

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

Barbara ZORICA, Gorenka SINOVIĆ and Vanja ČIKEŠ KEČ

*Institute of Oceanography and Fisheries, P.O. Box 500, 21 000 Split, Croatia*

*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 (THRESHER, 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

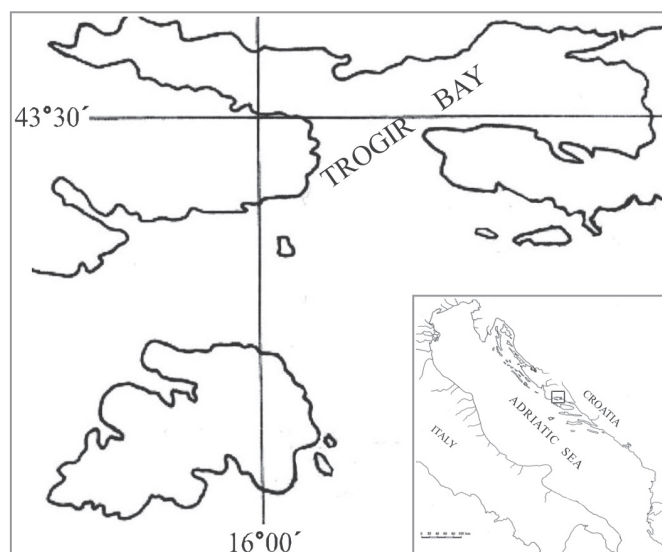


Fig. 1. Location of Trogir Bay

(*GSI*) was calculated for each fish and values were averaged monthly. The *GSI* was calculated as  $W_g \times 100/W$ , where  $W_g$  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  $\mu$ m) 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  $11.0 \pm 1.7$  cm; mode 10.5 cm; Fig. 2). Body weight ranged 4.21-108.99 g (mean  $18.59 \pm 10.248$  g).

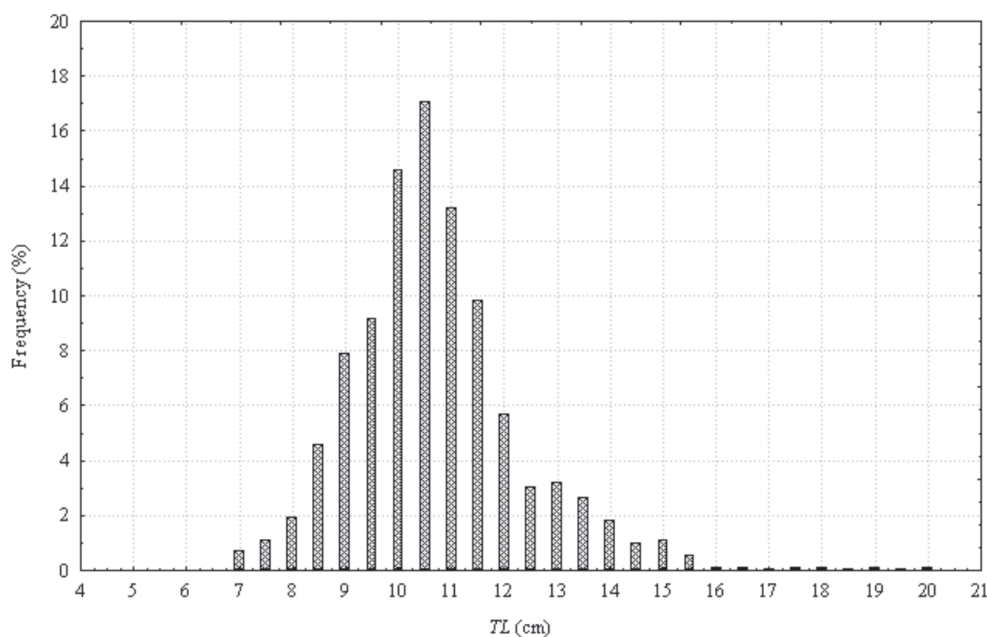


Fig. 2. Total length frequency of *Serranus scriba* caught in the Trogir Bay from June 2001 to May 2002

