

The Beach Zone of Islands and Cays in the Lizard Island Area of the Great Barrier Reef: Do They Serve as Nursery Zones for Fish Larvae?

Report on Pilot Study

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Introduction

In temperate areas, the beach zone (or surf zone) serves as a temporary nursery for the larvae of a variety of fish species. Generally, these are older larvae nearing the end of their pelagic larval period. For example, a survey of four Sydney beaches found the larvae of 70 fish species, including several of sport and commercial importance (Leis and Reader, unpublished data). The size ranges of most of these larvae were narrow (centred around 10 mm), indicating only temporary occupancy of the beach zone.

If beach zones are essential nursery grounds for fishes, even on a temporary basis, they must receive special protection. The beach zones of tropical islands and cays in the Great Barrier Reef have not been examined previously to determine if they serve this nursery function. It was the purpose of this pilot study to examine the fish larvae at beaches on Lizard Island. Weather did not permit sampling on other islands and cays in the vicinity.

Methods

At each beach, three replicates were taken with a small (6m x 1m) fine-mesh (1mm) beach seine. The net was pulled from a depth of 1 m diagonally toward shore, so a stretch of shoreline 20 m long was covered. Samples were preserved in 10% formalin/seawater and returned to Sydney for processing. The fish larvae from these samples are deposited in the Australian Museum, Sydney under the station numbers I.34111-I.34124 (inclusive).

All samples were taken during the day. Mermaid Cove Beach was sampled on 3 April 1993. Watsons Bay Beach was sampled on 4 April 1993. Research Beach (=Casurina Beach) was sampled four times: 5, 9, 11, and 13 April 1993. A total of 18 samples was taken.

Larvae were identified and the size range of each taxon in each sample was noted, and if there was a gap of more than 1 mm in the sizes of any species in a sample, this was noted.

Results

Only eight species of seven families were captured (Table 1). Of these few, only one, the blenniid Petroscirtes sp could be considered a coral reef species. The single gobiid larvae captured was unidentified, and as gobiids live in a variety of habitats as adults, it cannot be determined what adult habitat is represented by this larva. The other taxa were shallow-water schooling fishes (Clupeidae, Atherinidae, Engraulididae), or sandy-bottom fishes (Callinoyimidae, Gerreidae).

Only three taxa occurred in more than two samples of the 18 taken (Table 1), and of these only the clupeid, Spratelloides delicatulus occurred in more than half the samples. These three will be referred to as abundant taxa.

A total of 5786 specimens was captured, and the two most abundant species, the clupeid and the gerreid accounted for 99.3% of them.

The size range of the abundant species was similar, from about 10 mm to about 30-40 mm (Table 1).

Inter-replicate variation was very high. For the abundant taxa, the value of the standard deviation amongst replicates exceeded the mean in 11 of 13 cases (Table 2).

Because the variation amongst replicates was so high, it is difficult to say very much about spatial or temporal patterns of abundance. No gerreids were taken after 5 April, and they were most abundant at Watsons Bay beach. Atherinids occurred throughout the study period with no apparent pattern. The clupeids were possibly more abundant at Watsons Bay and Mermaid Cove than at Research Beach, but there was no apparent temporal pattern in abundance of clupeids.

Abundance of gerreids declined from replicate one to two to three in the two cases when significant numbers of them were present, suggesting that either they were locally "fished out" by the sampling or that sampling disturbed them, and they left the sampling area. This pattern did not occur with either of the other two abundant species.

Discussion

There was no evidence that any coral reef fish species utilized the beach zone at Lizard Island. The fishes that did so were schooling "bait fishes" (clupeids and atherinids) or benthic fish of soft bottoms such as lagoons (gerreids). These are, however, important forage species for both reef and schooling predatory fishes and for seabirds.

The larvae and juveniles of the beach zone were not diverse and were clearly dominated by a very few species. However, judging by the reasonably wide size range (10-30 or 40 mm), they remain in the beach zone for some time. This is in contrast to the situation in Sydney, where the size range of the larvae of most species were very narrow (unpublished data).

Variance among replicates was very high. This is probably due to schooling by these fishes as they near the end of their larval phase and enter the juvenile phase. All three of the abundant species school as adults. Unfortunately, this high variance will make any study of the beach zone very difficult, because very large numbers of replicates will have to be taken to achieve reasonable precision or statistical power. This presents a special problem given the relatively small size of the beaches on the islands and cays of the Great Barrier Reef, because taking a large number of replicates in a small area may result in "fishing out" or driving away of the larvae. This would give rise to "replicates" that are not independent, thus violating a basic assumption of most statistical procedures. There were indications that this was taking place with the gerreids.

Little can be made of the apparent spatial or temporal patterns noted above because of the very high variance.

This pilot study was undertaken during April (autumn). It should be kept in mind that different results might have been found if sampling had taken place during spring or summer, the periods of peak recruitment of fishes to the coral reefs.

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Table 1. Types of larvae and juveniles, numbers and size ranges captured by beach seine at Lizard Island, April, 1993. An occurrence is presence in a replicate.

<u>Taxon</u>	<u>Number</u>	<u>Occurrences</u>	<u>Size Range (mm)</u>
Atherinidae			
Gen. sp.	35	7	11-41
Blenniidae			
<u>Petroscirtes</u> sp	1	1	10
Callinoyimidae			
<u>Diplogrammus</u>			
goramensis	1	1	32
Gen. sp.	1	1	4
Clupeidae			
<u>Spratelloides</u>			
delicatulus	4537	10	11-31
Engraulididae			
Gen sp	2	2	20-21
Gerreidae			
<u>Gerres</u> sp	1208	7	9-29
Gobiidae			
Gen sp	1	1	5

Table 2. Abundance (individuals/sample) and standard deviation (given in parentheses) of catches of the three abundant taxa for the six sampling occasions. Three samples were taken on each occasion.

<u>Date/Location</u>	<u>Atherinid</u>	<u>Clupeid</u>	<u>Gerreid</u>
3 April/ Mermaid	0(-)	377.3(401.2)	0.33(0.58)
4 April/ Watsons	2.67(2.52)	1082(1131)	374.3(293.1)
5 April/ Research	1.30(2.31)	3.0(5.2)	28(35.2)
9 April/Research	1.30(2.31)	1.7(2.9)	0(-)
11 April/Research	7.3(7.5)	0(-)	0(-)
13 April/Research	0.33(0.58)	47.7(80.8)	0(-)