Bull. Nat. Inst. Oceanogr. & Fish., A.R.E. 1994. 20 (1): 225 - 234

STEROID HORMONES OF MUGIL SEHELI IN SUEZ BAY (PROGESTERON & ESTRADIOL)

BY

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Key Words : Steroid hormones, Mugil seheli, Suez Bay, Red Sea.

ABSTRACT

Plasma estradiol hormone in female Mugil seheli in Suez Bay reaches to maximum value in ripe stage (V). In male, plasma estradiol hormone increased from immature to maturing stage and then decrease in the spawning stage. The levels of estradiol hormone in female was higher than that in male.

Plasma progesterone hormone in female Mugil seheli reaches to maximum value in ripe stage (V). The levels of progesterone hormone in female are higher than that in male.

INTRODUCTION

Annual reproductive cycle of teleost fishes are supported by the endocrine activities of the brain-pituitary-gonad axis. Reproductive hormones in particular have been extensively studied in order to better understand the mechanisms of sex differentiation and environmental regulation of gametogenesis and gamete release (Fostier et al., 1983; Goetz 1983; Idler, 1983).

The visualization of the hormonal changes that accompany spawning provides the fish culturist with a model to mimic or insight into the levels at which he may intervene.

Recently, changes in plasma hormone levels that accompany the reproductive process have been investigated in order to elucidate the hormonal control of reproduction in teleosts. Most of these studies have focused on the hormone changes that occur during annual cycles or during the pre-ovulatory period.

Tamaru et al., 1991, investigated the steroid profiles during maturation and induced spawning of the striped mullet, Mugil cephalus. They observed that during hormonaly induced spawning, mullet exhibit an initial increase in serum testosterone and estradiol compared to saline-injected controls. They also observed that, both testosterone and estradiol-17B were highly correlated oocyte growth.

Measuring plasma hormone (progesterone and estradiol) of Mugil seheli at different maturity stages, gives a picture for the physiology of steroid hormone during the reproductive cycle. This will help in the process of induced spawning of the fish.

MATERIALS AND METHODS

Study area : Suez Bay is a shallow extension of the Gulf of Suez which lies in North part of Red Sea, roughly elliptic in shape, with its major axis in the NE-SW direction. The average length along the major axis is 13.2 Km, its average width along the major axis is 8.8 Km. The mean depth is 10 m and the horizontal surface area is 77.13 Km^2. The Bay is connected to the Gulf of Suez through most of its south eastern side where a channel is dredged to a depth of 12 m for navigational purposes. It is connected to the Suez Canal by a dredged channel of 12 m depth through the same side (Fig. 1).

Blood sampling : Soon after being caught, the fish were transported to the laboratory in suitable aerated aquaria with sea water. The fish were left for 7 days before collecting the blood samples, in order to give them time to resume their normal condition. The aquaria (2 x 1.0 x 1.25) were of fiber glass. The blood obtained from the caudal artery and sucked immediately by a syringe which was previously washed with a heparin. The plasma was obtained by a centrifugation at 6000 rpm for 10 minutes. Supernatant plasma was pipetted in vials and kept frozen at -20°C until required.

Determination of hormones : (Radioimmunoassay)):

Radioimmunoassay was performed using pantex 125 Iodine kits (No. 337) to measure the progesterone levels in plasma. While number 374 used to measure estradiol.