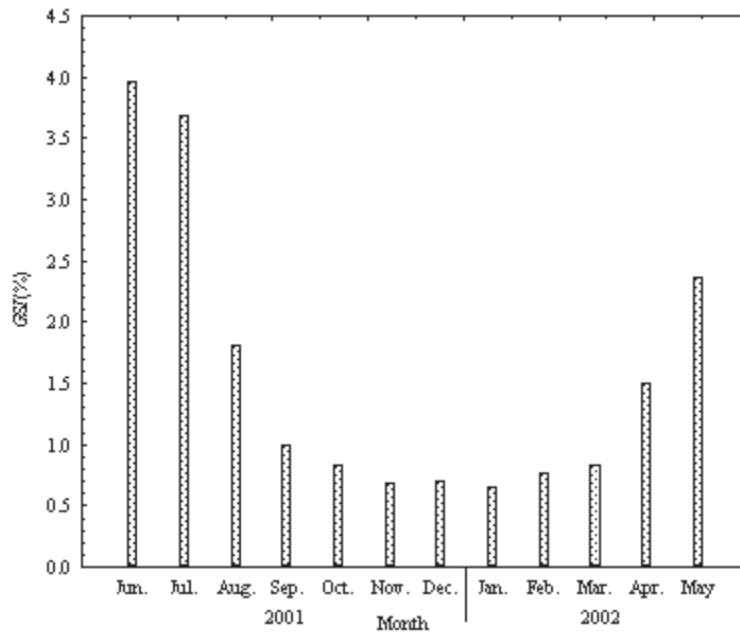


Fig. 3. Monthly variation of the gonadosomatic index (GSI) of *Serranus scriba* from the Trogir Bay

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)

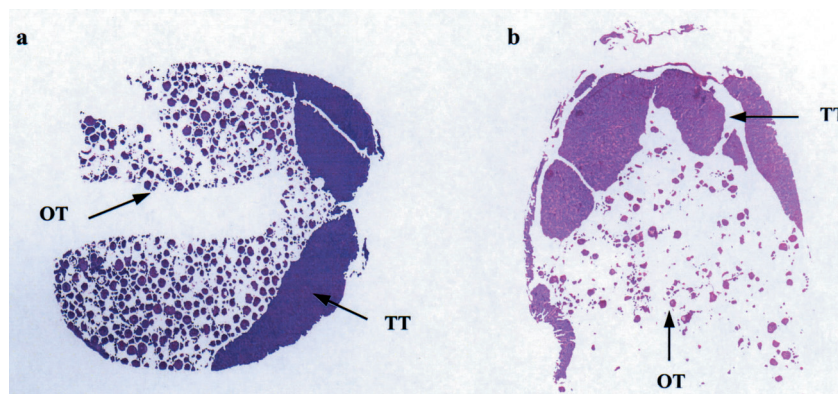


Fig. 4. (a) Longitudinal and (b) cross sections of *Serranus scriba* gonads (40x). OT = ovarian tissue; TT = testicular tissue

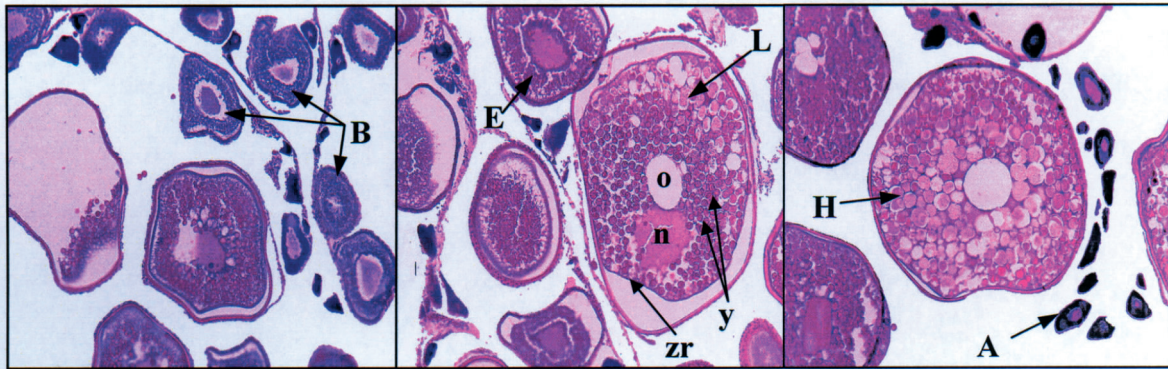


Fig. 5. *Serranus scriba* oocytes (40x). A = primary growth phase; B = yolk vesicle formation; E = early vitellogenesis; H = hydrated oocyte; L = late vitellogenesis; n = nucleus; o = oil droplet; y = yolk granules; zr = zona radiata

