



# **BEHAVIOURAL STUDY WITH SPECIAL REFERENCE TO BREEDING OF PYGMY HALFBEAK FISH *Dermogenys collettei*, MEISNER 2001**

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## **ABSTRACT**

This small fish *Dermogenys collettei* are found in Southeast Asia. Its body size ranges from 4.9 cm to 8.4 cm. It is carnivorous, surface feeder and lives in flock. It gets sexual maturity at the age of 90-100 days. Sexual dimorphism is vivid and conspicuous. It gives birth 15-30 hatchings at a time. It breeds throughout the year. It is an important component of the ecosystem and helps to eradicate malaria and other mosquito born diseases by engulfing the mosquito eggs and larvae of stagnant waters.

## **KEYWORDS**

*Dermogenys collettei*, Pygmy Halfbeak, Breeding

## **INTRODUCTION**

Behind the name of pygmy halfbeak have proper contention. In Prominent beak condition for fish upper jaw is small and lower jaw is longer and thickened form upper jaw, for this reason this species is called halfbeak. *Dermogenys collettei* body size range is 4.9 to 8.4 cm, because of this halfbeak species body size is small, for this reason this is called pygmy. Above the mentioned point is the main story of called pygmy halfbeak fish to *Dermogenys collettei*.



**Figure 1: Female *Dermogenys collettei***

Study about morphology is not only important point, it is a big Section in research. About discussion in morphology part of *Dermogenys collettei*, most important body part is upper and lower jaw because this body part is main reason of called pygmy halfbeak fish to *Dermogenys collettei*. Body shape of *Dermogenys collettei* is slender type with greyish colour. In mature stage it comes up to approx. 8 cm in length. In this species one of the most important things is female fish is longer comparing to male fish in mature stage. The total length of male *Dermogenys collettei* is approx 5.5 cm, the body length 4.3 cm, the jaw length 0.5 cm. The total length of female *Dermogenys collettei* is 8.4 cm, the body length 7.4 cm, the jaw length 1.3 cm and body depth is 0.1 cm. The young fish length is 1.1 cm. Jaw of adult *Dermogenys collettei* is properly asymmetrical. Feeding habit of this species is very different compare to other fishes due to its jaw structure. In *Dermogenys collettei* upper jaw helps to clamp down on prey items. Lower jaw of *Dermogenys collettei* consists of mechanoreceptive neuromasts that detect taste buds or sensing chemicals with movement also. Elongated lower jaw of this species is responsible for its injury in sometime. Olfactory organ of the species for identify chemicals in the water. The anal fin of female fish has unmodified anal fin, when the male viviparous halfbeak has a modified anal fin and also this is called andropodium or gonopodium, where the anal fin of first five fin rays have a posterior curve and this is thickened and elongated.

## METHODOLOGY

In natural water condition they are swim together in group in surface of the water. After capture natural water condition (pond) we are shifted this species in prepared aquarium condition. Before shifted the fish in aquarium water, we are added in this water Salt, Chlorine and Methylene blue for suitable fish adaptation. In this aquarium aeration is must be important. We are observed this species breeding behaviour in aquarium condition.

## Aquarium design &amp; fabrication:



Figure: Big size aquarium

Figure 2: Small size Aquarium

In aquarium condition we observed this species properly. In this process we included one big size aquarium, one small size aquarium and one small size earthen tank. The big aquarium size is length - 36 inch, height-18 inch, width- 18 inch, total water capacity of this aquarium is 80 ltrs. The small aquarium size is length -24 inch, height-12 inch, width- 12 inch and total water capacity of this aquarium is 50 ltrs. At first prepare the aquarium water for suitable fish adaptation. The aquarium was filled up with water and adds particular quantity of Salt, Chlorine and Methylene blue in this water. Because of this species live in brackish water, salinity should be 3-20 ppt, this water pH range 5-7.5 ppm and water temperature 24-28°C. We also supplied sufficient aeration in aquarium tank. We used decoration like colouring light, colouring stone, aquarium plant etc. in aquarium tank. At first we caught this fish from natural water body and then shifted this fishes into small tank and maintain this tank very carefully and supply proper food, aeration and light. After the fish become mature, the mature male and female fish shifted in other medium size aquarium tank with 1:3 ratio. This time is the fish breeding period and this time the mature fishes need proper protein foods. This time we supply the mature fishes in supplementary feed, mosquito larvae etc. The fish prefer breed in peaceful condition at night time as live young. After breed the live young shifted to other tank, because of this species are carnivorous sometime this pygmy halfbeak fish also eats their young.

