CHAPTER 7 - HABITAT AND ECOLOGY

7.1. INTRODUCTION

Ecological information of the natural habitat of fishes is very important for successful rearing, maturation, breeding and culture of that particular fish under captive condition. The fishes are widely distributed throughout central Africa, eastern and southern Asia from Pakistan through Thailand, Vietnam, Malaysia, India, China and north and east Korea and Japan (Forselius, 1957). For successful captive maturation and breeding of these indigenous ornamental fishes, suitable ecological parameters need to be established. The Gourami species are available in tropical fresh water zone. The fish mainly found in slow moving, heavy vegetated low land where they can hide properly (Menon, 1995; Froese *et al*., 2014). The natural territory of the fish includes ditches, canals, swamps, lake, river etc (Day, 1878; Rahman, 1989; Gupta and Banerjee, 2013). The fishes can survive in low oxygenated area due to the presence of labyrinth organ by which they can engulp oxygen from air and survive easily (Labyrinth fish Britannica, 1998). There are numbers of work done previously on manipulation of habitat preference of different fish species (Makori *et al*., 2017; Sahu and Datta, 2018). In case of *Ctenops nobilis*, except some scattered data about temperature range and natural habitat (Talwar and Jhingran, 1991; Baensch, 1991; Ng, 2005; Shafi and Quddus, 2001), no such proper scientific details on appropriate ecological parameters for captive rearing are available. Habitat inventory includes the hydrobiological parameters of the environment where the fishes were naturally found. After studying the natural ecological condition of the fishes,

it can be maintained in laboratory condition with nearly same habitat arrangements and water quality parameters. Without the preferable water quality parameters and habitat setup fish cannot grow and mature properly.

7.2. MATERIALS AND METHODS

7.2.1. Study in natural habitat:

Study of the hydrobiological and ecological parameters of natural habitat e.g. breeding and rearing grounds of Noble gourami fish were conducted in Assam and North Bengal at the time of fish collection (**Figure 30**).

Figure 30. Natural availability site of *C. nobilis*
(See colour photo in Plate No. VII, Fig. 18)

7.2.2. Habitat preference study in captive condition at CIFE, Kolkata:

Some of the natural habitat was simulate in the captivity for studying the convenient habitat preference for the fish (**Table 57**). In each experiment 12 numbers of fish (average size length 55±1 mm and weight 2±0.5 g) were stocked and they fed on Tubifex @ 2% body weight for twice a day. The experiments continue for 60 days during

this time water temperature varies between 30-34°C and pH was 7.8-8. Each aquarium contains a sponge filter and one aerator.

Table 57. Different habitat setups for captive rearing of *C. nobilis*

Sl. No.	Habitat Setup	Picture
1.	3 mm deep fine and soft sand bottom with a bush of *Vallesnaria* plant.	
2.	A 3inch diameter and 10 centimeter long fiber pipe and a bush of *Vallesnaria* plant	
3.	A 3inch diameter and 10 centimeter long fiber pipe and 3 mm deep fine and soft sand bottom with a bush of *Vallesnaria* plant.	

4.	2 mm deep medium sized gravel bottom with a bush of *Vallesnaria* plant.	
5.	3 mm deep small gravel bottom with *Hydrila* plant.	

7.2.3. Temperature preference study:

To study the effect of water temperature on growth and survival of the fish under captivity during December, 2016 to February, 2017 experiment arranged at CIFE, Kolkata. Juveniles (average size is 1.5 ±0.5 g in weight and 25±0.5 mm in length) were stocked for 90 days for these experiments. It was arranged in five distinct experimental units, in duplicate with thermostat heaters to study the effect of temperature. Each experimental tank contains 10 nos. of fish and they fed on Tubifex @ 2% body weight for twice a day. Habitat was arranged with hydrilla and stone bottom in every aquarium during the experimental period. The temperature variations were controlled by thermostat

(ambient temperature during the experimental period Max: 27.4 ± 2.3^0C, Min: 16.1 ± 2.5^0C), 20 ± 2^0C, 25 ± 2^0C, 30 ± 2^0C, 35 ± 2^0C (**Figure 31**). After 90 days of experiment condition factor, Specific Growth Rate (SGR), Food Conversion Ratio (FCR) and survival rate percentage calculated for each experiment.

Figure 31. Setting of thermostat for temperature intervention study
(See colour photo in Plate No. VII, Fig. 19)

7.3. RESULT

7.3.1. Ecological and hydro biological parameters of natural and captive condition:

As the fish is preferred to stay in stagnant or slow moving clear water bodies and weedy area so in captive condition the fish were maintained in confined aquarium with sufficient aquatic plants and soft sand. Study of natural habitat e.g. breeding and rearing grounds of test fishes were conducted at Teesta in Jalpaiguri and Brahmaputra at Assam. From that survey it is observed that the ideal temperature for the fish is around 20-30°C, pH is slightly alkaline, near about 7.6-8 during April to June, 2015. During monsoon

season (July to September) pH become little lower approx 6.8-7.2. After gaining the knowledge about the natural habitat and hydro biological parameters, almost same type of environments were provided in laboratory condition. The comparative studies of both natural and captive hydro biological parameters are tabulated in **table 58**.

