resorts where Europeans have resided in the past. Further, he states that they have been transported from Europe to these places alongwith the earth surrounding the roots of exotic plants. The occurrence of *Lumbricus castaneus* (Savigny) at Mashobra might be due to this phenomenon like the other Indian lumbricid species. The lumbricids are able to withstand freezing temperatures for long periods (Gates 1958).

KEY FOR THE IDENTIFICATION OF INDIAN SPECIES OF *Lumbricus*.

1. Athecal; clitellum begins in front of XXV; tubercula puberatis absent. ..... *Lumbricus eiseni*
   Thecal; clitellum begins behind XXV; tubercula puberatis present .....2
2. Clitellum begins behind XXX. .....*Lumbricus terrestris*
   Clitellum begins in front of XXX .....3
3. Clitellum XXVI, XXVII-XXX, XXXI, XXXII; tubercula puberatis on XXVIII-XXXI .....*Lumbricus rubellus*
   Clitelllum XXVIII-XXXIII; tubercula puberatis on XXIX-XXXII .....*Lumbricus castaneus*

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REFERENCES

GATES, G. E. (1951): On the earthworms of Saharanpur, Dehra Dun, and some Himalayan hill stations. *Proc. natl. Acad. Sci. India,* (B) *21*: 16-22.

———— (1958): Contributions to a revision of the earthworm family Lumbricidae. II. Indian species. *Breviora,* No. 91: 1-16.

———— (1972): Burmese earthworms. *Trans. Amer. Phil. Soc., 62* (7): 1-326.

REYNOLDS, J. W., CLEBSCH, E. E. C. AND REYNOLDS, W. M. (1974): The earthworms of Tennessee (Oligochaeta). 1. Lumbricidae. *Bull. Tall Timbers Res. Stn.,* No. 17: 1-133.

STEPHENSON, J. (1923): Fauna of British India, Oligochaeta—Taylor and Francis, London: 1-518.

## 23. FAUNAL ASSOCIATIONS OF LITTORAL SPONGES IN AND AROUND BALUGAON IN CHILKA LAKE (LAGOON)

The littoral system of Chilka lake, the largest brackish water lagoon situated on the east coast of India supports luxuriant growths of algae and sedentary animal growths on the boulders and shingle of various islands in the lake (Annandale & Kemp 1915, 1916; Sewell & Annandale 1922; Parija & Parija 1946). The littoral plant and animal growths are of immense ecological importance as they form favourable habitats for a variety of organisms which in turn attract higher trophic level organisms for foraging (Gislen 1929; Dahal 1948; Round *et al.*, 1961; Perera & Arudpragasam 1966; Sarma & Ganapati 1972; Rao & Rao 1973). The organisms associated with these sessile growths at Chilka are little known

except for isolated taxonomic accounts of individual groups (Annandale & Kemp 1915; Sewell & Annandale 1922). Sarma & Satapathy (1978) recently reported on the phytal-faunal associations in and around Balugaon in Chilka lake. In the present paper the results of a study on the qualitative and quantitative distribution pattern of epibiotic fauna of two species of sponges of the lake are dealt with.

Samples of two species of encrusting sponges, namely *Spongilla* sp. and *Laxosuberites lacustris* Annandale occurring at Kalijugeswar, Chadheiga and Kalijai islands situated in and around Balugaon were collected during Jan.-Sept. 1977 and analysed as outlined by Rao & Rao (1973).

The qualitative composition and mean densities along with percentage composition based on an analysis of samples of diverse faunal elements inhabiting *Spongilla* and *Laxosuberites* are presented in Tables I and II respectively.

31 species belonging to seven major taxa namely Foraminifera (4), Polychaeta (2), Copepoda (11), Amphipoda (9), Isopoda (2), Tanaidecea (1), Bivalvia (2) have been identified. Besides, several species of undetermined identity belonging to Nematoda, Ostracoda and adult insects and larvae are found to exist associated with sponges.

On an average *Spongilla* supported a mean density of 852 animals/100 cc, of which amphipods, nematodes, tanaidaceans and foraminiferans were dominant. In the January samples of *Spongilla* as may as 57000 gemmules/100 cc were observed. *Laxosuberites* was found to harbour a mean density of 2742 animals/100 cc, consisting of nematodes, amphipods, copepods, tanaidaceans, ostracods as the dominant forms in the order of their abundance respectively.

