

Observations on Egg Hatching of *Syngnathoides biaculeatus* (Bloch) (Pisces: Syngnathidae)

JOHN J. HASSE¹

Abstract

The pipefish *Syngnathoides biaculeatus* (Bloch) has fewer but larger eggs than pipefishes with enclosed or semi-enclosed brood pouches. Vigorous shakes by males during hatching are comfort movements, not direct aids to hatching fish. Parental care does not exist, the young compensating for this by large size at hatching (18.0 mm TL) and lack of yolk sac.

Introduction

The pipefish, *Syngnathoides biaculeatus* (Bloch), inhabits sea grass beds of the western Indian Ocean and most of the tropical Pacific (Smith, 1963). Males carry eggs imbedded singly on the abdomen with no protective plates or membranes. This type of brood pouch is primitive (Herald, 1959). Information on pipefish spawnings is restricted to species with brood pouch development (Gudger, 1906; Taki and Mizokami, 1959). Sudarsan (1968) gave a brief description of the embryos of *S. biaculeatus*.

Materials and Methods

Two males (TL 206 mm, 227 mm) and one female (TL 206 mm) *S. biaculeatus* were dipnetted on the *Enhalus* grass flats of the east coast of Palau, Western Caroline Islands (7°30'N, 134°30'E) between 18 April and 15 May, 1973. The fish were housed in fiberglas tanks (45×45×20 cm) with natural seawater changed at three day intervals. Natural daylight (13 light:11 dark) illuminated the tanks. Water temperature was 26°-29°C. Observations of males were made while the young were hatching. Behavior of young pipefish was observed for five days. Growth and mortality were recorded. The female was examined and condition of ovaries noted.

Results

Ovaries of the female *S. biaculeatus* appeared of equal size with the right containing 149 eggs and the left 144 eggs. Eggs, averaged 1.4 mm wide and deep and

¹ Micronesian Mariculture Demonstration Center, Koror, Palau, Western Caroline Islands. Present address: N.Y.S.D.E.C., State Office Building, Water Town, N.Y. 13601.

1.6 mm long (n=38), were orange-yellow, angular, and packed tightly. Each ovary was 37.1 mm long. Proximal and distal portions were 8.1 mm wide and 3.9 mm deep while the middle was 8.8 mm wide and 5.5 mm deep.

Both males were carrying eggs when captured. Eggs from the 18 April male hatched on 27 April while eggs of the 15 May male hatched on 20 May. Most eggs hatched between 0830 hrs and 1430 hrs (Fig. 1). In one hour during peak hatching, 16 eggs hatched singly, two eggs hatched together twice, three eggs hatched together once, five eggs hatched together twice and 13 eggs hatched together once. When more than two young hatched simultaneously, there was a vigorous shake from the male, though some shakes did not release young. The males did not shake until approximately one third of the young had hatched. Shakes occurred after hatching and continued until the males were separated from the young 96 hrs later. No shakes were observed when the males were free of attached young pipefish.

Eggs began hatching at the periphery of the brood pouch (Fig. 2). Some eggs protruded 1 mm to 2 mm above the median height of eggs in the brood pouch a few minutes before hatching. This only occurred for eggs surrounded by other eggs.

