

REPRODUCTIVE ASPECTS OF THE GULF PIPEFISH, *Syngnathus scovelli* (TELEOSTEI: SYNGNATHIDAE), FROM SOUTHEASTERN BRAZIL

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(With 2 figures)

ABSTRACT

This study attempts to assess the relationship between fecundity and fertility of males and females of the gulf pipefish, *Syngnathus scovelli*. Specimens of this pipefish were collected in detached algae in the inner surf-zone of a dissipative sandy beach in southeastern Brazil. 97 specimens were collected, and they were associates to detached algae.

From these, 14 were males, 36 females and 47 immature. Male-female sex ratio was 0.4:1, which was significantly different from the expected 1:1 ratio. Fish ranged from 43 to 98 mm TL (Fig. 1), and males and females showed similar size. Only 7 males were pregnant, while 9 females had hydrated oocytes. Minimum number of eggs/embryos in the pouch was 30 and the maximum 92. Minimum number of hydrated oocytes was 36, and the maximum was 165. The number of egg/embryos, and hydrated oocytes were weakly related to total length. It seems that the gulf pipefish occupy the inner surf-zone of the Praia do Iate are brought to the shallows accidentally when the specimens were inhabiting drifting vegetation.

Key words: parental care, brood pouch, sex role reversal, surf zone, detached algae.

RESUMO

Aspectos reprodutivos do peixe cachimbo *Syngnathus scovelli* (Teleostei: Syngnathidae), de uma praia arenosa de Vitória, ES

Este estudo avalia a relação entre fecundidade e fertilidade de machos e fêmeas do peixe-cachimbo, *Syngnathus scovelli*, o qual ocorre em algas destacadas na zona de arrebentação de uma praia arenosa com ondas do tipo dissipativa em Vitória, ES. Foram coletados 97 exemplares, sendo todos associados com algas destacadas. Destes, 14 eram machos, 36 fêmeas e 47 imaturos. A razão sexual macho/fêmea foi de 0,4:1, a qual foi significativamente diferente da esperada razão sexual de 1:1.

O peixe-cachimbo variou de 43 a 98 mm de comprimento total, e machos e fêmeas tiveram tamanhos similares. Somente 7 machos tinham ovos na bolsa incubadora, enquanto 9 fêmeas apresentaram ovócitos hidratados. O número mínimo de ovos/embriões na bolsa incubadora foi 30 e o máximo 92. O número mínimo de ovócitos hidratados foi 36 e o máximo 165. O número de ovos/embriões e ovócitos hidratados foram fracamente relacionados ao comprimento total. Parece que os exemplares de *S. scovelli* que habitam a parte interna da zona de arrebentação da Praia do Iate são trazidos para as partes rasas involuntariamente quando os espécimens estão ocupando algas destacadas.

Palavras-chave: cuidado paternal, bolsa incubadora, reversão do papel sexual, zona de arrebentação, algas destacadas.

INTRODUCTION

The gulf pipefish, *Syngnathus scovelli* (Evermann & Kendall, 1896), occurs from St. Johns River, Florida, to southeast Brazil, and it is the only western Atlantic species of *Syngnathus* known to have breeding populations in both, fresh and oceanic waters (Dawson 1982). Targett (1984) reported a breeding population of the gulf pipefish on the northern portion of the Georgia coastline, increasing the geographical north range of this species. The gulf pipefish occurs more often in eelgrass beds and in detached algae, but a breeding population has been described for fresh water of Louisiana (Whatley, 1962). This pipefish species has been misidentified in Brazilian collections, and has been identified as *S. rousseae* or *S. folletti* (Dawson, 1982).

As other pipefishes, male gulf pipefish incubates the eggs received from females in a ventral brood pouch, which characterizes the syngnathids as sex role reversal. Females do not play any role after mating (Berglund *et al.*, 1986; Ahsnejo, 1992; among others). Period of incubation by the male varies between species, probably due to differences in egg size. In *S. scovelli*, incubation period takes from 11 to 15 days (Joseph, 1957). Young *S. scovelli* measured 12 mm at birth, and a very rapid growth rate has been noted in the young from 12-80 mm (Whatley, 1969).