**Water parameters :** For the present study water parameters are measured as per the book “**Work Book of Limnology**” by **A.D. Adoni**(1985). To analysis the water parameters sample was collected from the selected aquariums during the study period.

**Physical parameter: Temperature:** Water temperature was recorded with the help of Standard digital thermometer. The water temperature of the sample was recorded from aquarium by dipping the thermometer into the water for nearly 1 minute. The result was recorded in °C.

**Chemical Parameter- Free CO<sub>2</sub>:** 50 ml sample was taken in a conical flask and add 2 drops Phenolphthalein indicator (if slight pink colour appears then free carbon dioxide is absent). If the solution

till remains colourless, than titrate with Sodium hydroxide(0.02272N) to slight pink. Note the reading and calculate the free carbon dioxide in mg/l.

$$\text{Free CO}_2 \text{ mg/l} = \frac{\text{ml of titrant} \times 1000}{\text{ml of sample}}$$

Dissolved Oxygen (DO): Dissolved oxygen was determined by modified Winkler's methods. 250 ml sample was collected in a DO bottle, add 2 ml of Manganese Sulphate, then add 2 ml of alkaline-iodide-azide solution added to fix the dissolved oxygen and shake the bottle for 6 times to the brown precipitate which appeared was allowed to settle. Then add 2ml of Conc. Sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) through the sides of the bottle and shaken well to dissolve the precipitate. Took 50ml of sample in a conical flask and titrate with Sodium thiosulphate (0.025N) Solution till the pale straw colour appear, after using starch (as an indicator)blue colour appear after that farther titrate to colourless. Note the total used titrates and Dissolved Oxygen was calculated as follows:

$$\text{Dissolved oxygen in (mg/l)} = \frac{8 \times 1000 \times N}{V} \times v$$

Where,

V = Volume of the sample (ml)

v = Volume of titrate used (ml)

N=Normality of titrant

8 = Molecular weight of Oxygen

pH: pH was analyzed by pH paper.

Alkalinity: 50 ml sample was taken than added two drops of Phenolphthalein indicator, if pink colour developed then titrate with Sulphuric Acid (0.02N), until pink colour disappears. Then add 2-3 drops of Methyl Orange Indicator and colour changes from yellow to orange. If pink colour not appear than add 2-3 drops of Methyl Orange indicator and then titrant with Sulphuric Acid (0.02N).The total volume of titrant used in two titrations Phenolphthalein Alkalinity (P) and Total Alkalinity (T) were calculated by using the given formulas:

$$\text{Phenolphthalein alkalinity (P) mg/l} = \frac{\text{ml of titrant "p"} \times 1000}{\text{ml of sample}}$$

$$\text{Total alkalinity (T) mg/l} = \frac{\text{ml of titrant "T"} \times 1000}{\text{ml of sample}}$$

Total Hardness: 50 ml sample were taken in a conical than add 1 ml of Ammonia Buffer solution and 5 drops of Eriochrom black T as an indicator. When, the colour of the sample turns red-wine then titrate with EDTA solution until blue colour appear. Note the reading and calculation of total Hardness is as follows:

$$\text{Total Hardness mg/l} = \frac{\text{ml of titrant} \times 1000}{\text{ml of sample}}$$

