

Gut contents of larval fishes from light trap and plankton net collections at Enmedio Reef near Veracruz, Mexico

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Resumen: Se recolectaron larvas de pez en el arrecife Enmedio, México, con arrastres de red y trampas lumínicas, en tres tipos de hábitat: lecho de talaseas, arena y arrecife. Ambos métodos producen cantidades semejantes de ejemplares, pero las especies difieren. La red recolecta individuos más comunes en los arrecifes y las trampas solo funcionaron bien en el lecho de talasea. Los contenidos del tubo digestivo en 153 larvas de dos clases (3.0 y 5mm) mostraron que las larvas pequeñas se alimentan principalmente de tintinidos y dinoflagelados, las más grandes consumieron presas mayores, como crustáceos y huevos de invertebrado.

Key words: tropical reef fishes, larvae, diets, light-trap

Traditionally, it has been assumed that reef fish recruitment is a density dependent process determined by adult population size and resource limitations (Sale 1978). More recent ideas on factors regulating population size include the concept that reef populations are strongly influenced by pre-recruitment limitations (Victor 1986, Richards and Lindeman 1987, Doherty and Williams 1988). Variation in larval survival rates due to starvation can strongly affect year class strength. Finding appropriate planktonic prey within a few days of hatching is critical to larval survival. However, little is known about the diets of early (preflexion) larval reef fishes, thus studies of their feeding ecology would provide insight into survival and subsequent recruitment to reefs. A major limitation to such studies has been the low yield of reef fish larvae in plankton tows (Victor 1986, Leis 1989). Light traps are an attractive alternative since many fish larvae are attracted to light, and traps can be easily deployed in shallow reef sites. We conducted a study to examine the diets of tropical fish larvae collected by light traps and plankton tows at different habitats on a shallow coral reef. Our objective was to collect first feeding preflexion

larvae and to identify prey organisms in their guts. This information is needed for our long term goal of culturing coral reef fishes in the laboratory.

Collections were made at Enmedio Reef (19°06'N, 95°56'W) located 7 km from the mainland fishing village of Anton Lizardo just south of Veracruz, Mexico (see Tunnel 1988 for details). Enmedio is an emergent platform-type reef (2.25 x 1.15 km) surrounding a 1-3 m deep lagoon that contains both sandy bottom and seagrass beds of *Thalassia testudinum*.

Fish collections were made over three habitats (seagrass, sand and reef with depths of 1-1.5, 2-2.5 and 1.5-2 m respectively) from 12-20 June, 1991. All were evening, surface collections. Light traps (Fig. 1) constructed from 5 gallon plastic buckets had narrow (3 mm) slits to limit entrance of large organisms. These traps floated approximately 2 cm below the surface during the 10 or 15 min sampling periods. Net tows to collect both zooplankton and ichthyoplankton were made using a 0.5 m diameter x 1.5 m long 30 μ m or 153 μ m nitex net pulled behind a boat. From 5-10 m³ of water were sampled during tows.

