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Preliminary report

Preliminary determination of batch fecundity of Grass goby (*Zosterisessor ophiocephalus* Pallas, 1811) in Izmir Bay (Aegean Sea)

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In Izmir Bay (Aegean Sea), the grass goby (Zosterisessor ophiocephalus) *reproduces between February and May. In February, the maximum batch fecundity of hydrated oocytes was 16272. The relationship between total length and batch fecundity was* F = $4.5423L^{2.4236}$ (r = *0.306) according to the oocyte size-frequency method and* F = $2.9005L^{1.6576}$ (r = *0.073) according to the hydrated oocyte method. The relationship between gonad free weight and batch fecundity was* F = *1340.5 + 92.695W* (r = *0.328) and* F = *-2866 + 163.15W* (r = *0.528), according to the above methods, respectively. The correlation between the relationships was low. The oocyte and yolk compact mass diameters were 43-1376 μ and 301-774 μ, respectively. The length at earliest maturity for females was 9.8 cm.*

Key words: Grass goby, *Zosterisessor ophiocephalus*, batch fecundity, oocyte diameter, Izmir Bay, Aegean Sea

INTRODUCTION

The grass goby, *Zosterisessor ophiocephalus* is one of 56 Gobiid species found throughout the Mediterranean Sea. It is a predator that inhabits coastal sea areas, estuaries, sandy and muddy biotopes of lagoons, sea meadows and roots of marine plants (MILLER, 1986; PATZNER, 2000).

The grass goby is found throughout the Black Sea where it reproduces in April-May in the Tuzlov estuaries and in July along the Varna coast (MILLER, 1986). The grass goby reproduces in March-May in the northern Adriatic Sea (PATZNER *et al*., 1991) and February-May in Izmir Bay (AKYOL, 2003).

The few studies concerning the number of eggs spawned in the Aegean Sea by serial spawners include the anchovy, *Engraulis encrasicolus* (CIHANGIR & USLU, 1992), the sardine, *Sardina pilchardus* (CIHANGIR, 1996), the common sole, *Solea vulgaris* (HOSSUCU & ÇOKER, 1997) and the John Dory, *Zeus faber*, (AKYOL & ÇOKER, 2001).

This study aims to determine oocyte diameters, first maturity length and batch fecundity of the grass goby using samples taken from the shore of Izmir Bay during the goby reproduction period.

MATERIAL AND METHODS

One hundred forty-one grass goby (*Zosterisessor ophiocephalus*) females (mean total length 134±2.14 mm, mean weight 27.9±15.4 g) were obtained using fyke nets (24 mm mesh size) from depths of 0.5-1 m along the Bostanlı coast of Izmir Bay (Fig. 1) in February-April 2000.

