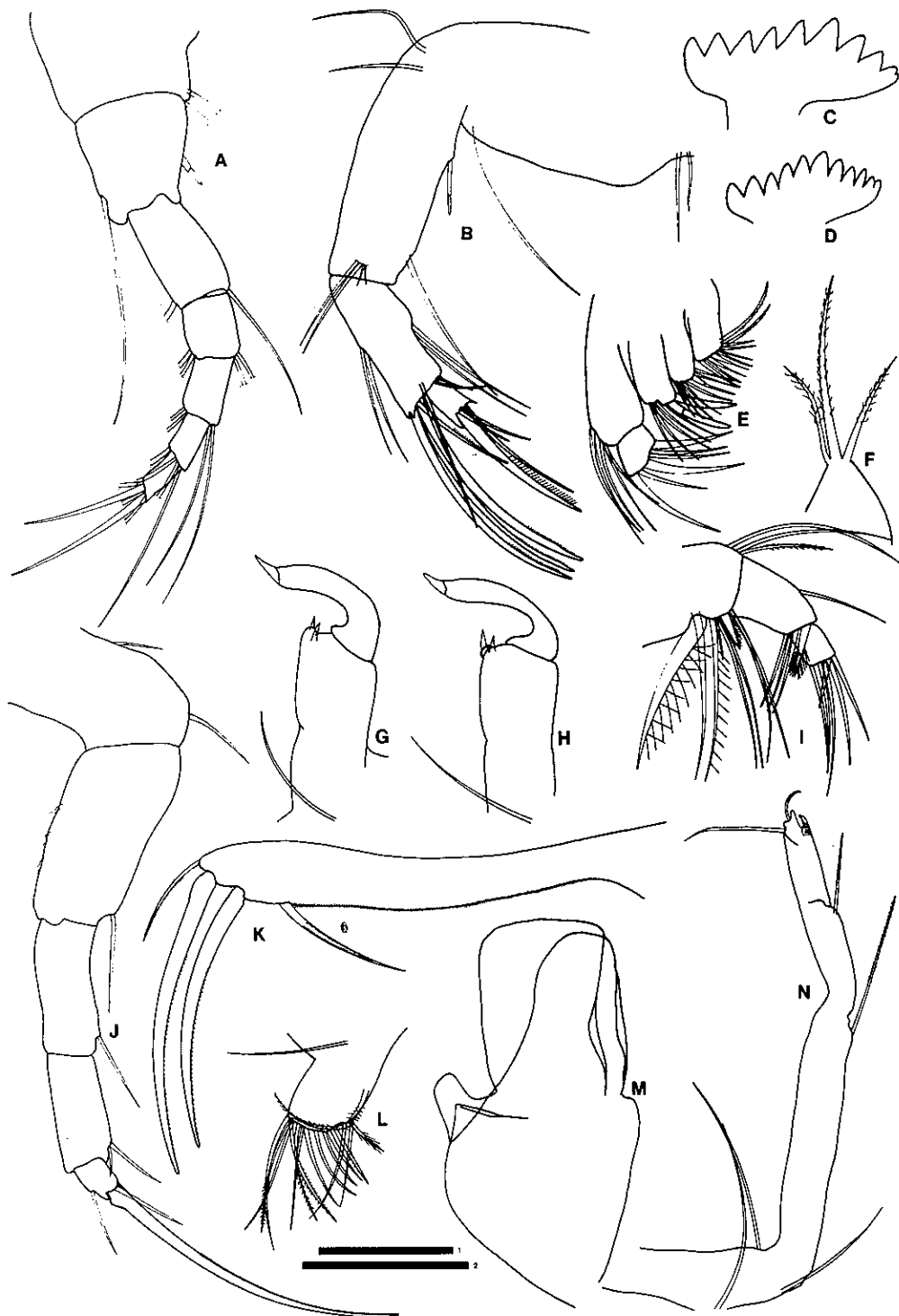


Fig. 8—*Ilyodromus amplicolis* n. sp. Granite rock pool on top of Boyagin Rock, between Brookton and Pingelly, W.A. A, B, D, E, G-J, L-N drawn from paratype adult male; remainder from holotype adult female. Scales: 1 = 100 μ for A, B, E-N; 2 = 50 μ for C, D. A, antennula. B, antenna. C, rake-like organ. D, rake-like organ. E, maxillula—palp and lobes. F, maxilla—endopodite. G, maxilla—endopodite. H, maxilla—endopodite. I, mandible—palp. J, thoracopoda I. K, furca. L, maxilla—protopodite. M, hemipenis. N, thoracopoda II.

hook-shaped and about 0.33 of the length of the other.

(Hemipenis)—(Fig. 8M) Lateral lobe broad and rectangular; inner lobe broad, subrectangular but about 0.8 of the width of the lateral lobe and almost same length; near the base of the lateral lobe on the inside, small knob-like protuberance.

(Zenker organ)—More than 30 rosettes.

(Furca)—(Fig. 8K) Claws almost equal with pectinate and thick posterior seta half the length of the posterior claw and 0.66 longer than the pectinate and narrow anterior seta.

(Furcal attachment)—Median branch long, divided distally and with a broad, but short, spike at right angle near its proximal end ventrally.

COLOUR OF SHELL: White to transparent ventrally and bluish green dorsally.

SIZE:	L	H	L	H
holotype adult				
female	LV 2 000 μ	920 μ	RV 2 020 μ	960 μ
paratype adult male	LV 1 540 μ	720 μ	RV 1 550 μ	—

TYPE LOCALITY: Granite rock pool on top of Boyagin Rock, between Brookton and Pingelly, W.A.

DERIVATION OF NAME: From Latin *amplus* (= large) and *colis* (= penis) for the unusually large penis.

ECOLOGY AND DISTRIBUTION: This species has been collected in the following localities: granite rock pools in Sullivan Rocks, 11 km south of Gleneagle, W.A. (or 63 km south of Perth on Albany Highway); roadside ditch north of Scadden, W.A. (56 km north of Esperance on road to Norseman). *I. amplicolis* appears to be restricted to fresh, temporary pools.

REMARKS: *I. amplicolis* differs from *I. varrovillius* (King 1855) and *I. stanleyanus* (King 1855), which have similar shell outlines, by the absence of long natatory setae on its antennae (in specimens of these two species examined in Sars' collection, the natatory setae extend past the tip of the antennal claws). No males have been found in the latter two species.

Ilyodromus condonites n. sp.

Figs 9a-k, 10

DIAGNOSIS: *Ilyodromus* with subrectangular shell in lateral view, with posterior broadly rounded and anterior tapering; valves faintly striated; inner lamella anteriorly almost three times the width of the posterior in both valves; faint selvage peripheral in the right valve and broader, 0.33 of width from the outer margin on the inner lamella posteriorly and ventrally; natatory setae of antenna atrophied; maxilla palps in male similar, hook-shaped and angular; lateral lobe of hemipenis digitate and broadest distally.

DESCRIPTION: CARAPACE (External)—Subrectangular in lateral outline with posterior broadly rounded and almost forming a right angle with the dorsum which is almost flat; anterior tapering but rounded and anterodorsal area inclined; ventrum almost flat except in the mouth region which is slightly concave 0.4 of length

from the anterior; surface of shell faintly striated with two generations of striae (Fig. 9k; in dorsal view, like a flattened ellipsoid with both ends pointed; simple normal pore canals scattered with broad rim.

(Internal)—Inner lamella anteriorly almost three times the width of the posterior in both valves; selvage peripheral and faint in the right valve and broader and 0.33 from the outer margin on the inner lamella posteriorly and ventrally; anteriorly the inner lamella is faintly reticulated like all *Ilyodromus* species.

ANATOMY (Antennula)—(Fig. 10A) Seven-segmented: length width ratio of last six segments: 2:3, 1.8:1, 1.2:1, 1.4:1, 1.8:1, 1.3:1; sensory organ on second segment 3-segmented and short; natatory setae as long as all segments together.

(Antenna)—(Fig. 10B) Three claws on penultimate segment and a fourth one on the distal one; natatory setae extremely short except for the outer one which is as long as half the length of the penultimate segment.

(Mandible)—(Fig. 10G) Mandibular coxale with seven teeth; palp 3-segmented and with α bristle stylet-like, β bristle stout, pointed and densely pilose, γ bristle slightly longer than distal segment, stout and densely pilose in the distal two thirds; epipod with five long plumose Strahlen plus a shorter one at mid-length and a smaller barren seta near its base.

(Rake-like organ)—Seven to nine teeth plus a bifid one on the inner side of each rake.

(Maxillula)—(Fig. 10C) Distal part short and trapezoidal; third lobe with two smooth Zahnborsten; epipod plate with 22 Strahlen.

(Maxilla)—Sexually dimorphic: in male (Fig. 10D, E) palps similar, narrow, angular and hook-shaped; in female (Fig. 10F) three plumose setae with middle one twice the length of the other two which are of almost equal length; for chaetotaxy of protopod, see Fig. 10F.

(Thoracopoda I)—(Fig. 10I) 3rd segment divided; distal seta of 2nd segment as long as half of the length of the 3rd segment; outer seta on 4th segment 0.25 of the length of the distal claw.

(Thoracopoda II)—(Fig. 10K) Three-segmented; distal setae unequal with shorter one curved and about 0.33 of the length of the other; distal pincers small.

(Hemipenis)—(Fig. 10H) Lateral lobe digitate with distal end broadest; inner lobe bilobate distally and curved inward.

(Zenker organ)—With about 27 rosettes.

(Furca)—(Fig. 10J) Both claws of almost equal length; posterior seta thick; pectinate and half the length of the posterior claw; slim anterior seta barren and about half length of the other seta.

(Furcal attachment)—median branch long, divided distally and with a broad, short and curved spike at right angle near its proximal end ventrally.

COLOUR OF SHELL: Green.

SIZE:	L	H	L	H
holotype adult male	LV 1 140 μ	600 μ	RV 1 140 μ	600 μ

TYPE LOCALITY: Small granite rock pool at summit of Mt. Chudalup, near Northcliffe, W.A.