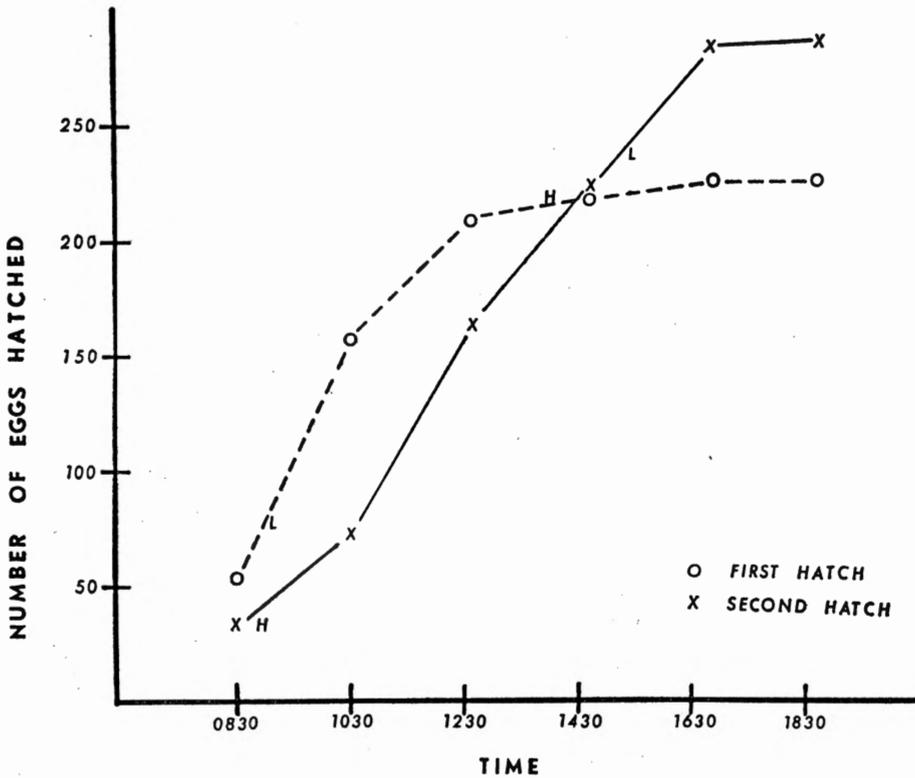


Fig. 1. Comparison of hatching times from 27 April (first hatching) and 20 May, 1973 (second hatching) for *S. biaculeatus*. Male from first hatching 206 mm TL, male from second hatching 227 mm TL. "L"=low tide, "H"=high tide.

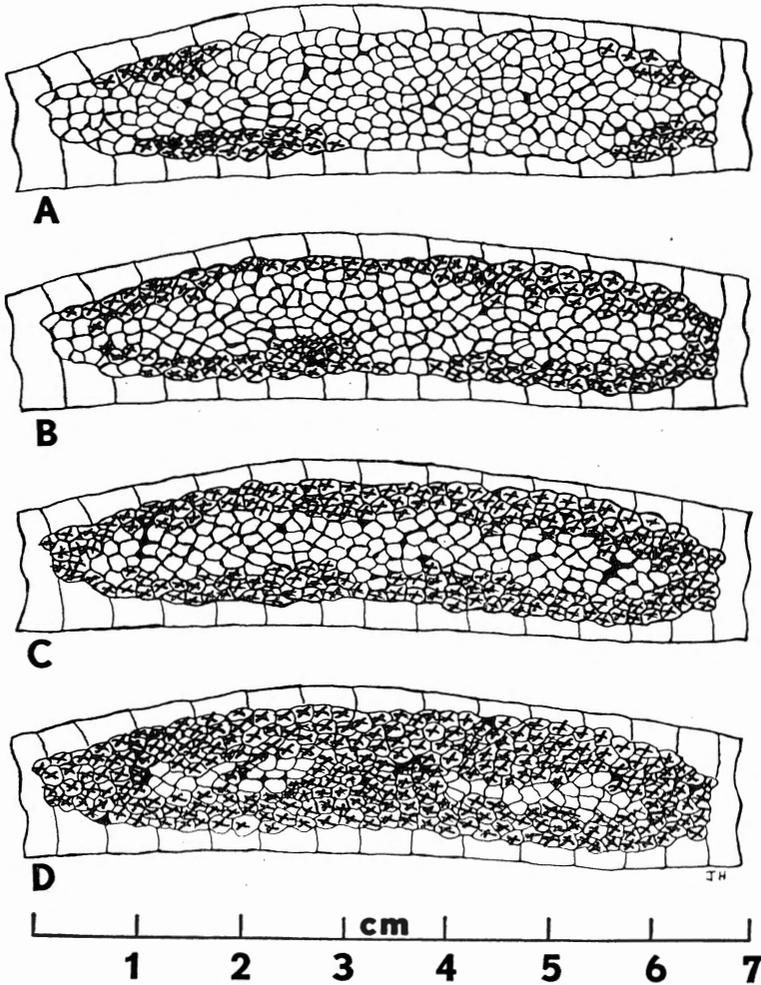


Fig. 2. Brood pouch of *S. biaculeatus* showing the hatching pattern over a seven-hour period. A. one hour into hatching, B. three hours into hatching, C. five hours into hatching, D. seven hours into hatching. "X" area indicates hatched eggs.

