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Reproductive biology of *Plicofollis tenuispinis* (Day, 1877) landed along the veraval centre, Saurashtra coast of the India

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Abstract

The current study were carried out investigation reproductive biology of Thinspine sea catfish, Plicofollis tenuispinis landed along the veraval centre of the saurashtra coast of the, India during the March 2016 to February 2017. The samples of the P. tenuispinis were brought from the recently landed catch at Veraval centre throughout the year of the study about 310 samples which is consisting of 143 male and 167 female individuals of the were examined for the investigation of the details. Revaling of these observations as overall sex ratio 1:1.2 for the male to female. Spawning season of the P. tenuispinis along the Veraval coast were February to June.

Keywords: Thinspine sea catfish, reproductive biology, gonado-somatic index, fecundity, spawning season.

Introduction

The studies on gonado-somatic index conducted by Mansor Mat Isa *et al*[1], they were reported that had a significance to know the gonad dynamics and it can also used as an indicator of the spawning period. As reviewed by Samat e*t al*[2], reproductive biological studies appraise size at first maturity, sex ratio, gonado-somatic index (GSI), egg size, fecundity, quantification of the reproductive potential whereas giving certain insight into a population reproductive potential. Reproductive biology of *Arius argyropleuron* along Malaysia coast carried out by Mansor Mat Isa *et al*[1]. They classified testes and ovaries were based on volume relative to abdominal cavity, gonadal forms, size of gonad, colours and oocytes diameter De Vlaming *et al*[3]; King[4], reported that the knowledge of fecundity is very essential for fish life history. Sea catfishes all are fractional spawners they had both unripe and ripe ova in same ovaries in female. Spawning males segregate into shoals, move along surface and preferably towards shallow water. Recently released juvenile (7 cm length) of all the ariid catfishes prefer to live in shallow muddy grounds feeding on the bottom epi and in fauna.

Studies carried out by Lakshmi and Srinivasa[5], reported that almost all ariid catfishes had low fecundity on an average between 25-190 ova per mature female along with single spawning per year. In the Sea catfishes parental care exhibited by male parent carry brood along with 25-120 eggs in its oral cavity upto two months until young ones are released, live and feed on shallow muddy grounds. Muhammad[6], Pointed that characters as breeding migration towards shore, low fecundity and buccal incubation related to survival by avoiding fishing mortality.

P. tenuispinis are highly carnivores and bottom feeder. The gut content of the fish shows very high level of emptiness where 63.5% of total stomachs have been reported to be empty with preferred food as crustaceans, polychaetes, molluscs, fishes and echinoderms noticed by Raje *et al*[7].

The Catastrophic mass destruction of brooder of marine catfishes along Indian coast by different gears repeatedly occurs in every year during February to March and September to October. An estimate on destruction of eggs/embryo/larvae, indicated on average every year, within a period of two months (September - October) 8.2 million eggs/embryo/larvae of *Plicofollis tenuispinis* are destroyed which is equivalent to 13.4 million tonnes eggs during the period 1980-86. Assuming with a 10% mortality (M, the loss caused by destruction of *P. tenuispinis* brooders, eggs/larval fishing mortality was estimated to be around 2,930 tonnes valued roughly at Rs. 1.46 crores every year. Normally *P. tenuispinis* is fully vulnerable to purse seine at age of two years and above, when it reaches 300 mm length and mean average weight of 375 gm. *P. tenuispinis* stock is over exploited along West coast and exceeded maximum sustainable yield in Indian waters. As reviewed by Menon and Pillai[8], Wanton destruction of sea catfish eggs/embryos/larvae is not only economically wasted but also biologically harmful to sustainable recruitment.

Materials and methods

Study Area: The present study was conducted along the coastal waters at Veraval (21º35'N, 69º36'E), which is situated along the Saurashtra coast of Gujarat, India. Landings of the *P. tenuispinis* at Veraval were considerably higher quantity along fish landing sites of Gujarat.

Study duration: Study were conducted for one year from March 2016 to February 2017 by excluding the month of July which is seasonal fishing ban at Veraval landing site.

