CHAPTER 3

MATERIALS
3. Materials:

For convenience, the materials part has been discussed under the following subheadings:

3.1 Algal genera

3.2 Taxonomic description of the algal genera

3.3 Fish genera

3.4 Taxonomic description of the fish

3.1 Algal genera:

The following five algal genera were used in this study:

i. *Phormidium valderianum* Gomont (Cyanophyceae)

ii. *Spirulina subsalsa* Ørsted ex Gomont (Cyanophyceae)

iii. *Navicula minima* Grunow in Van Heurck (Bacillariophyceae)

iv. *Chlorococcum infusionum* Schrank (Chlorophyceae)

v. *Rhizoclonium riparium* (Roth) Kützing ex Harvey (Chlorophyceae)
3.2 Taxonomic description of the algal genera used:

3.2.1 *Spirulina subsalsa* [Plate 1a; Desikachary, 1959, pg. 263, pl.36, fig.3, 9]
Trichomes multicellular, cylindrical, sheath absent, apex of trichome not attenuated, loosely or tightly coiled into a more or less regular spiral, crosswall present, obscured, terminal cell round, without calyptra. .............Hence, Genus- *Spirulina*.

**Key to species**

Spirals close to each other

Spirals broader than 3μ

............. Hence, Species- *S. subsalsa*

**Systematic position**

Division- Cyanophyta

Class- Cyanophyceae

Order- Oscillatoriales

Family- Oscillatoriaceae

Genus- *Spirulina*

Species- *subsalsa*
3.2.2 *Phormidium valderianum* [Plate 1b; Desikachary, 1959, pg. 263, pl.44, fig.5]
Filaments many forming a gelatinous or leathery stratum, thallus attached by the lower side, or floating in water with torn margins; sheath present, more or less firm, sometimes aglutinated, sometimes partly diffusent, thin, colourless; trichomes cylindrical, in some constricted at the joints, apices often attenuated, straight or bent, never regularly spirally coiled, capitulate or non-capitulate, apical cells in many species with a calyptra.

................. Hence, Genus — *Phormidium*

**Key to species**
Trichomes not constricted at cross walls; ends often bent and capitulate

- Trichomes upto 3 μ broad
  - End cells are not so conical or pointed
  - Trichomes broader
    - Cells longer than broad
      - Trichomes not so coloured
        - Trichomes broader than 2 μ
          - Trichomes 2-2.5 μ broad, cross walls granulated
            ....Hence species *P. valderianum*

**Systematic position**
Division- Cyanophyta
Class- Cyanophyceae
Order- Oscillatoriales
Family- Oscillatoriaceae
Genus- *Phormidium*
Species- *valderianum*.
3.2.3 *Navicula minima* [Plate 1c; Hustedt, 1930, pg.272, fig.44]
Valve without septa, not sigmoid, symmetry of valve not diagonal; valve without longitudinal canal, marginal ridges or furrows; raphe not lying in or between two siliceous ribs, striae not costa-like or with chambered structure; central area not a stauros; striae usually definitely formed throughout their length, if not so, not crossed by well-defined hyaline lines. ................. Hence, Genus – *Navicula*

**Key to species**
Segments of striae near the margin of the valve not of distinctly different appearance than those near the centre of valve
Axial area not distinctly thicker than the rest of the valve

Valves elliptic to linear-elliptical or linear with broadly rounded ends
Central area transversely widened or orbicular in shape
Ends of the raphe not turned in opposite directions
Central area transverse, variable in size
Striae 16-26 in 10μ; length- 6-17μ, breadth 2.5-5

......Hence, Species *N. minima*

**Systematic position**
Division- Bacillariophyta
Class- Bacillariophyceae
Order- Naviculales
Family- Naviculaceae
Genus- *Navicula*
Sub genus- *minuscula*
Species- *minima*
3.2.4 *Chlorococcum infusionum* [Plate 1d; Singh, 1939, pg. 62]
Vegetative cells solitary or in temporary groups of indefinite form, never embedded in gelatin. Cells ellipsoidal to spherical and vary in size. Cell walls smooth. Parietal chloroplast with or without a peripheral opening and with one or more pyrenoids. Cells uni- or multinucleate, or multinucleate just prior to zoosporogenesis

............ Hence, *Chlorococcum infusionum*

**Systematic position**

Division- Chlorophyta

  . Class- Chlorophyceae

    Order- Chlorococcales

     Family- Chlorococcaceae

      Genus- *Chlorococcum*

      Species- *infusionum*. 

3.2.5 *Rhizoclonium riparium* [Plate 1e; Krishnamurthy, 2000, pg.126, fig. 25 L, M]

Cells are more twice as long as broad. Cells just before division 4 times as long as broad. Cell wall thin, almost homogeneous. Rhizoids like branches sparse. Cells binucleate, frequently elongated.

............. Hence, Genus- *Rhizoclonium*

**Key to the species**

Algae in marine or brackish waters
Filaments not contorted

Branches not right angle to main axis, rhizoids few or scarce

Cell-wall not constricted at septa....Hence, *R. riparium*

**Systematic position**

Division- Chlorophyta
Class- Chlorophyceae
Order- Cladophorales
Family- Cladophoraceae
Genus- *Rhizoclonium*
Species- *riparium*
Plate 1: Microscopic plates of the algal genera
(a) Spirulina subsalsa, b) Phormidium valderianum, c) Navicula minima
(d) Chlorococcum infusionum, (e) Rhizoclonium riparium
3.3 Fish genera:
The following two fish species belonging to the genus *Oreochromis* were used in the present study:

i. *Oreochromis niloticus* Linnaeus 1758 (Cichlidae) also known as nile tilapia

ii. *Oreochromis mossambicus* Peters 1852 (Cichlidae) also known as java tilapia

3.4 Taxonomic description of the fish genera used:

3.4.1 *Oreochromis niloticus* [Plate 2a; Carpenter, 2001]


............. Hence, Genus- *Oreochromis niloticus*

**Systematic position**

- Kingdom-Animalia
- Phylum- Chordata
  - Class- Actinopterygii
  - Order- Perciformes
  - Family- Cichlidae
  - Subfamily- Pseudocrenilabrinæ
  - Tribe- Tilapiini
  - Genus- *Oreochromis*
  - Species- *niloticus*
3.4.2 *Oreochromis mossambicus* [Plate 2b; Talwar & Jhangiani, 1992, pg. 887]


.......... Hence, Genus- *Oreochromis mossambicus*

**Systematic position**

Kingdom-Animalia
Phylum- Chordata
Class- Actinopterygii
Order- Perciformes
Family- Cichlidae
Subfamily- Pseudocrenilabrinae
Tribe- Tilapiini
Genus-*Oreochromis*
Species- *mossambicus*
Plate 2: Fish genera used in the present experiment

(a) *Oreochromis niloticus*, (b) *Oreochromis mossambicus*