Studies on Growth and Feeding Biology of Chanda Nama (Hamilton, 1822) from Vettar River of Cauvery River Basin Nagore, Tamil Nadu

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***Abstract*- The present study was carried out to determine the Length-weight relationship and feeding biology of Chanda nama (Hamilton, 1822) belongs to Ambassidae was collected during the period between January 2017 and March 2017 from Vettar river near Nagore Cauvery river basin of Tamil Nadu. In this study based on 75 specimens consisting ranging 5.0-8.5 cm in total length and 1.20-5.66 gm in total weight. The length-weight relationship of Chanda nama shows negative allometric growth. The r2 values show the linear relationship between the length and weight of the specimens. The food items in the stomach of Chanda nama suggest that they are carnivorous. The gut content analysis was revealed that among the six different food categories only two items namely algae and crustacean appendages were abundant throughout the study period. The present study is useful for an efficient and meaningful exploitation and regulation of the Chanda nama fishery in Vettar river, due to important edible food fish around Nagore Cauvery river basin area.**

***Index Terms*- Length-weight relationship, Feeding biology, Chanda nama and Vettar river.**

I. INTRODUCTION

The aquatic resource of the seven southern Indian states – Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Pudhucherry, Goa and parts of Maharashtra – cover about 20 % of rivers and canals, 38.6 % of reservoirs, 50 % of tanks and ponds and 63 % of swamps and derelict water sources of India. In Tamil Nadu the major reservoirs are Mettur and Grand Anicut Jayaram (2010) published a survey of the entire river Cauvery system with a major account on fish fauna.

The fishes of the order Perciformes popularly known as elongate glass perchlet, (Silanthal in Tamil). The elongate glass perchlet, (Chanda nama) is a carnivorous, brackish water fish in the Asiatic glassfish family Ambassidae, of the only species in the genus Chanda. It is native to an area of south Asia from Pakistan to Burma, in the Indomalaya ecozone. The family includes eight genera and about 50 species. The family was formely known as the Chandidae, a name which ITIS continues to use. Fish Base notes that Ambassidae, which were named by Klunzinger in 1820, has priority over Chandidae, which was created by Fowler in 1905.

The elongate glassy perchlet reaches a maximum overall length of 11cm. They have short, deep and compressed body. Head is also short and compressed and the snout is sharp. Mouth is wide and turned upward in particularly. The lower jaw is longer than the upper one. Lips are thin. Villiform teeth are present not only on the jaws but also on the palate and tongue in certain species. The lower limb of preopercle has a double serrated edge, and the opercle has no prominent spine. Two dorsal fins are present which are continuous. Also, dorsal fin has forwardly directed recumbent spine. Caudal fin is forked. Scales are cycloid. Eyes are large and superior.

In the Ambassidae family, the fishes (Chanda nama) is economically important and distributed in brackish water system. Elongate glassy perchlet are presumed to be surface feeding fish. Glassfish are fast swimmers, and also seem to be playful. Obviously, avoid predators large enough to eat the glassfish. The species is known by a variety of names locally, including “perchlet” and several variations on its generic name (“chanda”, “channa”, etc); internationally it is also known as the elongated glassfish. The fish is well known as a Small

Indigenous Species (SIS) of fish of Bangladesh. Most of them are taken for drying in Northern region of Bangladesh. Glassfish are a schooling fish and prefer to be kept in groups of five or more. They can be kept in smaller numbers. It is very much famous food in rural Bangladesh. Good source of nutrition but low price in the market.

This species occurs in the clear freshwater of rivers, streams, canals, beels and both freshwater and brackish water. Especially in the rainy season these are abundantly found from the marginal area of the jute and paddy fields (Bhuiyan, 1964). It is hardy and can stand foul water. (Iqbal et al., 1995) also described about feeding habit of Chanda nama. The number of species are used as aquarium fish, noted for their transparent bodies. Growth of Chanda nama in rivers is strongly related to seasonal water flow like flood season. The growth can vary significantly with flooding intensity and duration (Welcomee, 1985), and it can be expected that this phenomenon is an important factor for flood plain fish catches in Bangladesh.

