

## **THE STUDY OF SEASONAL FLUCTUATION OF STEROID HORMONES IN GREAT STURGEON (*HUSO HUSO*) CULTURED IN BRACKISH WATER CONDITION**

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### **Abstract**

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An experiment was conducted on blood sexual hormone measurement of Great sturgeon, aged 4-5 years, cultured in brackish water in Bafgh-Iran constructions. Hormone levels were measured with Radio Immunoassay (RIA). Gonadic sampling was stained with Hematoxylin & Eosin. Statistical results show significant elevation of sexual hormones in both sexes ( $p > 0.05$ ; more in male). However, only estradiol had significant elevation among seasons (maximum in fall and minimum in winter). Testosterone (T) had significant elevation in relation to gonadic development, but in females, estradiol (E2) and progesterone (P) had not significant elevation. In males, II, II-III, III, IV stages, T level was 5.5, 4.4, 6.3, 2.6 ng/m respectively l. In females, II, II-III stage, T was 0.1, 0.16, E2 was 1.455, 0.81 and P was 0.12, 0.13 ng/ml respectively. We concluded that in females, with parallel to progression of gonadic development, T and P have increased but E2 have decreased. Results were in accordance to the other works about reduction of sexual hormones in early life stages. What's more, we could acclaim that seasons, environmental conditions and gonad development affect sexual hormones levels.

*Key words:* steroid hormones, gonadic, Great sturgeon, brackish water

### **Introduction**

The established relationship between different body tissues is very vital. Among this relationship, hormones have important role (Barannikova et al., 2002). Hormones are regulators that affect cells metamorphism. Hormones are not beginners of reaction and many physiological actions can carried out without hormones. Hormones should be produced continually for their regulatory role (Nagahama, 1993). Great sturgeon is little known as sex steroid variations and go-

nadal development stage (Yousefian, 2005). In addition, most study on steroid hormone carried out in maturity and harmonious with final maturity of gonad hormone fluctuation only in short time had examined. However, with awareness to seasonal fluctuation and effect of environmental condition before maturity, could obtain the beneficial information about: suitable time of hormonal injection, to create premature fishes and decrease of long time maturity in this valuable fishes (Barton, 2002).

Therefore, in present study, the profile of seasonal

fluctuation of steroid hormones in before maturity stages was examined.

**Material and Method**

Experiments were carried out in one year. The fish were 4-5 years old that was collected by sachook. For field study we used 74 fish in 8 circle cement pond that supplement with air/water supply system (salinity was 12-17 ppt, pH was 7-8.5, Water Temperatue was 22-30 °C and population density was 7/m<sup>3</sup>). blood sampling was carried out at the middle of each season (August, November, February and May) In Salt Water Fishery Research Station Bafgh-Iran .Histological preparation were stained with hematoxyline & Eosin method (Bahmani and Kazemi, 1998) in physiology and biochemistry Dept of International Sturgeon Research Institute. Testosterone (T), Esteradiol (E2) and Progesterone (P) were measured by Radio Immune Assay (RIA) method using KAVOSHYAR kit in Yazd central laboratory (Bahmani and Kazemi, 1998). For statistical analyses, we used SPSS (version 10). The experiment was done in duplicate.

**Results**

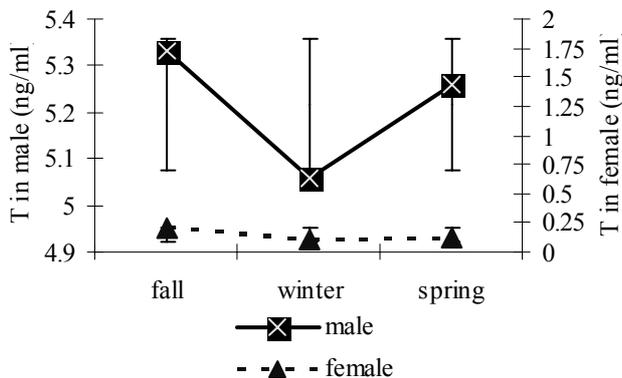
**Testosterone (T):** Statistical result show that amount T in male and female had strong significant

elevation ( $P = 00$ ,  $f = 127.3$ ) and is more in male. But in different season significant elevation was not observed ( $P = 0.94$ ,  $f = 0.062$ ) (Figure 1). The most amount of T in male was at fall ( $5.33 \pm 4.4$  ng/ml) and the lowest was at winter ( $5.06 \pm 2.4$  ng/ml). The average level of T in male was  $5.22 \pm 3.2$  ng/ml. in female also the most amount of T was at fall ( $0.21 \pm 0.21$  ng/ml) and the lowest was at winter ( $0.1 \pm 0$  ng/ml). The average level in female was  $0.14 \pm 0.13$  ng/ml.