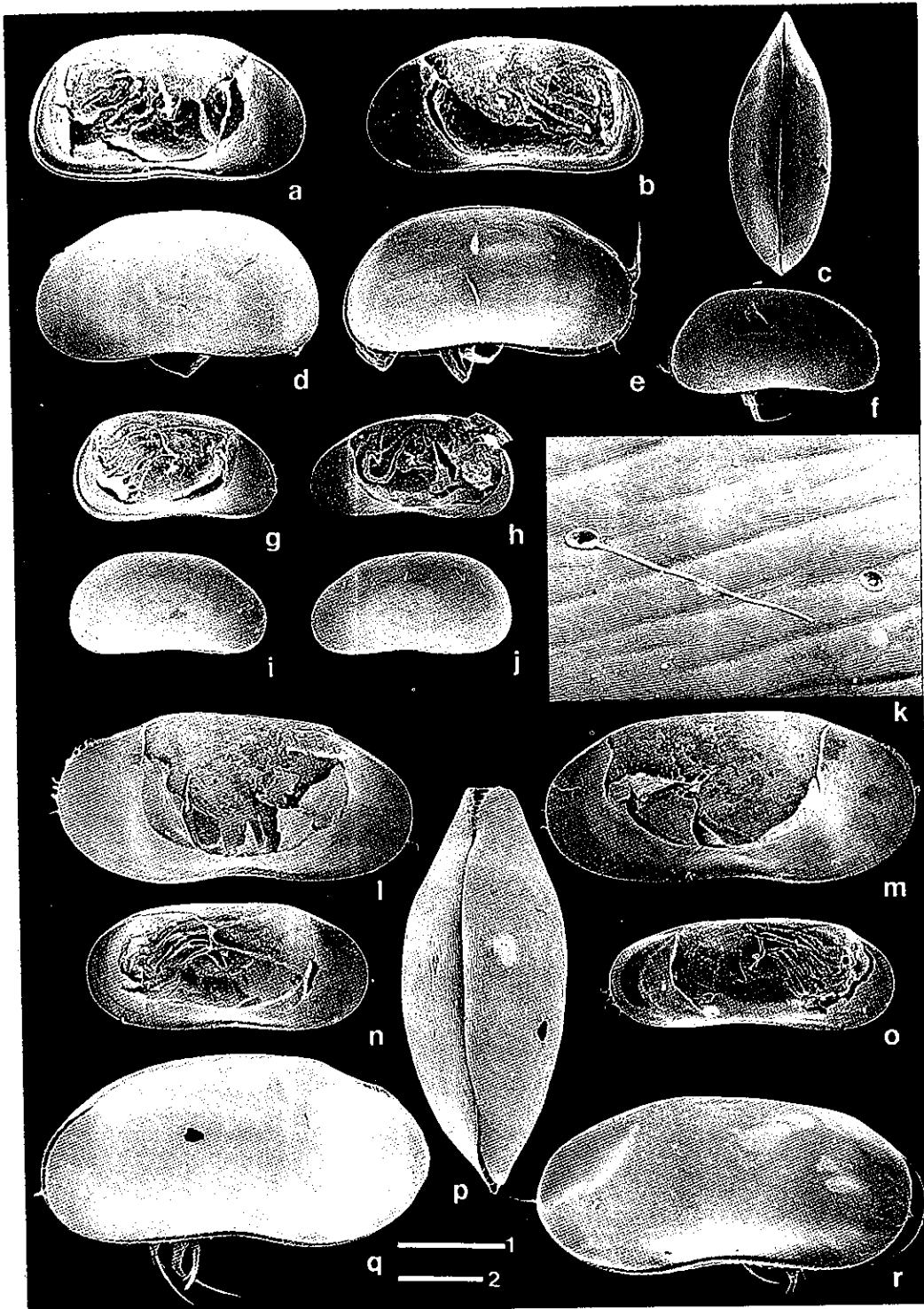


Fig. 9— a-k *Ilyodromus candonites* n. sp. a-e, k Small granite rock pool on Muirillup Rock, near Northcliffe, W. A. f-j Small granite rock pool at summit of Mt Chudalup, near Northcliffe, W.A. Scales: 1 = 500 μ for a-j; 2 = 10 μ for k. a-e, k females; f, i-j male paratypes; g, h male holotype. a, LV internal. b, RV internal. c, C dorsal. d, C showing LV. e, C showing RV. f, C showing RV. g, LV internal. h, RV internal. i, RV external. j, LV external. k, C showing LV, detail of d. l-r, *Ilyodromus amplicolis* n. sp. Granite rock pool on top of Boyagin Rock, between Brookton and Pingelly, W.A. Scale: 1 = 500 μ l, m holotype female; n, o paratype male; p, r paratype female. l, RV internal. m, LV internal. n, LV internal. o, RV internal, specimen distorted. p, C dorsal. q, C showing RV, same specimen as p. r, C showing LV, specimen distorted.



Fig. 10—*Ilyodromus candonites* n. sp. Granite rock pool on top of Boyagin Rock, between Brookton and Pingelly, W.A. A-E, H-K drawn from holotype adult male, F, G from paratype adult female. Scale: =100 μ . A, antennula. B, antenna. C, maxillula-palp and lobes. D, maxilla-endopodite. E, maxilla-endopodite. F, maxilla. G, mandible-palp. H, hemipenis. I, thoracopoda I. J, furca. K, thoracopoda II.

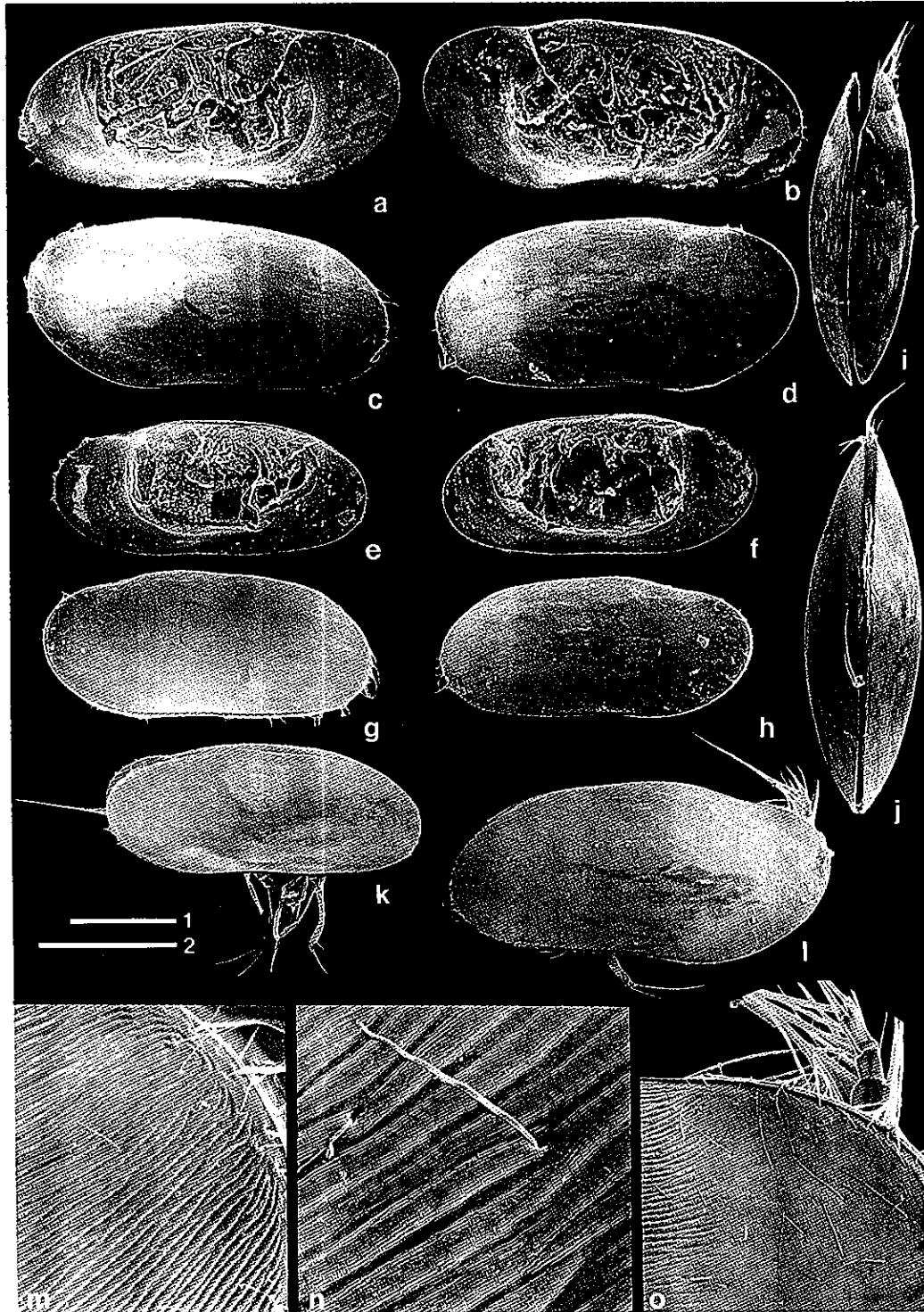


Fig. 11—*Ilyodromus dikrus* n. sp. Dam at Wasley Well, near Nallan, W.A. Scales: 1 = 500 μ for a-l; 2 = 100 μ for m, = 20 μ for n, = 200 μ for o. a-d, j, l, o female paratypes; e, f, i-k male paratypes; g, h, m, n male holotype. a, LV internal. b, RV internal. c, LV external. d, RV external. e, RV internal. f, LV internal. g, LV external. h, RV external. i, C dorsal. j, C ventral. k, C showing LV, penis and some appendages. l, C showing RV. m, LV external, posterior detail of g. n, LV external, detail of g. o, C showing RV, anterior detail of l.



Fig. 12—*Ilyodromus dikrus* n. sp. Dam at Wasley Well, near Nallan, W.A. A, B, D, E, G, H, K, L, N drawn from holotype adult male, the remainder from paratype adult female. Scale: 1 = 100 μ . A, antennula. B, antenna. C, maxillula—palp and lobes. D, thoracopoda I. E, hemipenis. F, maxilla. G, maxilla—right endopodite. H, maxilla—left endopodite. I, mandible—palp. J, mandible—coxale. K, Zenker organ. L, thoracopoda II. M, furcal attachment. N, furca.

DERIVATION OF NAME: From the genus *Candona* plus the Greek suffix *-ites* (=like) as the lateral profile of this species is reminiscent of many species of *Candona*.

ECOLOGY AND DISTRIBUTION: This species has only been collected in Western Australia. It occurs in many temporary granite pools near Northcliffe—at and near summit of Mt. Chudalup, and on and near Muirillup Rock. The size of *I. candonites* is variable: the length of adult specimens can vary between 1 100 μ and 1 400 μ .

