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# Observations on the Glochidial Stage of the Freshwater Mussel *Hyridella* (*Hyridella*) *drapeta* (Iredale) (Mollusca : Pelecypoda)

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*Abstract*

The early life history of the freshwater mussel *H.* (*H.*) *drapeta* was investigated between September 1975 and November 1976. Observations from this study are basically consistent with those from previous investigations of glochidia of Australian freshwater mussels.

The glochidia were found to be subtriangular in outline and possess an S-shaped larval tooth on the ventral margin of each valve. The dimensions (average ± standard deviation) of the glochidia were: height 0·23 ± 0·01 mm; length 0·33 ± 0·01 mm; height/length ratio 70·6 ± 2·7%.

The glochidia were observed to parasitize the river blackfish, *Gadopsis marmoratus* and the galaxiids *Galaxias maculatus* and *G. olidus*. Peak infections occurred between July and February. A single brown trout, *Salmo trutta*, was observed to be infected during one peak infection period. The gills of host fish were the major site of attachment and the glochidia were observed to be surrounded with a layer of epithelial tissue.

## Introduction

Much information is available on the freshwater mussels of North America and Europe, which are mostly representatives of the family Unionidae, and their life histories are for the most part well documented in a number of reviews (Pelseneer 1906; Coker *et al.* 1921; Pennak 1953; Fuller 1974).

Freshwater mussels of the Australian region are largely representative of the family Hyriidae (McMichael and Hiscock 1958). With some examples of the Hyriidae from South America and New Zealand, these mussels form a group which has received little attention and which is quite distinct from the Unionidae.

The glochidial larvae of only 9 of the 29 species of freshwater mussel found in the Australian region have been recorded (McMichael and Hiscock 1958; Walker, personal communication; Dean, personal communication). In particular there is a paucity of information regarding glochidial parasitism by mussels of the Hyriidae, although parasitism has been recorded from Australia (Hiscock 1951), New Zealand (Percival 1931) and South America (Parodiz and Bonetto 1962).

This paper records some observations on the glochidial stage of *H.* (*H.*) *drapeta*.

## Materials and Methods

Field and laboratory investigations were carried out between September 1975 and November 1976. Field work was conducted in Diamond Creek, a tributary of Bunyip River, Victoria. The temperature, salinity and discharge data for Diamond Creek were provided by the Hydrographic Section of State Rivers and Water Supply Commission of Victoria. The averages cited in the

The fish which were caught and examined during the field investigation included the river blackfish, *Gadopsis marmoratus*, the galaxiids *Galaxias olidus* and *G. maculatus*, a single brown trout, *Salmo trutta*, short-finned eels, *Anguilla australis*, and the ammocoete larvae of the lamprey. Glochidia were only discovered on the blackfish, galaxiids and trout. The results of the examination appear in Table 1.

**Table 1. Glochidia attached to fish from Diamond Creek**

B, blackfish; G, galaxiids; T, trout

| | Oct. 75 | | Feb. 76 | | June 76 | | Oct. 76 | | |
|---|---|---|---|---|---|---|---|---|---|
| | B | G | B | G | B | G | B | G | T |
| No. of fish caught | 9 | 4 | 18 | 4 | 6 | 1 | 11 | — | 1 |
| No. of fish examined | 6 | 4 | 6 | 4 | 6 | 1 | 6 | — | 1 |
| Av. No. of glochidia | 15 | 10·3 | 1·2 | 3·0 | 2·8 | 2 | 35·9 | — | 7 |
| S.d. | 6·6 | 7·4 | 2·4 | 2·1 | 3·4 | — | 32·0 | — | — |

Most glochidia were found attached to the gills of the respective fish and two were found attached to the inner surface of the gill operculum of two blackfish. Glochidia were always found to be completely covered by a thin layer of epithelial tissue (Fig. 1*e*).

## Discussion

Expulsion of glochidia of *H.* (*H.*) *drapeta* is similar to that observed in unionid mussels of North America (Coker *et al.* 1921; Pennak 1953) and Europe (Pelseneer 1906). The only Australian species studied so far, *Velesunio ambiguus* (Hiscock 1950), and *Alathyria jacksoni* and *V. angasi* (Walker, personal communication), exhibit similar behaviour.

