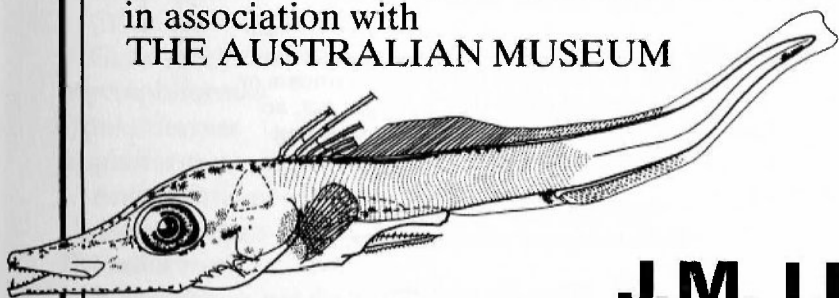


THE LARVAE OF INDO-PACIFIC SHOREFISHES

(a companion volume to
The Larvae of Indo-Pacific Coral Reef Fishes)

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Acanthuroidei

This suborder was dealt with by L & R (1983, p 209). Leis and Richards (1984) and Johnson and Washington (1987) provide recent reviews.

Families included here:

Zanclidae

Other Indo-Pacific shorefish families and references to them in addition to Leis and Richards (1984) and Johnson and Washington (1987):

Acanthuridae — L & R 1983 (p 210), Manabe and Ozawa 1988b

Siganidae — L & R 1983 (p 215), Kojima 1988d



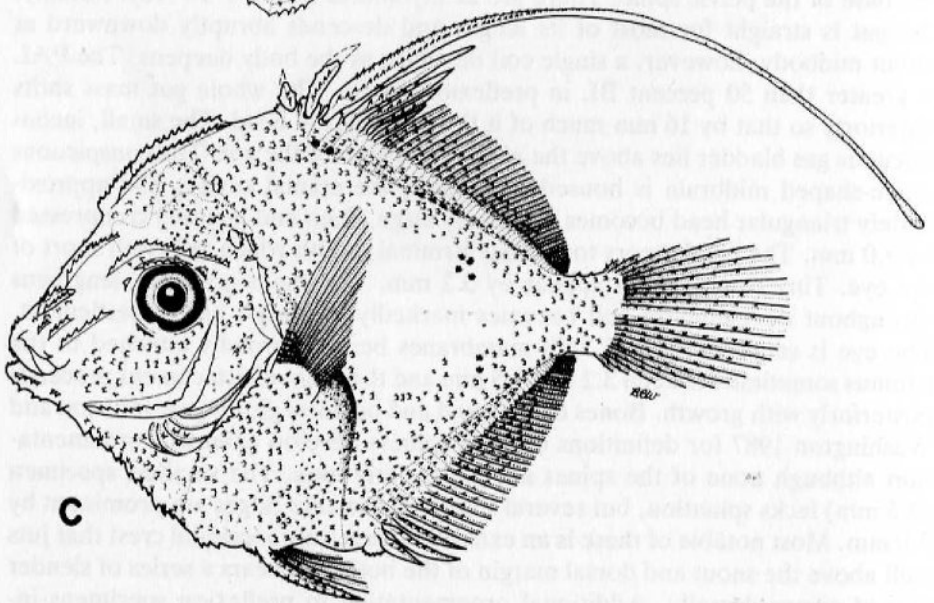
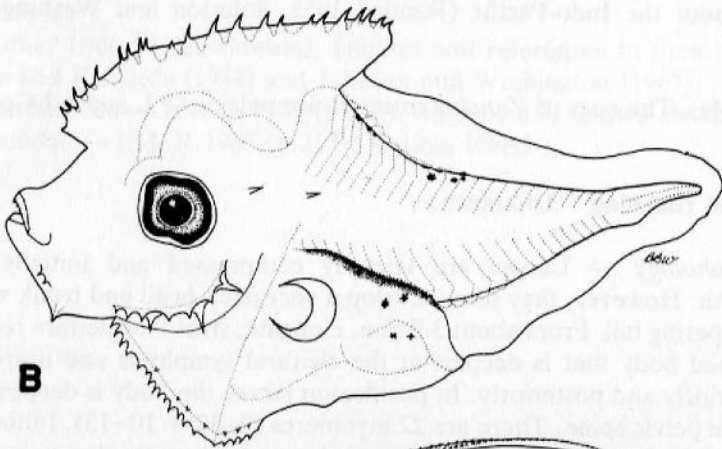
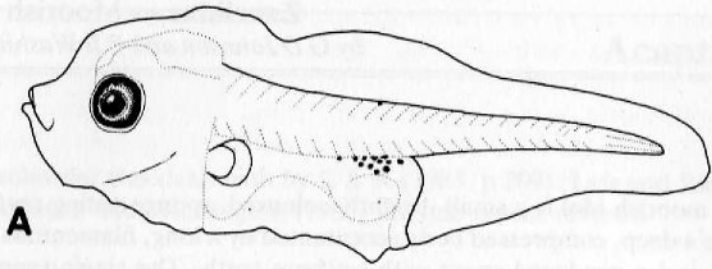
Zanclidae — Moorish Idol
by G D Johnson and B B Washington