Materials: Following materials were utilized during current investigation of details on Reproductive biology of *P. tenuispinis* landed at Veraval centre such as *Plicofollis tenuispinis* landed at Veraval fishing harbour (Nos. 25/week) specimens, Measuring board, Electronic balance (capacity=5kg, sensitivity=50g), Electronic balance (capacity=200g, sensitivity =10mg), Insulated box (5kg, capacity), Labels, Cloth for wiping out surface slime, wastes materials, Specimen bottles, Forceps, Scissors, Formalin (4% cons.), Compound microscope, Ocular and stage micrometer and Stereo zoom microscope, Verniercaliper.

Methodology: Ovaries of female fishes were collected and preserved in 4% formalin. The weight (g) and the status (stage III and above) of the gonads were recorded. As absolute fecundity was less in target species hence total ova were included into counting. The ova diameter (mm) in each sub-samples of the ovary containing both the mature and maturing ova were measured using a Verniercaliper (accuracy of 0.1mm) and immature ova were observed under the microscope and measured with the ocular micrometer (Minimum division of 0.02 mm) Mojumder[9].

Observation noticed: i. Total length of the fish (mm), ii. Total weight of the fish (g), iii. Sex and maturity stage of gonad, iv. Total weight of the gonad (mg), v. Total No. of fully matured ova in ovary, vi. Diameter of ova (mm).

Statistical analysis: Sex-ratio: Month wise sex ratio of the species was determined and Chi-square test was performed to test the homogeneity of male and female distribution in the population.

Maturity studies: Maturity was observed based on the stages of gonad and matured specimens (stage III and above) against their standard body length.

Fecundity: Fecundity was determined following the gravimetric method by preserving ovaries in 5% formalin. Fecundity was worked out by raising the number of ova in all the sub samples of the matured and ripened ovary (stage V and VI) to the total ovary weight, Mojumder[9], As absolute fecundity was less in target species hence total ova were included into counting.

Results and discussion

The Thin spine sea catfish samples were collected for the year for undertaking the reproductive biological studies after reaching the laboratory samples dissected ventrally from the belly portion in order to get the gonads for sex determination of sample.

Table-1: Month wise sex ratio of *P. Tenuispinis.*

Month	Male (M)	Female (F)	Sex ratio M:F
March 2016	12	18	1:1.5
April	17	13	1:0.8
May	14	17	1:1.2
June	4	12	1:3
August	17	17	1:1
September	14	12	1:0.9
October	14	17	1:1.2
November	11	10	1:0.9
December	16	15	1:0.9
January 2017	13	17	1:1.3
February	11	19	1:1.7
Total	143	167	1:1.2

Table-2: Sex ratio of length class-Chi-square test (x^2).

Size class (centimeter)	Male	Female	Total	F (Expected Frequency)	Chi-square test (x^2)
20-25	10	8	18	9	0.222222
26-30	33	30	63	31.5	0.142857
31-35	19	38	57	28.5	6.333333
36-40	46	31	77	38.5	2.922078
41-45	32	48	80	40	3.2
46-50	3	11	14	7	4.571429
51-55	0	1	1	0.5	1
	143	167	310	155	

Sex ratio of male and female were showed as given in Table-1 and chi sqaure test of the sex ratio of the collected sample were mentioned in Table-2.

Length at which 50% of maturity of samples of individually male and female specimens were segregated in order to estimate the probability of length at 50% maturity. The result of estimated probability of length at which 50% of both male and female samples were get matured showed in Figure-1 and 2.

Fecundity of female *P. tenuispinis* samples observed for only matured female specimens gonads were used for the counting of ova in matured ovaries given in Table-3.

