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# A NEW SPECIES OF THE GENUS *GLACIDORBIS* (?HYDROBIIDAE: GASTROPODA) FROM GREAT LAKE, TASMANIA.

BRIAN J. SMITH

*Senior Curator (Zoology), National Museum of Victoria.*

## SUMMARY

A new species of operculate snail, *Glacidorbis pawpela* sp. nov., is described from Great Lake, Central Tasmania. More distributional data is given for the other two Australian members of the genus.

## INTRODUCTION

Following recent work on the two Australian species, *Glacidorbis hedleyi* and *Glacidorbis pedderi*, by Meier-Brook and Smith (1975), further distributional data have been sought to establish the range of these species. Field ecologists from state instrumentalities and universities have provided valuable data for this study. As part of this cooperation Mr. Wayne Fulton from the Inland Fisheries Commission, Tasmania submitted what he regarded as unusual specimens from Great Lake for identification. These were recognised as a large new species of *Glacidorbis*, and through the ready cooperation of the Inland Fisheries Commission, sufficient additional material was collected to enable the species to be described.

## DESCRIPTION

*Glacidorbis pawpela* sp. nov.

Figures 1-6

DIAGNOSIS: A species of *Glacidorbis* with a long, wide mesocone on the rhachidian bearing 16 to 20 denticles on each side; shell smooth, rounded with no carination present, more than 3 mm in diameter at 2½-3 whorls.

DESCRIPTION: Shell planispiral, thin, fragile, 2½-3 whorls, rounded with no keel or carinations present, often with obvious growth lines (Fig. 3). Diameter of whorls increases sharply with growth. Shell diameter is greater than 3 mm at the 2½ whorl stage. Fine brown periostracum present, usually covered by brown crystalline deposit. Operculum thin, horny, paucispiral (Fig. 4).

The radula consists of 22-26 rows each represented by a single rhachidian. The rhachidian is a large triangular recurved mesocone with a row of 17 to 18 denticles along each posterio-lateral margin (Fig. 5 & 6). Each rhachidian is a heavy structure shaped like a reptilian jaw, with a curved anterior rounded keel, a sharp pointed cusp and a wide triangular winged base plate with articulating surfaces with adjacent teeth. The denticles are flattened peg-like structures with inward curving pointed ends. The posterior surface of the rhachidian, inside the rows of denticles, is concave to allow the rounded keel surface of the next tooth to fit into the concavity. No lateral teeth are present.

Two preserved animals were dissected, a female with a shell of 3 whorls and a maximum diameter of 4.4 mm, and a male with broken shell of 2½ whorls. The female had two large embryos in the lower uterus (Fig. 1a). The largest of these had a shell of 3/4 whorl, maximum diameter 1.3 mm, minimum diameter 1.0 mm; the other was about half this size. A further three very small embryos were seen in the upper part of the reproductive tract. Few details of the anatomy were revealed from these two specimen s because of their small size.

Externally the head and operculum is very similar to *G. pedderi.* The eyes are situated at the base of short round tentacles, the head and foot have a distinct bilobed appearance with the concave, paucispiral operculum being attached to the rear of the foot with about a third of its length being free, protruding forward.

An examination of the pallial cavity reveals no ctenidia present. The pallial cavity opens to the exterior on the right side, the ventral and median sides of the opening being a raised, thickened band of tissue. This passes backwards on the floor of the pallial cavity, like a flagellum that has fused to the surface.

The buccal mass is short with the oesophagus emerging from the dorso-posterior end. A loose nerve ring also appears to be situated at the posterior end of the buccal mass, around the oesophagus, with pedal ganglia below the pedal gland, free in the ventral part of the body cavity. Arising from the point of insertion of the oesophagus into the buccal mass are two short ducts with long white sausage-shaped salivary glands at least twice the length of the buccal mass. The long oesophagus, without expansion into a crop, leads to a small stomach partly embedded in the digestive gland.

Sexes appear to be separate in the species, the specimen with large embryos in the uterus having no sign of a penis. The male had what appeared to be an everted penis emerging from a damaged left side of the head (Fig. 1b). This took the form of a short, straight, finger-like process which appeared to be soft and hollow with longitudinal rows of fine papillae. Around the base of this was a wide, coiled, collar-like structure about twice the diameter of the papillate process. This collar was separated from the process by a deep groove and bore fine longitudinal folds. Distal to the collar the structure was attached to an anterior duct of the reproductive tract by a short narrow process.