In many pipefish species, males can receive another clutch of eggs, since the brood pouch carrying capacity allow it. Some pipefishes are polygamous, and females can be simultaneously or sequentially polygamous (Vincent *et al.*, 1992). Intense mating by females is allowed due to the unusual pipefish ovary, which produces continuously hydrated oocytes. Ovarian cycle in the gulf pipefish has been well described by Begovac & Wallace (1987, 1988).

There is no information about the biology or ecology of the gulf pipefish population in Brazil. This study attempts to assess the relationship between fecundity and fertility of males and females of this pipefish species occupying the inner surf-zone of a sandy beach in eastern Brazil.

MATERIAL AND METHODS

Samples were taken monthly from July 1988 through June 1989 in two stations at the inner surf-

zone of Praia do Iate, a dissipative sandy beach located at approximately 19°18'S, Vitória, Espírito Santo State, southeastern Brazil. One haul at each station was made with a beach seine 12 x 1.5 m, 5 mm bar mesh. Surface temperature was recorded with a sticker thermometer 0.5 °C precision. After sampling, fishes were preserved in 10% formalin for a week, washed and stored in 70% ethanol.

Laboratory procedures included: specimen identification based on Dawson (1982); measurement to the total length (TL mm); total weight (0.001 g precision); and fish were sectioned for gut content analysis. Number of eggs/embryos found in the brood pouch, as well as number of hydrated oocytes found in gravid females that were counted in order to compare fecundity and fertility.

RESULTS AND DISCUSSION

A total of 97 specimens were collected, and they were always associates to detached algae. They occurred in temperatures between 21 °C and 26.5 °C. From the fish collected, 14 were males, 36 females and 47 immatures. Male-female sex ratio was 0.4:1, which was significantly different from the expected 1:1 ratio ($\chi^2 = 50.0$; $P > 0.05$). Fish ranged from 43 to 98 mm TL (Fig. 1), and males and females showed similar size. Specimens of the gulf pipefish, which reach the Praia do Iate, are small. Maximum size reported was 183 mm but specimens larger than 165 mm are uncommon (Dawson, 1982). Neither sex of the gulf pipefish showed any particular change in morphology or coloration during the mate period. In other pipefish species, such as *S. fuscus* and *S. folletti*, females had sexually dimorphic features during the mate period, and males of *Oostethus lineatus* had more coloration on the snout than did females (Teixeira, 1995; Teixeira & Vieira, 1995). All models in sexual selection assume that the selection pressures favoring male secondary sex traits are eventually opposed by the costs to the males bearing them (Anderson, 1989).

There is no information about mating systems in most fish families belonging to Gasterosteiformes. Allocation and use of energy to invest in reproduction, together with the fitness of different reproductive strategies, associated with different environmental conditions, are the principal keys to defining different lineage's in the evolution of the Solenostomidae and Syngnathidae.

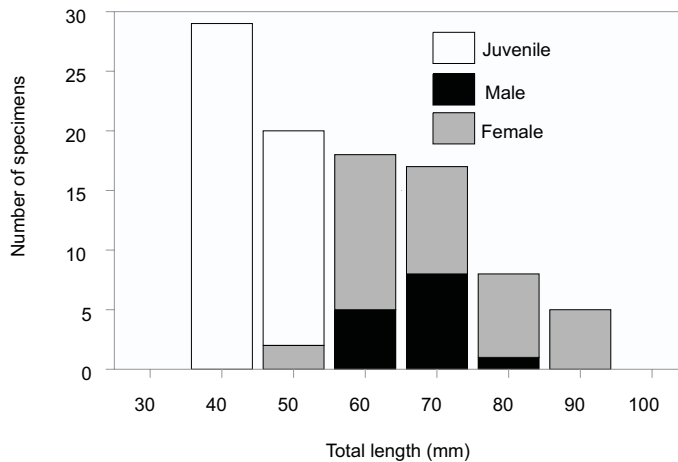


Fig. 1— Length frequency distribution of the gulf pipefish, *Syngnathus scovelli*, of the inner surf-zone of Praia do Iate, Vitória, Espírito Santo State.