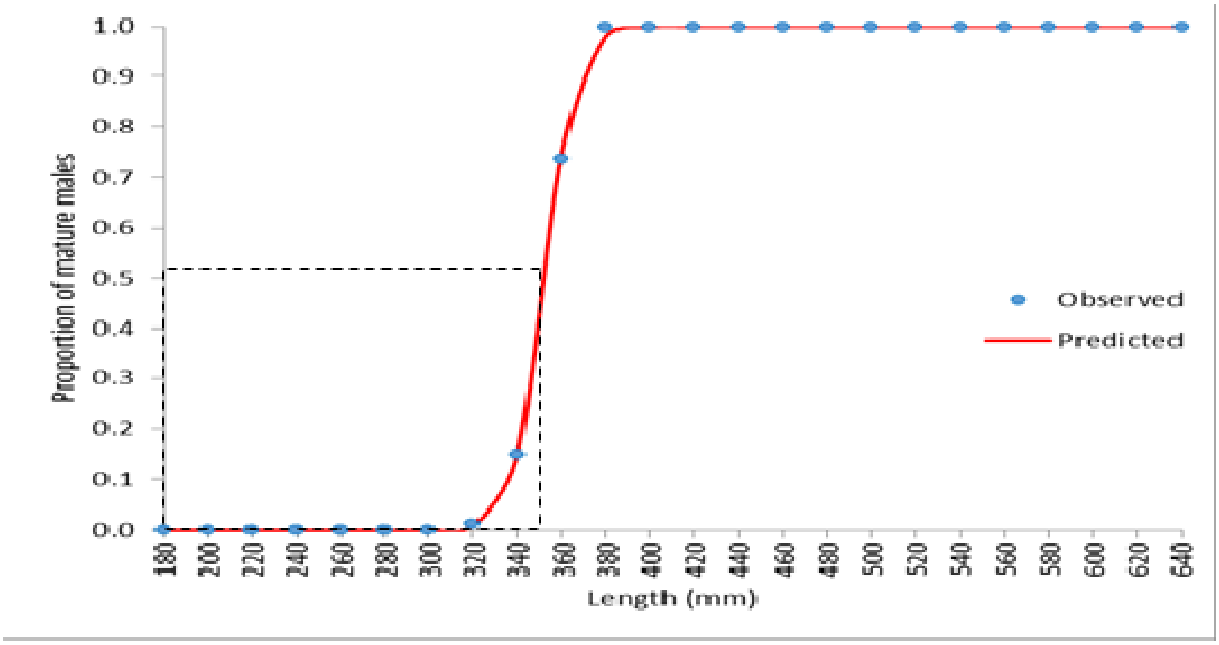

Figure-1: Length at 50% maturity of males were calculated as 352 mm.

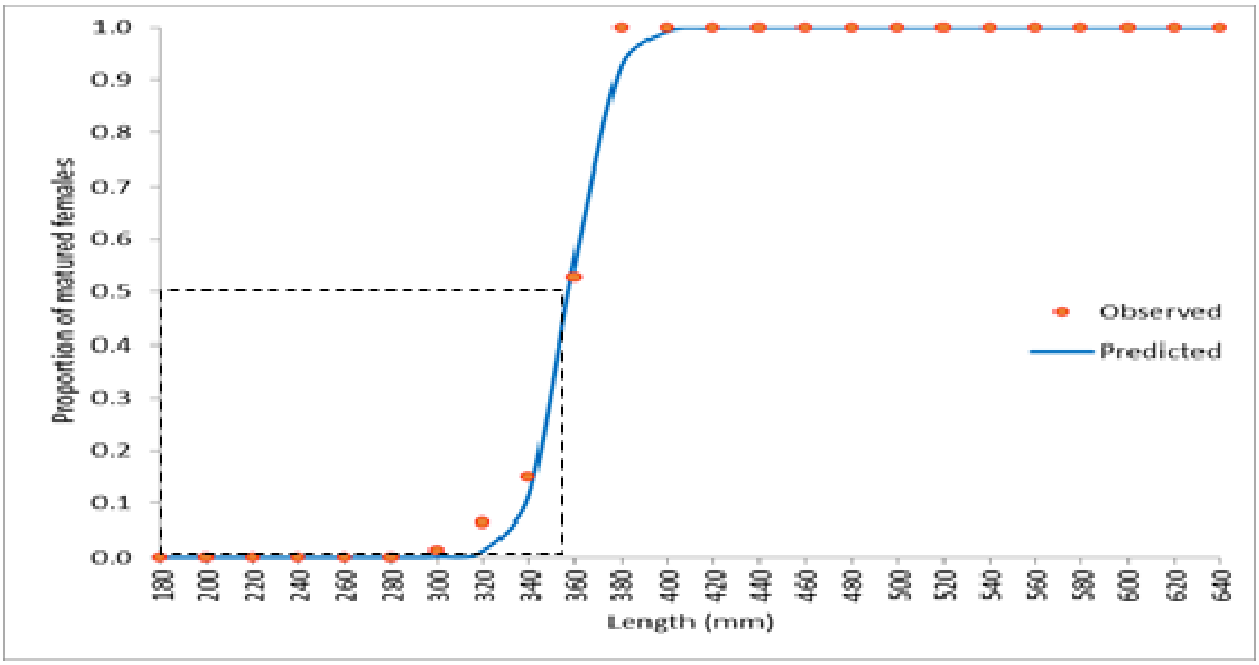

Figure-2: Length at 50 % maturity of Females were calculated as 357 mm.

