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# ANNUAL MORPHOLOGICAL VARIATION OF FEMALE REPRODUCTIVE SYSTEM IN SPOTTED SNAKEHEAD *CHANNA PUNCTATA* (BLOCH, 1793)

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**Abstract:**
Snakehead *Channa punctata* (Bloch, 1793) is popular food fish. Reproductive cycle or breeding cycle of *C.punctata*has five phases viz., preparatory phase, early maturing phase, prespawning phase, spawning phase and spent phase. Gonadosomatic index (GSI) reveals the period and duration of different phases in reproductive cycle. GSI is maximum during spawning phase while it is minimum in preparatory phase. Snakehead, *C. punctata* is annual breeder. Ovary of *C. punctata* increases its size and shape from preparatory phase to spawning phase and again reduces its size in spent phase. In different phases of reproductive cycle ovary also changes its color. Preparatory phase ovary is whitish which become pinkish during early maturing and prespawning phase due to vascularization of ovary. It become transparent and yellowish due to thining of tunica albuginea and underlying yellowish eggs. Smooth contour of ovary become granular during spawning phase.
**Keywords:** *Channa punctata*, Gonadosomatic index.

## Introduction:

Spotted snakehead, *Channa punctata* (Bloch, 1793) is highly esteemed as food (Chakrabarti, 2006). All the species of the *Channa* viz., *C. punctata, C. marulius, C. striata and C. gachua* bear a pair of folded sac like outgrowth of pharynx called pharyngeal outgrowth to store air (Chakrabarti, 2006). This pharyngeal outgrowth provides these fishes a tenacity to survive outside the water for considerable period. Reproductive histology can be well investigated by various histological techniques. Ovarian cycle and spawning season of *Ophiocephalus punctatus* inhabiting Jammu water water was documented (Malhotra et al., 1978) where six stages of oocytes were reported by following method of Srivastava and Rathi (1970). Variation in gonadal cycle, spawning time and spatial behaviour of this fish were well documented (Swaroop, 1954; Belsare, 1962; Malhotra et al., 1978).

Present study was undertaken to ascertain the breeding cycle, spawning season and to study ovarian morphological changes in *C. punctate.*

## Materials and methods:

Matured female *C. punctata* of 150-200 gm weight were collected / procured from various water bodies of eastern Vidharbha . Fishes were acclaimatized in aquaria for one week. After sacrificing fishes, ovaries were dissected out and fixed in Bouin's fluid. After fixation, ovaries were cutted in pieces and cutted tissues were washed and transferred to 70% alchohol and dehydrated in graded alcohol, cleared in xylene and embedded in paraffin wax at 60$^0$C- 62$^0$C. blocks of tissues were trimmed and serial sections of these blocks were cut on Cambridge (rocking) microtome at 6-8 µm thickness in transverse plane. The sections were fixed on clean slide and later stained by Haematoxylene- Eosine procedure (Lillie, 1965). Sections were observed under Karl Zeiss microscope and photographed by photographed by Tucsen USB 2.0 H series.

Gonado-somatic index (GSI) was used to ensure the different phases of reproductive cycle. GSI was calculated by formula:

$GSI= (Wg \times W^{-1}) \times 100$

Were: Wg- Weight of gonads (g), W- Body weight (g).

Results were expressed as the mean and standard error of mean (SEM). Difference between means were analysed by one-way ANOVA. Level of significance was set at $P \leq 0.05$.

Morphological study of ovary was studied after giving midventral cut to abdomen of fish. Dissected fish were photographed by Nikon camera.

## Results:

Paired ovary of *C. punctata* is suspended from dorsal wall of periotoneal cavity by mesorchium. Two ovarian lobes in *C. punctata* are of unequal length . The ovarian lobes are of smooth cyclindrical in shape. The ovarian lobes on outer side covered by tunica albuginea (Fig. 1a).

Based on GSI, morphology of the ovarian lobe and proportion of oocytes present in ovarian lobes, five phases of maturation or reproductive cycle of *C. punctata* were identified.