## STUDY AREA

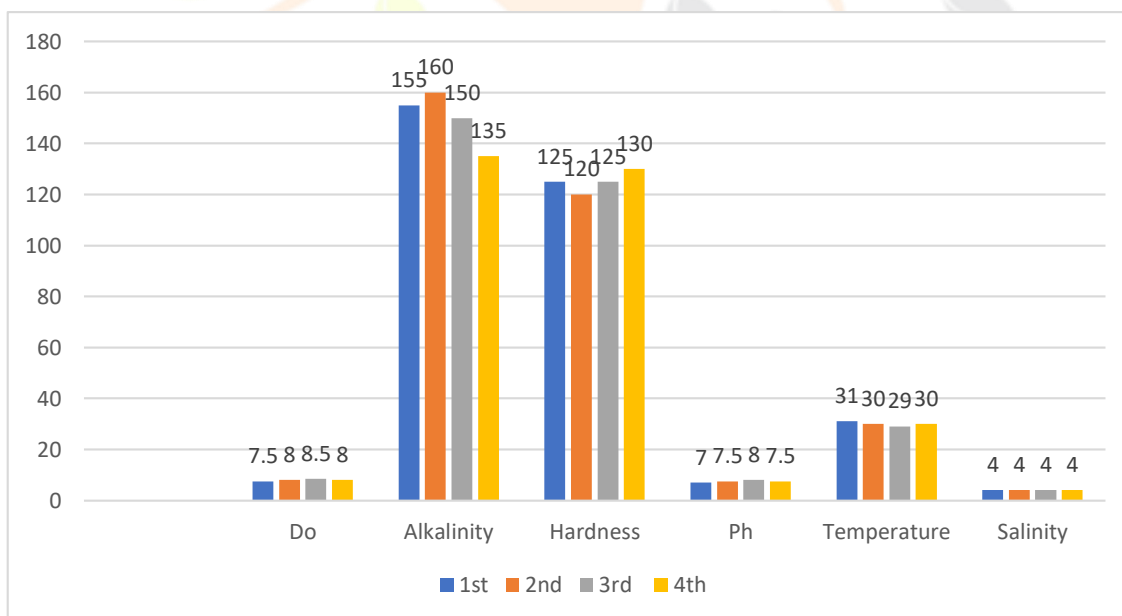
This species live in fresh water and brackish water. In my research paper this pygmy halfbeak fish (*Dermogenyscollettei*) capture in Khejuri, West Bengal, Purba Medinipur.

## RESULTS

### Physico-chemical Parameter results

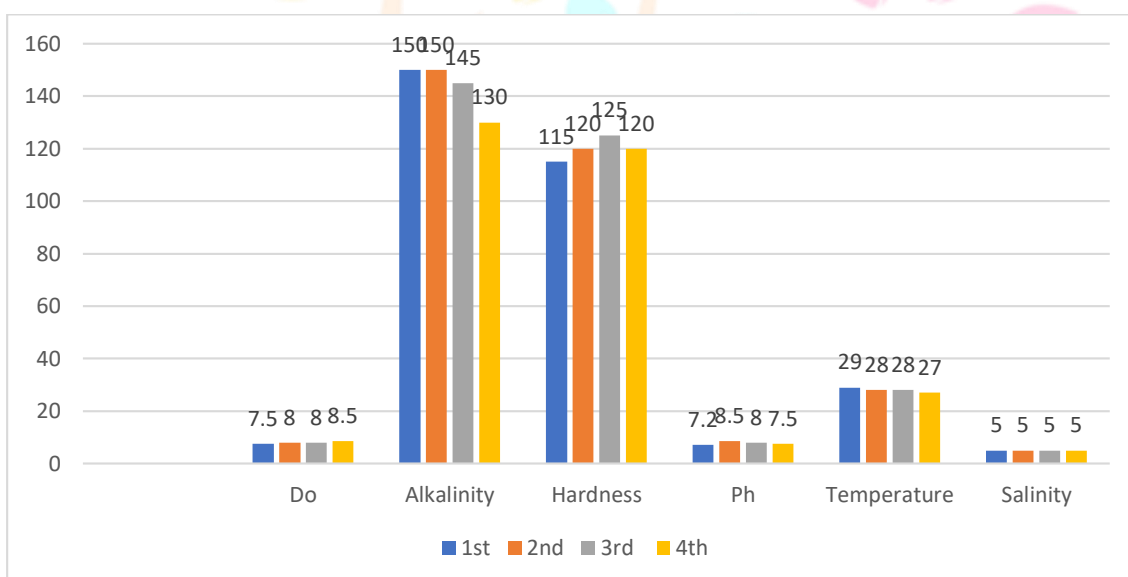
Water parameter report of September month of 2022.