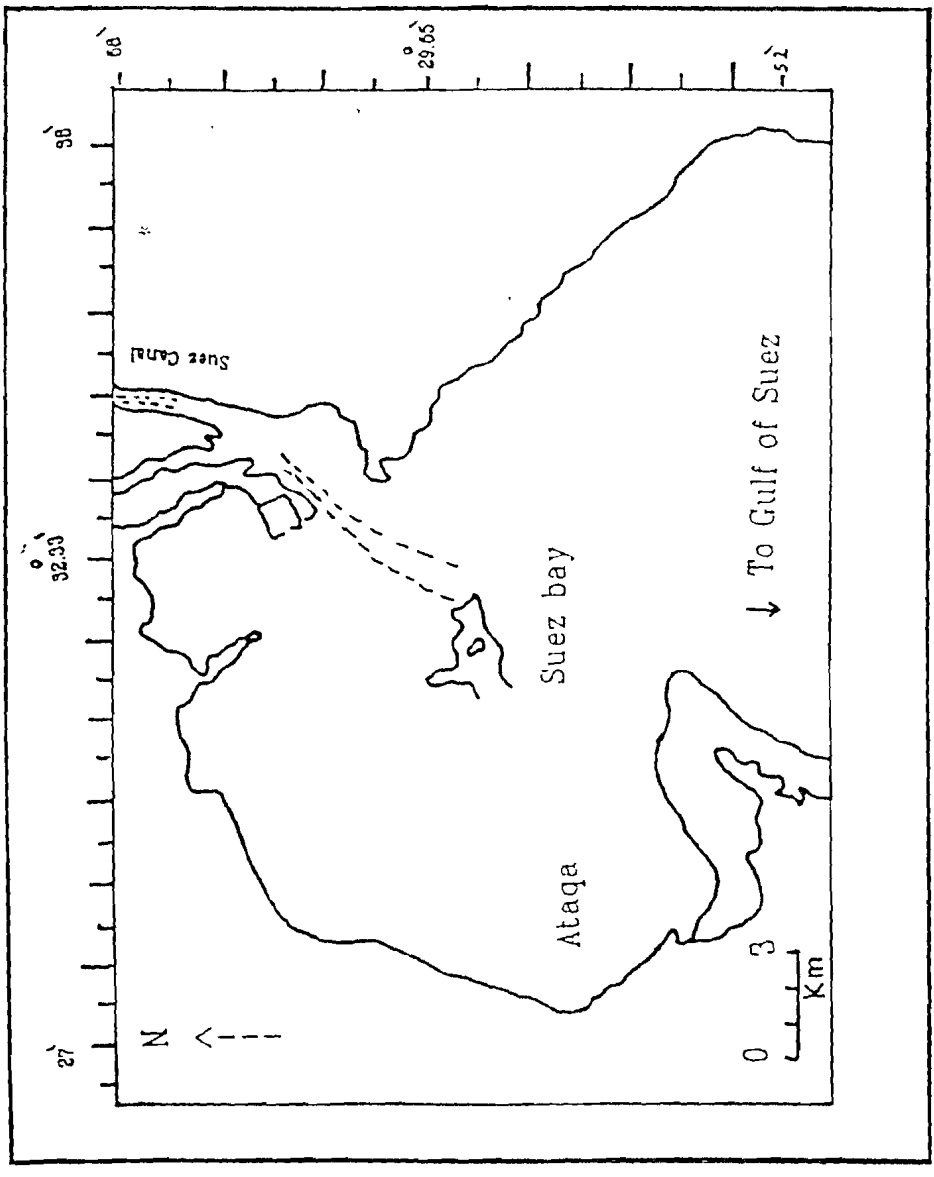

Figure 1 : Map of the study area (Suez Bay).

RESULTS

In the present study, on Mugil seheli, the level of two basic steroid hormones in plasma (progesterone and estradiol) were studied in different maturity stages in females and males.

1- Progesterone hormone in plasma of female and male Mugil seheli :

The concentrations of progesterone in different maturity stages are shown in Fig. (2).

In developing stage, the concentration of progesterone in plasma varied between 1.4 and 3.8 ng/ml with an average value of 2.23 ng/ml ± 0.77. The concentration of progesterone in maturing stage increased and ranged from 3.2 to 5.0 ng/ml with an average value of 3.93 ng/ml ± 0.71.

In ripe stage, the concentration varied between 2.3 and 9.0 ng/ml. The average value is 5.23 ng/ml ± 2.47. In spawning stage the concentration of progesterone in female plasma decreased than in the previous stage. The progesterone varies between 1.1 ng/ml and 6.0 ng/ml with an average 2.81 ng/ml ± 1.511. The concentration in spent stage was low and ranged between 1.5 and 2.3 ng/ml with an average 1.9 ng/ml ± 0.33. The plasma progesterone levels in different maturity stages of the males are shown in Fig. (3).