Only seven males of the gulf pipefish were pregnant, while nine females had hydrated oocytes. Minimum number of eggs/embryos in the pouch was 30 and the maximum 92 (mean = 55.8; standard deviation = 21.1). Minimum number of hydrated oocytes was 36, and the maximum was 165 (mean = 92.4; standard deviation = 44.6). The number of egg/embryos (E), and hydrated oocytes (O) were weakly related to total length (Fig. 2), and the regression equations obtained were:

$$E = 2.68 TL - 142.68 \quad (n = 7; r^2 = 0.38)$$

$$O = 3.59 TL - 212.61 \quad (n = 9; r^2 = 0.38)$$

Smallest male carrying eggs was 66 mm, whereas the smallest with brood pouch totally developed was 62 mm. The largest male carrying eggs was 88 mm. Brown (1972) pointed out that males mature at 87 mm. Average number of eggs/embryos in the male pouch varies in different localities, probably due to differences in length of fish examined, or due to influence of extreme abiotic conditions. Also, growth rate could be totally different at different latitudes. McLane (1955) obtained an average of 29.5 eggs for St. Johns River population, whereas Joseph (1957) found an average of 56-58 eggs/embryos for Cedar Key, Florida, and Hellier JR. (1967) obtained an average of 12.2 in the Santa Fe River. Targett (1984) found 296 embryos and approximately 73 non-developing eggs in a male 159 mm TL, the largest number of eggs/embryos that a male has

been found carrying. Differences in number of eggs found in the brood pouch at different localities suggest that males may have different carrying capacities. Maybe this is a result of differences of brood pouch morphology, or related to differences in egg size. Specimens living in different localities are subject of different prey availability. Then, energy requirement may vary according location.

In this study, the smallest female having hydrated oocytes was 74 mm, and the largest 98 mm. Hamilton (1942) observed 94 hydrated oocytes in a 52 mm female, whereas Reid (1954) counted 143 hydrated oocytes in a 121 mm female. Brown (1972) did not find gravid females in specimens smaller than 84 mm, and majority females having hydrated oocytes were larger than 100 mm for a Florida population.

The small amount of pregnant males and gravid females occurred sporadically throughout the year at the inner surf zone of Praia do Iate. But the gulf pipefish appears to have a protracted mating season in the studied area. It seems that the gulf pipefish which occupies the inner surf-zone of the Praia do Iate are brought to the shallows accidentally when the specimens were inhabiting drifting vegetation. Future studies on this pipefish species should investigate its main habitat, structure of the population, mating period, and the intrinsic relationship to other syngnathid species.

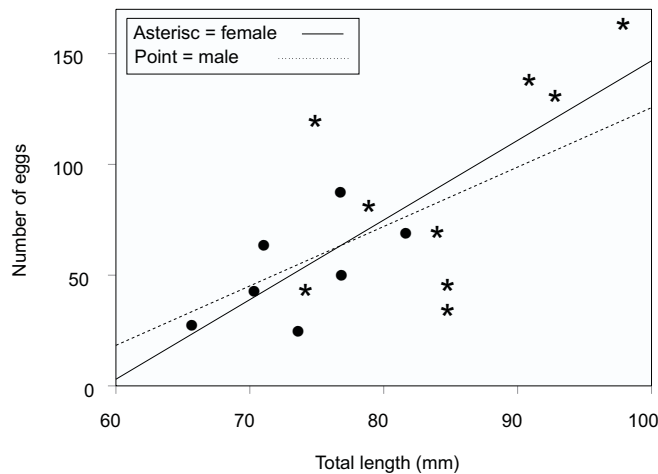


Fig. 2 — Relationship between fecundity and fertility against total length of the gulf pipefish, *Syngnathus scovelli*, of the inner surf-zone of Praia do Iate, Vitória, Espírito Santo State.

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