Adults The moorish idol is a small, brightly-coloured, sponge-eating reef fish. Zanclids have a deep, compressed body accentuated by a long, filamentous third dorsal spine, and a produced snout with setiform teeth. The single species is found throughout the Indo-Pacific (Randall 1955, Johnson and Washington 1987).

Spawning Mode The eggs of *Zanclus cornutus* are pelagic (PL and LJ Colin, pers comm).

Development at Hatching Unknown.

Larvae Morphology — Larvae are laterally compressed and initially of moderate depth. However, they soon develop a very deep head and trunk with an abruptly tapering tail. From about 3.0 mm, elongate, strut-like cleithra result in a kite-shaped body that is deepest at the cleithral symphysis and narrows abruptly anteriorly and posteriorly. In postflexion larvae the body is deepest at the base of the pelvic spine. There are 22 myomeres (9–12 + 10–13). Initially, the gut is straight for most of its length and descends abruptly downward at about midbody, however, a single coil develops as the body deepens. The PAL is greater than 50 percent BL in preflexion larvae. The whole gut mass shifts anteriorly so that by 16 mm much of it lies beneath the head. The small, inconspicuous gas bladder lies above the anterior portion of the gut. The conspicuous dome-shaped midbrain is housed in a dome-like cranial cavity. The approximately triangular head becomes extremely large, deep and laterally compressed by 3.0 mm. The head tapers to a small terminal mouth which falls well short of the eye. Tiny conical teeth appear by 3.2 mm. The snout gradually lengthens throughout development and becomes markedly produced before settlement. The eye is small and round. Gill membranes become broadly attached to the isthmus sometime between 3.2 and 9.5 mm and the point of attachment proceeds posteriorly with growth. Bones of the head and pectoral girdle (see Johnson and Washington 1987 for definitions of head spines) develop extensive ornamentation although none of the spines are particularly long. The smallest specimen (2.5 mm) lacks spination, but several spines and serrate ridges are prominent by 3.0 mm. Most notable of these is an extremely large supraoccipital crest that juts well above the snout and dorsal margin of the body and bears a series of slender curved spines dorsally. Additional ornamentation in preflexion specimens includes: single spines on the supraclithrum, pterotic and retroarticular, two spines on the ventral margin of the dentary, series of small to moderate spines on the lateral and posterior margin of the opercle, and a serrate midventral keel



from the isthmus to the pelvic base. In the smallest available postflexion specimen (9.5 mm) the supraoccipital crest is less pronounced and bears a dorso-lateral serrate ridge on each side of the median serrate ridge. There are additional serrate ridges on the frontal, lacrimal, nasal, ascending process of the premaxilla, anguloarticular, dentary, pterotic, posttemporal, supracleithrum and cleithrum; small spines on the dermosphenotic, second infraorbital, lateral ethmoid and extrascapulae; and a large retrorse spine on the ventral margin of the lacrimal. Dorsal- and anal-fin anlagen are present by 3.0 mm — the former