REMARKS: *Ilyodromus candonites* differs from *I. viridulus* specimens examined in Sars' collection on the following important details: the natatory setae of the antenna almost reach the tip of the claws in the latter species, and its shell is more elongated: it is faintly concave dorsally in front of the hinge (*I. candonites* is flat) and the selvage is near the inner margin posteriorly in the left valve and is broader posteriorly in the right valve. The greatest extension of the shell posteriorly in *I. viridulus* is at mid-height whereas it is near the ventrum in *I. candonites*. The latter species differs from type specimens of *I. substriatus* Sars 1894 and *I. obtusus* Sars 1894 from Sars' collection (which have short natatory setae on the antennal segment), on the following features of the shell: *I. substriatus* has a broad selvage posteriorly in the right valve which is met by a depression in the left valve where the selvage is faint and along the periphery of the inner margin; in *I. obtusus* the selvage is faint and along the outer margin in both valves. No males are known for Sars' species.

Ilyodromus dikrus n. sp.

Figs 11, 12

DIAGNOSIS: Member of *Ilyodromus* like an inclined parallelogram with rounded ends in lateral view; obvious depression anterior to the hinge dorsally; with the greatest extension of the shell anteriorly 0.4 from the dorsum plane; inner lamella broad throughout in both valves; male maxilla palps asymmetrical, the narrower one being more arched; outer seta of 4th segment thoracopoda more than half the length of the distal claw; hemipenis with digitate lateral lobe and inner lobe like an elongated rectangle reaching almost the tip of the lateral lobe.

DESCRIPTION: CARAPACE (External)—Inclined parallelogram with rounded ends in lateral view, with obvious depression anterior to the hinge dorsally; shell with longitudinal striations of two generations (Fig. 11n) all over except in the anterior area near the margin; simple type normal pores; greatest extension of the shell anteriorly at 0.4 from dorsum plane and 0.6 posteriorly; ventrum concave just before mid-length. In dorsal view extremely narrow and with both ends pointed.

(Internal)—Inner lamella similar in both valves and of similar width anteriorly and posteriorly; it is broadest anteriorly where the valve extends the furthest, and narrowest in the mouth region above the concavity.

ANATOMY. (Antennula)—(Fig. 12A) Seven-segmented: length width ratio of last six segments: 1:1, 1.8:1, 1:1,

1.3:1, 1.7:1, 2.5:1; natatory setae as long as last six segments, sensory organ on second segment elongate.

(Antenna)—(Fig. 12B) Three distal claws on the penultimate segment with a shorter one on the distal segment; natatory setae extending much further than the tip of the claws.

(Mandible)—(Fig. 12I, J) Mandibular coxale with seven teeth; palp with α bristle stylet-like, β bristle stout and densely pilose, γ bristle broad, almost twice the length of the distal segment and pilose in the distal half; epipod plate with four pilose Strahlen.

(Rake-like organ)—Seven to nine teeth, plus one bifid tooth on inner side of each rake.

(Maxillula)—(Fig. 12C) Distal segment of palp trapezoidal and third lobe with two smooth Zahnborsten; epipod with about 18 plumose Strahlen.

(Maxilla)—Sexually dimorphic: male (Fig. 12G, H) palps asymmetrical with the narrower more strongly arched; the other is broadest at mid-length; female (Fig. 12F) palp with three short plumose setae, the middle one almost twice the length of the other two which are of similar length; for chaetotaxy of protopod see Fig. 12F.

(Thoracopoda I)—(Fig. 12D) Seta at mid-length on outer side of fourth segment thick and more than half the length of the distal claw; proximal seta on first segment 0.33 of the length of the distal one.

(Thoracopoda II)—(Fig. 12L) Three-segmented; distal pincers small and distal setae unequal: longest seta 1.6 times the length of the shorter and slightly curved one.

(Hemipenis)—(Fig. 12E) Lateral lobe digitate and inner lobe like an elongated rectangle reaching almost the tip of the lateral lobe; the broad tip of the inner lobe is covered with small hooks.

(Zenker organ)—(Fig. 12K) Elongate, with 25 rosettes.

(Furca)—(Fig. 12N) Claws almost equal; posterior seta slim, pectinate, twice the length of the other barren seta and 0.66 of the length of the posterior claw.

(Furcal attachment)—(Fig. 12M) Median branch thick, bifurcate distally and with broad spike at right angle near its base.

COLOUR OF SHELL: White.

SIZE:	L	H	L	H
holotype				
adult male	LV 1 270 μ	560 μ	RV 1 270 μ	560 μ
paratype				
adult				
female	LV 1 470 μ	660 μ	RV 1 470 μ	660 μ

TYPE LOCALITY: Dam at Wasley Well, near Nallan, 21 km NNE of Cue, W.A. (27°16'54"S, 118°09'06"E).

DERIVATION OF NAME: From Creek *dikros* (=forked) for the forked appearance of the distal end of the thoracopoda I which has a long outer seta on the last segment.

ECOLOGY: this species has only been collected once from the type locality: water was fresh and turbid.

REMARKS: Although this species appears at first glance to resemble the elongated *I. varrovillius* (King 1855), it is easily separated from the latter by its long seta on the

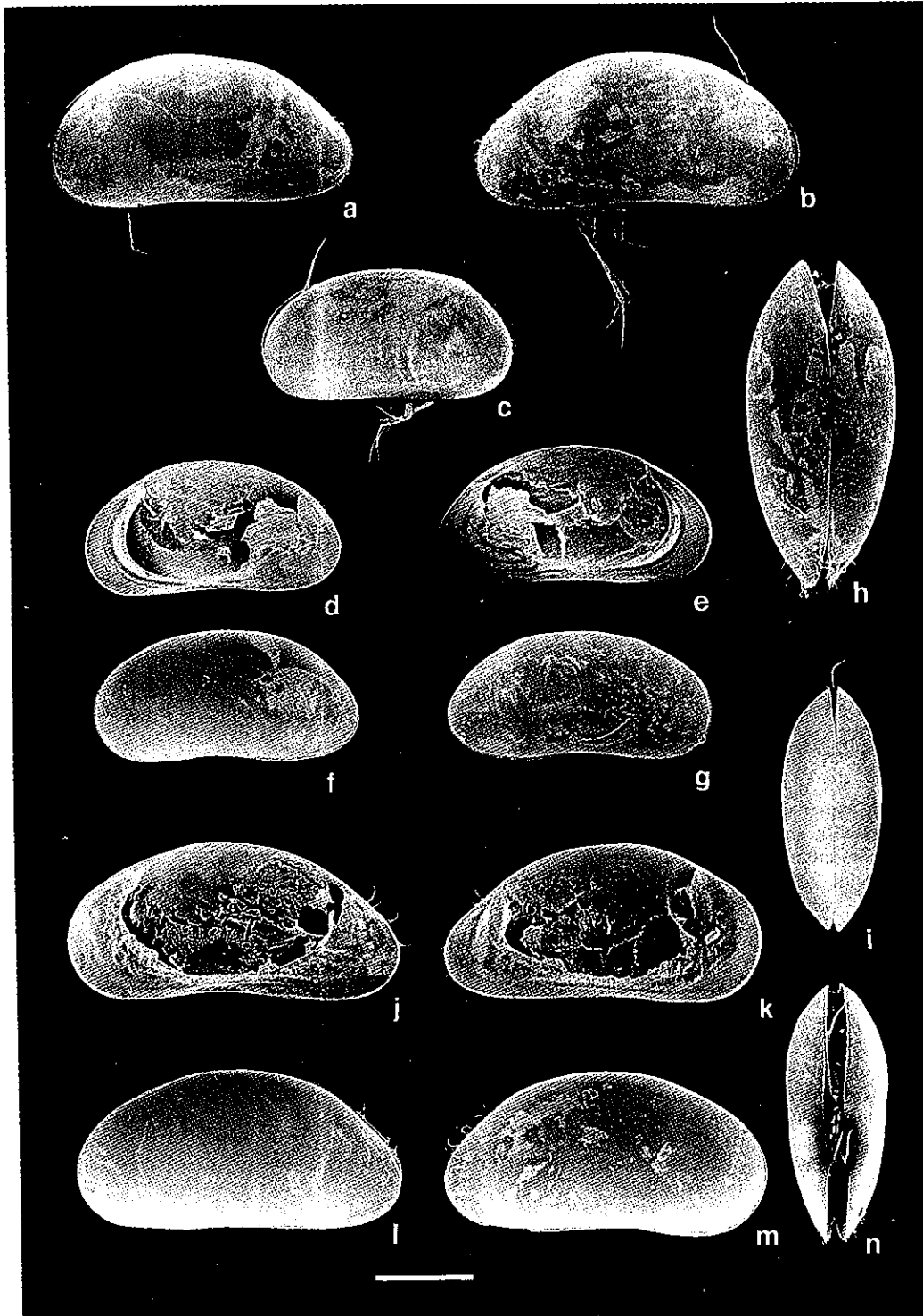


Fig. 13 — *Ampullacypris oblongata* (Sars 1896). Roadside pool, on Gibb River Road, 58 km E. of Derby, W. A. Scale: = 500 μ . a, b, h, j-m females, c-g, i, n males. a, C showing LV. b, C showing RV. c, C showing LV. d, RV internal. e, LV internal. f, LV external. g, RV external. h, C dorsal. i, C dorsal. j, RV internal. k, LV internal. l, LV external. m, RV external. n, C ventral.

last segment of the thoracopoda I and by its inclined parallelogram outline in lateral view. *I. varrovillius* in Sars' collection has short natatory setae on the antenna.

***Ilyodromus williamsi* (McKenzie 1966)**

1966 *Isocypris williamsi* McKenzie, p. 266.

REMARKS: The transfer of this species to *Ilyodromus* is suggested here because this species possesses many typical anatomical features of that genus. These are: 3-segmented sensory organ on the 2nd segment of the antennula; slim stylet-like α bristle; stout, pointed and densely pilose β bristle; thick, stout γ bristle which is pilose in its distal half; trapezoid palp and smooth Zahnborsten on maxillula; presence of two setae on 1st segment of thoracopoda I; thick and pectinate posterior seta on furca and furcal attachment with stout spike forming a right angle with the median branch near its base. All these were seen on the holotype.

Although *I. williamsi* has a smooth shell (when examined under a binocular microscope), contrary to most *Ilyodromus* species, it is still included in that genus for the reasons given above. It is worth noting, however, that striations on the shell of many *Ilyodromus* specimens, all belonging to the one species and collected together, can vary; on some specimens of *I. viridulus*, for example, striations are only visible anteriorly and posteriorly, on others the shell is smooth, and others the shell is finely striated.