Eggs not surrounded by other eggs usually increased 1 mm in diameter shortly before hatching. Unhatched fish were seen twitching in the eggs at that time. Most young fish hatched head first, although a few hatched tail first. Young popped out about one body length, were motionless for a moment then swam to the nearest object they could grasp. Males remained horizontal and motionless near the surface while eggs hatched.

Newly hatched *S. biaculeatus* were morphometrically similar to adults except for a shorter snout. Unlike the green adults, young were brown. Although young

fish could swim about two body lengths per second, they usually remained attached to some object, even another fish.

Feeding on zooplankton and brine shrimp began soon after hatching. Eighty percent of the individuals fed while attached to an object. The remainder fed while swimming ($n=25$). Feeding movements similar to those described by Bigelow and Schroder (1953, p. 313) began about sunrise and concluded about sunset. Young fish ($n=10$) grew about 1.0 mm per day from an average TL of 18.5 mm at hatching to 35.6 mm TL in two weeks.

Discussion

Syngnathus schlegeli, which has a primitive inverted brood pouch chamber (Herald, 1959) is an Indo-Pacific pipe-fish examined in some detail (Taki and Mizokami, 1959). Compared with ovaries of *Syngnathus schlegeli* of similar size (Taki and Mizokami, 1959), the ovaries of *S. biaculeatus* are about 1 cm shorter. Similar numbers of eggs in each ovary as found for *S. biaculeatus* also occurs for *Syngnathus schlegeli* (Taki and Mizokami, 1959). However, the total number of eggs is greater for *Syngnathus schlegeli*, the difference being due to the larger egg size of *S. biaculeatus*. The angular shaped eggs found in the ovaries of *S. biaculeatus* are considered "immature" based on Strawn (1958). Fewer eggs in the brood pouches of *S. biaculeatus* ($\bar{x}=243$) compared to *Syngnathus schlegeli* ($\bar{x}=1137$, $n=2$) of similar size (Taki and Mizokami, 1959) is due to the larger egg size of *S. biaculeatus*.

Vigorous shakes by males during hatching appear to be "comfort movements" rather than deliberate aids to hatching fish. In all cases, several newly hatched pipefish were seen hanging on the snout and tail of the male. When their numbers became excessive the males shook them off. No shakes were observed unless young were attached to the males. This activity was not observed until nearly one third of the young had hatched. It continued until the males were removed from the young several days after hatching. If shakes were an aid to the hatching fish they would probably be more closely time-related to the start and finish of hatching.

Unlike *Syngnathus schlegeli* which carries young for six to ten days after hatching (Taki and Mizokami, 1959), parental care does not exist for *S. biaculeatus*. Lack of membranes or plates to form a closed or semi-closed brood pouch eliminates the possibility of carrying young for an additional time period. Young *S. biaculeatus* may compensate for this lack of parental protection by hatching at nearly twice the size of *Syngnathus fuscus* (Gudger, 1906) and *Syngnathus schlegeli* (Taki and Mizokami, 1959), species with more specialized pouches. Also, the specialized pipefishes are born with yolk sacs (Taki and Mizokami, 1959), while *S. biaculeatus* has none. Sudarsan (1968) incorrectly described a newly hatched *S. biaculeatus* as having a yolk sac. His figure corresponds with the developmental stage I observed five days before hatching when I accidentally knocked an egg from the brood pouch. The growth rate of *S. biaculeatus* for the first two weeks is twice that of *Syngnathus schlegeli* (Taki and Mizokami, 1959) but similar to that of *Syngnathus fuscus* (Tracy,

1910; cited in Bigelow and Schroeder, 1953).

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