Table-3: Fecundity of *P. tenuispinis* with respect to female total length and body weight.

Total length (millimeter)	Body weight (grams)	Fully matured fecundity (numbers)
302	340	58
303	340	74
360	1193	74
364	1086	72
375	1087	94
392	1229	71
395	522	68
415	906	78
415	898	74
416	932	76
419	973	73
423	976	75
425	955	76
426	1259	99

Total length (millimeter)	Body weight (grams)	Fully matured fecundity (numbers)
428	1085	78
450	526	58
455	674	80
465	793	74
466	672	71
470	966	92
480	379	95
501	731	94
505	428	93
509	781	92
513	1317	94
513	1317	99
302	340	58
		79.32

Figure-3: Observation of gonadal condition of fish.

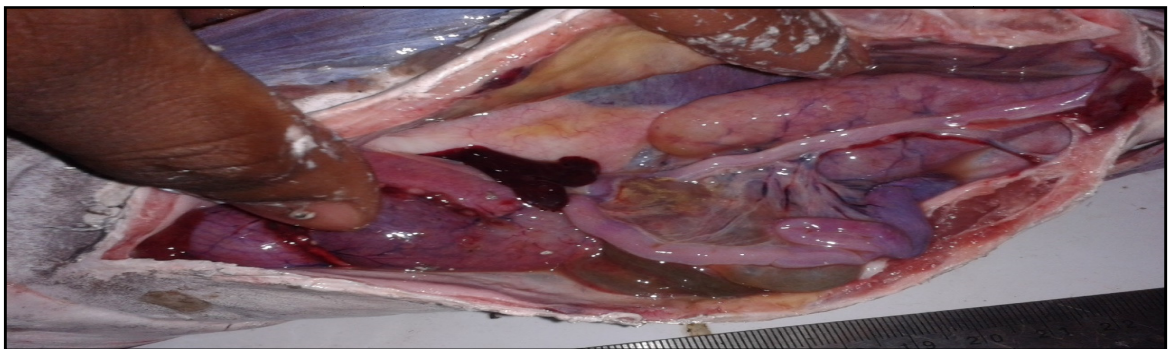

Figure-4: Third and fourth stage of mature ovary.

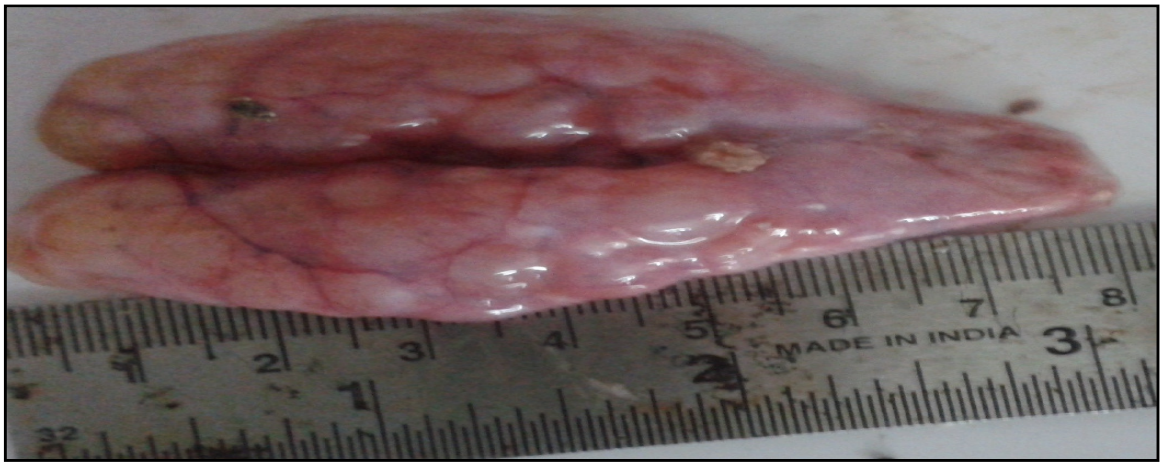

Figure-5: Fifth and sixth stage of mature ovary containing - fully mature ova.

Figure-6: Third and fourth stage mature ovary –view of ova.