Parameter(Sept 2022)	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>
Do	7.5	8	8.5	8
Alkalinity	155	160	150	135
Hardness	125	120	125	130
Ph	7	7.5	8	7.5
Temperature	31°C	30°C	29°C	30°C
Salinity	4	4	4	4



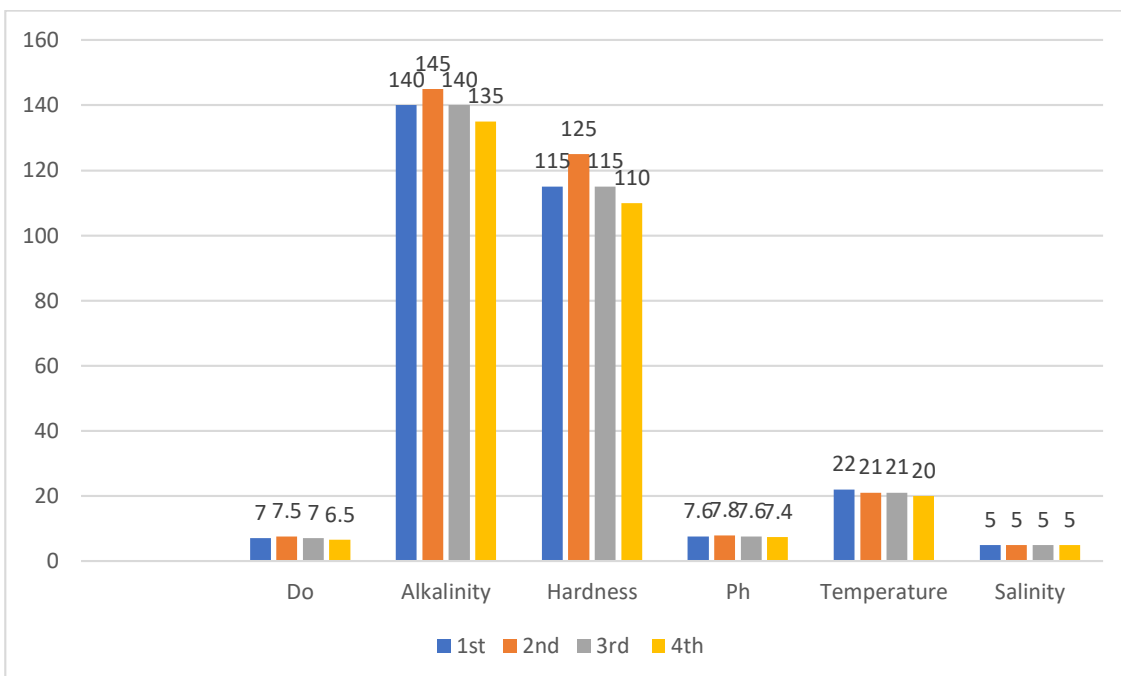
## Water parameter report of October month of 2022.

Parameter(Oct)	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>
Do	7.5	8	8	8.5
Alkalinity	150	150	145	130
Hardness	115	120	125	120
Ph	7.2	8.5	8	7.5
Temperature	29°C	28°C	28°C	27°C
Salinity	5	5	5	5



