

Studies on The Architectural Plan of the Gas Exchange Machinery (Gill Sieve) of *Danio Acquipinratus*



Aparna
Research Scholar
P.G. Dept. of Zoology
B. R. A. Bihar University,
Bihar, India

ABSTRACT

Fishes are primarily water breathers using their gills and integuments for gaseous exchange from water. The gills of the fishes have the dual function of maintaining osmotic balance and gas exchange in aquatic medium. Its efficiency depend on various factors such as :

- i. The effective gill surface area.
- ii. The nature of blood water pathways.
- iii. The counter current flow of blood and water.
- iv. Nature of respiratory pigment.

To study the gill dimensions is one of the fascinating problems for modern fish respiratory physiologist.

Keywords : Gaseous exchange, Osmotic balance, Counter – current flow Respiratory pigment.

I. INTRODUCTION

Oxygen and CO_2 dissolve in water and most fishes exchange dissolve oxygen CO_2 in water by means of the gills. The gills are protected by a gill cover in fishes.

Various parameters of gills to be studied.

They are: -

- i. Total number of gills filament.
- ii. Average filament length.
- iii. Total filament length.
- iv. Secondary Lamella.

II. MATERIALS AND METHODS

Danio aequipinnatus (Mc. Cleu) is a hill stream fish belonging to :

Family : Cyprinidae

Order : Cypriniformes

with silvery body.

It feeds on the periphyton attached to the stony substratum.

Twenty eight (28) specimens of body weight ranging from 0.512 to 10.622 gr. were preserved in Bowin's fluid for gill morphology.

The gill arches were stained with borax carmine. The number of secondary Lamellae was determined under calibrated ocular micrometer. The number was doubled to the total number ($n = \frac{2}{d}$) of secondary Lamellae / mm.

Average bilateral area of 2^{ndary} Lamellae was determined by a graphical method. The number of 2^{ndary} Lamellae of all the sections were summed up and divided by the total length to obtain a weighted value of Lamellae.

III. RESULTS

Structure of gills and respiratory surface area in relation to body weight :-

1. It is observed that incurrent water is retained for few seconds inside the branchial chamber by keeping the opercula aperture closed.
2. Relationship between body weight and total number of gill filament –

It was obtained with the following equation :

$$\begin{aligned}\log y &= \log a + b \log w \\ &= \log 2.784 + 0.106 \log w\end{aligned}$$

Body Weight	Equation
1. Total filament no.	$\log y = \log 2.784 + 0.106 \log w$ $y = 607.561w^{0.106}$
2. Average filament length	$\log y = \log 0.117 + 0.360 \log w$ $y = 0.765w^{0.360}$
3. Secondary Lamellae (both side)	$\log y = \log 1.858 - 0.005 \log w$ $y = 72.182w^{-0.005}$
4. Total gill area mm^2	$\log y = \log 2.482 + 0.869 \log w$ $y = 303.131w^{0.869}$

IV. DISCUSSION

Gills are typical respiratory organs of fish in their usual habitat of well aerated water. In last three decades, several investigations have dealt with the function of gill and the respiratory surface has been studied in relation to body weight in several species of teleosts.

(Hughes, 1966, 1972, Hughes and Muir 1969, Hughes et al 1973, 1974).

Hakim et al 1978, Munshi et al 1980, Singh et al 1981, Roj 1984, Kunwar and Munshi 1988, Yadav et al 1990, Dutta et al 1996, Ojha 1997 and Pandey 2000 to understand the nature of the gills sieve.

V. REFERENCES

1. Adney, R.J. and Hughes, G.M. (1977) – some observations on the gills of the oceanic sunfish. *Molamola* (J.Mar biol AssUk 57 825 – 837)
2. Biswas, Niva, Ojha J. and Munshi JSD (1981) Morphometries of the respiratory organs of an estuarine goby.
3. Das, Chandra, Gopal, C. Bhattacharya, Datta, N.C. and Ganguli D.N. (1975) – The body form and other parameters in relation to locomotion of some stream fishes J. 2001. Soc. INDIA 27.
4. Munshi, J.S.D. Ojha, J. Sinha, A.L. (1980) – Morphometries of the respiratory organs of the fish.