Studies on the aspects of biology of elongate glassy perchlet rich as growth pattern, reproduction, length–weight relationship, nutrition are necessary as they would furnish relevant information for the formulation of fisheries management policies (Everhart et al., 1975). Hence, the present work deals about the length-weight relationship and the feeding biology among Chanda nama from Vetter river. The length–weight relationship is particularly important in parameterizing yield equations and in estimations of stock size. This relationship is helpful for estimating the weight of a fish given length and can be used in studies of gonad development, rate of feeding, metamorphosis, maturity and spawning gonadal development and general well being of the fish population (Le Cren, 1951) and comparing the life history of fishes of different localities.

Length–weight relationship are useful in fishery management for both applied and basic use to (i) estimate weight from length observations, (ii) calculate production and biomass of fish population, and / or (iii) provide information on stock or organism condition at the corporal level. Length-length relationships (LLRs) are also important in fisheries management for comparative growth studies. Length–weight relationships for fish were originally used to provide information on condition of fish and to determine whether somatic growth was isometric or allometric. In fishery biology, Length–weight relationship are useful in determining weight and biomass when only length measurements available, as indications of condition and to allow for comparison of species growth between different regions (Koutrakis et. al., 2003). Besides the length-weight relationship can also be used in setting yield equations for estimating the number of fish landed and in comparing the population in space and time (Beverton and Holt, 1957).

Furthermore, length-weight relationship allow inter alia; i) estimation of average weight of the fish of a given length group (Beyer, 1987); ii) Conversion of length-growth equations to weight-growth equivalents (i.e., length-at-age to weight-at-age) in yield-per-recruit and related models; iii) inter specfic and inter population morphometric comparism of fish species; and iv) Assessing the relative well-being of fish populations. In tropical and subtropical waters, the growth fluctuation is more composition.

Length–weight relationships are of great importance in fisheries research because they provide information on population. First, a change in length and weight tells the age and year-classes of fishers, which is important in fishery. Secondly, the data can be used to estimate the mortality rate, and thirdly they can be used to assess the sustaining power of the fishery stock. In addition, the data on length and weight can also provided important clues to climatic and environmental changes, and the change in human subsistence practices (Pauly, 1984). Length and weight data are useful standard results of fish sampling programs (Morato et al., 2001).

Fish are said to exhibit isometric growth when length increases in equal properties with body weight for constant specific gravity. The regression coefficient for isometric growth is ‘3’ and values greater or lesser then ‘3’ indicate allometric growth. Condition factor studies take into consideration the health and general well – being of a fish as related to its environment; hence it represents how fairly deer bodied or robust fishes. It is one of the standard practices in fishery ecology that the individual fish species conditions determined based on the analysis of length – weight data reflected that the heavier fish at a given length is in better condition.

The study of the food and feeding habits of fish has received attention from various workers from

different angles although the methodology adopted has varied considerably. Hynes (1950) and Pillay (1952) have given their reviews with critical assessment of the various methods employed. Rounsefell and Everhart (1953) have described the different methods used for collection of the material for detailed study of the food and feeding habits.

Food habits and feeding ecology research is a fundamental tool to understand fish roles within their ecosystems since they indicate relationships based on feeding resources and indirectly indicate community energy flux which allows inferring competition and predation effects on community structure. Indian glassfish is usually found in shoals in the wild. Food is the main source of energy and plays an important role in determining the population levels, rate of growth and condition of fishes have a great significance in aquaculture practice. It helps to select such species of fishes for culture which will utilize all the available potential food of the water bodies without any competition with one another but will live in association with other fishes. The literature on the food and feeding habits of some Indian brackish water fishes are available viz., Labeo rohita, Catla catla major carps Ophiocephalus punctatus, Barbus stigma and Callichrous seenghala, Labeo bata and Labeo gonius, Labeo calbasu (Mookherjee et.al.,1947) and Puntius sarana.