McKenzie (1971a) has already pointed out that *I. williamsi* was not an *Isocypris sensu stricto* on shell characters alone. This species in fact is closely related to *I. dikrus* as they both have a similar shell outline but *I. williamsi* has a faint selvage at a distance from the outer lamella anteriorly in the left valve and has a very short outer seta on the distal segment of the thoracopoda I.

I. williamsi is only known from the type locality, about 16 km west of Inverway, N.T.

Genus *Ampullacypris* n. gen.

TYPE SPECIES: *Ampullacypris oblongata* (Sars 1896).

DIAGNOSIS: Smooth ellipsoidal shell with normal pore canals and flattened when viewed dorsally; inner lamella broad anteriorly and posteriorly in both valves; central muscle field consisting of a row of three in front and two behind plus a hollow inclusion above and in front of the upper adductor scar; two mandibular scars in front and below the adductor scars; two toothed Zahnborsten and rectangular palp on maxillula; mandibular palp with α bristle smooth and slim, β bristle longer (but not stout) and densely pilose, γ bristle longer than last segment, stout and pilose on its distal half; maxilla palps on male asymmetrical; 1st segment of thoracopoda I with one long seta, furcal shaft smooth and posterior seta on furca thick and pectinate; furcal attachment with median branch long and no distal ornament plus dorsal branch forming narrow elongated loop.

DERIVATION OF NAME: from Latin *ampulla* meaning flask (as the type species has been described from specimens originally grown in an aquarium by G. O. Sars) and the generic name *Cypris*.

REMARKS: *Ampullacypris* n. gen. is closely related to *Psychrodromus* Danielopol & McKenzie 1977 and *Ilyodromus* Sars 1894. It differs from these two genera on the following important anatomical feature: the distal end of the furcal attachment does not have a wedge shaped spike and the dorsal branch forms a loop. *Ampullacypris* differs from *Psychrodromus* by possessing a smooth furcal shaft and from *Ilyodromus* by its two-toothed Zahnborsten and a rectangular palp on the maxillula. The α , β , and γ bristles on the maxilla of *Ampullacypris* are like those of *Psychrodromus* as is the two-segmented, short sensory organ on the 2nd segment of the antennula.

***Ampullacypris oblongata* (Sars 1896)**

Figs 13, 14

1896 *Cypris oblongata* Sars, p. 29.

1901 ? *Amphicypris oblongata*; Sars, p. 18.

1923 *Amphicypris oblongata*; Henry, p. 268.

DIAGNOSIS: Smooth ellipsoidal shell with posterior narrower than anterior and ventral area almost flat; in dorsal view, shell narrow and greatest width at about a third from the anterior. Inner lamella broad anteriorly and posteriorly in both valves. Lateral lobe of hemipenis crescent-shaped; Zenker organ with 42 rosettes.

DESCRIPTION: CARAPACE (External)—smooth ellipsoidal shell with posterior narrower than anterior and ventral area almost flat except in the mouth area in the middle where it is faintly concave. Valves similar with left one slightly longer and overlapping the other slightly ventrally. In dorsal view, shell narrow and greatest height at about a third from the anterior. Shell hirsute posteriorly.

(Internal)—Inner lamella broad anteriorly and posteriorly in both valves and selvage faint and peripheral except in the right valve ventrally; thin flange along the periphery of the right valve. Marginal pore canals common, short and straight. Central muscle field consisting of a row of 3 scars in front with the central one the smallest; two scars are situated behind the front row and are at the level of the two lower scars; two mandibular scars in front and below the adductor scars and a hollow inclusion above and in front of the upper adductor scar.

ANATOMY: (Antennula)—(Fig. 14B) Seven-segmented, length width ratio of the last six segments: 1:1, 2.2:1, 5:3, 8.5:5, 7:4, 3:1; 2nd segment with two segmented, short sensory organ.

(Antenna)—(Fig. 14C) Natatory setae reaching the tip of the claws; 3 claws of equal length on penultimate segment and reaching the tip of the other claw on the last segment.

(Mandible)—(Fig. 14A, G) Palp with α bristle smooth and slim, β bristle longer (but not stout) and densely pilose, γ bristle longer than last segment, stout and pilose on its distal half.

(Rake-like organ)—(Fig. 14D) Seven teeth plus one inner bifid tooth.

Maxillula)—(Fig. 14F) Distal palp rectangular and two toothed Zahnborsten on the third lobe.

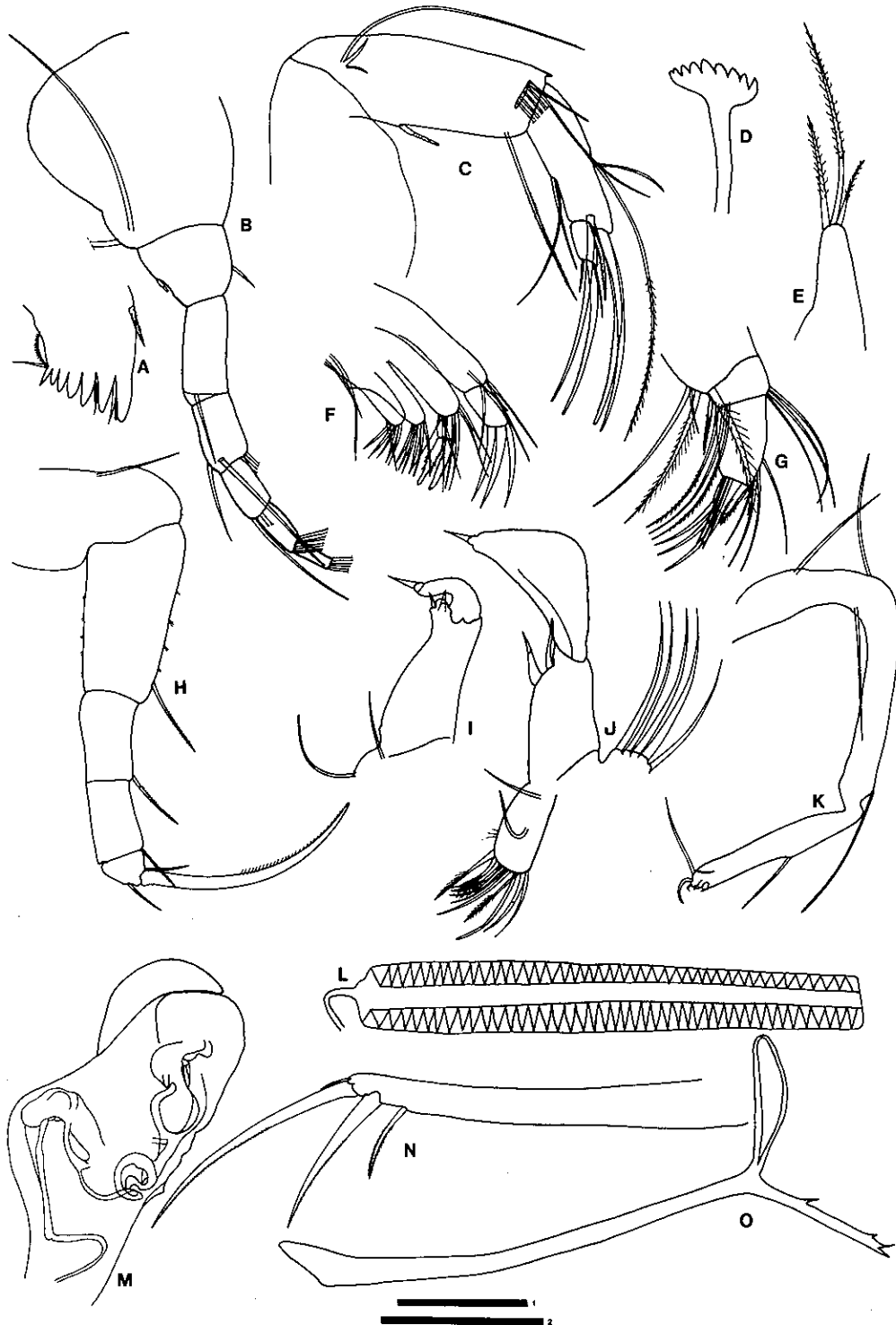


Fig. 14—*Ampullacypris oblongata* (Sars 1896). Roadside pool, Gibb River Road, 58 km E. of Derby, W.A. A-D, G-N drawn from adult male, E, F, O from adult female. Scales: 1 = 100 μ for A-C, E-O; 2 = 50 μ for D. A, mandible-coxale. B, antennula. C, antenna. D, rake-like organ. E, maxilla-endopodite. F, maxillula-palp and lobes. G, mandible-palp. H, thoracopoda I. I, maxilla-left endopodite. K, right maxilla. L, thoracopoda II. M, Zenker organ. N, hemipenis. O, furca. P, furcal attachment.