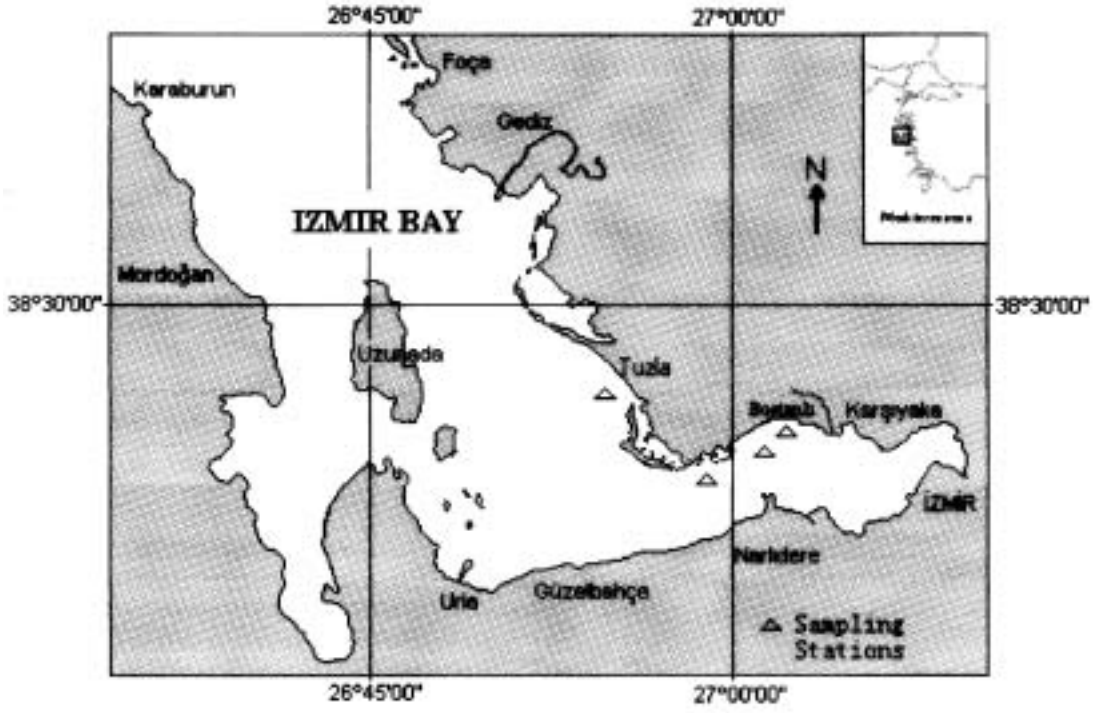

Fig. 1. The sampling area

The mature gonads of twenty-six were removed and fixed in a 4% buffered formaldehyde solution. The batch fecundity was estimated by the "oocyte size frequency" and the "hydrated oocyte" methods (HUNTER *et al.*, 1985). Three samples (3 g each) were taken from the middle, the front and the back of the each gonad (ovary). Samples were spread with glycerine in a glass PETRI dish. Oocytes were counted (n = 12822) and their diameters (yolk compact mass n = 589) were measured under a binocular microscope (x 20). Oocytes greater than 430 µ diameter were defined as "large oocytes". Statistical differences between oocyte diameters in the sampling months were tested with the KRUSKAL-WALLIS nonparametric test (SUMBULOGLU & SUMBULOGLU, 2000).

Total length:batch fecundity (F) and gonad free weight:batch fecundity relationships were calculated by power ($F = aL^b$) and linear ($F = c + dW$) regressions, respectively, where L is total length (cm), W is weight without gonad (g), and a, b, c and d are constants.

The gonads in 141 females were examined and classified as ripening or ripe. Earliest maturity was determined when at least 50% of the females had ripe gonads. The length that corresponded with this proportion was considered the earliest maturity length (KOHLER, 1960; WAIWOOD & BUZETA, 1989).

RESULTS

Oocyte diameters ranged 43-1376 µ (Fig. 2). The fact that small oocytes and hydrated oocytes are seen together in this species indicates that there it is a group synchronous ovary. According to the KRUSKAL-WALLIS test, there were statistical differences between oocyte diameters in sampling months ($p \leq 0.05$). Yolk compact mass diameters in hydrated oocytes ranged 301-774 µ (Fig. 3).

The total length:batch fecundity relationship was $F = 4.5423L^{2.4236}$ ($r = 0.306$) and $F = 2.9005L^{1.6576}$ ($r = 0.073$) according to the "oocyte size frequency" (Fig. 4) and "hydrated oocyte" (Fig. 5) methods, respectively. The gonad free weight:batch fecundity relationship was $F = 1340.5 + 92.695W$ ($r = 0.328$) and $F = -2866 + 163.15W$ ($r = 0.528$) according to the same two methods (Figs. 6, 7), respectively.