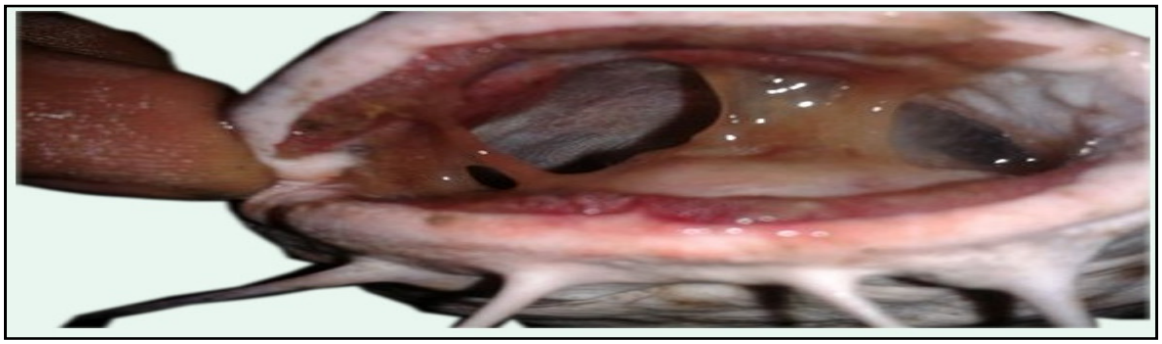

Figure-7: Male mouth brooder of thinspine seacatfish with excessive saliva secretion.

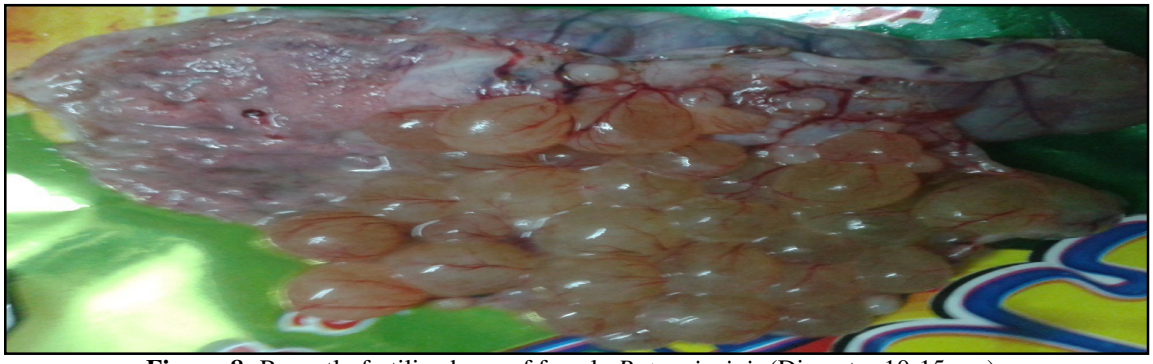

Figure-8: Recently fertilized ova of female *P. tenuispinis* (Diameter 10-15mm).

Figure-9: Preservation of gonads in 5% formalin in specimen's bottle.

Figure-10: Utensils, preservatives used for ova preservation and counting.

Initially from the matured female specimens dissected were showed in Figure-3. Followed by general view of maturity stage wise samples were indicated in Figure 4,5,6,7 and 8.

Counted matured and immatured various maturity stages of ova were measured using the Figure-11 and monthly mean of ova diameter of *P. tenuispinis* given in Table-4.

Figure-11: Verniercaliper for the lager matured ova diameter measurement.

Table-4: Month wise mean ova diameter of *P. tenuispinis* at Veraval during the March 2016 to February 2017.

Month	Mean ova diameter (millimeter)
March	12.58
April	6.19
May	2.74
June	7.22
August	0.25
September	0.70
October	0.54
November	0.69
December	1.37
January	1.15
February	3.62

Table-5: Month wise and Sex wise Gonado-somatic index (GSI) of *P. Tenuispinis.*

Month	Female
March	8.251
April	5.896
May	4.183
June	4.155
August	0.393
September	0.414
October	0.430
November	0.434
December	0.533
January	0.865
February	2.206

The month wise Gonado-somatic of *P. tenuispinis* were given in Table-5.