The general morphology of the host animal, the sediment accumulated on it and the physicochemical parameters of the environment appear to influence the composition and abundance of the epibiotic organisms (Dahal 1948; Round *et al.* 1961; Sarma & Ganapati 1972; Rao & Rao 1973). The loosely aggregated *Spongilla* growths laden with numerous monaxon spicules and less sediment deposition offer fewer biospaces for animal inhabitation and as such it supported few species and low density of organisms. The compact mat-forming *Laxosuberites* with well developed cortex affording more surface area for animal colonisation and sediment settlement supported a high species diversity and faunal density. However, foraminiferans were more on *Spongilla* than on *Laxosuberites* as the rough body wall of the former offers more grip to them than the smooth surface of the latter.

There are no published census of sponge associates from the Indian coast to compare and contrast with the present observations. The density of lake sponge associates is many times higher than that reported for the littoral sponge *Halichondria panicea* at Oregon (1.15 organisms/$cm^3$) by Long (1968).

From the foregoing account it is clear that the littoral sessile animal growths serve as an oikos for a variety of morphologically and biologically divergent organisms and as such play a vital role in the bio-economy of the littoral system.

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TABLE I

QUALITATIVE COMPOSITION OF EPIBIOTIC FAUNA OF *Spongilla* sp. AND *L. lacustris* ANNANDALE

| Species | *Spongilla* sp. | *L. lacustris* |
|---|---|---|
| FORAMINIFERA: | | |
| *Rotalia* sp. | + | + |
| *Spirillina* sp. | + | – |
| *Cibicides* sp. | + | – |
| *Trochammina* sp. | + | – |
| NEMATODA: | | |
| Undetermined spp. | + | + |
| POLYCHAETA: | | |
| *Nereis chilkensis* Southern | + | + |
| *Fabricia spongicola* Southern | + | + |
| OSTRACODA: | | |
| Undetermined spp. | + | + |
| COPEPODA: | | |
| *Oithona* sp. | – | + |
| *Laophonte* sp. | + | + |
| *Nitocra* sp. | + | + |
| *Mesochra* sp. | – | + |
| *Harpacticus* sp. | + | + |
| *Ergasilus* sp. | – | + |
| *Cyclopina* sp. | – | + |
| *Halicyclops* sp. | – | + |
| *Cyclops* sp. | – | + |
| *Mesocyclops* sp. | – | + |
| *Saphirella* sp. | – | + |
| AMPHIPODA: | | |
| *Talorchestia martensi* (M. Weber) | + | + |
| *Hyale brevipes* Chevereux | + | + |
| *Orchestia platensis* Kroyer | + | + |
| *Photis longicaudata* (Bate & Westew) | + | – |
| *Photis* sp. | + | + |
| *Paracalliope fluviatilis* (G. M. Thomson) | + | + |
| *Maera* sp. | + | + |
| *Niphargus chilkensis* Chilton | + | + |
| TANAIDACEA: | | |
| *Apseudus chilkensis* Chilton | + | + |
| ISOPODA: | | |
| *Exosphaeroma parva* Chilton | + | + |
| *Ligia exotica* Roux | + | – |
| ADULT INSECTS & LARVAE: | | |
| Undetermined sp. | + | – |
| BIVALVIA: | | |
| *Modiola undulata* Dunker | + | + |
| *Modiola striatula* Hanley | + | + |

Present +; Absent –

TABLE II

MEAN NUMERICAL DENSITY DISTRIBUTION AND PERCENTAGE COMPOSITION OF EPIBIOTIC FAUNA OF *Spongilla* sp. and *Laxosuberites lacustris* ANNANDALE.

| Animal groups | *Spongilla* sp. Nos./100 cc. | *Spongilla* sp. % Composition | *L. lacustris* Nos./100 cc. | *L. lacustris* % Composition |
|---|---|---|---|---|
| Foraminifera | 107 | 12.55 | 10 | 0.36 |
| Nematoda | 250 | 29.30 | 1333 | 48.60 |
| Polychaeta | 25 | 2.93 | 15 | 0.54 |
| Ostracoda | 6 | 0.70 | 67 | 2.45 |
| Copepoda | 10 | 1.20 | 167 | 6.10 |
| Amphipoda | 273 | 32.00 | 1007 | 36.73 |
| Tanaidacea | 116 | 13.60 | 93 | 3.39 |
| Isopoda | 47 | 5.60 | 17 | 0.62 |
| Adult Insects & Larvae | 3 | 0.35 | — | — |
| Bivalvia | 15 | 1.76 | 33 | 1.20 |
| Total | 852 | 99.99 | 2742 | 99.99 |