Reproductive period and histological analysis of the painted comber, *Serranus scriba* (Linnaeus, 1758), in the Trogir Bay area (eastern mid-Adriatic)

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A total of 798 specimens of the painted comber, *Serranus scriba* (Linnaeus, 1758), were caught in Trogir Bay (eastern mid-Adriatic) from June 2001 to May 2002 and analyzed. Total length ranged 7.1-20.0 cm (mean 11.0±1.7 cm); body weight ranged 4.21-108.99 g (mean 18.59±10.248 g). Histological analysis of 242 specimens confirmed simultaneous hermaphroditism. The annual variation of gonadosomatic index indicates that *S. scriba* spawns from May to August. Descriptions based on microscopic examinations of ovarian and testicular tissues are given.

**Key words:** *Serranus scriba*, simultaneous hermaphrodite, spawning season

**INTRODUCTION**

The painted comber, *Serranus scriba* (Linnaeus,1758), is a subtropical species, abundant in the eastern Atlantic from the Bay of Biscay to Mauritania (MAIGRET & LY, 1986), including the Canary, Azores and Madeira Islands, and in the Mediterranean and Black Sea (BAUCHOT, 1987). It is generally found along continental shelves covered with Posidonia or Cymodocea beds, at a depth of 0.5-150 m. *S. scriba* is a simultaneous hermaphrodite (FISCHER & PETERSEN, 1987), with the possibility of self-fertilization (ATZ, 1965). It tends to spawn during spring and summer and is reproductively active for five months, depending on environmental conditions (THRESHOR, 1984; SHAPIRO, 1987). Painted combers are mainly caught in the Adriatic Sea by small coastal trawl and trammel bottom nets as a by-catch species throughout the year, especially during the spring and summer. Fishing takes place early in the morning.

The purposes of this study were to acquire knowledge on gonad maturation using macroscopic and histological examination and to determine the reproductive period of the painted comber in the Adriatic Sea.

**MATERIAL AND METHODS**

A total of 798 painted combers were caught as a by-product species by small coastal trawler (12 mm stretched mesh) in the Trogir Bay (eastern mid-Adriatic; Fig. 1) from June 2001 to May 2002.

Total length was measured to the nearest 0.1 cm; total weight and gonad weight were measured to the nearest 0.01 g. The gonadosomatic index
(GSI) was calculated for each fish and values were averaged monthly. The GSI was calculated as Wg × 100/W, where Wg is the weight of the gonads and W is the wet weight of the fish.

Gonads of 242 specimens caught during the peak of the spawning period were taken for histological analysis. They were fixed in 4% formaldehyde solution, dehydrated in alcohol, and embedded in paraffin wax. Longitudinal or cross sections (10 μm) were made with a microtome, stained with hematoxylin and eosin, and examined by microscope. Oocytes were classified according to morphology and the presence and position of lipid droplets, yolk vesicles, and granules (YAMAMOTO, 1956). Spermatogenic cells were classified according to GRIER (1981).

RESULTS AND DISCUSSION

Total length ranged 7.1-20.0 cm (mean 11.0±1.7 cm; mode 10.5 cm; Fig. 2). Body weight ranged 4.21-108.99 g (mean 18.59±10.248 g).
GSI values were low from September (0.99%) to March (0.65%; Fig. 3). They increased in April (1.50%) and May (2.37%), peaked in June (3.96%), and decreased in July (3.67%) and August (1.82%). Consequently, the reproductive period for this species in this environment is May to August.

Microscopic examination confirmed that ovarian and testicular tissues of S. scriba gonads matured at the same time. Ovarian tissue was yellowish while testicular tissue was white. The ovotestis was formed of two fairly cylindrical lobes of similar size that joined at the level of the anus. Each lobe was covered by smooth muscle and connective tissue (tunica albuginea). Longitudinal and cross sections of the gonads revealed that the dominant tissue was ovarian; testicular tissue was restricted to the anterior region and positioned ventrolaterally (Fig. 4).