TYPE MATERIAL: Holotype in the Tasmanian Museum, E10389, a complete specimen with animal preserved in 70% alcohol (shell slightly damaged).

Nine paratypes; eight complete with animals preserved in 70% alcohol and one dry, prepared for SEM examination. Paratype 1 lodged in Tasmanian Museum, E10390; paratypes 2-8 in National Museum of Victoria, F30145 a-g; paratype 9 in National Museum of Victoria, F30146, mounted for SEM (Fig. 3).

DIMENSIONS:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Holotype | E10389 | Max. | 3.6 mm | Min. | 3.0 mm | Whorls | 2-3/4 |
| Paratype 1 | E10390 | " | 2.7 mm | " | 2.2 mm | " | 2 |
| 2 | F30145a | " | 2.2 mm | " | 1.6 mm | " | 1-1/2 |
| 3 | F30145b | " | 3.0 mm | " | 2.5 mm | " | 2-1/2 |
| 4 | F30145c | " | 3.7 mm | " | 3.1 mm | " | 2-3/4 |
| 5 | F30145d | " | 3.0 mm | " | 2.5 mm | " | 2-1/4 |
| 6 | F30145e | " | 2.5 mm | " | 1.9 mm | " | 1-3/4 |
| 7 | F30145f | " | 2.4 mm | " | 1.9 mm | " | 1-1/2 |
| 8 | F30145g | " | 2.5 mm | " | 2.0 mm | " | 1-3/4 |
| 9 | F30146 | " | 3.5 mm | " | 2.9 mm | " | 2-1/2 |

TYPE LOCALITY: Elizabeth Bay, Great Lake, Tasmania, from a soft mud bottom at 30 m depth, water temperature $< 4^{\circ}C$. The holotype and paratypes 2 and 9 were collected by W. Fulton, 7 November, 1975; the remaining paratypes were collected by W. Fulton and B.J. Smith, 1 Septemb er, 1978.

OTHER MATERIAL: Three other specimens were collected with the type series on 1 September 1978. These were used in dissection and the remains are lodged in the National Museum of Victoria (F30147).

REMARKS: *Glacidorbis pawpela* differs from all other members of the genus by the size of the shell and the structure of the rhachidian. The other three known species, *G. pedderi* from

Tasmania, *G. hedleyi* from Victoria and New South Wales and *G. magallanicus* from south Chile, all have a shell diameter under 3 mm for a 2½ whorl shell and the rhachidian mesocone bears eight or less denticles on each side. *G. pawpela* has a shell diameter greater than 3 mm for a 2½ whorl shell and the rhachidian mesocone bears 16 to 20 denticles on each side.

Great Lake is an oligotrophic lake with fresh, slightly acidic waters. Species associated with *G. pawpela* are the bivalve *Sphaerium (Musculium) tasmanicum,* three or four species of oligochaetes, chironomid fly larvae and the phreatoicid *Onchotelson spatulalus* (W. Fulton - pers. comm.). The specimens were collected by Ekman-Birge grab. Several dead shells of *G. pawpela* were collected in the same sample series. On examination, these were found to consist of the periostracum only, all the calcareous elements of the shell having been broken down. This suggests that live snails have a dynamic mechanism for retaining the calcareous elements of the shells in conditions where the chemical conditions of the environment would cause these structures to break down.

The presence of large, developing embryos in the uterus is of interest as viviparity has also been noted in two of the other three members of the genus (Smith – unpublished, Meier-Brook and Smith, 1975).

ETYMOLOGY: *pawpela* is a Tasmanian Aboriginal word, used by tribes from Oyster Bay to Pittwater (Roth, 1899), meaning "large or big". This name seems appropriate for a Tasmanian species that is the largest of the genus, coming from Great Lake, the largest lake in Tasmania.

## OTHER *GLACIDORBIS* SPECIES

Further distributional and ecological data have become available on the two other Australian species of *Glacidorbis.* These have emerged as a result of ecological survey work by staff and students of Monash University, Victoria and the University of Tasmania. The present known distribution of the Australian species of *Glacidorbis* is shown in Fig. 2.