Discussions: Present study were investigated details during throughout year of the study except during the month of the July which is completely fishing ban period at sampling site of the Veraval**.**

Sex ratio: The observation of sex of males and females were performed by the dissection the samples used for the biological studies then subsequently by visual perception gonadal condition were noticed. The sex ratio of *P. Tenuispinis* was calculated for month wise for males and females (Table-1 and 2). The year round samples sex ratio of male and females was 1:1.2.

The current study was calculated sex ratio for total samples used were slightly exceeded by the females over males in numbers at Veraval particularly during the month of June, February, March, January, October, May while males population were slightly more than females during the month of April, September, November and December.

The present study on reproductive biology was recorded sex ratio was 1.1.2 that slightly dominance of the females over males while Raje[10], Studies on *P. tenuispinis* at Veraval noticed sex ratio was uniform both sex which is 1:1 ratio which is showing in variation at current observations of *P. tenuispinis* at Veraval.

Length at First Maturity: Along the Indian Saurashtra coast first time were that occurrence of external parasites on caudal peduncle region of *P. tenuispinis* infected with the external parasites were observed during month of March to May during the 2016 at Veraval, revealed that parasites were infecting the larger host of *P. Tenuispinis* of Mature individuals observed and suggested to parasitic species can have scope for its utilization in biological tag on Thinspine sea catfish stockalong Veraval coast initiated by Bhukya Bhaskar[11]. Length at First maturity was determined with total of 310 specimens of which 143 individuals of males and 167 numbers of females. The samples with observed gonadal stages between third to seventh maturity stages during the current study on *P. tenuispinis* at Veraval were considered as mature individuals. The cumulative percentage of both males and females was separately pooled against individually for the both sex groups at 20mm length class intervals for this fixing of the length at first maturity of the *P. tenuispinis.* The calculated length at which 50% maturity of males and females was about 352mm (35.2cm) and 357mm (35.7cm) respectively. The age first maturity of both males and females worked as 2.1 year. The results of length at 50% maturity of males and females given as in (Figure-1 and Figure-2).

Dan[12], work on *P. tenuispinis* reported that length at first maturity of these species was 27.5 cm in total length whereas current study at Veraval found that *P. tenuispinis* length at first maturity was calculated as 35 cm.

Spawning season: During present study observation recorded at Veraval that this *P. Tenuispinis* was spawned only once in the throughout the year of study with extended spawning season from the month February to June. The maximum individuals of the fully matured females were observed during the month of March 2016 lowest during the June from which Spent individuals of the females were predominantly higher in numbers. The peak in the Gonado-somatic index was highest during month of March was 8.25 which can be inferring that this species was ready for the spawning in the subsequent months. The immature stages of both the sex of the *P. Tenuispinis* at Veraval was found throughout the year of observation.

Dan[12], reported work on spawning season of *P. Tenuispinis* was spawned once during the year May – September.

Fecundity: Total individuals of matured females were observed for the collection of details about the fecundity of *P. Tenuispinis* at Veraval. To determine the absolute fecundity during the current study were randomly total of 25 fully matured ovary selected (Table-3 fecundity). The specimen's selected were noticed with respect to its total length, body weight and absolute fecundity of fully matured females ranged were from 302 to 513 mm, 340 -1317g and 58 to 99 number of ova respectively. The present study investigated observations were reporting that there is significantly increasing in the number of ova from smallest length and weight of individuals to larger specimens and the maximum contribution of gonadal weight to total body weight of females were noticed. The gonadal weight highest recorded during the month of March was 107 grams.

Raje[10], studied on *Arius tenuispinis* at Veraval, recorded fecundity of fifth matured stage of ovary were range from 72-89 for fish length 394 to 570mm. whereas Dan[12], observations on *P. tenuispinis* noticed that fecundity range from 29 to 82 ova while present study at Veraval recorded higher range which is 58 to 99 eggs.

Ova diameter study of *P. Tenuispinis:* The present study work on ova diameter was carried out by the total of 56 ovaries was examined for the investigation of details about the ova diameter of females. It is observed that there is presence of different number of ova at various stages of development in all examined ovaries. Mean of ova diameter observed during the different months during the study period except during the fishing ban at Veraval. Mean size of ova diameter was 12.8mm which highest then remaining months were recorded. Lowest average ova diameter was 0.25mm, which is noticed during month of August. Month wise mean ova diameter of *P. Tenuispinis* at Veraval during the March 2016 to February 2017, given in Table-4 and Figure-9: Verniercaliper for the lager matured ova diameter measurement.