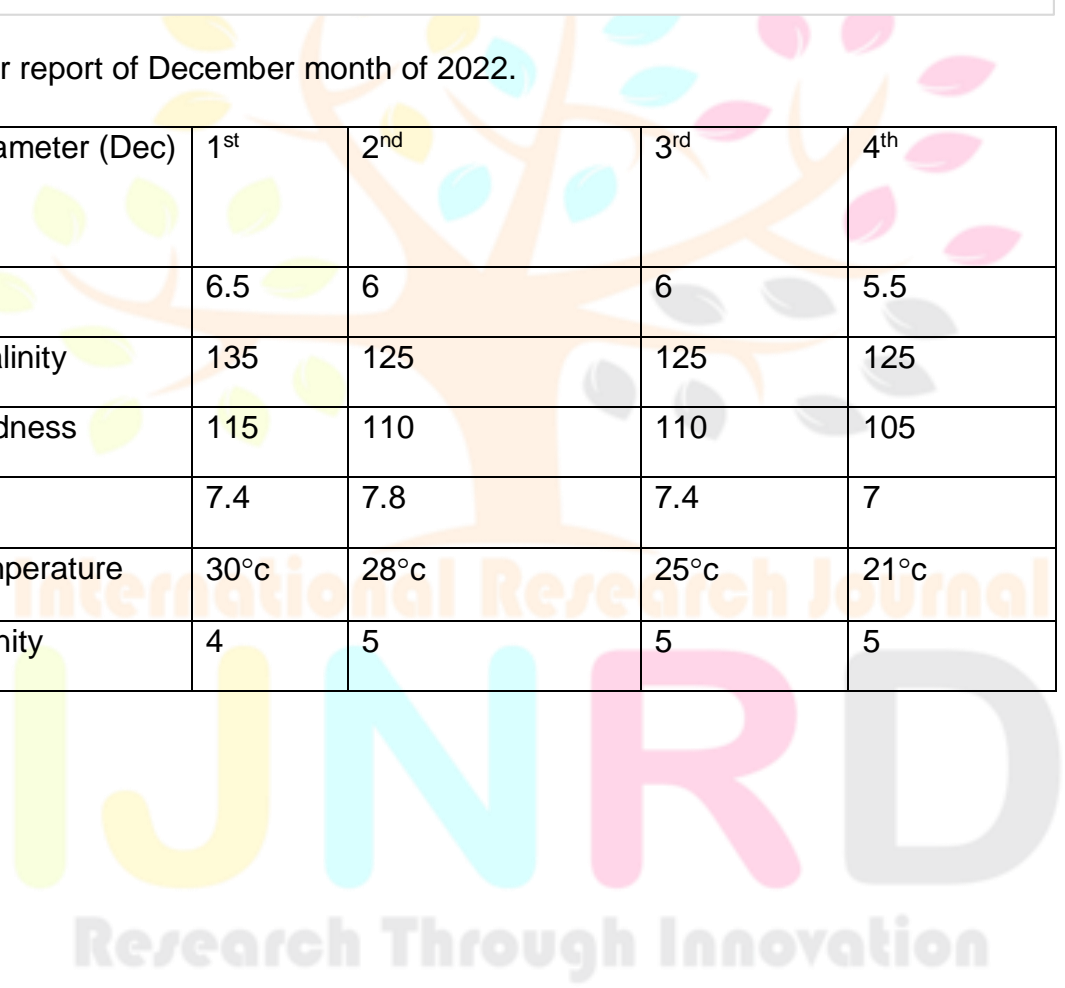
## Water parameter report of November month of 2022.

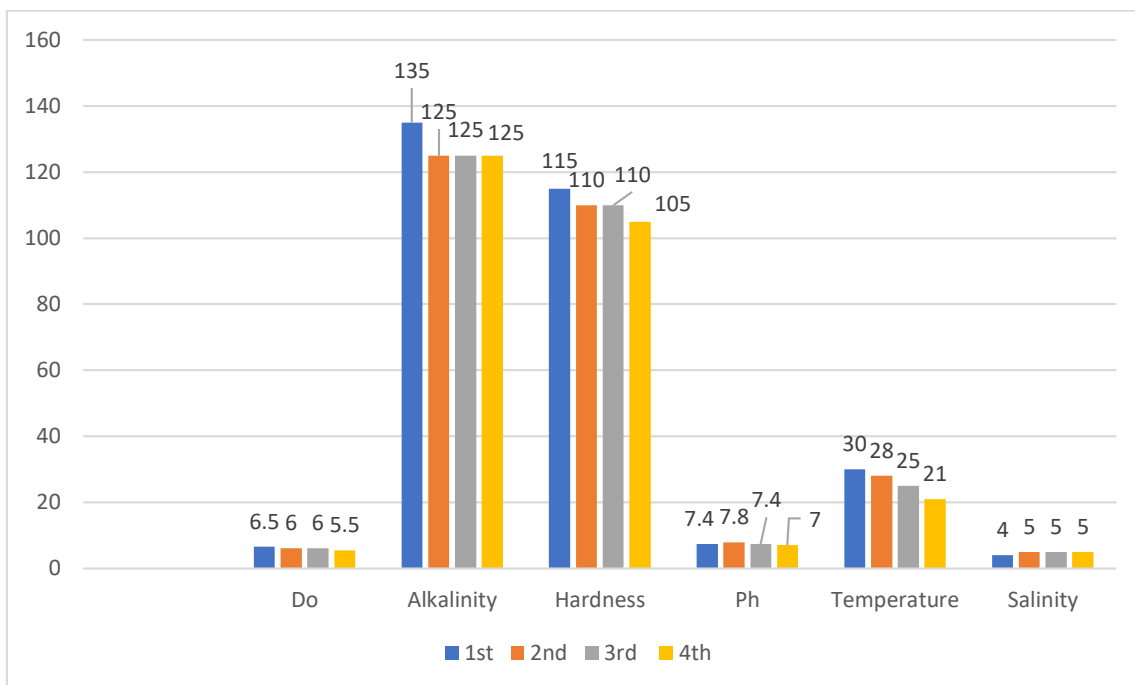
Parameter(Nov)	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>
Do	7	7.5	7	6.5
Alkalinity	140	145	140	135
Hardness	115	125	115	110
Ph	7.6	7.8	7.6	7.4
Temperature	22°C	21°C	21°C	20°C
Salinity	5	5	5	5



