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Morphometric and meristic characters of *Dayella Malabarica* (Day 1873) *& Hyporhamphus Limbatus* (Val 1847)

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Abstract
The morphology of fishes is the primary source of information for taxonomic and evolutionary studies. The present work aims to study the length-length relationship and meristic characteristics of two indigenous fresh water species, *Dayella malabarica* and *Hyporhamphus limbatus*. Both fishes are of great demand as food fish as well as in ornamental fish industry. Fish samples were collected by the fisherman from Kole wetlands of Thrissur district during the month of October 2013. 10 morphometric and 6 meristic counts were recorded from a total of 60 specimens. *Dayella malabarica* specimens ranging from 4.7 to 6.6 cm Total Length and *Hyporhamphus limbatus* specimens ranging from 7.4 cm to 12 cm Total Length were used for the morphometric and meristic studies. Fish length measurements form the important resource for stock assessment and management including evaluation of population age structure and biomass for harvest regulations and habitat protection. Hence forth the present study helped in revealing more about stock for conducting sustainable fisheries in ornamental fish industry.

Keywords: *Dayella malabarica, Hyporhamphus limbatus,* morphometric and meristic characteristics

1. Introduction
The morphology of fishes forms the primary source of information for taxonomic and evolutionary studies. There are numerous characters available for morphological study. These characters are most commonly divided in to two categories: morphometric and meristic. Morphometric characters are the measureable structures such as fin length, head length, eye diameter or ratios between such measurements. Meristic characters include almost any countable structure, including fin rays, scales, gill rakers, and so on.

The study of morphometric and meristic characterstics of two indigenous species of fresh water fishes, *Dayella malabarica* and *Hyporhamphus limbatus* are accounted here.

Dayella malabarica, the Day's round herring, is a relative of the herrings that is endemic to southwestern India. It is the only species in its genus. It is a small fish inhabiting both lowland rivers and the area where rivers reach the backwaters. It is not present in any protected areas [12]. According to IUCN Red List it is of Least Concern but it is considered as critically endangered [15].

Hyporhamphus limbatus, Congaturi halfbeak, was originally described from India; its range extends from the Persian Gulf to China along the mainland coast of Asia [6]. In Asia, it is known from India, Sri Lanka, Myanmar, Thailand and China [26]. It has a stable population trend and it's of least concern according to IUCN list [12].

Dayella malabarica and *Hyporhamphus limbatus* are two indigenous freshwater fishes of Kerala well distributed all over the lowlands. They are also well distributed in the Kole wetlands of Thrissur also. Both of them serve as food fish as well as indigenous ornamental fishes which has good demand in the market. These small indigenous species (SIS) used to be abundantly available in rivers, streams, ponds, beels, ditches and floodplains in the past in the South Asian countries [2,3], but the populations have seriously declined or on the verge of extinction due to over exploitation and various ecological changes in its natural habits which in return, severely affects biodiversity [3], but the populations have seriously declined or on the verge of extinction due to over exploitation and various ecological changes in its natural habits which in return, severely affects biodiversity [3,18]. In order to manage endangered species effectively, it is necessary to identify the reason for decline and a severe understanding of the ecology of the target species [16].

Standing stock, yield and biomass are frequently estimated from length frequency data and length–length relationships are useful for standardization of length type when data are summarized [24]. LLR is important for comparing growth. In the field, the tail flukes are often cut knowing the standard length will enable to figure out the total length [14]. Length-length relationships are generally used to assess the influence of food composition changes, environment changes, rate of spawning in fish [1]. LLR's help in the inter-conversion of total length data with other morphometric charac ters in fishes [17]. Length–length relationships were studied by Subba and Moutopoulos [19, 25] and Mophometric relationship in genus labeo and puntius was studied by Choudhury [4, 5].

This work will contribute data in the field of length-length relationships and meristic characters of *Dayella malabarica* and *Hyporhamphus limbatus* which is useful in fisheries statistic studies and stock assessment studies.