In immature stage, the concentration of progesterone plasma varied between 1.0 and 2.6 ng/ml with an average value of 1.9 ng/ml ± 0.68. In developing stage, the concentration increased and ranged from 2.3 to 2.8 ng/ml with an average value of 2.5 ng/ml ± 0.21. In mature stage, the plasma progesterone varied between 1.7 and 2.3 ng/ml with an average value about 2.07 ng/ml ± 0.26. In spawning stage, the concentration of progesterone in male plasma varied between 1.5 and 3.8 ng/ml with an average 2.6 ng/ml ± 0.94.

2- Estradiol hormone in plasma of female and male Mugil seheli :

The concentrations of 17B-estradiol in relation to different maturity stages of ovaries were shown in Fig. (4). In developing stage, the concentration of 17B-estradiol in plasma varied between 0.01 and 0.019 ng/ml with an average value of 0.012 ng/ml ± 0.004. In maturing stage, the concentration ranged from 0.01 to 0.02 ng/ml with an average value of 0.014 ng/ml ± 0.004.

In ripe stage, the concentration varied between 0.58 and 0.62 ng/ml with an average value of 0.600 ng/ml ± 0.02.

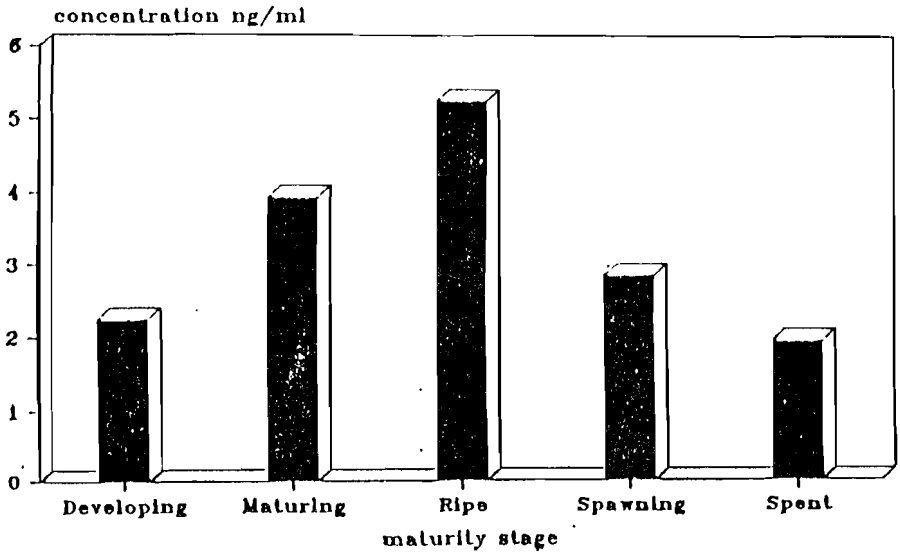

Figure 2 : Plasma progesterone in ng/ml for female *Mugil seheli* to in relation to maturity stages.

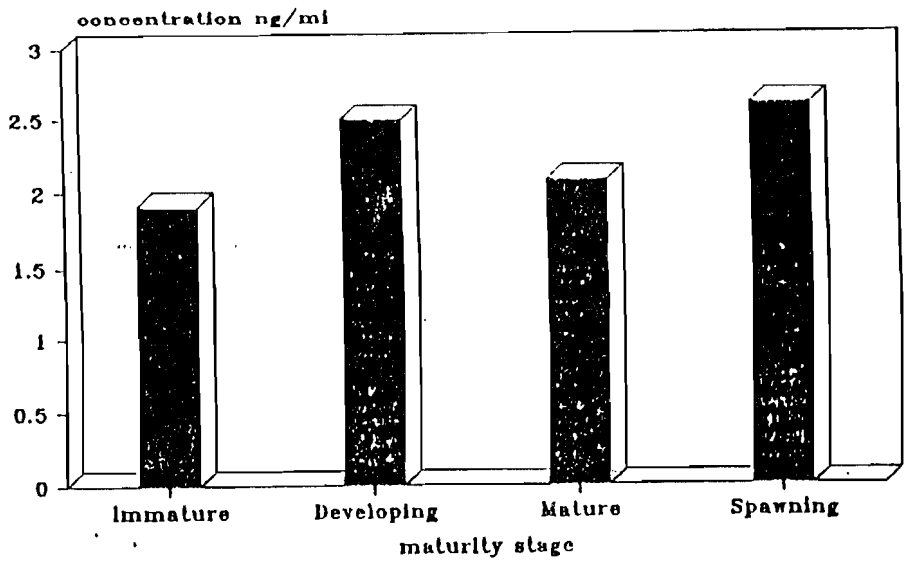

Figure 3 : Plasma progesterone in ng/ml for male *Mugil seheli* in relation to maturity stages.