2. MATERIALS AND METHODS

Study Area:

A branch of Cauvery river basin namely Vettar river was selected for this present study which is located in the region of 10049'N latitude and 79º 51' E longitude. The village of Nagore is very well renowned for its fishing activities as it is a traditional activity for the local community for more than a century., Currently all the boats in the region are berthed at the banks of vettar river which is about one km from Nagore. However, due to increase in population and the number of people involved in fishing activity. More than 4,307 people involved in fishing activities throughout the year. They are operating the cast net from catamaran and fishing boats. Thermacole are also used as a craft for fish catching. Gear lockers are provided for storing fishing maintenance gears (net cords, ring buoys, and sinkers, etc.), air tanks, oil, fishing crates, fishing boat maintenance equipment, and tools for commercial fishing to reduce the inconvenience and labour required for transporting fishing gear, and the installation of gear lockers is also necessary to improve fishing effort. The elongate glassy perchlet are economically important in the fish landing centre of Nagore Vettar River.

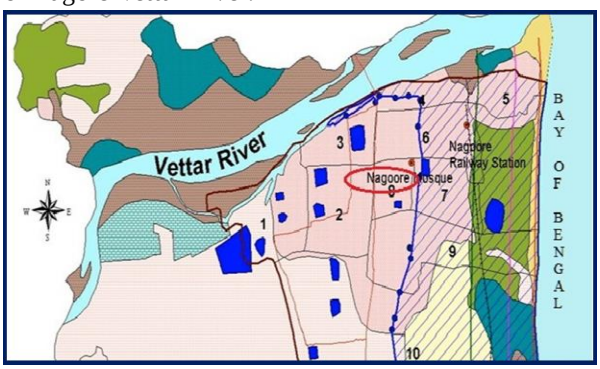

Figure 1: Sampling area in Vettar River near Nagore Cauvery river basin

Collection of specimen:

75 specimens of Chanda nama were collected from Vettar river during the period from January 2017 – March 2017. (Figure-2) They were captured by using a cast net and then the specimens were brought to the laboratory in an ice box. The specimens were mopped on filter paper to remove excess water from their body surface. Their total length was then measured using a ruler to the nearest one millimeter. The total length was measured as the distance from snout to the tip of the caudal fin. The body weight was taken to the nearest one gram.

Figure 2: *Chanda nama* (Hamilton, 1822)

Craft and Gear:

The fishermen at Vettar River used the catamaran and thermacole teppam as a major crafts for fishing. In addition, they are using tubes of four wheelers as

craft. Generally, cast net is used for fishing in this river. This net could be operated either from the bank of the river or by employing a craft. The size of the net ranges from 40-60 feets in radius. This hand operated net spreads out when thrown in to the water, trapping the fish. It is made up of either cotton or nylon thread.

Length-weight relationship:

The length-weight relationship was calculated by the least square method applying the Le Cren (1951) formula $W=aL^b$ or its logarithmic form, log a+b log L where W= weight,

L= length and 'a' and 'b' are constants.

A scatter plot of log body weight against log total length was made for the species. The regression of weight against length was computed from the relationship.

$W=aL^b$

Where;

W = weight (in gm.)

L = Total length (in cm.)

a = constant

b= Exponent of values between 2 and 5 (Tudorancea, 1988)

The log transformed data gave a regression equation.

Log W = log a + log b L Where,

a & b = constants

Food and feeding habit:

A total of 75 specimens of different size groups (5.0-8.5 cm) were collected weekly from a branch of Cauvery river basin namely vettar river, during the period of January – 2017 to March – 2017. The specimens were kept chilled in an ice box immediately after capture and brought to the laboratory for further examinations.

Total length (cm) and total weight (gm) of each specimen was immediately recorded. The stomach of each one was taken out and weight of the gut was noted with the help of electronic balance. Then, every gut was opened and the contents in it was observed and identified, and last the gut contents, were preserved in 5% formalin.