*Glacidorbis pedderi* (Smith, 1973) is known from four localities in western Tasmania. The original specimens of this species were collected from Lakes Pedder and Edgar prior to their inundation in the enlarged Lake Pedder. No further specimens have been found in this locality. However teams of staff and students from the University of Tasmania have found it in three other localities during wide ranging limnological surveys in that state. It was taken on submerged logs, from *Triglochin* and from aquatic plants in a small perched lake just upstream from Butler's Island in the Lower Gordon River, Western Tasmania on 25 January 1976 by P.S. Lake, A. Richardson, D. Coleman and P. Allbrook. The water was reported as brown and acidic. A specimen was taken by T. Walker from a lagoon at Cleveland, Western Tasmania on 26 August 1974 and several specimens by A. Richardson et al at the Dip River falls, north western Tasmania on 28 January 1974. These scattered distribution records imply that the species is probably widespread throughout western Tasmania in cold acidic waters. Despite this additional material coming to light, little more can be added to the knowledge of the anatomy of the species. So far no direct evidence has emerged of viviparity in this species though this can be surmised as the other three species have all been shown to be viviparous.

*Glacidorbis hedleyi* Iredale, 1943 is now known from seven localities in the Great Dividing Range of central and eastern Victoria and southern New South Wales (Smith, 1978).

These localities are:–

(a) Running Creek, above and below Mason Falls, Kinglake National Park, Victoria (600 m), April 1977 in shallow water on stones by A. Fletcher.

(b) Backwater of Acheron River, between Warburton and Narbethong, Victoria (900 m), in July 1975 in organic debris by L. Macmillan, R. Plant and B. J. Smith.

(c) *Sphagnum* bog at summit of Mt. Baw Baw, Victoria (1500 m), in February and April 1976 in shallow acidic water by J. McAuley.

(d) Mt. Buffalo National Park, Victoria (1700 m), in a tributory of Buffalo Creek (Wirbill Plain) in April 1978 in gravel by A. Fletcher and in stream from *Sphagnum* bog in acidic water in Dingo Dell in January 1978 by B. J. Smith.

(e) Cape Creek, Bogong High Plains, Victoria (1500 m) in February, 1978 in shallow acidic water on gravel by A. Fletcher.

(f) In small creek near junction of Native Cat Track and Nunning Track, Cobbras, East of Benambra, Victoria (1200 m) in January 1976 under stones in shallow water by R. Plant.

(g) Blue Lake, Kosciusko National Park, Mt. Kosciusko. New South Wales (1700 m) – type locality.

