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Notes on the Use of Microbound Artificial Diets for Larval Rearing of Sea Bass (*Lates calcarifer*)

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Abstract - Two microbound diets (MBD) containing marine fish roe were as-sessed as a replacement for rotifers for first feeding sea bass *(Lates calcarifer)* larvae. Although larvae readily ingested the MBD, total mortality had occurred by eight days post hatch; five days from the start of feeding. The results indicate that larvae were unable to digest ingested food particles.

Sea bass or barramundi *(Lates calcarifer,* Bloch) is a widely cultured species throughout Asia. Culture of *L. calcarifer* larvae requires provision of live feeds in the form of rotifers and brine shrimp *(Artemia)* which is expensive and labor intensive. Development of a suitable artificial diet for larvae would have significant economic benefits in the form of simplified hatchery procedures and considerably reduced hatchery running costs.

Walford et al. (1991) assessed the potential of commercially prepared protein-walled microcapsules as a diet for *L. calcarifer* larvae. They showed that the larvae readily ingested the microcapsules but were unable to digest them. Unlike microcapsules, microbound diets (MBD) consist of nutrients bound within the matrix of the food par-ticle; they do not have a capsule wall and, as such, may be easier to digest. MBD have been used with some success as a larval diet for
a number of fish species (Adron et al. 1974; Teshima et al. 1982; Kanazawa et al. 1989). This study was undertaken as a preliminary investigation into the potential of MBD for *L. calcarifer* larvae.

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Mackerel *(Scomberomorus commerson)* and mullet *(Mugil* sp.*)* roes were used as the experimental diets. Marine fish roes have shown promising results when used in artificial diets for fish larvae (Garatun-Tjeldsto et al. 1989). Roes were homogenized, freeze-dried and powdered and incorporated into MBD by methods described by Teshima et al. (1982). Gelatin (300 bloom, swine skin) was used as a binder for the MBD containing mackerel roe, and carrageenan as a binder for the mullet roe. MBD were powdered in a ball-mill and finally passed through a 63-μm sieve. Gelatin and carrageenan composed 10% and 5% of the dry weights of their respective diets.

At one day after hatch, *L. calcarifer* larvae were stocked into 10-l plastic vessels containing full-strength (35‰) seawater, at a density of $100 \cdot l^{-1}$; feeding was commenced three days post-hatch. Larvae were fed the MBD at a rate of 1.62, 2.59, 3.24, 4.86, 6.48 $mg \cdot l^{-1}$ for days 1, 2, 3, 4 and 5, respectively.

L. calcarifer larvae were observed to ingest the MBD, indicating that the particles had suitable physical characteristics and were attractive to the larvae. Larvae with distended guts containing MBD were observed (Fig. 1). However, complete mortality of larvae fed both MBD occurred by five days after the start of feeding. This mortality corresponded with the death of unfed larvae indicating that larvae were unable to digest ingested MBD particles. In contrast, larvae fed rotifers showed negligible mortality over the same period.

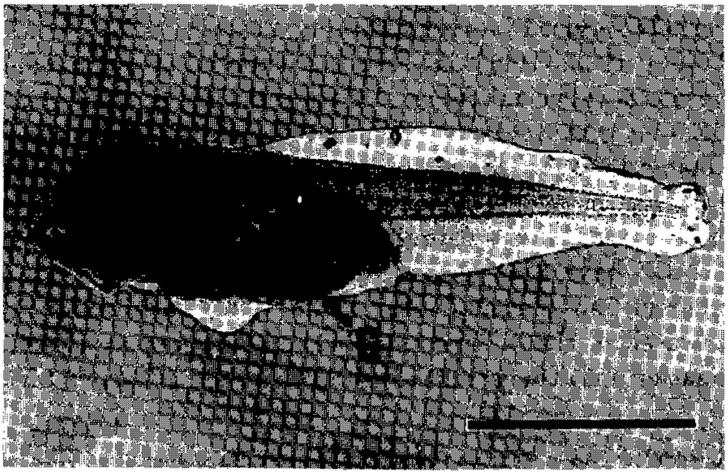

Fig. 1. Larva of *L. calcarifer* five days after the start of feeding on MBD. Note distended gut (G). Scale bar = 1 mm.

The larvae of a number of species of fish are able to utilize MBD (Adron et al. 1974; Teshima et al. 1982; Kanazawa et al. 1989). The present study has shown that *L. calcarifer* larvae are unable to digest MBD composed of carrageenan and gelatin. Walford et al. (1991) showed that protein-walled microcapsules were not digested by *L. calcarifer* larvae; however, some digestion was indicated when microcapsules were fed in conjunction with rotifers. The authors inferred that ingested rotifers generated sufficient proteolytic activity in the larval intestine to allow digestion of the microcapsule wall. It is likely that digestion of MBD may also be possible if fed in conjunction with live food organisms.

The results of this study, and those of Walford et al. (1991), indicate that the complete replacement of live food organisms with artificial food particles may not be possible for first-feeding *L. calcarifer* larvae. Future studies are warranted on the potential of artificial diets as a partial replacement for live food organisms. Incorporation of digestive enzymes into artificial diets may also facilitate the development of a suitable artificial diet for *L. calcarifer* larvae.

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