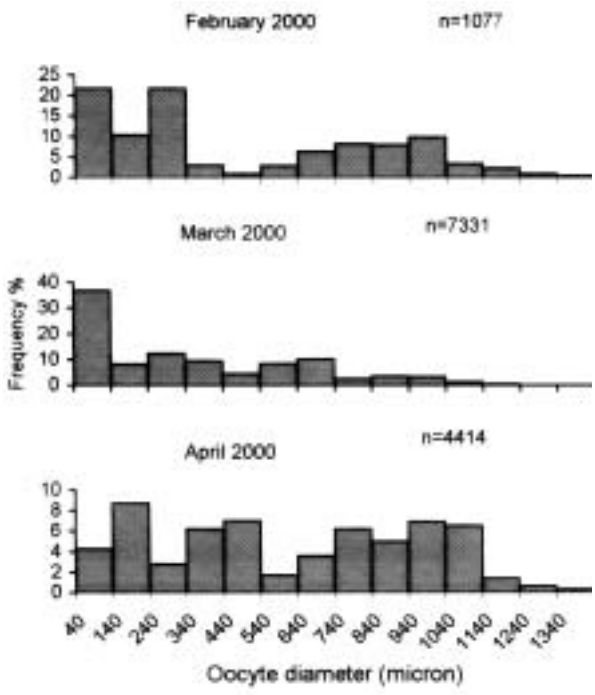

Fig. 2. Oocyte diameters of grass goby, by month

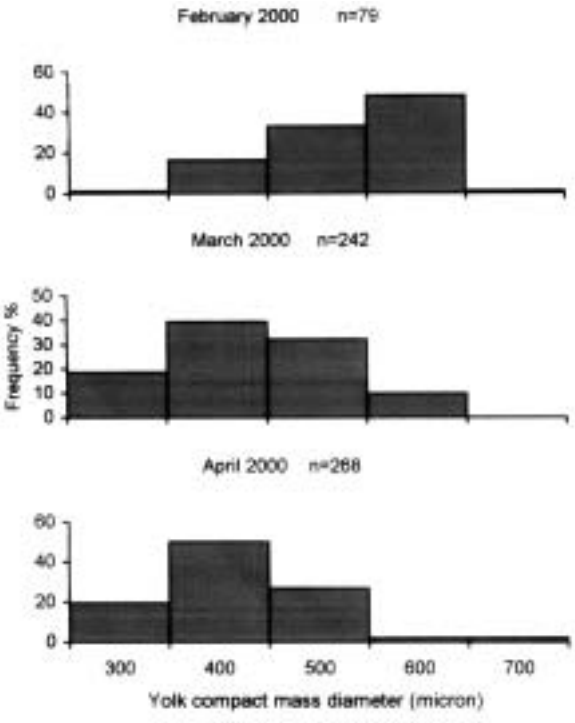

Fig. 3. Yolk compact mass diameters at the vegetal pole of maturing oocytes in grass goby, by month

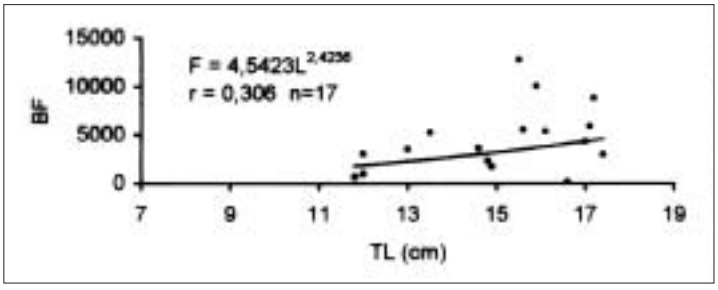

Fig. 4. Total length:batch fecundity relationship according to oocyte size-frequency method

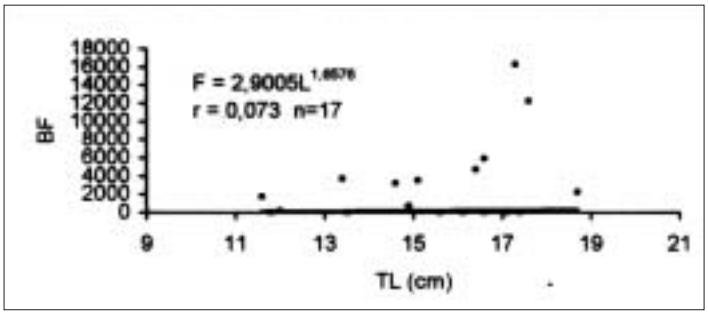

Fig. 5. Total length:batch fecundity relationship according to hydrated oocyte method

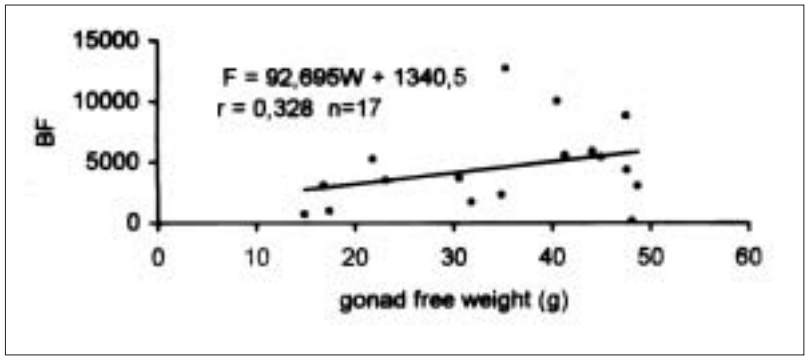

Fig. 6. Gonad free weight:batch fecundity relationship according to oocyte size-frequency method

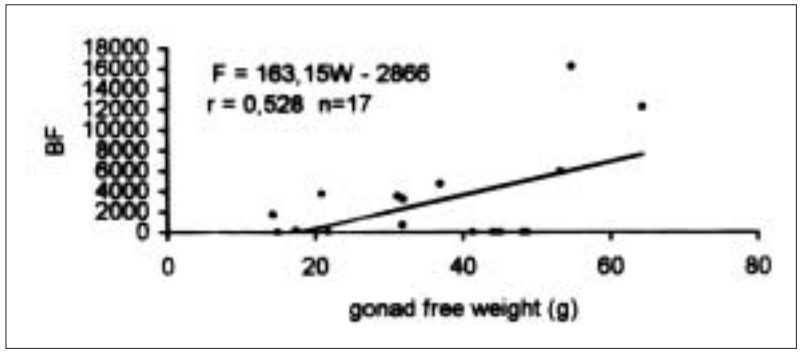

Fig. 7. Gonad free weight:batch fecundity relationship according to hydrated oocyte method

The first maturity length of female grass goby was 9.8 cm (Table 1, Fig. 8).