Oocytes of different development stages were simultaneously present within the ovarian lamellae, which were radially oriented towards the lumen. This type of ovary is known as asynchronous (MARZA, 1938). Oocytes of the so-called “second growth” (ZANUY & CARRILLO, 1973) or “vitellogenesis” (FEBVRE et al., 1975)
phase were most numerous. Three stages of oocytes were identified during this phase (Fig. 5): (a) yolk vesicle formation - yolk vesicles appeared in the cytoplasm of oocyte cells and rounded up the nucleus. Later, the number and size of yolk vesicles increased and lipid inclusions began to accumulate in the cytoplasm. The zona radiata and follicular layer became visible; (b) vitellogenesis - the yolk vesicles were larger in number and size; some had fused. Yolk granules, which appeared first in the periphery of the cytoplasm, increased in size and number, dispersing throughout the cytoplasm; (c) ripe - several oil droplets fused together, forming a large droplet that migrated towards the animal pole together with the nucleus. The nucleus was not always visible due to disintegration of the nuclear membrane and dispersion of its contents into the cytoplasm. The yolk granules fused, forming a continuous mass of fluid yolk. This type of oocyte is called a “hydrated oocyte” (HUNTER & MACEWICZ, 1985) and spawning begins with its formation (HUNTER et al., 1986).

A smaller number of primary-growth oocytes were noticed, together with the second growth oocytes, in all histological sections. The primary-growth oocytes represent oocyte reserves for the next reproductive season.

The testes were organized inside the lobules. Testicular tissue extended upwards and towards the central lumen of the gonad. The lobules consisted of many seminiferous tubules containing cysts. Each cyst was formed of spermatogenic cells in the same stage of spermatogenesis and bounded by a thin layer of connective tissue. In accordance with the terminology of GRIER (1981), the following cells were observed (Fig. 6): (a) spermatogonia - globular cells positioned at the periphery of the seminiferous tubules, usually forming cysts; (b) spermatocytes - oval

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**Fig. 5. Serranus scriba oocytes (40x).**  
A = primary growth phase; B = yolk vesicle formation; E = early vitellogenesis; H = hydrated oocyte; L = late vitellogenesis; n = nucleus; o = oil droplet; y = yolk granules; zr = zona radiata

**Fig. 6. Testicular tissue of Serranus scriba (40x).**  
S = spermatogonia; SP = spermatocytes; ST = spermatids
cells smaller than spermatogonia; (c) spermatid cells with a large and rounded nucleus; (d) spermatozoaa - spermatid cells rejected into the cyst cavity as spermatogenesis neared its end. They continued to develop as spermatozoaa.

The histological characteristics of *S. scriba* agree with those of other *Serranus* species (GARCÍA-DÍAZ *et al.*, 1999; 2002). Nevertheless, further detailed histological analysis of the *S. scriba* gonad is required to obtain a more detailed spawning pattern of this species.

**REFERENCES**


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Reproduktivni ciklus i histološka analiza gonada pirke, *Serranus scriba* (Linnaeus, 1758) iz uzoraka lovina Trogirskog zaljeva (istočni dio srednjeg Jadrana)

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**SAŽETAK**

U radu se iznose podaci histološke analize radi utvrđivanja razmnožavanja pirke, *Serranus scriba* (Linnaeus, 1758). Obradeno je 798 primjeraka ove vrste iz lovina ostvarenih na području Trogirskog zaljeva obalnom povlačnom mrežom (strašin) tijekom razdoblja lipanj 2001. - svibanj 2002. god. Raspon totalnih dužina tijela pirke se kretao između 7,1 cm i 20,0 cm, dok je srednja vrijednost iznosila 11,0±1,700 cm. Histološkom analizom gonada je potvrđeno da je pirka sinhroni hermafrodit. Obzirom na dobivene vrijednosti gonadosomatskog indeksa utvrđeno je da se pirka mrijesti od svibnja do kolovoza.

**Ključne riječi:** *Serranus scriba*, sinhroni hermafrodit, reproduktivni ciklus, Jadranosko more