AIRO JOURNALS

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Peer Reviewed
Multidisciplinary
National

ISSN: 2321-3914
Volume 2 Issue3
June 2021
Impact Factor: 11.9
Subject: Zoology

Phylogeny of the animal world

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Session: 2015-16

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ISSN: 2321-3914
Volume 2 Issue3
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Abstract

In recent years, research on the phylogeny of animals has advanced significantly. Regarding several profound animal connections, including the monophyly of animals, Bilateria, Protostomia, Ecdysozoa, and Spiralia, there is widespread agreement. The stability now enables academics to construct alternate theories for the dwindling number of unanswered problems. The connections at the base of the animal tree, the placement of Xenacoelomorpha, and the internal relationships of Spiralia are some of the unanswered mysteries. Our comprehension of the evolution of development, morphology, genomes, and other characteristics has been significantly impacted by recent developments in the study of animal phylogeny. A startling trend appears: even amid many complicated traits like segmentation and nervous systems, there is far more homoplasy for all these characters than was previously thought. The fossil record places the roots of the majority of the deep animal tree branches in the Late Neoproterozoic and an evolutionary radiation in the Early Cambrian.

Keywords: Phylogeny, Protostomia, Ecdysozoa, Cyprpaniedae.

1. Introduction

This extremely diverse genus, which belongs to the Teleostei family of fish called Cyprinidae, has over 280 recognised or valid species of tropical Asian river fish called Puntius. In South Asia (from Pakistan in the west to Sri Lanka in the south), Mainland Southeast Asia, Taiwan, and South China, Puntius is a prominent part of the freshwater fauna and is widespread throughout (Froese et al., 2016; Tan and Armbruster, 2018; Ren et al., 2020). Along with being important in terms of shape, biology, and taxonomy, these fish are also notable in terms of beauty and economic importance. In his book from 1822, Francis Buchanan-Hamilton recognised and described the Puntius genus. The Puntius complex, which is the more accurate name for the genus, has been used as a catch-all term for an artificial categorization that often includes a variety of various small to medium-sized cyprinids. In this genus, the exact number of recognised species has changed throughout time. There are 39 Puntius species found in India out of the 53 verified Puntius species worldwide (Jayaram, 1991). The genus in South Asia, according to Talwar and Jhingran (1991), comprises 48 real species. There are now 50 recognised species of Puntius (Froese and Pauly, 2021). Members of the Puntius complex have had a large number of new species identified in the last ten years, and many more are currently

ISSN: 2321-3914
Volume 2 Issue3
June 2021
Impact Factor: 11.9
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being found and described. Additionally, a number of the species that were in the catch-all "genus" have been transferred to different genera. The scientific community is still arguing and reaching consensus on this subject as new genera and species continue to be reported. Additionally, the combination of cutting-edge approaches with traditional ones in fisheries research may provide a fresh perspective and enhance interpretation of fish resources.

The Bangla term for little cyprinids, Pungti, which has the pronunciation Puti, is where the name Puntius comes from. In binomial nomenclature, the five-Kingdom categorization system is used. The kingdom Animalia, the phylum Chordata, the class Actinopterygii, the order Cypriniformes, the family Cyprpaniedae, and ultimately the genus Puntius have all been assigned to Puntius (Table 1).

Table: 1. Systematic position of the genus Puntius (Hamilton, 1822)

Classification
Kingdom Animalia
Phylum Chordata
Subphylum Vertebrata
Class Actinopterygii
Superclass Gnathostomata
Order CYPRINIFORMES
Suborder Cyprienoidei
Family CYPRPANIENIDAE
SUBFAMILY BARBINAE
Genus *Puntius*

1.1.Objective of the study

- To describe the numerous Puntius species using both conventional and contemporary methods
- To determine the phylogenetic link between the different Puntius species
- To assess Puntius's gonads' cycle of development and depletion.

2. Literature Review

Since various fish families are covered by different genera and numerous species that have a striking likeness in appearance, any least or non-selective equipment (gear) exploits a

ISSN: 2321-3914
Volume 2 Issue3
June 2021
Impact Factor: 11.9
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considerable number of nontargeted fish species in a single catch. When closely related species are analysed as a single taxonomic species in biological research, such as growth, spawning, fecundity, and other factors, there is a probability that at least two closely related species will be misclassified, leading to inaccurate interpretation (Sahayak, 2003). It is crucial to have a solid understanding of the taxonomy of the fish species that are important to fisheries as well as the capacity to accurately identify them at the species level. Morphological traits may be used to distinguish species, and they are also the best method for separating subspecies or stocks, especially in cases when resources are being overused. Excluding it from all evaluations of species yields no helpful results since the capacity to discriminate between species is highly important.

In recent years, environmental preservation has drawn increased attention. Without a solid grasp of the species that make up biodiversity, it is impossible to effectively handle biodiversity concerns and conservation. This is especially true for tropical ecological units where a variety of species, from lower invertebrates to larger vertebrates, coexist in distinct clusters. Freshwater fish are among the most endangered species; more than 20% of them are in danger, and many of their species are already "extinct" or "extinct in the wild" (Darwall and Freyhof 2016; Pinder et al., 2019). It is thought that species conservation and taxonomy research go hand in hand (Mace, 2004). Consequently, taxonomic investigations are necessary for any in-depth study of species and ecosystems. Furthermore, conventional taxonomic research in fisheries science cannot be outdated. Important scientists have acknowledged their complete trust in taxonomy.