1. Preparatory phase (Mid December- February)
2. Early maturing (March- April)
3. Prespawning (May)
4. Spawning (June- October)
5. Spent (November- Mid December)

GSI in preparatory phase (resting phase) is 0.58 ± 1.2 (Table 1, graph 1). In preparatory phase, ovary is slender and whitish (Fig.1a). Histologically in preparatory phase, ovary show distinguished ovigerous lamellae hanging in ovocoel (Fig. 2a). Ovigerous lamellae possess primary oogonia, chromatin nucleolus oocyte, early perinuceloar oocyte and few late perinucleolar oocytes (Fig. 2a).

Early maturing phase ovary slightly swollen and become pinkish (Fig.1b). Beside primary oogonia, chromatin nucleolus oocyte, early perinucleolar oocyte and late perinucleolar oocyte; vitellogenic oocyte also seen.GSI is early maturing phase increases slightly and is 1.99±0.9 (Table 1, graph 1).

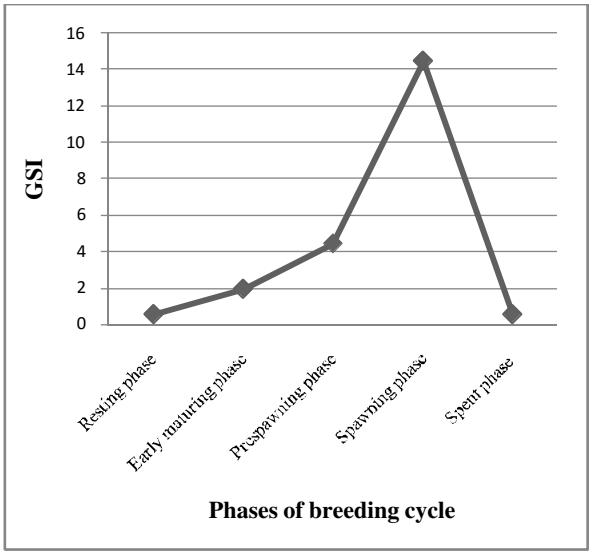
Prespawningovarian lobe further enlarges become transparent and vascularised (Fig. 1c). Histologically it showsfew additional ripe eggs besides the oocytes stage which were seen in early maturing phase (Fig.2c). GSI of prespawningovary increases further and is 4.49±0.89 (Table 1, graph 1).

In spawning phase, ovary attains maximum size and outer tunica albuginea become thinner and completely transparent.Smooth contour of ovary look granular due to presence of bulging oocytes (Fig. 1d). In this phase, ovary become highly vascularized (Fig. 1d). Histologically ovary show abundant ripe eggs along with other stages of oocytes (Fig.2d). Maximum GSI attained during spawning phase and is elevated to 14.49±0.73 (Table 1, graph 1).

In spent phase, ovary become flaccid and thinner (Fig. 1e). During this phase, follicles expel the oocyte thus ovary showed several ovulated follicles. Several atretic follicles were also reported during this phase (Fig. 2e). GSI again lowered down and is 0.60± 1.03 (Table 1, graph 1).

**Table 1: GSI in various phases of breeding cycle.**

| Phases | GSI |
|---|---|
| Preparatory phase | 0.58 ± 1.2 |
| Early maturing phase | 1.99 ± 0.9 |
| Prespawning phase | 4.49 ± 0.89 |
| Spawning phase | 14.49 ± 0.73 |
| Spent phase | 0.60 ± 1.03 |