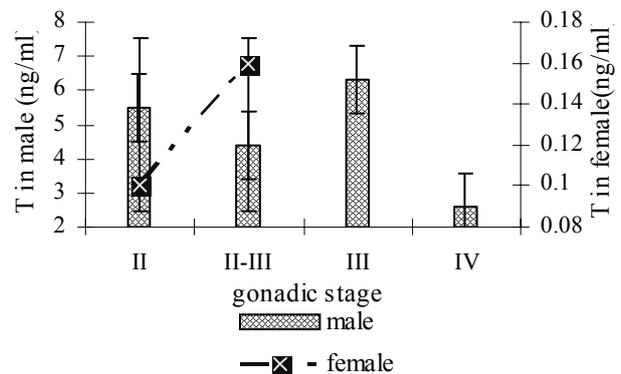
In addition result state that T in different sexes had significant correlation with gonadic index ( $P = 0.01$ ,  $r = 0.5$ ) (Figure 2). Histological result showed that in male stage II, II-III, III and IV respectively amount of T was 5.5, 4.4, 6.3 and 2.6 ng/ml and in female stage II and II-III respectively was 0.10 and 0.16 ng/ml.

**Progesterone (P):** Amount of P was measured only in female. Statistical result showed that there are no significant elevation in different seasons ( $P = 0.064$ ,  $f = 3.48$ ) (Figure 3). The highest amount of P was at winter ( $0.66 \pm .06$  ng/ml) and the lowest was observed at spring ( $0.12 \pm 0.04$  ng/ml). The average of P was  $0.37 \pm 0.41$  ng/ml. In addition histological result show that in stage II and II-III respectively amount of P was 0.12 and 0.13 ng/ml (Figure 4).

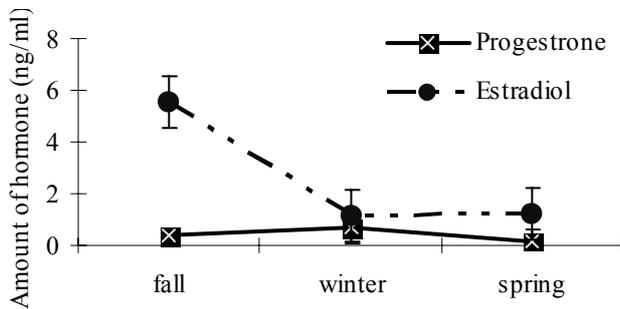
**Estradiol (E2):** Amount of E2 also was measured in female. Statistical result showed significant elevation in different season ( $P = 00$ ,  $f = 16.95$ ). The most



**Fig. 1. Variation of serum Testosterone in different season (Mean±SD)**



**Fig. 2. Variation of serum Testosterone in gonadic stage (Mean±SD)**



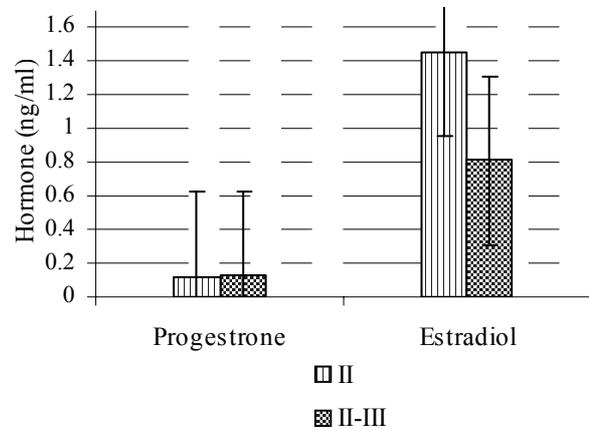
**Fig. 3. Variation of serum Estradiol & Progesterone in different season (Mean±SD)**

amount of E2 was at fall ( $5.51 \pm 2.6$  ng/ml) and the lowest was observed at winter ( $1.18 \pm 0.82$  ng/ml) (Figure 3). The average of E2 was  $2.63 \pm 2.6$  ng/ml. In addition histological result show that in stage II and II-III respectively amount of E2 was 1.45 and 0.81 ng/ml. (Figure 4).

## Discussion

Statistical result shows that amount of steroid hormones was affected by the sex, T in male and E2&P in female were more. Only E2 was affected by season varying in different season was varied. Histological study show that in male with progress of gonadic stage until stage III, amount of T had increased and then in stage IV, intensely decreased. In female with progress gonadic stage, amount of T increased. In addition, P with progress of gonadic stage increased, but amount of E2 had decreased.

In present study, only T was affected by the sexually & gonadic stage and P&E2 were not affected, that it is cause for immature fishes and we predict in upper stage (near maturity) all of steroid hormones will be affect by gonadic stage. So production of sexual steroid hormones and growth and development of gonad have direct correlation with synthesis and amount of gonadotropine hormones, in previttelogenic stage and stage II that oocyte is little and separation of animal and vegetable pole is not possible, since



**Fig. 4. Variation of serum Estradiol & Progesterone in gonadic stage of Female (Mean±SD)**

amount of sexual steroid hormones is low (Nazari, 2001). Also in immature fish of present study, amount of hormones was low.