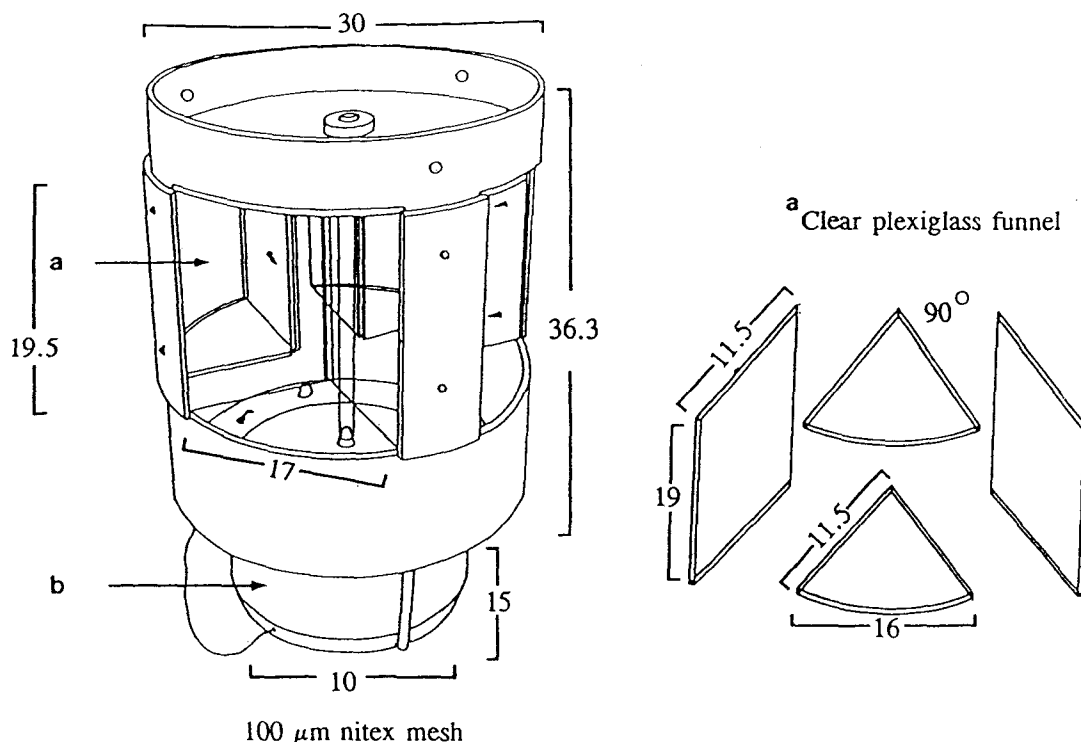


Fig. 1. Light trap with adjustable entrance funnel (a) and removable catch cup (b) was patterned after a design by R. Wallus of the TVA (personal communication), dimensions in centimeters (cm).

Samples were fixed in 10% formalin for two weeks then transferred to 70% ethanol for storage. In the laboratory, larval fish were identified to family, counted and gut contents of selected reef fish families were examined. The entire gastrointestinal tracts of larvae were removed and slit open to expose the contents. With a compound microscope, each food item was identified to the lowest taxonomic group possible, measured at the narrowest width, and counted. A stereomicroscope was used to measure notochord length (NL) and standard length (SL) to the nearest 0.1 mm. Collected larvae naturally fell into two size class distributions (≤ 3.0 and > 5 mm SL). Percent frequency of occurrence (%FO) and percent of total number (%N) of food items found in the guts of larvae in each size class were calculated (Lyczkowski Laroche 1982). Importance values (IPV) of food items were calculated by multiplying %FO by %N.

A total of 895 larvae from at least 27 families were collected in 18 light trap and 12 net tow samples (Table 1). Twenty-eight of the larvae could not be identified. Light trap samples

cannot be quantified but light trap and net samples can be compared in terms of number of larvae captured per sample. Although approximately equal numbers of larvae were captured with light traps and net tows (432 and 463 respectively), there were differences in taxonomic composition (Table 1). Individuals from seven families (Clupeidae, Atherinidae, Lutjanidae, Gerreidae, Sciaenidae, Labridae, Microdesmidae) were found only in light trap samples and representatives from 15 different families, including many reef associated families (i.e. Serranidae, Sparidae, Haemulidae, Pomacanthidae, Sphyraenidae, Balistidae) were captured only with net tows.

Total numbers of larvae from seagrass and reef sites were similar (444 vs 439). Larvae from the seagrass habitat were dominated by individuals of Mullidae, Microdesmidae, Scaridae, and Gobiidae. Major families collected over reefs were Blenniidae, Sparidae, Pomacanthidae, and Gobiidae. The sand bottom site was sparse, yielding only 12 larvae from five families, mostly Engraulids.