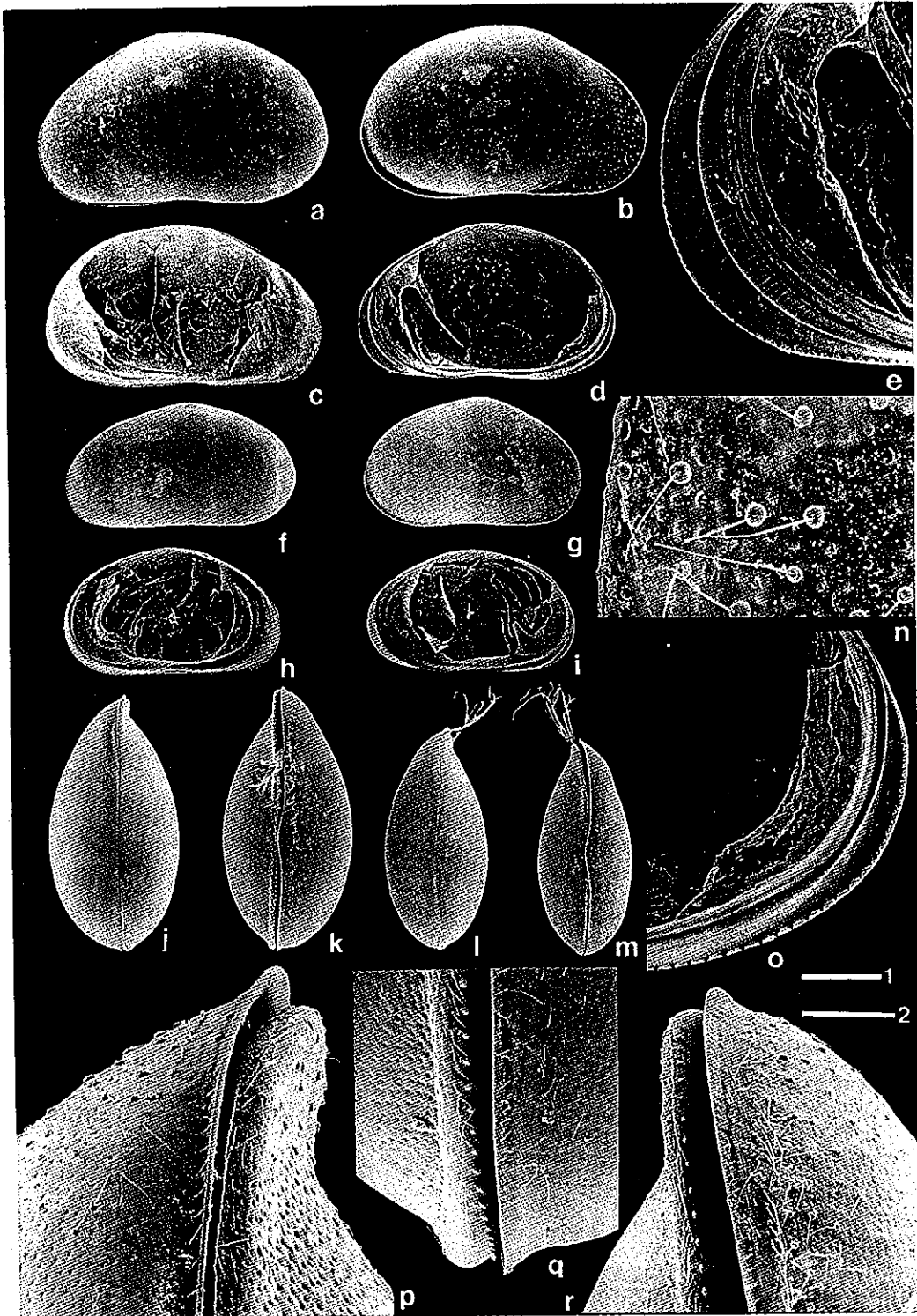


Fig. 15—*Heterocypris vatia* n. sp. Hexham Swamp, Newcastle, N.S.W. Scales: 1 = 500 μ for a-d, f-m, = 200 μ for e, o, = 40 μ for n; 2 = 100 μ for p-r. a-e, j, l, o, p female paratypes; f, g, k, m, n, q, r male paratypes; h-i male holotype. a, LV external. b, RV external. c, LV internal. d, RV internal. e, RV internal, anterior detail of d. f, LV external. g, RV external. h, LV internal. i, RV internal. j, C dorsal. k, C ventral. l, C dorsal. m, C ventral. n, RV external, anterior detail of g. o, RV internal, posterior detail of d. p, C dorsal, anterior detail of j. q, C ventral, posterior detail of k. r, C ventral, anterior detail of k.

(Maxilla)—Sexually dimorphic: male (Fig. 14I, J) palps asymmetrical: right one broad and triangular with outer side forming a rounded right angle and with two long bristles near the base of the palp; other smaller, narrower and more arched plus, at the base of the palp, with two shorter and also smooth bristles. Female (Fig. 14E) palp with three unequal plumose setae, the middle one being longer than the other two together.

(Thoracopoda I)—(Fig. 14H) Proximal end of 1st segment with a long seta only; penultimate segment divided; seta at the inner distal end of the last 3 segments and at the division of the penultimate segment; last segment with an outer seta, as long as inner one, near the distal end.

(Thoracopoda II)—(Fig. 14K) 3-segmented; distal seta of second segment longer than half the length of the third segment; distal setae unequal with shorter one curved and about one-third the length of the other straight one; distal pincers small.

(Hemipenis)—(Fig. 14M) Broadly ellipsoidal in shape with lateral lobe crescent-shaped.

(Zenker organ)—(Fig. 14L) Narrow long and with 42 rosettes.

(Furca)—(Fig. 14N) Distal claws unequal; posterior seta pectinate, much thicker and longer than anterior one and half the length of the posterior claw.

(Furcal attachment)—(Fig. 14 O) Median branch long and slightly curved with dorsal branch like a narrow, elongate loop normal to the median branch and forming an obtuse angle with the straight ventral branch.

COLOUR OF SHELL: Beige brown.

SIZE:	L	H
From Sars' (1896) female: carapace	1 900 μ	800 μ
male: carapace	1 600 μ	—
Specimens examined here:		
adult female: carapace	1 840 μ	880 μ
adult male: carapace	1 520 μ	760 μ

ECOLOGY AND DISTRIBUTION: This species was raised by Sars (1869b) from a dry sample of sand collected 64 km east of Roebuck Bay in W.A. In Sars' collection, there are a number of samples of *A. oblongata* for which the given locality is central Australia and others for which females and one male, all undissected and preserved in a hardened polyvinyl alcohol slide (Oslo Museum—Sars' collection No. 11 600) are syntypes. The male is designated here as lectotype. In addition, the vial containing about 10 specimens of *A. oblongata* in the "old spirit collection of Sars" held in the Oslo Museum, under the number of 53.3/2 are also syntypes. The specimens described here have been collected in a roadside pool on the Gibb River road, 58 km east of Derby, W.A. The specimens labelled "*Eucypris*" cf. *oblongata* (Sars, 1896) by McKenzie (1966) do not belong to the species described here as one of the specimens studied by him has peripheral tubercles on the right valve.

Subfamily CYPRINOTINAE Bronstein 1947
Genus *Heterocypris* Claus 1892

TYPE SPECIES: *Heterocypris incongruens* (Ramdohr 1808).

Heterocypris vatia n. sp.

Figs 15, 16

DIAGNOSIS: Member of *Heterocypris* with anterior edge of right valve bent outward; lateral lobe of hemipenis boot-shaped with "sole" of the boot convex; inner lobe of hemipenis with scattered minute hooks.

DESCRIPTION: CARAPACE (External)—Bean-shaped in lateral view with dorsum curved; greatest height at 0.4 to 0.5 from the anterior; posterior slightly more broadly arched than anterior; ventral area nearly flat except in the mouth region which is faintly concave; in dorsal view like a flattened ellipsoid with both ends pointed; anteriorly the extremity is bent slightly clockwise; anteriorly and posteroventrally the right valve bends outward along the edge; the left valve bends inward to meet the right valve all along its periphery except ventrally where it overlaps the other; shell pseudopunctate with numerous rounded wart-like tubercles on the anterior of the shell; a hair protrudes from each tubercle.

(Internal)—Right valve faintly tuberculate all along its periphery except dorsally; inner lamella broadest anteriorly in both valves; in right valve, selvage broad following the curvature of the shell halfway between the outer and inner margins anteriorly, whereas it is near the inner margin posteroventrally; the inner lamella between the outer margin and the selvage is convex anteriorly and posteroventrally; in left valve, selvage faint and peripheral and presence of narrow flange all along; radial pore canals numerous and straight.

ANATOMY (Antennula)—(Fig. 16A) Seven-segmented; length width ratio of the last six segments: 1:1, 2.25:1, 1.5:1, 1.5:1, 1.7:1, 2.5:1; small, rod-shaped, sensory organ at mid-length on the second segment; natatory setae slightly longer than all segments together.

(Antenna)—(Fig. 16C) Sexually dimorphic: in female the claw attached to the small 3rd segment is narrower and smaller.

(Mandible)—(Fig. 16E, F) Mandibular coxale with seven teeth (Fig. 16F); inner tooth longer than the previous two and pointed and near its base two setae, one of which is pilose; endopod (Fig. 16E) with α bristle short and narrow, β bristle of same length, wrinkled and covered with a few short hairs, γ bristle longer than last segment, stout and thickly pilose externally in its distal half; epipod with five plumose Strahlen plus a shorter one half way and a short, stout and pilose seta at its base.

(Rake-like organ)—With seven teeth and inner one bifid.

(Maxillula)—(Fig. 16D) Endopod with about 17 plumose Strahlen; length width ratio of palps: 3:1, 2:1; third lobe with two toothed Zahnborsten and near their base presence of a short and thick tufted bristle.

(Maxilla)—Sexually dimorphic: male palps strongly asymmetrical (Fig. 16I, J) with left one narrower and strongly arched; female palp with three plumose setae,



Fig. 16—*Heterocypris vatia* n. sp. Hexham Swamp, Newcastle, N.S.W. A-E, G, I-M drawn from holotype adult male, remainder from paratype adult female. Scale: =200 μ . A, antennula. B, rake-like organ. C, antenna. D, maxillula-palp and lobes. E, mandible-palp. F, mandible-coxale. G, thoracopoda I. H, maxilla-endopodite. I, left maxilla. J, maxilla-right endopodite. K, thoracopoda II. L, hemipenis. M, furca. N, furcal attachment.