Water parameter report of December month of 2022.

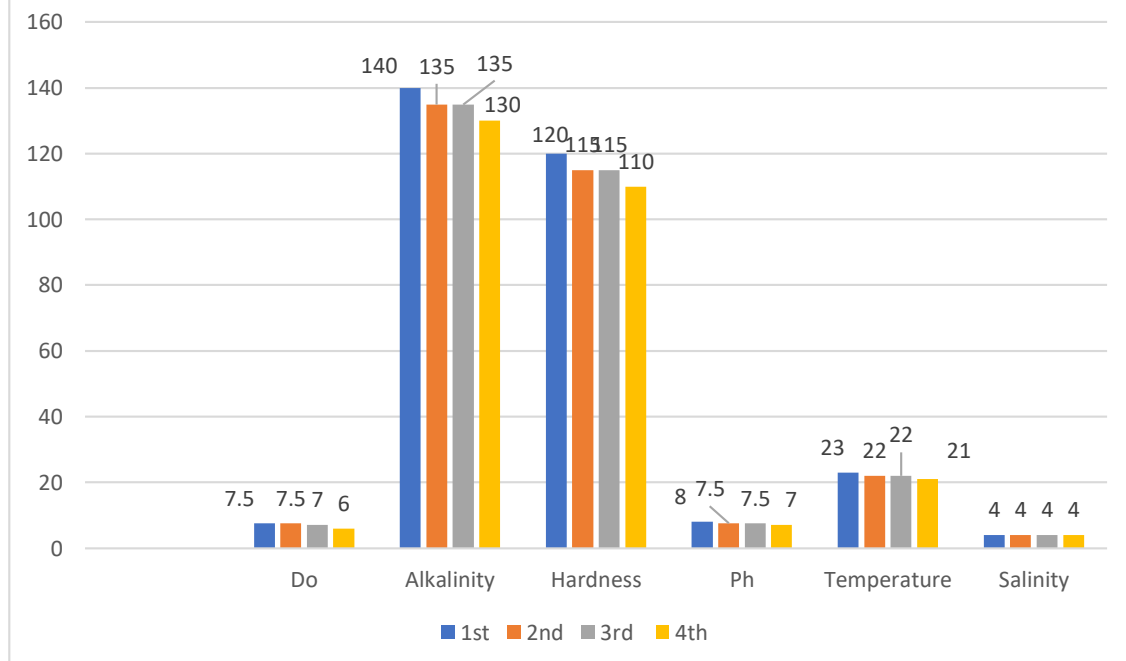
Parameter (Dec)	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>
Do	6.5	6	6	5.5
Alkalinity	135	125	125	125
Hardness	115	110	110	105
Ph	7.4	7.8	7.4	7
Temperature	30°C	28°C	25°C	21°C
Salinity	4	5	5	5





Water parameter report of January month of 2023.