Table 1. Frequency of ripe and ripening ovaries of grass goby, by length

Total length (cm)	Number	Ripening (no.)	Ripe (no.)	Ripe (%)	Consisting of three fluid means
9	2	2	0	0	44.2
10	11	4	7	63.6	65
11	29	9	20	69	65
12	24	9	15	62.5	66.4
13	27	10	17	63	71.5
14	19	5	14	73.7	75.5
15	9	2	7	77.8	76
16	8	2	6	75	73.3
17	8	2	6	75	91.7
18	2	0	2	100	100
19	2	0	2	100	100
Total	141	45	96		

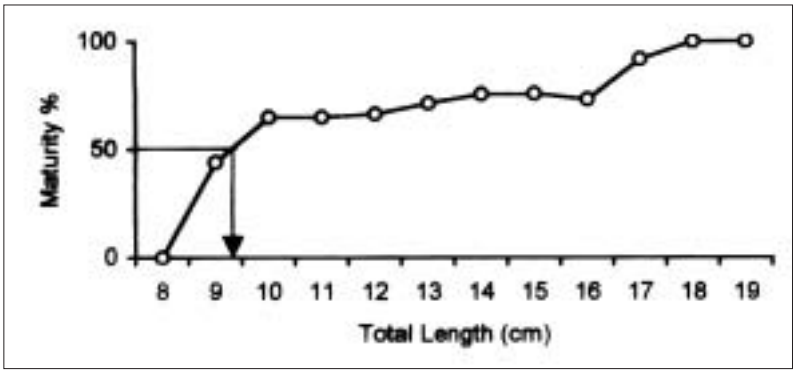

Fig. 8. Earliest maturity length of female grass goby in the Bay of Izmir

DISCUSSION AND CONCLUSIONS

Oocyte diameters of the grass goby ranged 43-1376 µ; yolk compact mass diameters of hydrated oocytes ranged 301-774 µ. Maximum batch fecundity was 16272 in February. MILLER (1986) reported that the oocyte diameter of this species when spawning is approximately 2.6 x 0.8 mm and its fecundity is 10000-45000. The oocyte diameter found by MILLER is much greater than our findings because it referred to fertilized oocytes.

There was low correlation between body length or weight and batch fecundity. Low correlation was not unexpected and similar findings were reported by URBAN (1988) for the common sole (*Solea solea*) in German Bight as $r = 0.12$, by HOSSUCU & ÇOKER (1997) in the same species in Izmir Bay as $r = 0.56$, and by AKYOL & ÇOKER (2001) for the John Dory (*Zeus faber*) in the Aegean Sea as $r = 0.539$ for length according to the hydrated oocyte method and $r = 0.30$ for body weight.

The earliest maturity length of grass goby is 9.8 cm in Izmir Bay. MILLER (1986) reported that the age at earliest maturity is 2-3 years.

Grass goby is the most important live bait for coastal longline fisheries for sea bass (*Dicentrarchus labrax*) in the Aegean Sea. Sustaining grass goby depends on knowing its first maturity length and reproduction period. As far as we know, no scientific studies have previously been conducted on this species in this area. Further, there are no seasonal closure or minimum landing size regulations in the fisheries records or circular. It is of great importance that the reproduction biology and other population parameters of grass goby be investigated in detail to ensure that this species will remain in Izmir Bay.

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Preliminarno izvješće o jednokratnom fekunditetu glavoča (*Zosterisessor ophiocephalus* Pallas, 1811) u Izmirskom zaljevu (Egejsko more)

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SAŽETAK

Glavoč (*Zosterisessor ophiocephalus*) se u Izmirskom zaljevu višekratno mrijesti u periodu između veljače i svibnja. Maksimalni pojedinačni fekunditet hidriranih oocita je iznosio 16272 u veljači. Odnos između ukupne duljine i jdenokratnog fekunditeta je iznosio $F=4.5423L^{2.4236}$ ($r=0.306$) i $F=2.9005L^{1.6576}$ ($r=0.073$) prema "metodi veličine-zastupljenosti oocita" te "metodi hidracije oocita". Težina gonada u odnosu na višekratni (serijski) fekunditet iznosila je $F=1340.5+92.695W$ ($r=0.328$) i $F=-2866+163.15W$ ($r=0.528$) prema gore navedenim metodama. Korelacije između ovih odnosa su slabe. Promjer oocita i kompaktne mase žumanjčane kesice varirao je od 43 µ do 1376 µ, odnosno 301 µ - 774 µ. Pri prvom mriješćenju u Izmirskom zaljevu (Egejsko more) duljina ženki je iznosila 9.8 cm.

Ključne riječi: Glavoč, *Zosterisessor ophiocephalus*, višekratni fekunditet, promjer oocita, Izmirski zaljev, Egejsko more