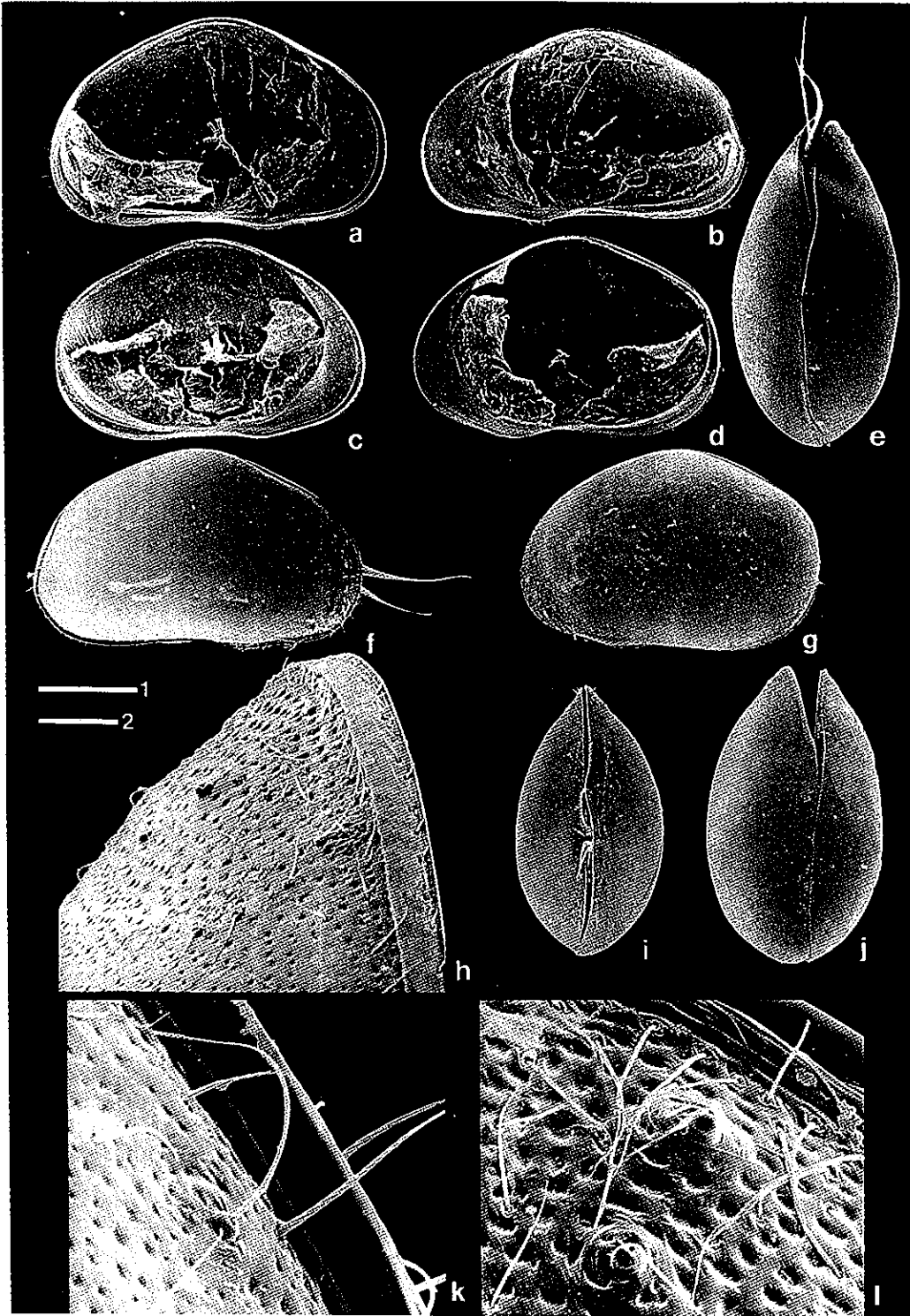


Fig. 17—*Eucypris virens* (Jurine 1820). Pond close to Reel Inlet (coastside), 19 km S. of Mandurah, W.A. Scales: 1 = 500 μ for a-g, i-j; 2 = 40 μ for h, = 20 μ for k, = 30 μ for l. All females. a, LV internal. b, RV internal. c, LV internal. d, RV internal. e, C dorsal. f, C showing RV. g, C showing LV. h, C dorsal, anterior LV detail of j. i, C ventral. j, C dorsal. k, C showing RV, posterior detail of f. l, C showing RV, anterior detail of f.

the two outside ones being of similar length; for chaetotaxy, see Fig. 16I.

(Thoracopoda I)—(Fig. 16G) Penultimate segment weakly divided and distal claw 1.2 times the length of the last two segments together.

(Thoracopoda II)—(Fig. 16K) Distal setae on last segment unequal: the longer one four times the length of the other which is hook-shaped.

(Hemipenis)—(Fig. 16L) Outer lateral lobe boot-shaped with "sole" part of the boot convex and "heel" part slightly angular and forming an obtuse angle; inner lobe broadly rectangular and covered with numerous short hooks.

(Zenker organ)—Both ends rounded with 48 rosettes.

(Furca)—(Fig. 16M) Setae almost equal with posterior one finely pectinate; claws unequal; anterior one 1.6 times the length of the other.

(Furcal attachment)—(Fig. 16N) Median branch straight with short dorsal branch normal to it; ventral branch curved and 2.5 times the length of the dorsal one.

(Eye)—Cups of nauplius eye fused; brown in colour.

COLOUR OF SHELL: Translucent pale brown.

SIZE:		L	H		L	H
holotype						
adult male	LV	1 700 μ	1 000 μ	RV	1 710 μ	1 000 μ
paratype						
adult						
female	LV	2 400 μ	1 400 μ	RV	2 340 μ	1 360 μ

TYPE LOCALITY: Hexham Swamp, behind the University campus at Newcastle, New South Wales.

DERIVATION OF NAME: From Latin *vatius* meaning bent outward for the diagnostic feature of the right valve.

ECOLOGY AND DISTRIBUTION: This species has only been collected once; water at the type locality is known to be fresh.

REMARKS: It was thought that this species belonged to *H. leana* (Sars 1896) because of its large size. The female specimens described by Sars (1896a) were 2.70 mm long and came from Hay, N.S.W. However, after examination of Sars' collections in the Oslo Museum, it became obvious that none of the male specimens labelled *H. leana* by Sars have the same outline of the lateral lobe as the specimens from Hexham Swamp; all Sars' specimens have a small and pointed protuberance in the "heel" part, the boot-shaped lateral lobe of the hemipenis. This feature is not seen in *H. vatia*. However, no specimen from Hay was found in Sars' collection; only specimens which are labelled as "Victoria" A or C are found. Therefore, designation of a lectotype will prove to be difficult. However, a 2.4 mm long male specimen collected from Goulburn Billabong, Alexandra, Vic. by R. Shiel corresponds to Sars' description of *H. leana* and possesses the pointed "heel" on the lateral lobe of the hemipenis. This substantiates the separation of the two taxa into different species which have a large shell but different anatomy. *H. vatia* differs from all other *Heterocypris* species recently reviewed in Victor and Fernando (1980).

Subfamily EUCYPRIDINAE Bronstein 1947

Genus *Eucypris* Vavra 1891

TYPE SPECIES: *Eucypris virens* (Jurine 1820)

Eucypris virens (Jurine 1820)

Figs 17, 18

1820 *Monoculus virens* Jurine, p. 171.

1900 *Eucypris virens*; Daday, p. 143.

DIAGNOSIS: Subrectangular shell with dorsum arched and greatest height in the middle; length height ratio of carapace: 1.45 to 1.65; shell convex ventrally just in front of the slightly concave mouth region; in dorsal view oval in shape with anterior more pointed than posterior; wart-like protuberances (Fig. 17h, k, l) near the outer margin anteriorly best seen in dorsal view. Colour of shell: pale green.

REMARKS: *E. virens* is a cosmopolitan species well known outside Australia; description of the shell and anatomy is therefore unnecessary but illustrations are provided in Figs 17, 18. This species has already been recorded from New Zealand (Barclay 1968, Chapman & Lewis 1976). In Australia, it is a common inhabitant of temporary pools and is usually found in fresh waters but has been recorded in slightly saline water; the highest salinity record for *E. virens* is 4.4‰ in a Western Australian locality (Geddes *et al.* 1981). So far *E. virens* has been collected in southern Australia (W.A., S.A., Vic.).

Variations in the outline of *E. virens* have been commonly noted, even on specimens collected in the same locality. These variations are illustrated in Fig. 17. They are best seen in lateral view and correspond to variations in shell outline already noted by Müller (1900) who designated the following variations: *E. virens* var. *acuminata* which has a more elongated shell (see Fig. 17a, b, f) and *E. virens* var. *obtusa* which has a more compressed shell and more broadly curved outline posteriorly (see Fig. 17 c, d, g). These variations may be ecologically significant but remain as yet unexplained.

It is likely that *Eucypris pratensis* Eagar 1970, recorded only from three localities near Wellington in New Zealand (Eagar 1970), is also a variant of *Eucypris virens*.

Eucypris virens in Australia is a parthenogenic species although both sexes have been recorded in other parts of the world (North Africa (Gauthier 1928); pond in the delta of the River Don, USSR—material received from Dr. E. I. Shornikov).

Subfamily CYPRICERCINAE McKenzie 1971

Genus *Cypricercus* Sars 1895

TYPE SPECIES: *Cypricercus cuneatus* Sars 1895.

Cypricercus salinus n. sp.