All the food contents were transferred in to Petridish containing known quantity of water. They were thoroughly mixed and were examined under the binocular microscope. The contents of the stomach were identified to the species level where possible and analyzed by the frequency of occurrence method.

The percentage occurrence of a particular food item was calculated on the basis of the following formula.

Percentage of occurrence of a food type =

$$\frac{\text{Number of gut where the food occurred}}{\text{Total no. of gut analyzed}} \times 100$$

3. RESULTS

3.1. TAXONOMY

Systematic position:

Kingdom	: Animalia
Phylum	: Chordata
Sub phylum	: Vertebrata
Class	: Pisces
Order	: Perciformes
Family	: Ambassidae
Genus	: Chanda
Species	: C.nama(Hamilton, 1822) Elongate glassy perchlet (Silanthal in Tamil)

Description:

They have short, deep and compressed body. Head is also short and compressed and the snout is sharp. Eyes are large and superior. Mouth is wide and turned upward. The lower jaw is longer than the upper one. Lips are thin. Villiform teeth are present not only on the jaws but also on the palate and tongue in certain species. The lower limb of preopercle has a double serrated edge, and the opercle has no spine. Laterally it's almost flat. (Figure-2)

Dorsal and ventral profile of this fish is almost equally convex. Lateral line is partly distinct, partly absent. Two dorsal fins are present which are continuous. A dark blotch is generally present on the upper edge of the dorsal fin. Also, dorsal fin has forwardly directed recumbent spine. Second dorsal spine is longest. Spines of first dorsal and rays of second dorsal gradually decrease in height. D1 is composed entirely of hard rays; D2 contains 1 hard ray and 8-18 soft rays.

Scales are minute and rounded. Scales cycloid, very small, about 125 in lateral series, frequently deciduous. Caudal fin forked. Body is transparent yellowish white with numerous tiny black dots. First dorsal and tip of second dorsal is deep black. Caudal fin is black and orange. A small black spot is found at the origin of the base of anal fin. (Rahman, 2005 and Bhuiyan, 1964).

Distribution:

They are found in India, Pakistan, Bangladesh, Nepal, Malaya, Burma and Thailand. In Sindh and Punjab, they are in abundance.

Remarks:

Chanda nama is the only species so far referred to the genus.

3.2. LENGTH-WEIGHT RELATIONSHIP

The length-weight relationship of 75 individuals of Chanda nama were randomly selected from vettar river during the period between January 2017 to March 2017. The total length of specimens 5.0-8.5 cm and total weight of 1.20-5.66 gm.

Length frequency distribution of January month

The total length ranged between 7.0-8.4 cm with corresponding total weight range from 3.42-5.22 gm. The r2 value of January month 0.95 and also b value 2.458. Table 1 & 2. Fig-3.

Length frequency distribution of February month

The total length ranged between 5.0-8.5 cm with corresponding total weight range from 1.20-5.66 gm. The r2 value of February month 0.96 and also b value 3.061. Table 1 & 2. Fig-4.

Length frequency distribution of March month

The total length ranged between 6.0-7.3 cm with corresponding total weight range from 2.04-3.86 gm. The r2 value of March month 0.73 and also b value 1.915. Tables 1 & 2. Fig-5.

3.3. FOOD AND FEEDING HABIT:

The result on the stomach contents of Chanda nama shows in Table 3. The stomach contents were made up of 6 categories. These were Algae (47.46%), Crustacean appendages (21.86%), Scales (11.7%), Insects (8.9%), Earthworm fragments (6.73%) and Prawn appendages (3.13%) as shown in Table-3.

The gut content of fish covers a variety of food items. The food types recorded are algae (Spirogyra, Clostridium, Scenedesmus, Zygnema, Oedogonium, Scenedesmus, Zygnema, Oedogonium, Ankistridesmus, Anabaena, Oscillatoria, Pediastrum. Juveniles feds on aquatic insect (mostly Ephemeroptera including Odonata and Coleoptera) and microcrustacea (Calanoid, Copepods, Cladocera, Isopoda and Amphipoda).