Gonado- somatic index (GSI) of *P. Tenuispinis:* Present work for the investigation of gonadal weight contribution in the overall weight of the *P. tenuispinis* females were performed with recording of total 167 females specimen's individuals in current study at Veraval during March 2016 to February 2017. Present study recorded observations found that highest peak in the Gonado-somatic index calculated for the males and females was 8.25 and 0.69 respectively. The lowest GSI for the females was found during month of August which was 0.25 and there is no significant variation gonadal weight in males was noticed.

Conclusion

These study investigation were carried out using the samples of the Thinspine sea catfish *P. tenuispinis* landed at Veraval centre, fishing harbour. Followed by samples were transported in the

insulated thermocoal ice box to laboratory. Recorded the total length (centimeter) and weight (grams), then observed externally mouth, abdominal belly region, thickness and shape of pelvic fins for external identification of the sex of these species which can be seen only during matured stages mostly. After these samples were dissected using scissors, recorded the gonadal conditions, sex of the sample, maturity stage of the sample, length of the gonad (cm) and weight of the gonads (milligrams) as the calculated length at which 50% maturity of males and females was about 352mm (35.2cm) and 357mm (35.7cm) respectively. The length at which 50% maturity of males and females the most of the samples were very smaller which were indicating the indiscriminately exploitation of the immature individuals during the pre and post spawning season. As a conservation measure to protect the young ones of *P. tenuispinis* need to be prevented from their overexploitation in order to give them chance to breed at least once in their life to sustain self-recruitment of the stock.

References

1. Isa M.M., Noor N.S.M., Yahya K. and Nor S.A.M. (2012). Reproductive biology of estuarine catfish, *Arius argyropleuron* in the northern part of Peninsular Malaysia. *Journal of Biology, Agriculture and Healthcare,* 2(3), 14-27.

2. Samat A., Yusoff F.M., Arshad A., Ghaffar M.A., Nor S. M.A., Magalhaes L.B. and Das S.K. (2016). Reproductive biology of the introduced sailfin catfish, *Pterygoplichthyspardalis* (Pisces: Loricariidae) in peninsular Malaysia. *Indian J. Fish.*, 63(1), 35-41.

3. Devlaming V., Grossman G. and Chapman F. (1982). On the use of the gonosomatic index. *Comparative Biochemistry and Physiology Part A: Physiology,* 73A(1), 31-39.

4. King R.P. (1998). Weight-fecundity relationships of Nigerian fish populations. *NAGA, the ICLARM* quarterly, 22 (3), 33-36.

5. Lakshimi K. and Rao S. (1992). Trend in catfish catches at Visakhapatnam showing disappearance of Arius tenuispinis. *J. Mar. Bio. Ass. India*, 34(1&2), 26-37.

6. Amin M., Shoaib M., Nabi G., Ahmed N. and Kifayatullah M. (2015). A comprehensive review on fishery biology of catfishes. *Journal of biology and life science*, 7(1), 1-11.

7. Raje S.G., Dineshbabu A.P. and Das T. (2008). Biology and stock assessment of Tachysurus jella (Day) from Mumbai waters. *Indian Journal of Fisheries*, 55(4), 295-299.

8. Menon N.G. and Pillai C.S.G. (1996). Text book on marine biodiversity conservation and management. C.M. F.R.I. edited by Menon, N. G. and Pillai, C.S.G. 8th chapter: 89-96.

9. Mojumder P. (1978). Maturity and spawning of the cat fish Tachysurus thalassinus (Ruppel) off Waltair Coast. *Indian Journal of Fisheries*, 25(1&2), 109-121.

10. Raje S.G. (2003). Some aspects of the biology of Tachysurus tenuispinis day from Veraval. *Journal of the Indian Fisheries Association*, 30, 97-103.

11. Bhukya Bhaskar (2017). First report on parasites occurrence and length-weight relationship of the thinspine sea catfish *Plicofollis tenuispinis* (Day, 1877) landed along Veraval centre of Saurashstra coast of Gujarat, India. *Research Journal of Animal, Veterinary and Fishery Sciences,* 5(5), 1-7.

12. Dan S.S. (1977). Maturity, spawning and fecundity of catfish Tachysurus tenuispinis (Day). *Indian Journal of Fisheries*, 24(1&2), 90-95.