Figs 19 a-1, 20

DIAGNOSIS: Smooth, triangular shell, elongated ellipsoid

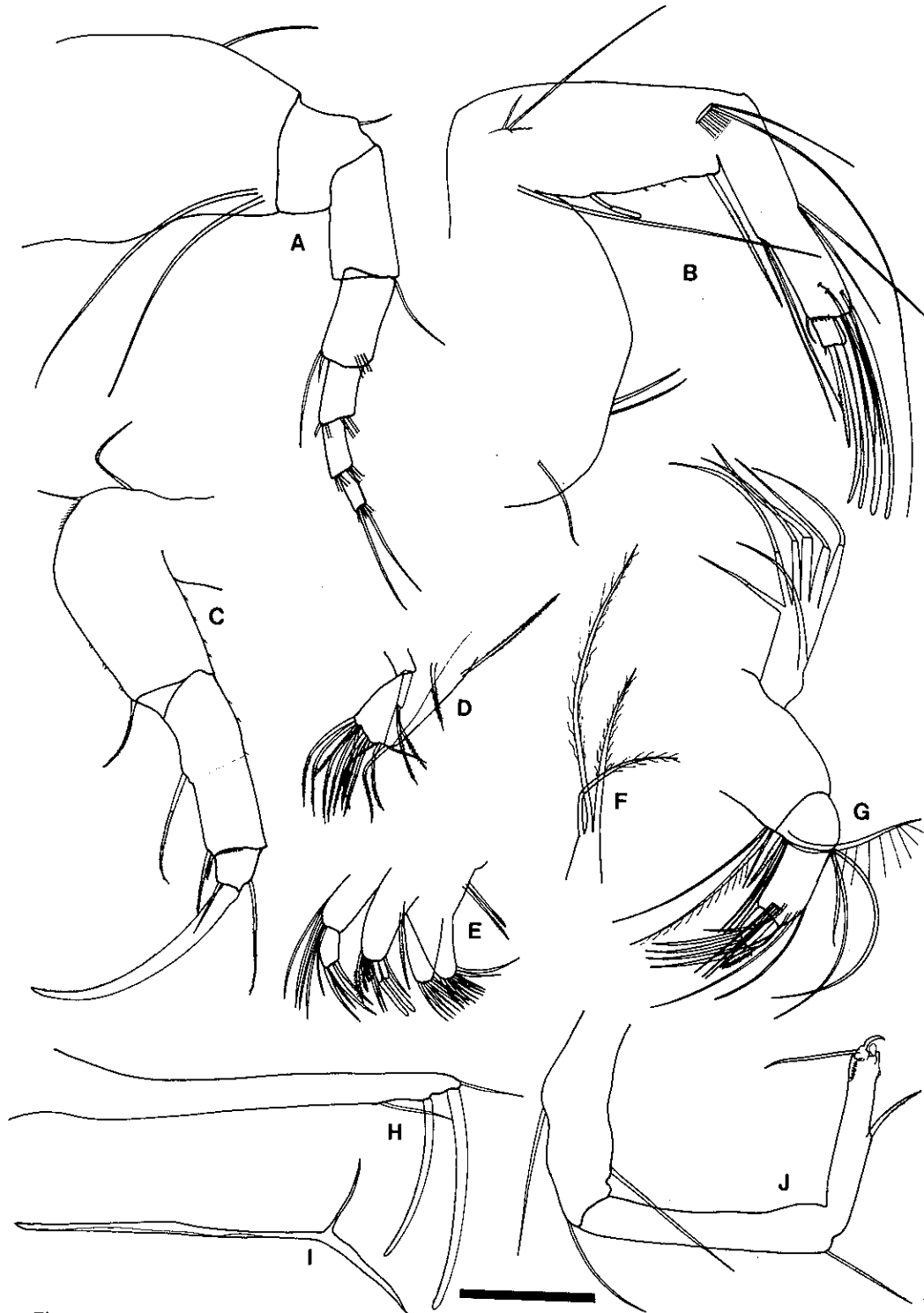


Fig. 18—*Eucypris virens* (Jurine 1820). Pond very close to Reel Inlet (coastside), 19 km S. of Mandurah, W.A. Scale: 1 = 100 μ . Drawn from adult female. A, antennula. B, antenna. C, thoracopoda I. D, maxilla—protopodite. E, maxillula—palp and lobes. F, maxilla—endopodite. G, mandible—palp. H, furca. I, furcal attachment. J, thoracopoda II.

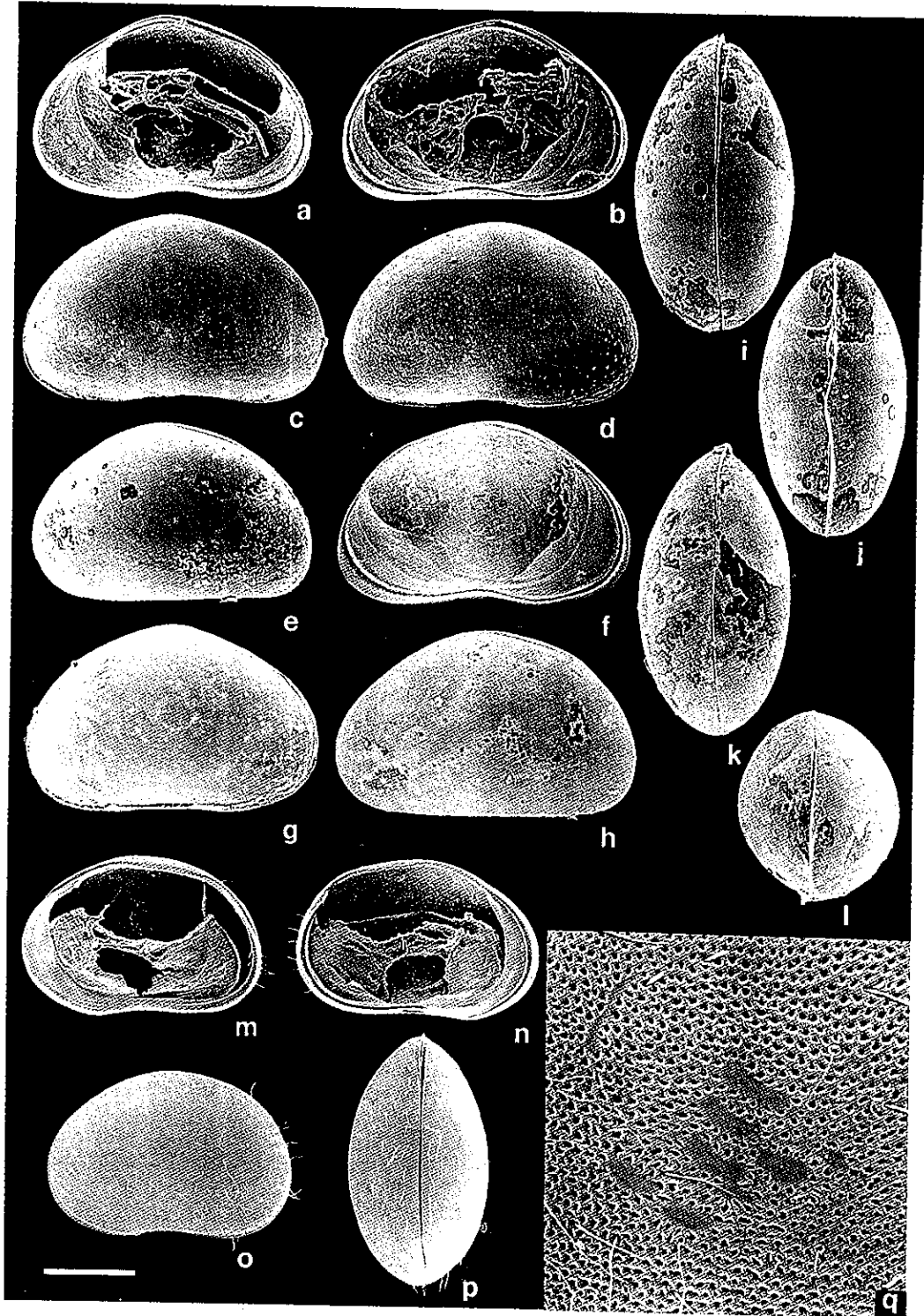


Fig. 19— a-l, *Cypricerus salinus* n. sp. Small lake N. of Lake Terangpom, Vic. Scale: = 200 μ . a, b male holotype; c-e, i, j male paratypes; f-h, k, l female paratypes. a, RV internal. b, LV internal. c, LV external. d, RV external. e, C showing LV. f, LV internal. g, RV external. h, LV external. i, C dorsal. j, C ventral. k, C dorsal. l, C anterior. m-q, *Cypretta baylyi* McKenzie 1966. Granite rock pool on top of Boyagin Rock, between Brookton and Pingelly, W.A. Scale: = 200 μ for m-p, = 40 μ for q. m, n male; o-q unknown sex. m, RV internal. n, LV internal. o, LV external. p, C dorsal. q, LV external, detail of o (central muscle scar area).

in dorsal view; distal end of lateral lobe of hemipenis broader than its base.

DESCRIPTION: CARAPACE (External)—Triangular in lateral view with greatest height at about middle; anterior and posterior ends broadly rounded; anterodorsal area almost straight whereas posterodorsally it is slightly arched; ventral area almost flat except in the mouth region in the middle where it is concave. Left valve slightly larger anteriorly and overlapping ventrally, especially in the mouth region. In dorsal view, like a flattened ellipsoid.

(Internal)—Inner lamella twice as broad anteriorly in both valves compared to posteroventral area; selvage near the rounded outer margin in right valve anteriorly, and at about 0.33 of the width of the inner lamella from the outer margin posteroventrally; in left valve, selvage bordering the rounded outer margin antero- and posteroventrally and separated from it by a broad groove all along; ventrally it is distant from the outer margin.

ANATOMY (Antennula)—(Fig. 20A) Length width ratio of the last six segments: 1:1.4, 1.7:1, 1.2:1, 1.2:1, 1:6.5, 2.7:1; natatory setae slightly longer than all segments together.

(Antenna)—(Fig. 20B) Natatory setae much longer than the last three segments and claws together; four terminal claws in both sexes.

(Mandible)—(Fig. 20C) Endopod with α and γ bristles long, narrow and smooth; β bristle short, stout and pilose; mandibular coxale with seven teeth: inner one slightly longer than the two adjacent.

(Rake-like organ)—Seven teeth plus one bifid on the inner side of each rake.

(Maxillula)—(Fig. 20E) third palp with two smooth Zahnborsten; length width ratio of palps 4.5:1, 2.5:1.

(Maxilla)—Sexually dimorphic: in male (Fig. 20 H, I) distal palps unequal with the narrow one strongly arched and forming a right angle; female (Fig. 20 D) endopod with three unequal setae. For chaetotaxy of epipod, see Fig. 20 D, H.

(Thoracopoda I)—(Fig. 20F) Third segment divided at mid-length where an inner seta as long as the distal half of the third segment and the fourth one together occurs.

(Thoracopoda II)—(Fig. 20L) Distal setae unequal with small one hook-shaped; seta at mid-length of the last segment shorter than hook-shaped distal seta; small distal pincers present.

(Hemipenis)—(Fig. 20G, K) Outline of copulatory sheath triangular with greatest length on inner side; lateral lobe arched inward and distal end broader than its base.

(Zenker organ)—(Fig. 20M) Elongate with 13 broad rosettes.

(Furca)—(Fig. 20J) Anterior claw 1.6 times longer than posterior one; anterior seta slightly longer than posterior one.

(Furcal attachment)—(Fig. 20N) Ventral branch almost as long as median one and hook-shaped distally; dorsal branch short with a spike at each end on the distal

side to form an almost closed eyelet which is typical of the genus as illustrated for the type species *C. cuneatus* by McKenzie (1977). (In the latter species, the eyelet is closed).

(Eye)—Cups of nauplius eye fused; dark brown in colour.

COLOUR OF SHELL: Pale Green.

SIZE: L H L H

holotype adult

LV 600 μ 380 μ RV 580 μ 360 μ

paratype adult

LV 640 μ 390 μ RV 620 μ 370 μ

TYPE LOCALITY: Small lake (38°06'06"S, 143°18'47"E) north of Lake Terangpom, west of Lake Corangamite, western Victoria.

DERIVATION OF NAME: From Latin *salinus* meaning saline as this species has been collected in many slightly saline waters.

ECOLOGY AND DISTRIBUTION: *C. salinus* has been collected from lakes in the vicinity of Colac and Camperdown, Victoria (e.g. Lakes Martin, Koreetnung, Kariah, Wingeel, Terangpom). The salinity range of the species is: 0.34–12.3‰. Salinity of the water at the type locality was 4.9‰.

Cypricercus unicornis n. sp.

Figs 21, 22

DIAGNOSIS: Pseudopunctate, ellipsoid shell with asymmetrical valves: left valve longer especially posteriorly where it often tapers to a broad and rounded spike; no spike in the right valve; lateral lobe of hemipenis digitate and straight.