Monthly occurrence of food items:

The results on the occurrence of food items in Chanda nama from January 2017 to March 2017 are provided in Table 3. The food items namely algae, crustacean appendages, scales, insects, earthworm fragments and prawn appendages were reported throughout the study period.

Table-1: Length-weight range and Mean±SD of the Chanda nama from vettar river

Month and year	No. of Specimen	Length range (cm)	Weight range (gm)	Length		Weight	
				Mean	SD	Mean	SD
January 2017	10	7.0-8.4	3.42-5.22	7.7	0.4	4.4	0.5
February 2017	43	5.0-8.5	1.20-5.66	6.5	0.8	2.7	1.0
March 2017	22	6.0-7.3	2.04-3.86	6.6	0.6	2.7	0.5

Table-2: The length-weight relationship, r2 value, b value and growth pattern of Chanda nama

Month and year	Sample size	LWR	r^2	b value	Growth patterns
January 2017	10	Log w= 2.458 L=1.535	0.958	2.458	Negative allometric
February 2017	43	Log w=3.061 L=2.089	0.964	3.061	Negative allometric
March 2017	22	Log w=1.915 L=1.138	0.735	1.915	Negative allometric

Table-3: Monthly percentage composition of food items of Chanda nama

Month and year	No. of fish examined	Algae	Crustacean appendage	Scales	Insects	Earthworm fragments	Prawn appendages
January 2017	10	44.4	26.6	10.5	7.2	7.7	3.3
February 2017	43	48	20	13.3	10	6	2.6
March 2017	22	50	19	11.3	9.5	6.5	3.5
% of occurrence of average in 3 months		47.46%	21.86%	11.7%	8.9%	6.73%	3.13%

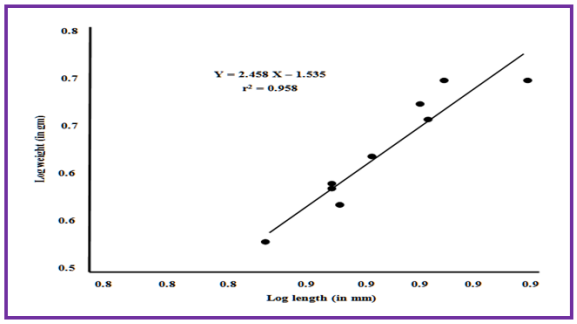

Figure 3: Logarithmic relationships between length and weight of Chanda nama in January 2017

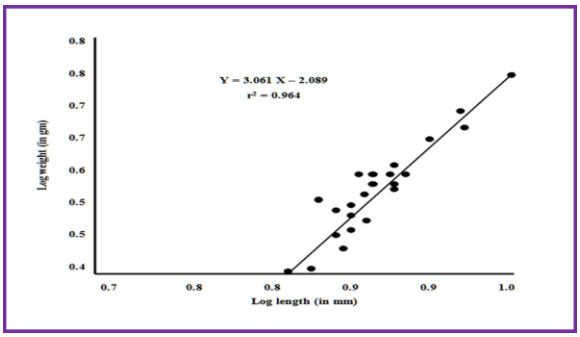

Figure 4: Logarithmic relationships between length and weight of Chanda nama in February 2017

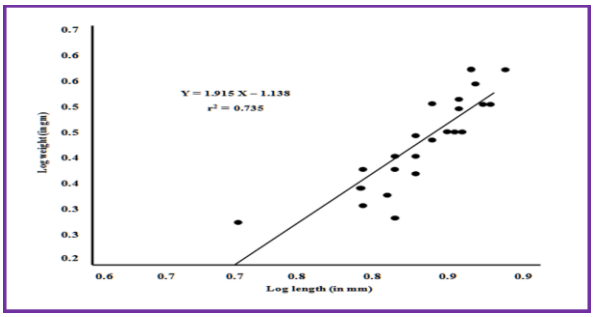

Figure 5: Logarithmic relationships between length and weight of Chanda nama in March 2017