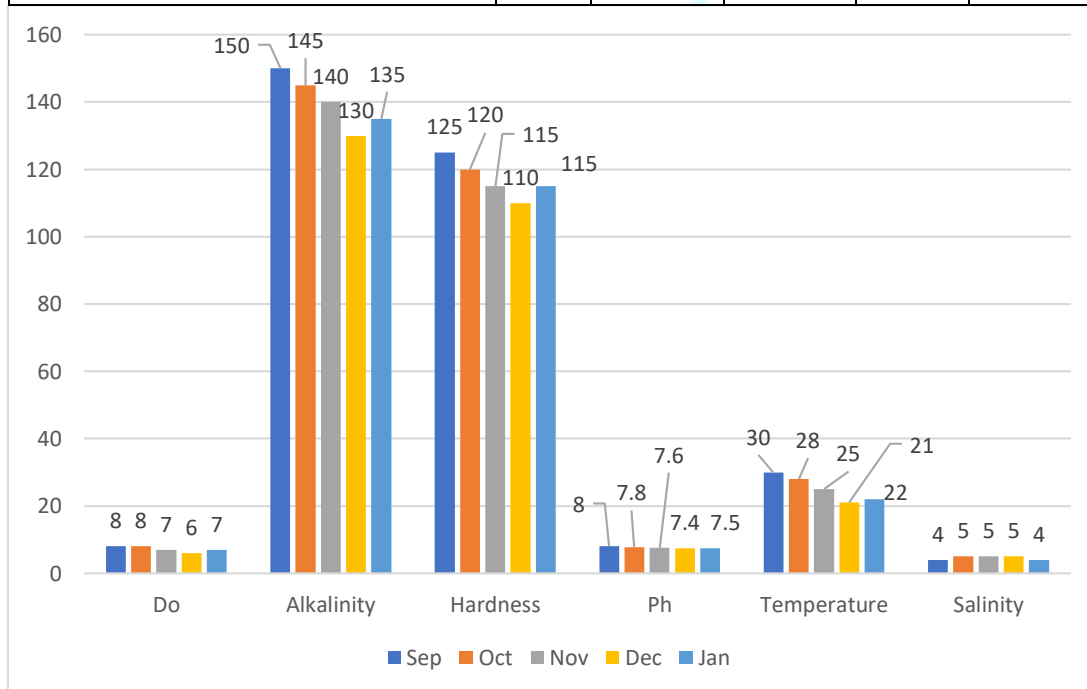
Parameter(Jan 2023)	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>
Do	7.5	7.5	7	6
Alkalinity	140	135	135	130
Hardness	120	115	115	110
Ph	8	7.5	7.5	7
Temperature	23°C	22°C	22°C	21°C
Salinity	4	4	4	4





## Water parameter report of September 2022- January 2023

Parameter (Sep2022-Jan2023)	Sep	Oct	Nov	Dec	Jan
Do	8	8	7	6	7
Alkalinity	150	145	140	130	135
Hardness	125	120	115	110	115
Ph	8	7.8	7.6	7.4	7.5
Temperature	30°C	28°C	25°C	21°C	22°C
Salinity	4	5	5	5	4



## DISCUSSION

In this study, Pygmy halfbeak (*Dermogenys collettei*) fish takes 90 days to mature from birth. After matures Pygmy halfbeak (*Dermogenys collettei*) fish hatch in every 30days on optimum environments. First month growth little slow compare to second month after born. Body shape of pygmy halfbeak (*Dermogenys collettei*) fish will be form properly in adult stage like Jaw portion modified to elongated from beak shape respectively younger to adult, not only body shape, anal fin colours of male species also become bright through red patch in adult stage. In this study, pygmy halfbeak (*Dermogenys collettei*) fish monitored in aquarium for five months from September 2022 to January 2023. I complete my work through breeding of this species from younger to adult stage, for that I take 40 species with male & female ratio respectively 1:3. Out of them one single species breeds 30 young's at a time after 90 days of stocking. Last month of my research, measured the highest length of male species is 5.3 cm and 8.4cm in female species that show 0.03cm is daily growth rate for male species and 0.05cm in female. It is an important tiny Surface feeder fish was abundant in Coastal Bengal even

few years back. But it is new scarcely found. As far my study they are becoming endangered due to the following reasons —