2. Materials and Methods

Fish samples were collected by the fisherman from Kole wetlands of Thrissur district during the month of October 2013. The fish was collected using cast nets. Fishes collected from sampling locations were preserved in 7% formaldehyde and brought to the laboratory for the studies. Species identification was carried out using standard references such as Day [7], Jayaram [13] and Talwar & Jhingran [26]. Lengths of fishes were measured with mm scale and calipers. Linear measurement of the body or its parts or of any structure thereon is the subject of morphometry. Total length, Standard length, Fork length, Head length, Post orbital length, Snout length, Body depth, Eye diameter, Pre dorsal length and Pre pectoral Length are measured here. Meristic characters are those characteristics which can be counted such as scales, fins and fin rays, etc. A total of 60 specimens were studied, 30 specimens each of *Dayella malabarica* and *Hyporhamphus limbatus.*

3. Result & Discussion

Dayella malabarica specimens ranging from 4.7 to 6.6 cm Total Length was used for the morphometric and meristic studies. The main morphometric and meristic data are reported in Table I and Table V respectively.

Hyporhamphus limbatus specimens ranging from 7.4cm to 12cm Total Length was used for the morphometric and meristic studies. The main morphometric and meristic data are reported in Table III and Table VI respectively

Systematic position

I. Kingdom: Animalia

Phylum: Chordata
Class: Actinopterygii
Order: Clupeiformes
Family: Clupeidae
Genus: *Dayella* (Talwar & Whitehead, 1972)
Species: *Dayella malabarica* (Day 1873)
Common Name: Day's round herring
Vernacular Name: Chooda/ Kozhuva in Malayalam

II. Kingdom: Animalia

Phylum: Chordata
Class: Actinopterygii
Order: Beloniformes
Family: Hemiramphidae
Genus: *Hyporhamphus*
Species: *Hyporhamphus limbatus* (Val 1847)
Common Name: Congaturi halfbeak
Vernacular Name: Kolaan in Malayalam.

Fig 1: *Dayella malabarica* (Day 1873)

Fig 2: *Hyporhamphus limbatus* (Val 1847)

Table 1: Morphometric Measurements of *Dayella Malabarica* (N=30) Form Kole Wetlands.

S. No.	Parameters	Min (cm)	Max (cm)	Mean±SD	TL%/Mean
1	Total Length	4.7	6.6	5.86±0.476	
2	Standard Length	3.8	5.5	4.88±0.397	83.276%
3	Fork Length	4.2	6.5	5.38±0.526	91.808%
4	Head Length	1	1.9	1.27±0.191	21.672%
5	Pre Dorsal Length	1.8	3.2	2.363±0.338	40.324%
6	Post Dorsal Length	1	3.1	1.87±0.667	31.911%
7	Snout Length	0.2	0.5	0.37±0.059	6.313%
8	Body Depth	0.31	0.57	0.434±0.050	7.406%
9	Pre Pectoral Length	1	3.6	1.753±0.770	29.914%
10	Pre Pelvic Length	1	3.2	2.286±0.567	39.01%

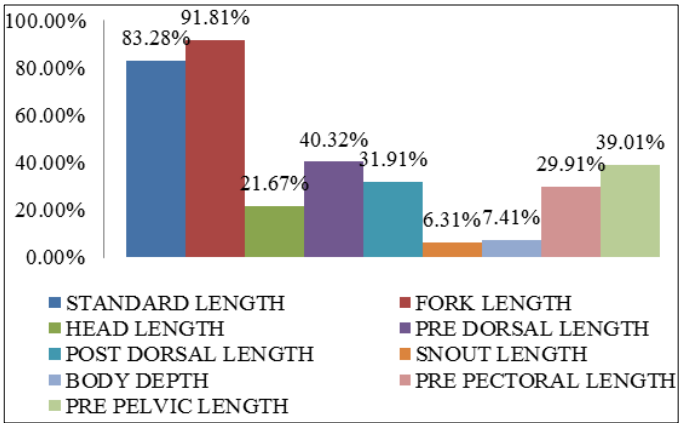

Fig 3: Morphometrics expressed as percentage of total length in *dayella malabarica*