The monthly percentage composition of food items are given in Table 3. The highest percentage of algae was recorded in the month of March 2017 (50%) and lowest on January 2017 (44.4%). The highest percentage of crustacean appendages was observed in the month of January 2017 (26.6%) and the lowest in March 2017 (19%). The highest percentages of scales were recorded in February 2017 (13.3%) and the lowest in January 2017 (10.5%). The highest percentage of Insects was noticed in February 2017 (10%) and lowest in January 2017 (7.2%). The highest percentage of earthworm fragments was recorded in January 2017 (7.7 %) and lowest in February 2017 (6%). The highest percentage of prawn appendages was recorded in March 2017 (3.5%) and lowest in February 2017 (2.6%) respectively. (Figure: 6 - 8)

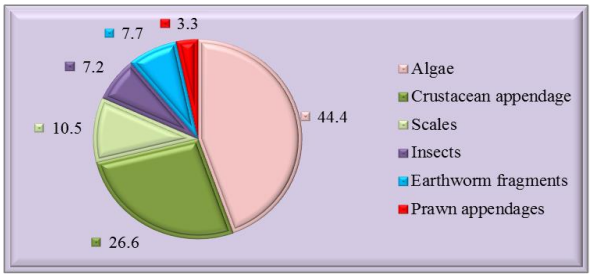

Figure 6: Monthly percentage composition of food items of Chanda nama during January 2017

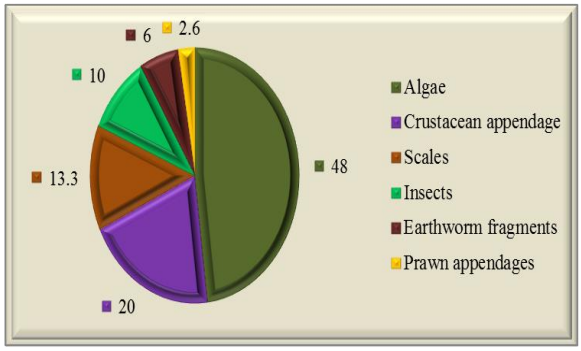

Figure 7: Monthly percentage composition of food items of Chanda nama during February 2017

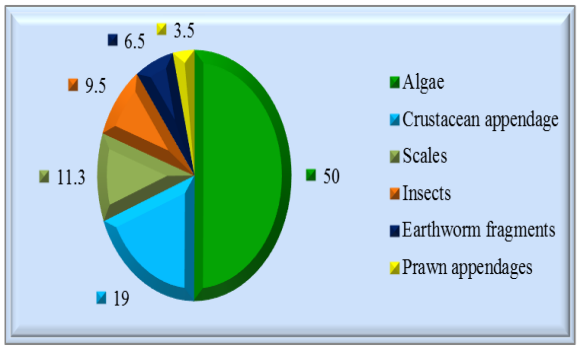

Figure 8: Monthly percentage composition of food items of Chanda nama during March 2017

4. DISCUSSION

The length-Weight relationship is helpful for estimating the weight of a fish of a given length and can be used in studies of gonad development, rate of feeding, matamorphosis, maturity and condition (Le Cren, 1951). The exponential value of the length-weight relationship b in Chanda nama given in Table 1&2, indicating there-by an negative allometric growth in the fish. According to Hile (1936) the value of b usually remains constant at 3.0 for an ideal fish. However Boverton & Holt (1957) suggested the departure of the 'b' value from 3 is rare in adult fishes.

Pathak (1975) reported 'b' value of less than 3 for males and females of Rasbora daniconius from Karnataka. Sunilkumar et al., (1999) opined that the exponential values for endemic catfish Horavagrus brachysoma do not significantly differ from 3 and Mercy et al., (2002) reported 'b' value of 3.04 for Puntius denisonii from Kerala and values above 3 are possible in some conditions such as in farming and other stress free environment. Generally, weight of the fish will be proportional to the cube of their length, based on its dimensional equality.