In spawning stage, the concentration decreased than that in the previous stage. It varied between 0.35 and 0.48 ng/ml with an average value of 0.415 ng/ml ± 0.07. Where, in the spent stage the concentration ranged from 0.013 to 0.015 ng/ml with an average 0.014 ng/ml ± 0.001.

The plasma 17B-estradiol levels in relation to different maturity stages of males are shown in Fig. (5). In immature stage, the concentration of 17B-estradiol in plasma varied between 0.023 and 0.062 ng/ml with an average value of 0.043 ng/ml ± 0.02. In developing stage, the concentration varied between 0.14 to 0.200 ng/ml with an average value of 0.170 ng/ml ± 0.03.

In maturing stage, the concentration of 17B-estradiol varied between 0.120 and 0.150 ng/ml with an average value of 0.135 ng/ml ± 0.015. In mature stage, the concentration ranged from 0.006 to 0.014 ng/ml with an average of 0.10 ng/ml ± 0.002. In spawning stage the concentration ranged from 0.008 to 0.012 ng/ml with an average 0.010 ng/ml ± 0.002.

DISCUSSION

There are obvious academic reasons for studying the secretion of hormones during the natural spawning process. The information obtained from such studies has an important place in applied research, particularly in artificially inducing fish to spawn.

Progesterone is one of most active naturally occurring hormone in the progestin hormones. In the female Mugil seheli a gradual increase was observed from developing stage to ripe stage but at the spawning stage the concentration begin to decrease. These observations are in agreement with those of Baranikova et al. (1989) for female Oncorhynchus keta, and Asem (1992) in Oblada melanura where plasma progesterone content is increased by increasing the maturity stages.

The concentration of progesterone in plasma of female Mugil seheli in the spawning stage was higher than that in the spawning stage of male.

The present results of progesterone concentration in spawning stage confirmed with those of other authors, Asem (1992) in Oblada melanura and Zaki et al. (1993) in Mugil capito. They mentioned that, during the spawning season mature female had plasma progesterone content higher than those found in mature male.

According to Billard (1976) in hypophysectomized goldfish, Carassius auratus, progesterone was more effective in spermiation induction than were some other steroids.

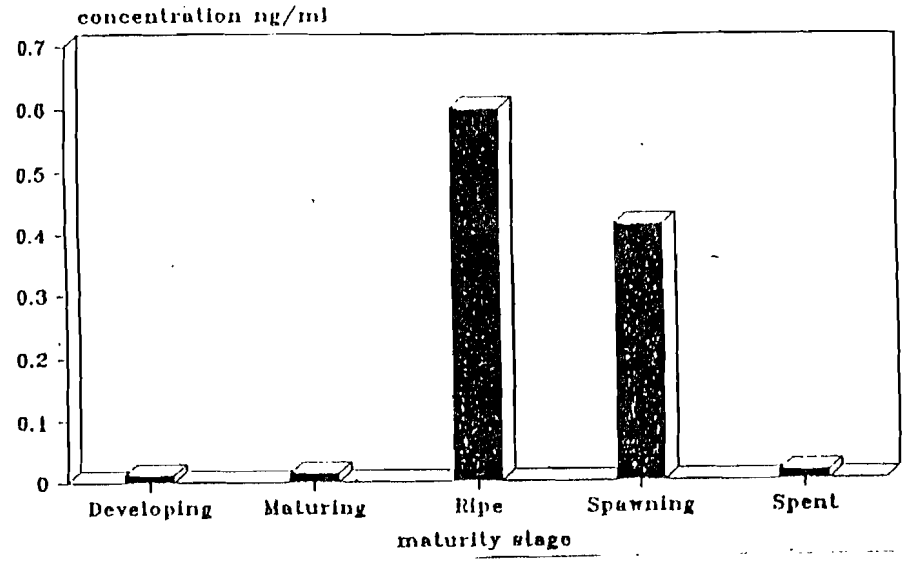

Figure 4 : Plasma estradiol in ng/ml for female ***Mugil seheli*** in relation to maturity stages.