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

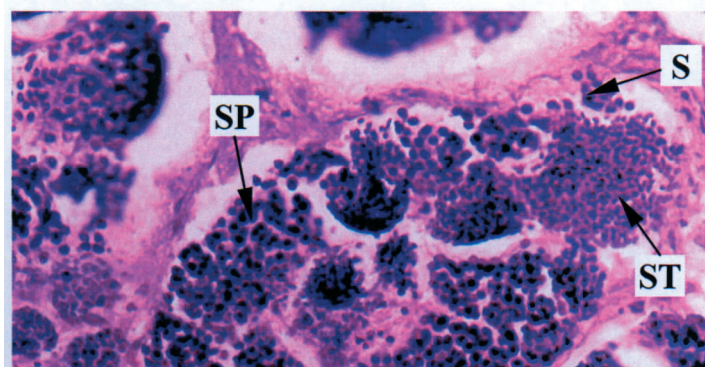


Fig. 6. Testicular tissue of *Serranus scriba* (40x). S = spermatogonia; SP = spermatocytes; ST = spermatids



cells smaller than spermatogonia; (c) spermatid cells with a large and rounded nucleus; (d) spermatozoa - spermatid cells rejected into the cyst cavity as spermatogenesis neared its end. They continued to develop as spermatozoa.

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

- ATZ, J.W. 1965. Hermaphroditic Fish. *Science*, 150: 789-797.
- BAUCHOT, M.L. 1987. Serranidae. In: W. Fischer, M.L. Bauchot, M. Schneider (Editors). Fiches FAO d'Identification des Espèces pour les Besoins de la Pêche. (Révision 1), Méditerranée et Mer Noire. Zones de Pêche 37, II (Vertébrés). FAO-CEE, Rome, pp. 1301-1319.
- FEBVRE, M., M. MICHELE & M. LAFAURIE. 1975. Comparaison de la séquence ovogénétique chez des Téléostéens ovipares gonochoriques et hermaphrodites (*Mullus*, *Serranus*, *Boops*). *Pubbl. Staz. Zool. Napoli*, 39: 140-152.
- FISHER, W. & C.W. PETERSEN. 1987. The evolution of sexual patterns in the seabasses. Space use and behavior can predict whether a species has harems or is monogamous and hermaphroditic. *BioScience*, 37: 482-489.
- GARCÍA-DÍAZ, M.M., M.J. LORENTE, J.A. GONZÁLEZ & V.M. TUSET. 1999. Comparative ultrastructure of spermatozoa of three marine teleosts of the genus *Serranus*: *S. articauda*, *S. cabrilla* and *S. scriba*. *J. Submicrosc. Cytol. Pathol.*, 31: 503-508.
- GARCÍA-DÍAZ, M.M., M.J. LORENTE, J.A. GONZÁLEZ & V.M. TUSET. 2002. Morphology of the ovotestis of *Serranus atricauda* (Teleostei, Serranidae). *Aquat. Sci.*, 64: 87-96.
- GRIER, H.J. 1981. Cellular organization of the testis and spermatogenesis in fishes. *Amer. Zool.*, 21: 345-357.
- HUNTER, J.R. & B.J. MACEWICZ. 1985. Rates of atresia in the ovary of captive and wild northern anchovy, *Engraulis mordax*. *Fish. Bull.*, 83: 119-136.
- HUNTER, J.R., B.J. MACEWICZ & J.R. SIBERT. 1986. The spawning frequency of skipjack tuna, *Katsuwonus pelamis*, from the south Pacific. *Fish. Bull. U.S.*, 84: 895-903.
- MAIGRET, J. & B. LY. 1986. Les poissons de mer de Mauritanie. *Science Nat., Compiègne*, 213 pp.
- MARZA, V.D. 1938. Histophysiologie de l'ovogénèse. Paris, 81 pp.
- SHAPIRO, D.Y. 1987. Reproduction in groupers. In: J. Polovina, S. Ralston (Editors). *Tropical Snappers and Groupers*. Westview Press, Boulder, pp. 295-328.
- THRESHER, R.E. 1984. Reproduction in reef fishes. T.H.F. Publ., Neptune City, 399 pp.
- YAMAMOTO, K. 1956. Studies on the formation of fish eggs. Annual cycle in the development of the ovarian eggs in the flounder, *Liopsetta obscura*. *J. Fac. Sci. Hokkaido University, ser VI, Zool.*, 12: 362-373.
- ZANUY, S. & M. CARRILLO. 1973. Estudio histológico del ovario de cabrilla (*Paracentropristis cabrilla*) (L.) en relación con la ovogénesis. *Inv. Pesq.*, 37: 147-165.

Received: 29 September 2004

Accepted: 16 February 2005

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

Barbara ZORICA, Gorenka SINOVIĆ i Vanja ČIKEŠ KEČ

*Institut za oceanografiju i ribarstvo, 21 000 Split, Hrvatska  
E-mail: zorica@izor.hr*

**SAŽETAK**

U radu se iznose podaci histološke analize radi utvrđivanja razmnožavanja pirke, *Serranus scriba* (Linnaeus, 1758). Obrađeno 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  $11,0 \pm 1,700$  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, Jadransko more

---