Table 2: Size frequency distribution of *dayella malabarica* from kole wetlands

S. No	Total Length (CM)	Frequency
1	4.5-5.0	1
2	5.0-5.5	4
3	5.5-6.0	10
4	6.0-6.5	12
5	6.5-7.0	3

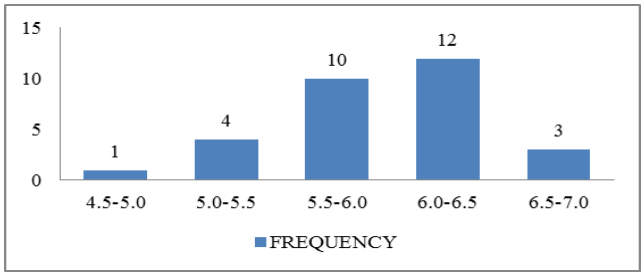

Fig 4: Size frequency distribution of *dayella malabarica* from kole wetlands

Table 3: Morphometric measurements of *Hyporhamphus limbatus* (n=30) form kole wetlands

S. No.	Parameters	Min (CM)	Max (CM)	Mean ± SD	TL%/Mean
1	Total Length	7.4	12	10.013 ± 0.926	
2	Standard Length	6.5	10.4	8.806 ± 0.832	87.945%
3	Fork Length	6.9	18.2	9.84 ± 1.838	98.272%
4	Head Length	2.2	3.7	3.12 ± 0.402	31.159%
5	Pre Dorsal Length	5	8.3	7.083 ± 0.70	70.738%
6	Post Dorsal Length	0.5	2.8	1.613 ± 0.677	16.109%
7	Snout Length	1.2	2.9	2.106 ± 0.350	21.032%
8	Body Depth	0.19	0.62	0.418 ± 0.093	4.174%
9	Pre Pectoral Length	2.2	4.8	3.283 ±0.525	32.787%
10	Pre Pelvic Length	4.2	6.6	5.613 ± 0.538	56.057%

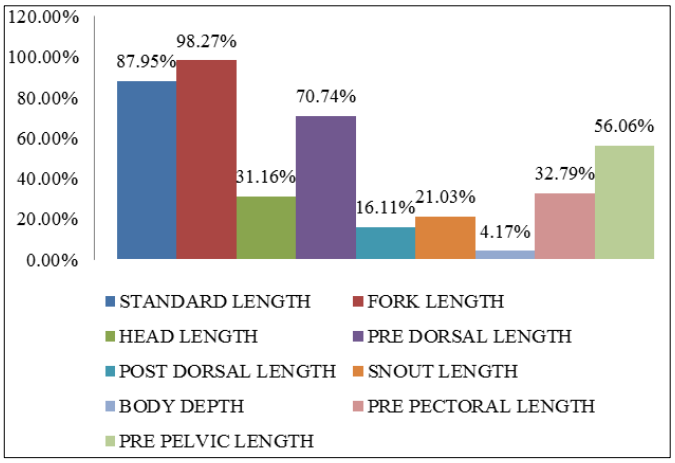

Fig 5: Morphometrics expressed as percentage of total length in *Hyporhamphus limbatus*

Table 4: size frequency distribution of *Hyporhamphus limbatus* from kole wetlands

S. No	Total Length (CM)	Frequency
1	7.0-8.0	1
2	8.0-9.0	1
3	9.0-10.0	12
4	10.0-11.0	10
5	11.0-12.0	5
6	12.0-13.0	1

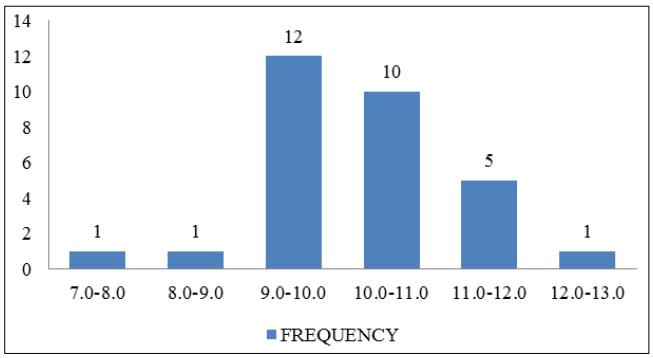

Fig 6: size frequency distribution of *hyporhamphus limbatus* from kole wetlands

Table 5: meristic counts of *Dayella malabarica*

Meristic data	Number
Dorsal fin rays	iii 10
Anal fin rays	iii 15-16
Pectoral fin rays	i 12
Pelvic fin rays	i 7
Caudal fin rays	ii 26-27