The present results were pooled samples exhibited negative allometic growth pattern and the data should that the deviation from the ideal condition. Commonly seen in most fishes both of the tropical and temperate regions are their 'b' value ranging from 2.7 to 3.3. Another example of species Heterobranchus logitinis which has negative allometric 'b' values ranging from 2.025 - 2.153. The overall result indicates that Chanda nama showed an almost negative allometric pattern of growth in this study.

Chanda nama is the only brackish water fishes in Asia reported to consume scales (Roberts, 1989). Scales provide lepidophagous consumers an abundant and rapidly renewable resource. Fish scales have substantial energy content but their nutritional value has not been investigated extensively. The major food items of Chanda nama in Vettar river of Nagore consisting Algae, Crustacean appendages, Scales, Insects, Earthworm fragments, and prawn appendages indicated that this species feeds on a large variety of food items. The other food items eaten by the fishes were regarded as not abundantly. The present status on the food of Chanda nama strongly suggested that this fish is an carnivorous. There is no sand particles in the gut of these fishes evidence that their feeding at the surface. Scale feeding in Chanda nama appears to be facultative, and adults also consume insects and microcrustacea.

Elongate glassy perchlet are presumed to be mid water and surface feeding fish and have been observed taking small scales which are detached and bloating near the water surface. This may also be true for Chanda nama. Ivlev (1961) suggested that the tendency of a particular animal to consume certain food items selectively in comparison to other is determined by its inherent properties. Prakash (1962) found in Salmon that its food changes with its locality and time (seasons) and sometimes when the normal food was not available salmon feed on alternate food. Bhatnagar and Karam-Chandani (1970) reported that Labeo fimbriatus fed on available food showing no preference for any particular type of food.

In a manner similar to Neotropical characids in the genus Roeboides, Chanda nama undergoes an ontogenetic diet shift from feeding primarily on invertebrates as juveniles to scale feeding as adults. Seasonal resource fluctuations could have been associated with temporal variation in the degree of lapidophagy observed in Chanda nama in the Manavalakurichy wetlands.

5. CONCLUTION

The present study was length-weight relationship and feeding biology of Chanda nama (Hamilton, 1822) from Vettar river, Tamilnadu. In the Ambassidae family, the fishes (Chanda nama) is economically important and distributed in brackish water system. Elongate glassy perchlet are presumed to be surface feeding fish. Glassfish are a schooling fish and prefer to be kept in groups of five or more. They can be kept in smaller numbers. Good source of nutrition but low price in the market. This species occurs in the both freshwater and brackish water. Especially in the rainy season these are abundantly found from the marginal area of the jute and paddy fields. The number of species are used as aquarium fish, noted for their transparent bodies. Growth of Chanda nama in rivers is strongly related to seasonal water flow like flood season. Length–weight relationships for fish were originally used to provide information on condition of fish and to determine whether somatic growth was isometric or allometric. Length–weight relationships are of great importance in fisheries research because they provide information on population. The study of the food and feeding habits of fish has received attention from various workers from different angles although the methodology adopted has varied considerably. Food habits and feeding ecology research is a fundamental tool to understand fish roles within their ecosystems since they indicate relationships based on feeding resources and indirectly indicate community energy flux which allows inferring competition and predation effects on community structure. Indian glassfish is usually found in shoals in the wild. The food items namely algae, crustacean appendages, scales, insects, earthworm fragments and prawn appendages were reported throughout the study period. Commonly seen in most fishes both of the tropical and temperate regions are their 'b' value ranging from 2.7 to 3.3. The overall result indicates that Chanda nama showed an almost negative allometric pattern of growth in this study. The present study is useful for an efficient and meaningful exploitation and regulation of the Chanda nama fishery in Vettar river,

due to important edible food fish around Nagore Cauvery river basin.

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