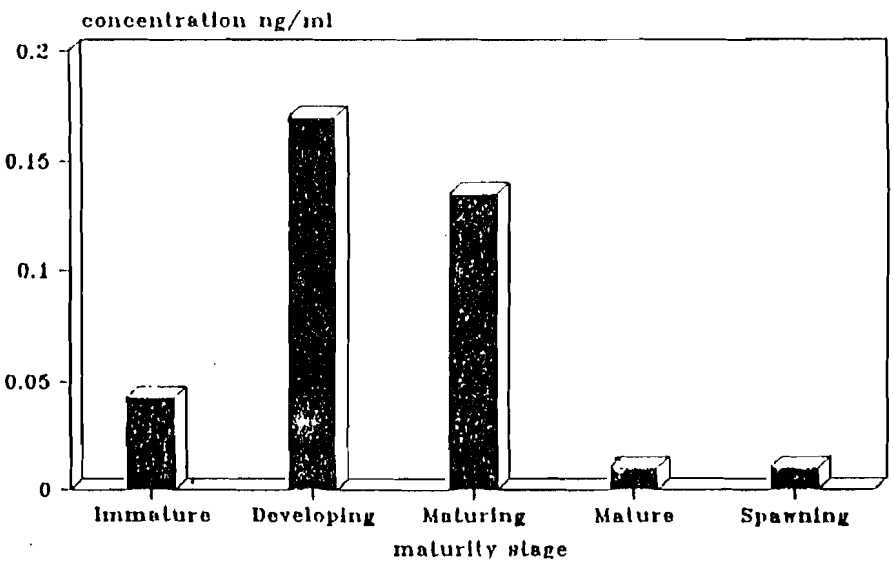

Figure 5 : Plasma estradiol in ng/ml for male ***Mugil seheli*** in relation to maturity stages.

Scott et al. (1982) observed that, the levels of plasma progesterone such as 17 &-hydroxy progesterone and 17&, 20B-di-oH-prog was increased in conjunction with the pre-ovulatory increases in plasma gonadotropin, reaching peak levels at or after the period of oocyte maturation.

It is known that 17B-estradiol induce the synthesis and secretion of a female specific protein, vitellogenin, by the liver (Wallace and Selman, 1981).

In female Mugil seheli, the plasma 17B-estradiol reached to the maximum concentration at the ripe stage. Where in the spawning stage, the concentration decreased gradually until it reached to the minimum value in the spent stage. In male Mugil seheli the concentration of plasma 17B-estradiol increased from immature to maturing stage, but in mature and spawning stage the concentration decreased. This description agrees with Kaneko et al. (1986) who observed that, plasma estradiol levels kept high while the oocytes actively accumulating yolk globules, but it was low just after spawning.

In contrast, Young et al. (1983) in Oncorhynchus rhodurus recorded that, plasma estradiol levels decreased immediately prior to oocyte maturation, this observation may be due to a decrease in aromatase activity in the granulosa cells. Kobayashi et al. (1988) observed that plasma estradiol levels in the goldfish Carrassius auratus after ovulation showed higher values for 3 days than those before ovulation and decreased on the third day. They recorded that this elevated level in estradiol may play a role in inducing vitellogenesis in the next crop of oocytes.

Aida (1988) in the Kanehira bitterling and goldfish Carrassius auratus which are multiple spawners observed that plasma estradiol level increased slightly during ovulation, this suggested the continuous formation of vitellogenin. Where in the common carp, a one time spawner, estradiol level remained relatively low and unchanged. He also said that, the decrease in estradiol and the increase in testosterone at the end of vitellogenesis appear to be a common phenomena indicating the completion of vitellogenesis.

Matsuyama et al. (1990) examined ovarian developmental stages and serum steroid hormone levels at six different times of day in a marine teleost, Sillago japonica. They indicated that, the fish possesses a diurnal rhythm of oocyte development and regulated by diurnal secretions of estradiol-17B and the maturation inducing steroid, 170C-20B-di-oH-prog.

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