

**ONTOGENY OF GROWTH, FEEDING AND REPRODUCTION OF  
MUGILIDS IN TOWNSVILLEWATERS,  
NORTHERN AUSTRALIA**

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## ABSTRACT

Mugilids are a relatively unexploited fishery resource in the coastal and estuarine waters of North Queensland. At present, apart from a small amount of biological information on a few species, the existing number of species, life history information, age and growth, and feeding biology of the species inhabiting the area is poorly known. Information of this type is required before informed management decisions can be made. This study aimed to significantly contribute to knowledge of the biology and ecology of these species in the waters around Townsville, North Queensland.

Seven species of Mugilids; *Liza vaigiensis*, *L. subviridis*, *Valamugil seheli*, *V. cunnesius*, *V. buchanani*, *Mugil cephalus* and *M. georgii* were identified and a taxonomic key was prepared for the identification of juveniles and adults in Townsville waters. *V. buchanani* and *M. georgii* were recorded in Townsville for the first time. The identification of mugilid species is difficult due to the similarity of general taxonomic features between species. Internal anatomical characteristics such as number and structure of pyloric caeca, in addition to external taxonomical characteristics, were found to be more reliable and useful for identification of local mugilids than external characteristics alone.

Post-larvae of mugilids inhabit surface waters and form small schools. Post-larvae of *L. vaigiensis*, *V. seheli* and *L. subviridis* form daily increments in their otoliths and it was possible to accurately age post-larvae and juveniles up to approximately 140-170 days of age. Post-larval mugilids grow linearly at approximately 0.17-0.37 mm/day and move into shallow coastal waters at approximately one month of age.

Ageing juvenile and adult *L. vaigiensis*, *V. seheli*, *V. cunnesius*, *L. subviridis* and *V. buchanani* was carried out using scales and otoliths. Ageing of juveniles and adults was difficult due to the lack of clear growth rings in scales and otoliths. As a result, only 61 % of scales and 46 % of otolith samples collected could be used for ageing fish. Whole otoliths and sectioned otoliths together gave more reliable age estimates than scales. The estimated length-at-age data indicated that *V. seheli*, *L. vaigiensis* and *V. buchanani* were growing faster than *V. cunnesius* and *L. subviridis*.

Mugilids are total spawners. Ovaries develop in group-synchrony. Spawning occurs in a short and defined period, with all ripe ova being released within a single act

once a year. Spawning of *L. vaigiensis* and *V. seheli* occurred in local waters between November and February and between October and April, respectively. However, the presence of a few post-larvae throughout the year indicates that some spawning also occurs at other times of the year. The lengths at which 50% of the females of *L. vaigiensis* and *V. seheli* mature were 288.5 mm and 265.6 mm total length respectively. Females with ripe ovaries, spent ovaries with post-ovulatory follicles, and the presence of 10-14 day old post-larvae, indicate that spawning of these species occurs in coastal or near-shore waters of Townsville. Mugilids are gonochoristic but previtellogenic oocytes were present in approximately 6 % of testes examined in specimens of *L. subviridis*.

Food and digestion of mugilids were studied by examining gut contents, gut pH, assimilation efficiency and morphology and histology of the alimentary tract. Ontogenetic diet changes were observed in mugilids. Mugilid post-larvae are exclusively carnivorous, feeding on micro-crustaceans in pelagic waters. They move into shallow benthic waters approximately after one month of age and gradually change their diet to detritivory. The transition in diet occurs in juveniles at about 30-50 days of age. Juveniles and adults are detritivorous, their diet consisting of approximately 32-47% detritus, 1-2 % diatoms and other algae and 32-42 percent inorganic matter. Live microorganisms are abundant in the contents of the stomach, intestine and the rectum suggesting a symbiotic relationship between mugilids and microorganisms. However, further studies are required.

*L. vaigiensis* and *V. seheli* have a well developed muscular gizzard-like stomach which is used in the mechanical breakdown of plant cell walls and bacteria with the help of inorganic particles. The gut pH values of *L. vaigiensis* and *V. seheli* ranged between 5 and 7, indicating that acid lysis of plant cell walls does not occur. Morphology and histology of the alimentary tract of mugilids is well adapted to the digestion of a detritus diet. A muscular gizzard-like stomach, long intestine, a well developed pharyngobranchial apparatus for filtering food particles and a specially organised mucosa were adaptations observed in the mugilid gastro-intestinal system to utilise detritus as a food source. The elongation of the intestine, development of the pharyngobranchial apparatus, changes in dentition and stomach are noticeable during the ontogenetic diet changes from post larvae to adults.