Hormonal variations are depended to the alternation of environmental temperature and harmonies with suitable temperature for spawning, when amount of hormones will be increase (Malollahi, 1994). Researcher were examined fluctuation of E2 and T in young Great sturgeon cultured in freshwater and showed that there profiles are slight until 1-2 years of age (Yousefian, 2005). In brackish water amount of P is more, but amount of T and E2 is fewer than freshwater.

In study on immature white sturgeon clarify that in age of 2 years, in both sexes amount of T are less than 1ng/ml, and this amount in males and females are 37.4 and 1.7 ng/ml (Fitzpatrick et al., 2004). Researcher with study on mature and immature *Acipenser sturio* in brackish water was shown that the highest amount of steroid hormones is T. amount of E2 and T in immature fishes was very little that it is probably due to less gonadic development. In addition, they show seasonal fluctuation of steroid hormone in immature fishes (Bahmani and Kazemi, 1998). This result clarify that seasonal fluctuation in steroid hormones isn't only in mature fish and could observed also in immature fish like present study.

Results in present study are there same as in other report about lower hormone in early stage of gonad development (Cuisset et al., 2005). In stage of gathering vitellin in ovule (when still nucleus is in center of ovule) and cell layer that produce steroid hormone are in ovule, affected by secretion gonadotropin hormone in pituitary gland and produce of steroid hormone, amount of steroid hormone will be increased (Yousefian, 2005). In present study also production of steroid hormone in stage II-III increase that is for this reason.

Tests on correlation between gonadic and sexual steroid development in *Acipenser schrenckii* definite that gonadic development in all of stages were affected by sexual steroid and have significant correlation with together. Amount of T in male was higher than female, but amount of E2 in female was higher than male. In addition, T until stage III has increase and then decrease. Amount of E2 with progress of gonadic stage will be increase and stay at high level in stage IV (Nagahama, 1993). This result clarifies that sexual hormone before maturity has fluctuation and affect by different seasonal and environmental condition (Allen and Joseph, 2006).

The analyses of our results and comparing with other similar reports, confirm the hypothesis of correlation between blood profile and gonadic stage of Great sturgeon cultured in brackish water. The lower amount of steroid hormone in early stage, increase until stage III and decrease in stage IV have been proved. Eventually definite that brackish water medium have a wonderful effect on progress of gonadic growth and produce steroid hormones in Great sturgeon and with sustainable management and use of effective factor on gonadic growth of this fishes could reduce long time of maturity in sturgeon cultured in brackish water and produce caviar in short time.

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## **References**

- Allen, J. P. and J. C. Joseph**, 2006. Age/size effects on juvenile green sturgeon, *Acipenser medirostris*, oxygen consumption, growth, and osmoregulation in saline environments. *Environ. Biol. Fish.*, pp. 123-142.
- Bahmani, M. and R. Kazemi**, 1998. Histological study of gonad in young cultured sturgeon. *Iranian Journal of Fishery Science*, **7**: 1-16.
- Barannikova, I. A., V. P. Dyubin, L. V. Bayunova and T. B. Semenkova**, 2002. Steroids in the control of reproductive function in fish. *Neuroscience and Behavioral Physiology*, **32**: 141-148.
- Barton, B. A.**, 2002. Stress in fishes: A diversity of responses with particular reference to changes in circulating corticosteroids. *Integr. Comp. Biol.*, **42**: 517-525.
- Cuisset, B. D., S. Lacomme, T. Rouault, M. Pelard, M. Lepage and P. Williot**, 2005. Hormonal profile in adult of critically endangered sturgeon *Acipenser sturio*, adapted to hatchery condition. 5<sup>th</sup> I.S.S. RAMSAR. Iran.
- Fitzpatrick, M. S., G. W. Feist, J. V. Eenennaam, S. I. Doroshov and C. B. Schreck**, 2004. Sex identification of White sturgeon at early stage of growth. Oregon State University, USA.
- Malollahi, A.**, 1994. Examination of seasonal fluctuation of sexual hormone in *Acanthopagrus latus*. *Persian Gulf Fishery Research Center*, 47 pp.
- Nagahama, Y.**, 1993. Endocrine regulation of gametogenesis in fish. *Dev. Biology*, **38**: 217-229.
- Nazari, R.**, 2001. The study of correlation between some biochemical composition of ovule and serum with gonadic stage in Persian sturgeon. Thesis of PhD. Tarbiat Modarrec University, 84 pp.
- Yousefian, M.**, 2005. The sex differentiation by gonadogenesis and sex steroid hormones in cultured Grate sturgeon, *Huso huso*. 5<sup>th</sup> I.S.S. RAMSAR. Iran.