**Graph 1:** Oscillation in GSI during various phases of breeding cycle

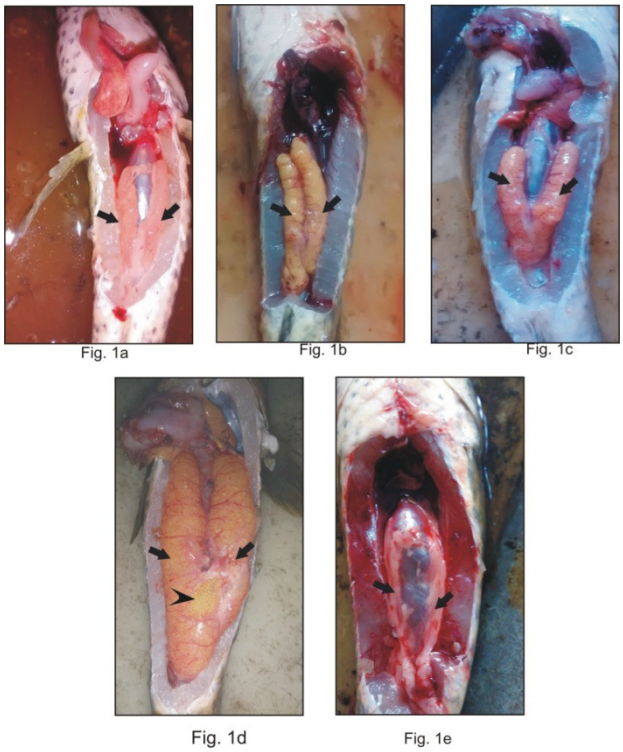



Fig. 1: Ovary of *C. punctata* in various phases of breeding cycle.
Fig. 1a,Resting phase ovary.
Fig. 1b,Ovary in early maturing phase.
Fig. 1c,Prespawning phase ovary.
Fig. 1d,Spawning phase ovary.
Fig. 1e,Ovary in spent phase.

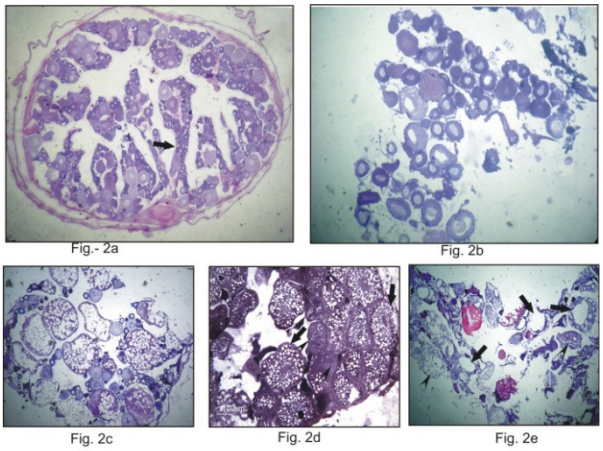


Fig.- 2a Fig. 2b Fig. 2c Fig. 2d Fig. 2e

Fig. 2 a, T.S. of resting phase ovary showing ovigerous lamellae (arrow).
Fig. 2b, T.S. of early maturing phase ovary.
Fig. 2c, T.S. of prespawning phase ovary.
Fig. 2d, T.S. of spawning ovary showing numerous ripe oocytes (arrow) along with vitellotgen , vitellogenic and late perinucleolar oocytes (arrowhead).
Fig, 2e, T. S. of spent phase ovary showing ovulated follicles (arrow) and atretic follicles (Arrowhead).

## Discussion:

In *C. punctata,* a pair of elongated ovaries was located in coelomic cavity. Each ovary leads into short oviduct which later opens outside through urinogenital opening. Ovaries from preparatory phase to spawning phase turn whitish to yellowish in early maturing phase and then become transparent in spawning phase. In spent phase it looks whitish. Similar result were reported in *Carassiums auratus* (Munkittrickand Leatherland, 1984), *Anabas testudineus* (Bahera, 2015).Ovary attain maximum size during spawning phase. Similar observations were describe in several cyprinid fishes (Al-Daham and Bahati, 1979; Al-Nouri, 1996; Bardakci et al., 2000).

Symmetry wise, ovaries could be categorized into symmetric and asymmetric ovaryies. Most of the teleostean species exhibit symmetric ovary with similar ovarian lobe. Some teleost show remarkable difference in the length of ovarian lobes. Such ovary represents asymmetric ovaries. *Anchoa mitchilli* shows asymmetric ovaries (Kobelkowsky, 2012). To ascertain type of *C. punctata* ovary is difficult task as difference between right and left lobe of ovary is less during the preparatory and early maturing phase, difference between two lobe became remarkable in spawning phase.

GSI is strongly correlated with gonadal development and maturity of fish (Rae and Calvo, 1995; Zimmerman 1997; Koya et al., 1998). Maximum GSI was reported during spawning phase. Similar reports were describe in *Cynoglossusarel* and *C. lida* (Rajguru, 1992), *Potogonotothentesselata*(Rae and Calvo, 1995) and in rainbow trout, *Oncorhynchus mykiss* (Sharma and Bhat, 2014).

Ovary of C. punctate is asynchronous type as each phase of breeding cycle shows different type of oocytes. Similar asynchronous ovary was reported in *Chirostoma humboldtianum* (Cardenas et al., 2008).

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