DESCRIPTION: CARAPACE (External)—Ellipsoid in lateral view with greatest height at about middle in the right valve; surface of shell deeply pseudopunctate except dorsally and ventrally. Anterior broadly rounded, ventrum almost flat and posterior tapered. Valves asymmetrical: left valve, which overlaps the right one all around, has protuberance posteriorly which extends slightly outward. The extension of this protuberance is variable: in some specimens, it is almost non-existent. In dorsal view, like a flattened ellipsoid except in the posterior area of the left valve where the protuberance occurs. Normal pore canals of two types; some simple and others simple with a broad rim.

(Internal)—Inner lamella twice as broad anteriorly compared to posterior; selvage faint and peripheral in the right valve whereas it is broad and follows the periphery of the left valve where it is separated from the rounded outer margin only by a narrow but deep groove. The posterior protuberance in the left valve is hollow. Radial pore canals numerous, narrow and straight.

ANATOMY (Antennula)—(Fig. 22A) Length width ratio of the last six segments: 1:1, 2.6:1, 1.6:1, 2:1, 2.3:1, 4:1; natatory setae slightly longer than all segments together.

(Antenna)—(Fig. 22B) Four terminal claws in both sexes: the claw attached to the small distal segment is



Fig. 20—*Cypricercus salinus* n. sp. Small lake N. of Lake Terangpom, Vic. A-C, F-N drawn from holotype adult male, D, E from paratype adult female. Scale: = 100 μ . A, antennula. B, antenna. C, mandible. D, maxilla. E, maxillula—palp and lobes. F, thoracopoda I. G, hemipenis. H, left maxilla. I, maxilla—right endopodite. J, furca. K, hemipenis. L, thoracopoda II. M, Zenker organ. N, furcal attachment.

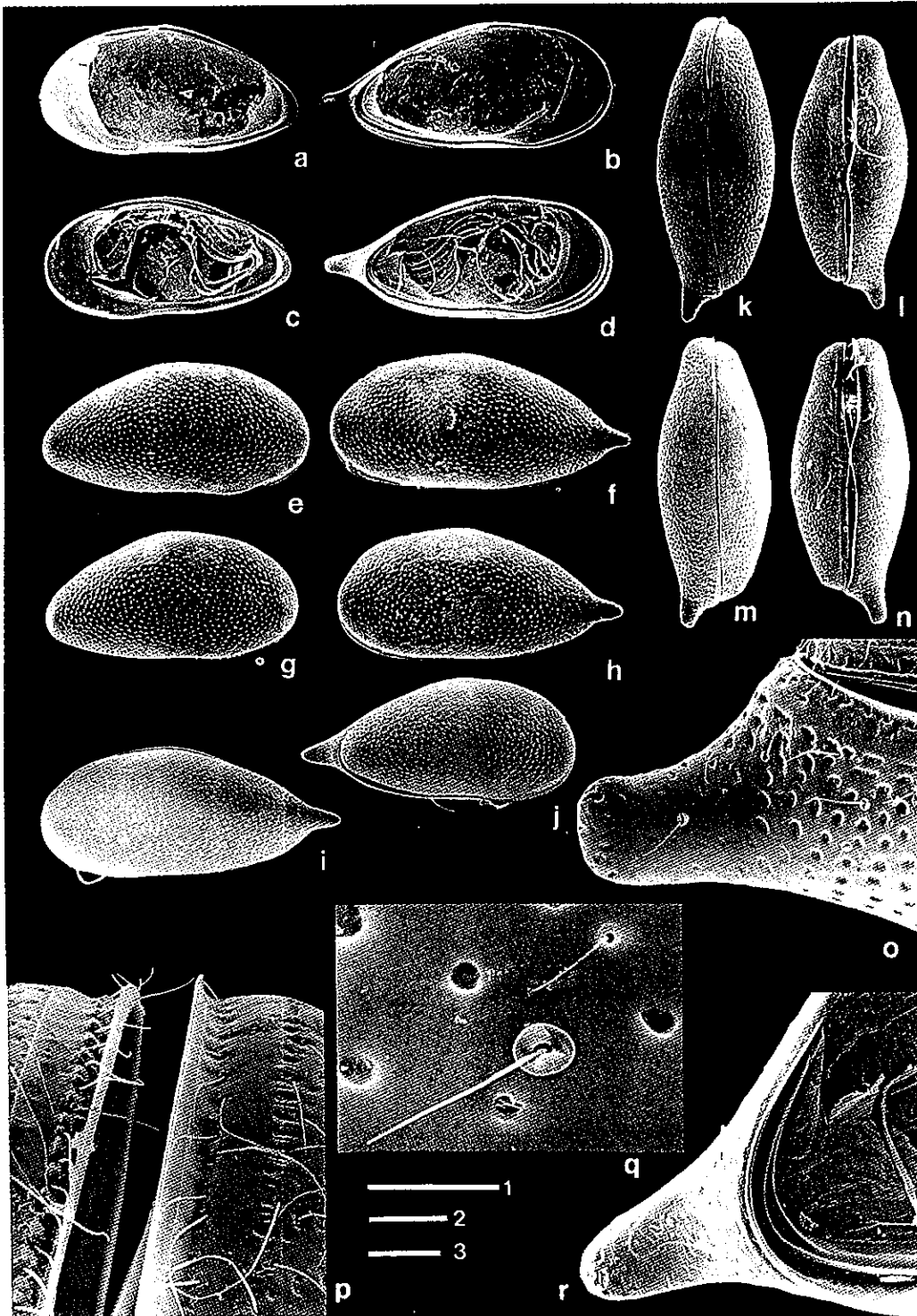


Fig. 21 — *Cypricercus unicornis* n. sp. Granite pool, Newmann's Rocks, 140 km E. of Norseman, W. A. Scales: 1 = 500 μ for a-n; 2 = 40 μ for o, = 20 μ for p, = 60 μ for r; 3 = 10 μ for q. a, b, e, f, j-l, p female paratypes; c, d, r male holotype; g-i, m-o, q male paratypes. a, RV internal. b, LV internal. c, RV internal. d, LV internal. e, RV external. f, LV external. g, RV external. h, LV external. i, C showing LV. j, C showing RV. k, C dorsal. l, C ventral. m, C dorsal. n, C ventral. o, C ventral, posterior detail of n. p, C ventral, anterior detail of l. q, RV external, detail of g. r, LV internal, posterior detail of d.

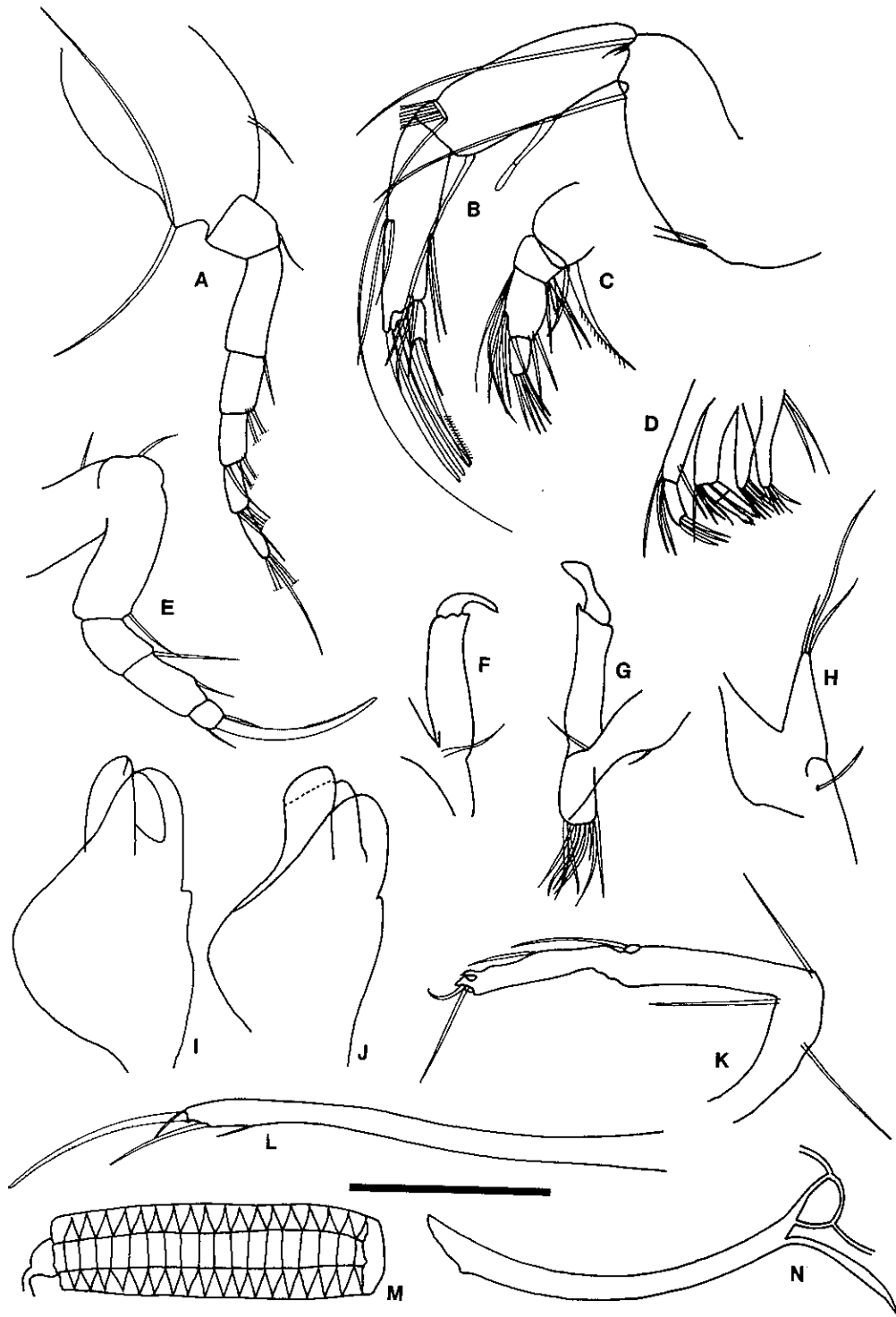


Fig. 22—*Cypricercus unicornis* n. sp. Granite pool, Newmann's Rocks, 140 km E. of Norseman, W.A. A-G, I-M drawn from holotype adult male, H, N from paratype adult female. Scale: = 100 μ . A, antennula. B, antenna. C, mandible—palp. D, maxillula—palp and lobes. E, thoracopoda I. F, maxilla—left endopodite. G, right maxilla. H, maxilla—endopodite. I, hemipenis. J, hemipenis. K, thoracopoda II. L, furca. M, Zenker organ. N, furcal attachment.