The natural water bodies of the Coastal belt of Purba Medinipur, west Bengal becoming a synchronising due to extreme population growth. More than 50% paddy fields of the Coastal area are now converted for Prawn, Shrimps and crab culture, so natural fishes are not getting their natural habitat. Due to over fishing they are not getting their normal habitat and breeding ground. Due to excessive pollutant like Petrol, Diesel, etc are mixing in the river mouths, creeks, khals etc for harbouring Creeks, the enormous number of mechanised boats which trawls for sea fishing. Moreover, the huge amounts of various chemicals are mixing in the river and canal waters from the high yielding prawns, Shrimps and crab culture fisheries. In the aforesaid condition the halfbeaks are not getting their Suitable ecosystem specially breeding ground like many Indigenous weed fishes, they are becoming threaten. At the Same time lack of knowledge of the Local people regarding the importance of biodiversity conservation and the lack of awareness It may extinct in near future like many other fish diversities.

## CONCLUSION

In this study, included breeding behaviour to growth factor with analysis of water parameter, references to aquatic environment that pull out various information that co-related with economic and social concept like entrepreneur scope, controlling malaria theory etc. Due to small & its different body shape, placed in aquarium that increased commercial value of this fish. In rural area it gives opportunities to earning through collect this species from natural water bodies and sell to market for aquarium species. Due to increased commercial value day by day, it becomes first row in aquaculture research topic that is scope of therapy, education, information, resources and empowerment in pisciculture industry.

## REFERENCES

Andersson (1994): Consequently, males are generally expected to invest more of their time and energy engaged in courtship behaviours to attract partners (inter-sexual selection) and agonistic behaviours towards rivals to compete for reproductive opportunities (Intra-sexual selection)

Berten *et al.*, (1991): Among aquarists, halfbeaks are perhaps best recognised for their elongated lower jaw the beak. Males especially use this beak during intersexual competition, by interlocking their beaks and “Wreatling” until a winner is determined.

Colenan *et al.*, (2009):Further-more, halfbeaks are sexually dichromatic, with males displaying on their fins (and to a lesser degree on the beak) that has been hypothesized to serve as asexual ornament in these fish.

Devigili *et al.*, (2021): Males readily engage in open fights with males, making it easy to study and quantity. Precopulatory male-male competition in this species. At the same time male are vigorous courters, spending around 30% of their time courting females.

Eschmery, William, N; Fricke, Ron and Vander Lann, Richard(eds). 2019:

"*Dermogenys collettei*" catalog of Fishes. California Academy of science. Retrieved 24 August 2019

Froese, Rainer, Pauly, Daniel, (eds)(2019)." *Dermogenys collettei* " in fish Base. April 2019 version.

Greven (2010): Pygmy halfbeak are sexually dimorphic in body, with adult females being larger than males, and sexually dichromatic with adult males expressing more red and yellow coloration than females, particularly on their modified and fins.

Greven, 2010). Experimentally examining shoaling behaviour in the zenarchopterid

*Dermogenys collettei* in the present study permits investigation of whether zenarchopterids also use shoaling as a defensive behaviour, and if their tendency to shoal is influenced by familiarity with (exotic) predators.

Ho, Jonathan (31 December 2015). "*Shoaling behaviour in the pygmy halfbeak Dermogenys collettei (Beloniformes: Zenarchopteridae): comparing populations from contrasting predation regimes*". *The Raffles Bulletin of Zoology*.

Marras et al. (2015): Certain environmental characteristics may also result in differences in locomotor behaviours, particularly when enabling or interfering with individuals' movement through the environment.

(Rosenthal,2017): Generally, devote time in choosing mates rather than courting them.

Reuland *et al.*, (2020): Female choose mates based on the amount of red coloration displayed by a male.

Ogden *et al.*, (2020): In this species, females give birth approximately every 30 days and males show a preference for females based on their breeding cycle.

Stark *et al.*, (2005): Males may also be more active than females, particularly is locomotors activity increases the probability of finding a mate.