Table 6: meristic counts of *Hyporhamphus limbatus*

Meristic data	Number
Dorsal fin rays	14
Anal fin rays	14
Pectoral fin rays	i 10-11
Pelvic fin rays	5
Caudal fin rays	19
Lateral line scale	40-62

Fig 3 represents the morphometrics expressed as percentage of total length in *Dayella malabarica*. Table 2 presents the size frequency distribution of *Dayella malabarica* with its representation in Fig 4. Fig 5 represents the morphometrics expressed as percentage of total length in *Hyporhamphus limbatus* Table 4 presents the size frequency distribution of *Hyporhamphus limbatus* with its representation in Fig 6.

The total length of *Dayella malabarica* is from 4.7 to 6.6 cm with the mean and standard deviation 5.86 and 0.476 respectively. Mean standard length was 4.88 cm; it was 83.276 percent of total length. The fork length was 91.808 percent of total length whereas the snout length was six percent. Fig 4 represents the length frequency data. On grouping the fishes into five groups of 0.5cm length difference, minimum number of fish was observed in 4.5-5.0cm group with a single fish. The maximum length of fish was 6.6cm. The dominant size group was 6.0-6.5 followed by 5.5-6.0 and 5.0-5.5. The standard length of the fish ranged from 3.8 to 5.5cm. Average fork length was 5.38 and mean head length 1.27.

The total length of *Hyporhamphus limbatus* is from 12 to 7.4 cm with the mean and standard deviation 10.013 and 0.926 respectively. Mean standard length was 8.806 cm; it was 87.947 percent of total length. The fork length was 98.272 percent of total length whereas the snout length was 21 percent. Fig 4 represents the length frequency data. On grouping the fishes into six groups of 1.0cm length difference, minimum number of fish were observed in three sets, they are 7.0-8.0, 8.0-9.0 and 12.0-13.0cm group represented with a single fish in each. The maximum length of fish was 12cm. The dominant size group was 9.0-10.0 followed by 10.0-11.0 and 11.0-12.0. The standard length of the fish ranged from 6.5 to 10.4cm. Average fork length was 9.84 and mean head length 7.083.

Dayella malabarica and *Hyporhamphus limbatus* serve as food fish as well as indigenous ornamental fishes which has good demand in the market. The morphometric relationships between length and weight can be used to assess the wellbeing of individuals and to determine possible differences between separate unit stocks of the same species. Hence the present study helps to know more about the stock and conduct sustainable fisheries for ornamental fish industry.

4. Conclusion

Kolelands of Thrissur, which is a part of Vembanad- Kole wetlands cited under Ramsar Site, is also a highly productive region. *Dayella malabarica* and *Hyporhamphus limbatus* are fish species which are easily available in large numbers in Kole wetlands of Thrissur. Morphometric and meristic studies of different marine and fresh water species are carried out in different parts of world as well as in India, much concentration is not given in the studies of *Dayella malabarica* and *Hyporhamphus limbatus* in Kerala. Both of them are used up as food fish as well as indigenous ornamental fishes has good demand in the market. This paper provides information on the length- length relationship and meristics of commercially important *Dayella malabarica* and *Hyporhamphus limbatus* in Kole wetlands of Thrissur. The results of the work yield valuable data for fish collectors hunting for appropriate sized fishes. It provides essential data on the fish population, the growth pattern and the dominant size group thereby helping the trade turn a scientific sustainable venture.

Population survey and stock assessments are urgently needed to establish the status of the wild stocks in terms of abundance and distribution, as well as ecological requirements for the successful proliferation of the species. A total ban should be put to destructive fishing practices and law enforcement enhanced during the breeding season. So everyone should be aware of the situations and try to conserve our wetlands at its best, saving the nature for the next generation.

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