TABLE 1

Mean number of larval fish (by family) collected per sample at three sites with two gear types, two mesh sizes were used in reef tows

| Family b N | Light Trap | | | Net Tow | | | | ^a Total |
|----------------|------------|------|------|----------|-------|----------|------|--------------------|
| | Seagrass | Reef | Sand | Seagrass | Reef | Reef(1g) | Sand | |
| Clupeidae | 1.00 | - | - | - | 5 | 3 | 2 | 7 |
| Engraulidae | - | - | - | 0.50 | 5.60 | 0.66 | - | 37 |
| Syndontidae | - | - | - | - | - | 1.00 | 3.00 | 3 |
| Ophidiidae | - | - | - | - | - | 0.33 | - | 1 |
| Exocoetidae | - | - | - | - | 0.20 | - | - | 1 |
| Atherinidae | 0.14 | - | - | - | - | - | - | 1 |
| Scorpaenidae | - | - | - | - | - | - | - | 1 |
| Serranidae | - | - | - | - | - | 0.33 | - | 1 |
| Carangidae | - | - | - | - | - | 0.66 | - | 2 |
| Lutjanidae | 0.14 | - | - | - | 0.40 | 1.33 | - | 6 |
| Gerreidae | 0.29 | - | - | - | - | - | - | 1 |
| Haemulidae | - | - | - | - | - | - | - | 2 |
| Sparidae | - | - | - | - | - | 2.00 | - | 6 |
| Sciaenidae | 0.29 | - | - | 0.50 | 5.80 | 29.66 | 0.50 | 120 |
| Mullidae | 7.29 | - | - | - | 1.40 | - | - | 2 |
| Pomacanthidae | - | - | - | - | - | - | - | 58 |
| Pomacentridae | 0.29 | - | - | - | - | 10.33 | - | 1 |
| Sphyraenidae | - | - | - | - | - | 4.00 | - | 14 |
| Labridae | 2.29 | - | 0.20 | - | - | 0.66 | - | 2 |
| Scaridae | 13.43 | - | - | - | - | - | - | 17 |
| Blenniidae | - | - | - | - | - | 1.33 | - | 98 |
| Gobiidae | 9.29 | - | - | 5.50 | 17.40 | 23.33 | - | 168 |
| Microdesmidae | 26.86 | - | - | - | 6.80 | 4.33 | 0.50 | 113 |
| Bothidae | - | - | - | - | - | - | - | 188 |
| Soleidae | - | - | - | - | 1.00 | 0.66 | - | 7 |
| Balistidae | - | - | - | - | - | - | 1.00 | 2 |
| Tetraodontidae | 0.14 | - | - | - | 0.20 | 1.33 | - | 5 |
| Unknown | - | - | - | - | 0.20 | 0.66 | - | 4 |
| Totals | 61.45 | 0.00 | 0.20 | 6.50 | 43.20 | 84.60 | 0.50 | 28 |

^a Total number of larval fish collected per family

^b N=number of samples at each site

Preflexion larvae from 1.1-3.0 mm NL (\bar{x} =1.52, SD=0.35) dominated the collections (84%) whereas larger larvae 5.4-14.3 mm SL (\bar{x} =6.25, SD=1.01) were only caught in light traps over seagrass beds. Light traps usually catch more later stage larvae than do towed nets (Doherty 1987). The lack of intermediate size larvae in net samples could be due to gear selectivity however their absence in light traps is perplexing. They were either not attracted to light during this stage or were distributed away from the reef.

The guts of 153 common or reef associated larvae (Table 2) were dissected, of which 35 (23%) were empty. The kinds of prey consumed by both size classes were similar (Table 3), however, the dominant food types differed. Dominant food (IPV) items for small larvae were tintinnids and dinoflagellates, and less importantly protozoans (primarily ciliates). In

TABLE 2

The number of guts examined in each larval size class by family

| Family | Size Class | |
|----------------|------------|-----------|
| | ≤ 3 mm | > 5 mm SL |
| Serranidae | 2 | - |
| Carangidae | 6 | - |
| Lutjanidae | - | 1 |
| Gerreidae | - | 3 |
| Haemulidae | 6 | - |
| Sparidae | 8 | - |
| Sciaenidae | 2 | - |
| Mullidae | 27 | - |
| Pomacanthidae | 1 | - |
| Pomacentridae | 11 | 2 |
| Sphyraenidae | 1 | 1 |
| Labridae | - | 17 |
| Scaridae | 4 | 19 |
| Blenniidae | 16 | - |
| Gobiidae | 7 | 4 |
| Bothidae | 6 | - |
| Balistidae | 5 | - |
| Tetraodontidae | 4 | - |
| Total | 106 | 47 |

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