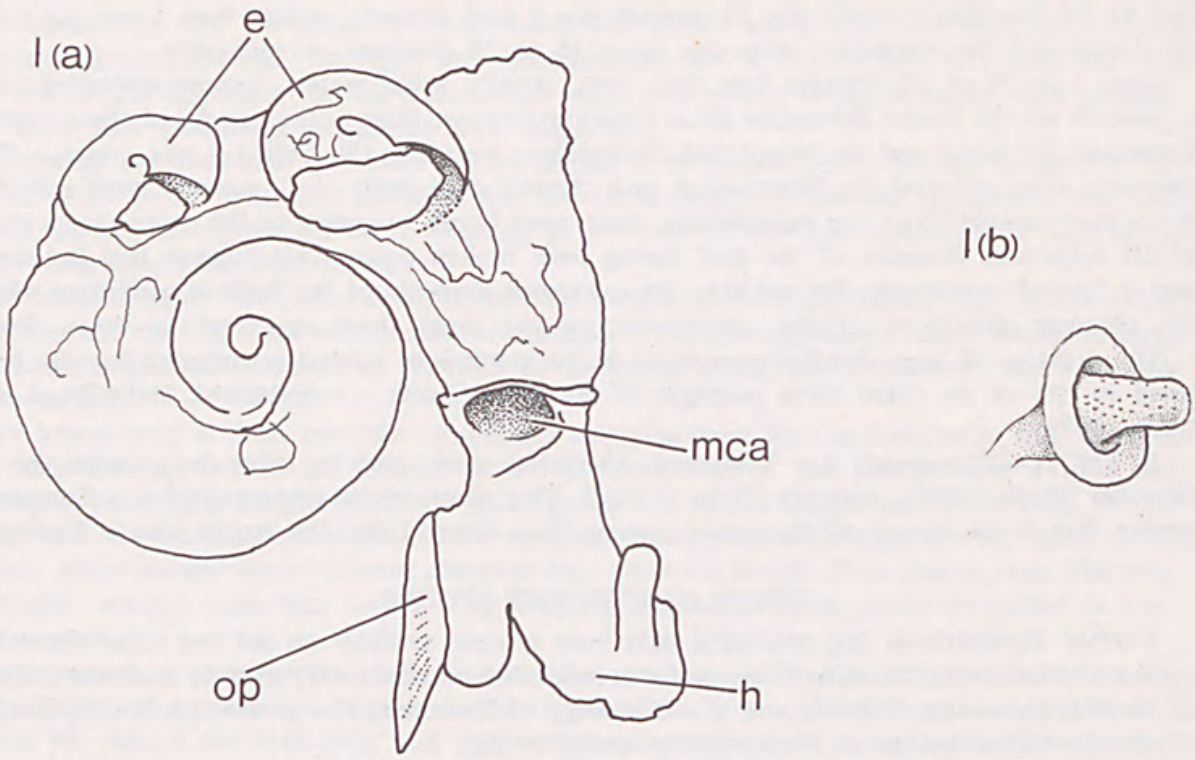
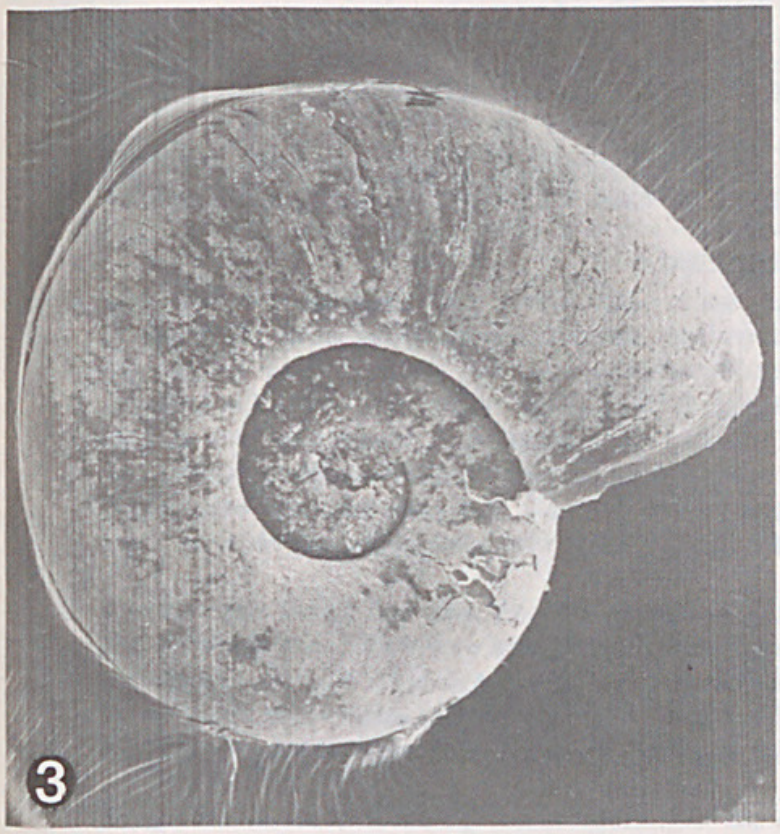
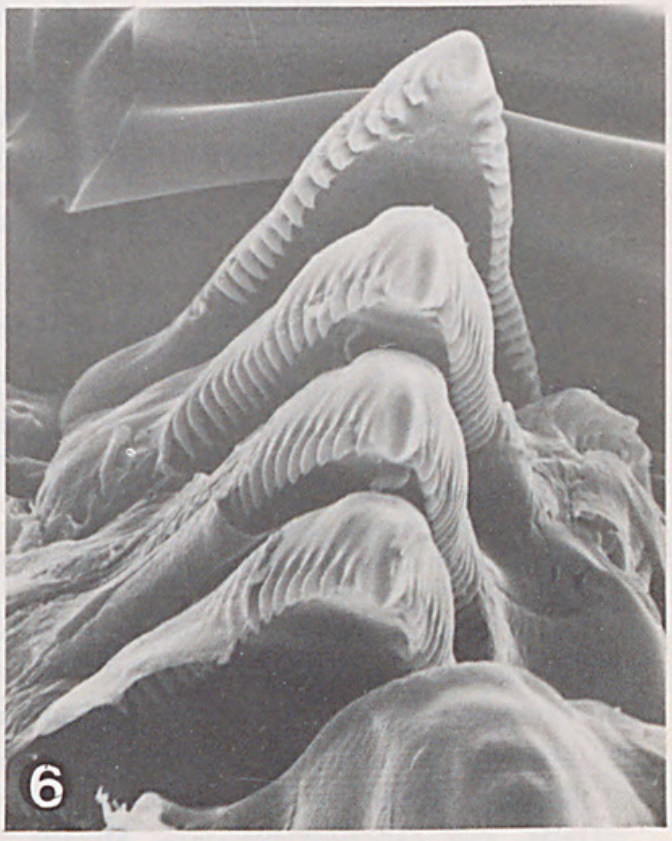



FIGURE 1. Diagrams of the animal of *Glacidorbis pawpela* sp. nov. showing (a) position of the embryos in the uterus (e — embryos, h — head, mca — mantle cavity aperture, op — operculum); (b) shape of the penis.