The classification of fish, particularly many tropical species, continues to be difficult. For many species, failure to identify species still poses significant obstacles to the gathering of useful data, and incorrect species identifications can provide a challenge for taxonomic difficulties (Gibson, 2005). The accuracy of data on the geographic and ecological ranges, ecological requirements, and developmental physiology of poorly known fishes are jeopardised by incorrect identifications and a failure to recognise species diversity. This highlights the problems with the current level of systematic taxonomy.

3. Methods

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In Dunaliellatertiolecta cultures, both live and pasteurised, and with or without antibiotics, Ciliates culture may flourish. A green algae culture was maintained at a salinity of between 15 and 33. 12 grammes of Red Sea salt and 500 cc of distilled water were purchased for 15 cents. 18.5 grammes of Red Sea salt and 500 ml of distilled water are combined in a conical flask and mixed to dissolve the salt. Each conical flask should contain 700 ml of Walne's medium, one drop of Benexa, and then 100 to 150 ml of a previous culture of Dunaliella.

Walne‘s medium:

- Stocks per 100 ml:

1. Trace metal solution (TMS)

- $ZnCl_2$ 2.1 g
- $CoCl_2.6H_2O$ 2.0 g
- $(NH_4)_6Mo_7O_{24}.4H_2O$ 0.9 g
- $CuSO_4.5H_2O$ 2.0 g

Make 100 ml of distilled water maximum. Normally, this solution is hazy. To create a transparent solution, acidify adding a few drops of strong HCl.

4. Result and Discussion

Small ciliates belonging to the genus Tetrahymena were formerly known by the names Leucophyres and Glaucoma (Furgason, 1940). Tetrahymena species are widely distributed around the world. They have eight ciliated membranes, including three adoralmembraneles and four oral, undulating, and membranelles.All Tetrahymena members have transcriptionally active macronuclei (Simon et al., 2008). Tetrahymena species grow quickly on axenic media, making them a model organism for physiology and biochemistry study (Hill, 1972; Elliott, 1973). Compared to the yeast model, Tetrahymena exhibit more genetic similarity to humans and have a greater level of functional conservation with human genes (Eisen et al., 2006).

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- Pear-shaped microorganisms may be found in practically all freshwater settings. Size in vivo: 35–50 m length, 15–25 m breadth.
- The oral apparatus is visible as a tiny chamber in the ventral aspect of the cell and is situated on the anterior end of the cell.
- Tetrahymena's macronucleus is larger and its micronucleus is smaller.
- Tetrahymena can swim quickly in the medium thanks to rows of cilia covering the surface of the cell. In order to get the food particles into the mouth, cilia produce currents (cytostome).
- A single contractile vacuole situated in the back.

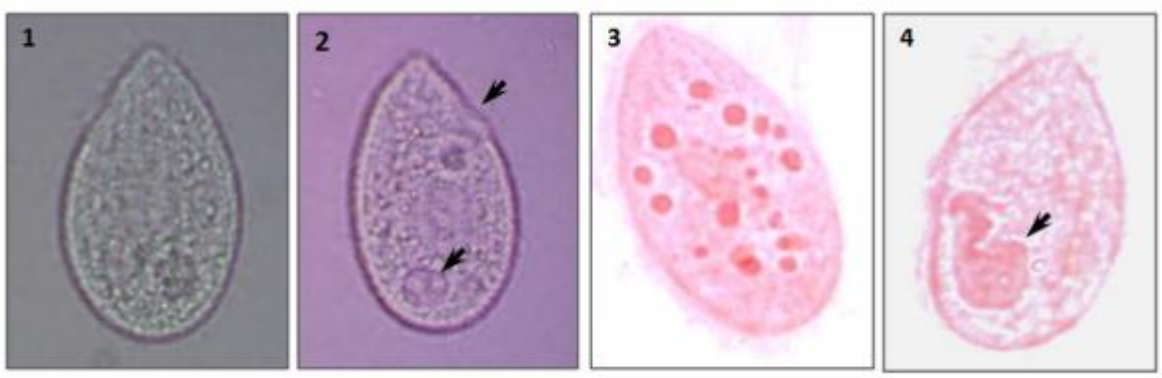

Figure: 1. 1) Tetrahymena sp. (ML3) in vivo; 2) The arrow denotes the oral apparatus (Cytostome) of a living cell; the arrow denotes the contractile vacuole (CV); 3) The food vacuoles of Tetrahymena sp. are hematoxylin stained (dark pink in hue); and 4) The arrow denotes the macronucleus of Tetrahymen

5. Conclusion

Several teleosts of the genus Puntius may be found in the freshwater habitats of the South East, South Asia, and South China (Hamilton, 1822). The fish in this group are classified as belonging to the subfamily Barbinae, family Cyprinidae, and order Cypriniformes. Puntius is a major genus in terms of morphology, biology, taxonomy, and economic value. In addition to a huge number of potentially cryptic species, the genus already comprises 50 recognised species, and new species are continuously being discovered and described (with many in the pipeline). Members of this genus are regarded as one of the taxonomically difficult fish

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groupings and are currently being reviewed by fish taxonomists worldwide due to their overlap in important identifying characteristics and complicated evolutionary history. Along with nomenclatural alterations, this genus has undergone several taxonomic changes. Additionally, the Cyprinidae family, to which this genus also belongs, has remained divisive. When identifying Puntius at the species level, species are often misidentified. The taxonomic problems of the Puntius species complex must thus be resolved. Despite being crucial to the management of both fisheries and aquatic ecosystems, research on the taxonomy and biology of Puntius has been conducted rather seldom in India, according to the literature. There are several holes in our understanding of the taxonomy, population dynamics, and reproductive biology of Puntius species. Closely related species are often difficult to distinguish using morphological characteristics.

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ISSN: 2321-3914
Volume 2 Issue3
June 2021
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Volume 2 Issue3
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