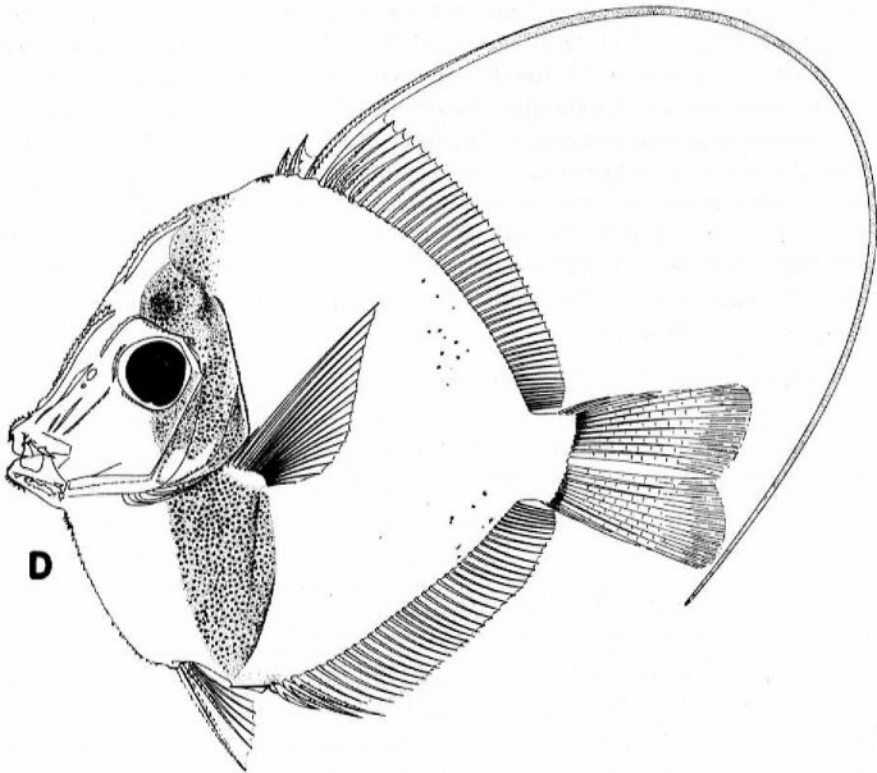


Fig 67 Larvae of *Zanclus cornutus*, A–B from plankton tows in the Great Barrier Reef Lagoon near Lizard Island, C from a midwater trawl in the Solomon Sea and D from a midwater trawl off Hawaii. A–C after Johnson and Washington (1987).

A 2.8 mm.

B 3.0 mm.

C 9.5 mm.

D 16.0 mm acronurus stage (after Strasburg 1962). Note scales omitted in drawing.

is located just posterior to the head — and are well developed in the largest preflexion specimen (3.1 mm). Because the developmental series is incomplete, sequence of fin development has not been documented, but it is probably similar to that of acanthurids, in which the elongate second (third in *Zanclus*) dorsal spine and pelvic spine develop first, followed by the elongate second anal spine, pectoral fin and the remainder of the dorsal-, anal- and pelvic-fin rays. In the smallest (9.5 mm) postflexion specimen, full fin-ray complements are present in all fins, and the third dorsal spine is extremely elongate and distally filamentous. All dorsal and anal spines and the pelvic spine bear spinules laterally as do all dorsal, anal and caudal soft rays and some pectoral and pelvic rays. Scales are lacking in preflexion specimens but distinctive, specialized, spiny scales cover much of the head and body in the smallest postflexion specimen. Each scale consists of a roughly ovoid basal plate with a vertically oriented, fan-like, laminar projection which extends outward at right-angles to the plate and bears one to several small points distally. The large specialized pelagic stage in zancids is often called an acronurus (as it is in acanthurids). The largest pelagic specimens (49 mm) examined are extremely laterally compressed and disc shaped; much of the bony ornamentation is retained in a relatively reduced state. Specializations to pelagic life include the serrate dorsal, anal and pelvic spines, extensive ornamentation of the bones of the head and pectoral girdle, and early-forming, specialized scales.