According to published records (Percival 1931; McMichael and Hiscock 1958) and other sources (Dean, personal communication; Walker, personal communication) the glochidia of Australian freshwater mussels present a uniform array of subtriangular, 'toothed' larvae. Any variation between species is slight and mainly involves the geometry of the glochidial valves. The present observations on *H.* (*H.*) *drapeta* are consistent with previous observations regarding glochidia of other mussel species from the Australian region.

Two forms of glochidial teeth have been noted (Parodiz and Bonetto 1962) in the South American Hyriidae but otherwise these mussels are similar to Australian mussel species that have been studied including *H.* (*H.*) *drapeta*. In comparison, the glochidia of unionid mussels present a very diverse range of valve sizes and shapes, and where larval teeth do occur vary to a large extent in size and shape (Coker *et al.* 1921).

All the available literature suggests that fish, native to the particular area in which mussels are found, are the normal hosts of viable mussel larvae (Pelseneer 1906; Coker *et al.* 1921; Pennak 1953; Negus 1966; Hiscock 1972; Yokley 1972). The occurrence of glochidia infecting species other than the normal host is not unknown, although such glochidia are usually short-lived and never develop to a juvenile stage (Coker *et al.* 1921; Yokley 1972). The glochidia of *V. ambiguus* have demonstrated

an ability to attach to exotic species of fish such as mosquito fish, *Gambusia affinis*, and carp, *Cyprinus carpio*, as well as the native callop, *Plectoplites ambiguus* (Hiscock 1951). Similarly, the glochidia of *H. (H.) drapeta* shows an ability to attach to both native blackfish and galaxiids and to the exotic trout. Only one trout was caught during this study and this precludes any comment on the viability of these glochidia or any comparison between numbers of glochidia infecting native and non-native species.

The number of glochidia infecting the blackfish and galaxiids, although varying throughout the year, are consistent with previous observations. In the field situation, glochidia of *H. depressa* have been noted in numbers ranging from 6 to 37 in Cox's mountain galaxias, *Galaxias coxii*, and from 16–21 in Macquarie Perch, *Macquaria australasica*, from Little River, N.S.W. (Dean, personal communication); and under laboratory conditions approximately 100 glochidia of *V. ambiguus* were able to parasitize the callop (Hiscock 1951).

There is considerable agreement that within the Unionidae, toothed glochidial forms characteristically attach to fins and general body surfaces while varieties not possessing teeth attach to the gills of host fish (Coker *et al.* 1921; Pennak 1953; Negus 1966; Yokley 1972). Within the Hyriidae and with *Hyridella* spp. in particular both gill and general body surface parasitism has been observed (Percival 1931; Hiscock 1951; Walker, personal communication; Dean, personal communication) despite all these mussels being toothed forms. The virtually exclusive gill infection observed in this study is uncommon in the literature although certainly not unique (Parodiz and Bonetto 1962). Glochidial parasitism is most likely to be a very complex process where many factors, such as the inherent ease of glochidial attachment, fish behaviour and stream structure, all play an important part in predisposing certain areas of the fish to attachment.

The observation that peaks in glochidial infection are coincident with the annual rise in stream temperature (tabulation p. 412; Table 1) parallels similar observations in the Unionidae (Coker *et al.* 1921; Yokley 1972). Salinity and stream discharge are generally discounted as important environmental stimuli for reproduction in freshwater mussels. Fluctuations in salinity are usually inversely related to the discharge rate (Bayly and Williams 1973) and, although exhibiting a clearly annual pattern (see tabulation), present an extremely variable factor which by the nature of its marked short-term changes is ill-suited as a biological stimulus.

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ERRATA

p.415. First line should read. " .... an ability to attach to the exotic mosquito fish, *Gambusia* spp., but not the carp, *Carassius auratus*, as well as attaching to the native callop, *Plectroplites ambiguus* (Hiscock 1951)."

p.416. The reference to Parodiz and Bonetto should read. "Parodiz, J.J., and Bonetto, A.A. (1963)."