Table 58. Comparative study of hydro biological parameters in natural and captive condition of *C. nobilis*

Parameters	Natural ecology	Captive ecology
Air temperature	21-32 $^{\circ}$C	22-34 $^{\circ}$C
Water temperature	20-30°C	20-32°C
pH	7.6-8.0	7.4-8.4
Hardness	110-130PPM.	98-112PPM.
Free CO_2	-	1-4PPM.
DO	6.5-7PPM.	6.0-7.5PPM.
Alkalinity	196-220PPM.	136-210PPM.
Nitrate	0.03PPM.	0.04PPM.
Total Ammonia	0.001PPM	0.001-0.002PPM

It is observed that as the fish is slow moving and shy in nature so they usually preferred to relax under the aquatic vegetation like, *Vallesnaria* sp., *Hydrilla* sp. etc and to stay in a sole (**Figure 32**). No such sand, gravel bottom or pipe hide out needed for the

fish as they prefer to stay surface level of the water due to their air-breathing capability by labyrinth organ.


Figure 32. Preferred habitat arrangements of *C. nobilis*
(See colour photo in Plate No. VII, Fig. 20)

7.3.2. Impact of temperature variation on *C. nobilis*:

Significant difference in the survival rate of fish with temperature changes observed from the above study. The experiment shows that, survival rate was highest at and 25 ± 2^0C (86.67%) and 20 ± 2^0C (83.33%) followed by control and in 30 ± 2^0C (76.67%) and lowest in 35 ± 2^0C (60%). The growth performance (SGR) was also highest in 25 ± 2^0C (0.62). FCR was lower in 35 ± 2^0C (1.15) and condition factor (K) was higher in 20 ± 2^0C (2.09), which indicates that the health condition is excellent (**Table 59**). The fish cannot tolerate large temperature fluctuation. In lower temperature (below 16^oC) they become cold arrest and they stop eating. At this time they prefer to stay at comparatively hotter place like beneath some busy plants. In much higher temperature (above 34^oC) bacterial infestation may arrived in fish. The changes of specific growth rate and condition factor with temperature flactuation are showed in **figure 33**.

Table 59. Impact of different water temperatures on *C. nobilis* under captivity

Treatments	Avg. WG (g)	FCR	SGR	K value	Survival %	Mortality %
Control (Max: 27.4±2°C, Min: 16.1±2°C)	0.49	1.58	0.54	1.99	76.67%	23.33%
T1 (20±2^{0}C)	0.46	1.65	0.51	2.09	83.33%	16.67%
T2 (25±2^{0}C)	0.56	1.73	0.62	1.95	86.67%	13.33%
T3 (30±2^{0}C)	0.42	1.28	0.46	1.65	76.67%	23.33%
T4 (35±2^{0}C)	0.38	1.15	0.42	1.12	60%	40%
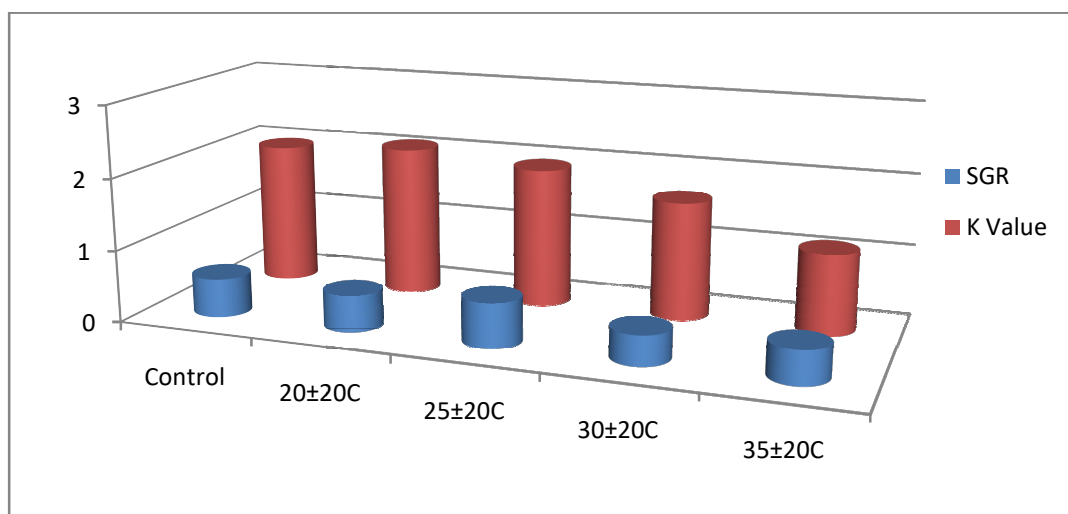
Figure 33. Changes of SGR and K value with temperature change for *C. nobilis*

(See colour photo in Plate No. VII, Fig. 21)

7.4. DISCUSSION

The fish are naturally found in little higher altitude and slow moving water area with high vegetation. The fishes are preferred to stay in sole. They are comfortable to stay in community aquarium but as they are very slow and shy in nature so they cannot fight for the food, due to this food availability problems may arrived for the fish in community tank. In the year 2005, Ng observed that the fish are found in average air temperatures between 15 – 32°C depending on locality and the present study also revealed that the fish generally found in that region where air temperature varies between 15 – 34°C. Baensch in the year 1991 recorded that the fish grow well within the temperature 20-24°C and in the present study it is observed that the temperature range of 20 ± 2^0C and 25 ± 2^0C give the better survival rate, condition factor and growth of the fish. Britz, 1992 also said that the preferable water temperature of the fish is 24°C. The FCR of the fish become higher in 25 ± 2^0C so it is assumed that in this temperature range fish can accept their maximum feed intake growth touch the highest point. With the increase of temperature the feed intake of the fish becomes lower. With the lowering of temperature the fishes like to hide themselves with aquatic vegetation which is quite similar behaviour, studied by Saffi and Quddus, 2001 where they observed that when the temperature decrease the fish hide in the root of water hyacinth. As the fish prefer to stay at surface level of water so aquarium cover is essential to avoid jumping out of the fish. The fish is very sophisticated so that appropriate water parameters are much need for captive rearing of the fish.