Size of smallest examined specimen — 2.5 mm

Size at initial ossification of dorsal-fin elements — *c* 3.2 mm

Size at caudal flexion — unknown, probably *c* 3.5–4.5 mm

Size of largest examined pelagic specimen — 49.0 mm

Morphometrics (proportion of body length):

	<i>preflexion larvae</i>	<i>postflexion larvae</i>
PAL	.61–.74	.32–.58
PDL	.45–.53	.42–.59
HL	.27–.41	.33–.46
SnL	.09–.19	.15–.27
ED	.09–.15	.09–.13
BD	.25–.64	.69–1.03
VAFL	—	.05–.12
DSL ^a	—	1.12–3.78
P ₂ SL	—	.20–.57

^a Length third dorsal spine

Pigment — Zanclid larvae are lightly pigmented with the exception of a strong vertical pigment band in the acronurus stage (from about 13 mm). In preflexion specimens pigment is restricted to a sprinkling of melanophores along the dorsolateral surface of the gut and a few melanophores on, and on either side of, the dorsal midline of the trunk. Postflexion larvae also have a few melanophores laterally on the tail, at the bases of the caudal-fin rays and on the filamentous portion of the third dorsal spine. Internal pigment is found on the gut mass, dorsally on the brain, on the opercle and posteriorly above the notochord. Acronurus-stage larvae are characterized by a broad band of pigment extending from the dorsal margin of the occiput to the ventral margin of the gut posterior to the pelvic-fin base, and a much narrower vertical pigment band along the base of the caudal fin; remnants of earlier pigment are variously present.

Similar Families — Zanclid larvae are characterized by the following: deep, laterally compressed, kite-shaped body; 22 myomeres; early-forming, serrate fin-spines; spinulose soft fin rays; elongate, filamentous third dorsal spine; early-forming, specialized scales; and extensive head spination. Zanclid larvae are most similar to larvae of acanthurids but they could also be confused with caproids, menids and luvarids. Preflexion larvae from 3.0 mm can be distinguished by the greatly enlarged, distinctively spinulose, supraoccipital crest (which is less prominent in acanthurids and bears relatively shorter spines), the presence in zanclics of pigment on and around the dorsal midline, and the relatively larger preopercular spines of zanclics. Postflexion larvae differ from those of acanthurids in having the following: more soft dorsal- and anal-fin rays; three serrate ridges along the supraoccipital crest; the third, rather than the second, dorsal spine elongate and that spine with a filamentous, pigmented extension; a large retrorse spine on the lacrimal; ventral margin of the pelvic girdle smooth; and scales with fan-shaped, rather than triangular, projections, lacking a ridge of firm connective tissue on the basal plate and not arranged in regular vertical rows. Caproid larvae are deep-bodied and compressed and have a large supraoccipital crest and a domed brain, but differ from zanclics in possessing a large preopercular spine. Menid larvae are deep-bodied and compressed, but differ from zanclics in lacking a serrate midventral keel between the isthmus and the pelvic base and in having only a low, small supraoccipital crest. Zanclid larvae also resemble, in certain features, larvae of the closely related, pelagic louvar (*Luvarus imperialis*), however the distinctive, truncate snout of the latter makes confusion unlikely.

Description is based on 5 preflexion and a full set of postflexion specimens; no larvae between 3.2 and 9.3 mm were available.

Meristic Characters of the Indo-Pacific Zanclid Genus

	D	A	P ₁	P ₂	C	Vertebrae
<i>Zanclus</i>	VII,38-43	III,31-36	18-19	1,5	8 + 8	22