FIGURE 2. Map showing the distribution of *Glacidorbis hedleyi* (solid dots); *Glacidorbis pedderi* (circles); *Glacidorbis pawpela* sp. nov. (star).






FIGURES 3-6.

3. Dorsal view of shell of *Glacidorbis pawpela* sp. nov. paratype No. 9. (NMV F30146) (X22).
4. Ventral surface of operculum of *Glacidorbis pawpela* sp. nov. (X 40).
5. & 6. Radula of *Glacidorbis pawpela* sp. nov. showing large rhachidian (Fig. 5 X800; Fig. 6. X1000).

All these localities are in forest or alpine areas and have high quality, slightly acidic waters with decaying vegetable matter found associated with the *Glacidorbis* populations. The water is cold for most of the year with the localities subject to snow every winter. It is assumed that the species occurs throughout the Great Divide region of central and eastern Victoria and southern New South Wales. More detailed ecological work is to be carried out on this species.

Several specimens of *Glacidorbis hedleyi* have been found to contain large, well developed embryos in the uterus, some up to 3/4 whorl showing that viviparity occurs in this species.

## DISCUSSION

The discovery of a third species of *Glacidorbis* in south-eastern Australia from a bay of Great Lake on the Central Plateau of Tasmania throws more light on this interesting group of freshwater operculates. Despite an extensive ecological survey of Great Lake (W. Fulton – pers. comm.) the new species is only known from Elizabeth Bay, half way up the eastern side of the Lake. Here it appears to be fairly common with 10 live specimens being taken from seven 0.1 m grab samples taken from two spots about 80 m apart in the centre of the bay. Before the water level of Great Lake was artificially raised in the 1930's, Elizabeth Bay was probably a separate lake only being joined in times of very high inflow. The bay is still a shallow basin with a submerged sill between it and the main body of the lake.

Little plant material was collected with the specimens, the soft mud and turbid water making plant growth impossible. Large numbers of freshwater oligochaetes were found with the snails and it is surmised that small specimens of these animals probably form the main food for the *Glacidorbis*. It is not known how the solid, jaw-like teeth are used in feeding but one might expect them to be used in conjunction with ancillary food holding structures to enable the teeth to shred and transport the food.

The value of the up-surge in interest in the environment, and particularly in the ecology of freshwater biological associations in both Tasmania and Victoria by local universities, is underlined by the results presented here. These ecological surveys have brought to light a great deal of valuable data only obtainable by the detailed, painstaking collecting now being undertaken in many almost inaccessible localities in the two states. Much more of this work needs to be done to fill in the much needed distributional and ecological details still wanting for many of our native animals.

These surveys have reinforced the earlier impression that the species of *Glacidorbis* prefer oligotrophic conditions of fresh, slightly acidic waters which remain cold for most of the year. All the localities where they have been found are subject to winter snow and almost constant cold conditions.

The family placement of *Glacidorbis* is still not resolved, though by elimination it is reasonable to place it close to the Hydrobiidae. Hydrobiids show a wide radiation in southern Australia and the presence of small planispiral hydrobiids in the oligotrophic waters of the mountain systems, showing convergence with the small planispiral planorbids, would be no surprise. The strange radula can possibly be derived by gross enlargement of the hydrobiid triangular rhachidian in response to an unusual feeding habit. However, it is obviously so far removed from any other known Australian hydrobiid as to keep its relationship in doubt till more information is forthcoming.

Now more material of the species has come to hand and several fairly easily accessible habitats located, a more intensive ecological and morphological study is planned.

## ACKNOWLEDGEMENTS

Thanks are due to Mr. Wayne Fulton of the Inland Fisheries Commission, Tasmania for his initial discovery of the new species and for his generous assistance in providing facilities for the collection of the type series. Thanks are also due to staff and students of Monash University and the University of Tasmania for providing valuable study material and distributional data. Thanks are due to Mr. P. Hollis of the Anatomy Department, University of Melbourne for the use of the SEM, Mr. F. Coffa of the National Museum of Victoria for assistance with photography, Ms. R. Plant for her drawing and collecting skills and Mrs. L. Anderson for typing the manuscript.

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