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Ossicle change in *Holothuria scabra* with a discussion of ossicle evolution within the Holothuriidae (Echinodermata)

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Abstract

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Ossicles of *Holothuria (Metriatyla) scabra* Jaeger, 1833 vary mainly in early juveniles between 0.9 and 15 mm long. While ossicles were not observed in auricularia and doliolaria larvae, which instead possessed elastic balls, ossicles were present in late pentactulae. Specimens 0.9–1.5 mm long have tables with tall spire (4–5 cross beams), no buttons, and large irregular perforated plates. Specimens 5–6 mm long have tables with moderate spire (2–4 cross beams) and a few smooth buttons. Specimens 9–16 mm long have tables with low spire (1–2 cross beams) and knobbed buttons. From 30 mm, ossicle are similar to those of adults, with more buttons and fewer tables. Several features of the ossicles of early juveniles, including their size, shape and prevalence, are unique to the species. Comparison with holothurian juveniles of other species indicates that presence of tables with tall spire and absence of buttons are plesiomorph characters in the evolution of the Holothuriidae.

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Introduction

The ossicles of holothurians undergo noticeable modifications during their life span (Massin 1994; Cutress 1996). These phenomena have been observed in cold water (Massin 1994) and tropical species (Cutress 1996; Massin 1996). However, few species have had ossicle variation investigated during the early life stages. Almost nothing is known about the ossicles of late pentactulae and early juveniles except for a few notes by Mortensen (1937, 1938), and for the works of James *et al.* (1994a) and Levin and Gudimova (1997).

Holothuria scabra Jaeger, 1833 is a commercially harvested holothurian (Conand 1986; Conand and Byrne 1993; James 1994; Battaglene and Bell 1999) occurring throughout the Indo-Pacific from the Red Sea and East coast of Africa to Japan and Cook Islands. The reproductive cycle and larval development (Mortensen 1937; James *et al.* 1994a,b; Battaglene *et al.* 1999) as well as the juvenile ecology (Mercier *et al.* 1999) of *H. scabra* have been studied. The ossicles of adult *H. scabra* have often been illustrated (Panning 1935a, 1941; Cherbonnier 1980, 1988; Mary Bai 1980), but ossicles of juveniles are known only from a short note by James (1976) who studied a specimen of 30 mm long. Nothing has been reported concerning ossicle change during growth in *H. scabra.*

Holothurian taxonomy at the species level is based mainly on ossicle shape and size. It is therefore important to study ossicles of early juveniles to define variation in these structure within a species, so that a reliable tool can be developed for identifying young holothurians that do not possess the phenotypic characters of adult specimens. Moreover, the study of early juvenile ossicles can be expected to throw some light on the evolutionary line