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Abstract

There had been neither extensive surveys carried out on the algal diversity nor on their abundance in the recent times. As a result, no attempts have been made to confirm the presence of species detected in earlier works either. Thus a large gap has been created in the marine algal research in Sri Lanka. A recent project on a grant by the National Science Foundation of Sri Lanka has attempted to study the ecological and anthropogenic impacts on algal diversity and abundance in addition to a taxonomic survey of algae along the Southwestern coast. As a result of this work, within a span of less than 2% of the coastline, nearly 15 new species of algae and nearly 30% of all recorded species have been identified suggesting that Sri Lanka's marine algal flora remains still to be explored. The dearth of an algal herbarium in Sri Lanka is a constraint for algal research. Therefore steps are underway to set up an Algal Herbarium at national level in collaboration with the National Herbarium of Sri Lanka and another supplementary algal herbarium at the University of Ruhuna.

PART A-History

Historical record of marine algal research in Sri Lanka is of considerable interest. Marine algal exploration in Sri Lanka had been mainly carried out in the 19th and 20th centuries. The first algal collection of Sri Lanka had been done by Paul Hermann (1646-1695), a Professor of Botany at Leiden (Netherlands) during his collections from Africa and India (Silva *et al* 1996). Thereafter Hermann's collection formed the basis for Flora Zeylanica of Linnaeus (1747). Johann Gerhard König (1728-1785) one of the Linnaeus's students, residing in Denmark went to the Danish settlement of Tranquebar on the southeast coast of India as surgeon and naturalist in 1768 and later served as naturalist in Madras office of the East India Company, collecting algae in Malabar, on the Southwest coast of India, Ceylon, Malacca, on the Malay peninsula and Siam (Rendle 1933) He bequeathed his collections and manuscripts to Sir Joseph Banks and these are now at the British Museum (Natural History) where they have remained unpublished. Linnaeus's son (Linnaeus fil 1782) described two species from Ceylon, *Fucus flavus*, which is probably a sponge, and *Fucus pinnatus* (*Caulerpa pinnata* C. Agardh). Many of König's collections were described by Retzius (1791), including *Fucus zelanicus*, of unknown identity. In 1841, G.G. Sigmond published "Ceylon moss for the cure of consumption, asthma etc" in communications of the Royal Medico-Botanical Society London (2nd ed.).

Of lately, William Ferguson's and William Henry Harvey's collections from Ceylon became important sources of studies in the marine flora in Sri Lanka. W. Ferguson (1820-1887), a British civil servant and amateur botanist in Sri Lanka from 1839 until his death in Colombo issued an informal exsiccata, *Algae ceylanicae*, with the specimens determined by Albert Grunow (1826-1914). The rich collection of marine algae made by Ferguson is preserved in the British Museum, but duplicates of these are also in the Herbarium of Peradeniya - Sri Lanka and the Herbarium of J.G. Agardh in Lund. W.H. Harvey (1811-1886), stayed in Sri Lanka from September to December 1853 and visited Trincomalee, Weligama and Galle collecting algae. As a result of this work he published a paper describing three spectacular reticulate Delesseriaceae from Ceylon: *Claudea multifida*, *Martensia fragilis*, and *Vanvoorstia spectabilis*, the latter representing a new genus named for John Van Voorst. Most of his Ceylon collections, however, were treated by Kützting and J. Agardh, as Harvey was busy pursuing other projects. His extensive collections are preserved in Trinity College Dublin; duplicates of the collection at the Royal Riksmuseum in Stockholm and in the Algal Herbarium of J.G. Agardh in Lund. A list of Harvey's and Ferguson's Ceylon Algae was prepared by George Murray (1887) and was published in "Catalogue of Ceylon algae in the Herbarium of the British Museum". He included 223 species of Ceylon Algae in his catalogue, of which 15 belong to the Cyanophyceae and fresh water algae. However, some of the species recorded earlier are not recognized as specially destined and are considered to be synonyms. In 1853 W.C. Ondaaje, published "Ceylon moss (*Gracilaria lichenoides*) in Observations on the vegetable product of Ceylon".

The Swedish phycologist F.R. Kjellman who joined the Vega expedition, visited Sri Lanka on his way back to Europe and made some algal collections. Some of his specimens are found in Wittrock and

Nordstedt; *Algae Exsiccate*. In 1900 he published "Om Floride- slagtet *Galaxaura*, dess organografi och systematic" 20 pls.

Miss Ethel S. Barton (Mrs A. Gepp) has published "List of marine algae collected by Professor Herdman in 1902" Some specimens included in her list were from the diaries of Herdman and Hornell. This is not a critical list because she has accepted the records without any attempts to eliminate incorrect identifications. In 1904 she published two more papers "*Rhipidosiphon* and *Callipsygma*" (A reference to *Udotea javensis* Ceylon, Ferguson No. 439) and the Sporangia of *Halimeda*

Nils Svedelius stayed in Sri Lanka from November 1902 to August 1903 and visited Galle, Matara, Weligama, Gintota, Dondra head and Tangalle in the South, Ambalangoda, Kosgoda, Bentota, Beruwela, Colombo and Negombo in the West, Jaffna in the North and Trincomalee along the East coast. The results of his investigation were published in two important papers: the genus *Caulerpa* of Ceylon (Ecological and systematic studies of the Ceylon species of *Caulerpa*) and a well known paper on the algal vegetation of the coral reefs at Galle (Über die Algaevegetation eines Ceylonesischen Korallenriffes mit besonderer Rücksicht auf ihre Periodizität in Botaniska Studier tillagnade F.R. Kjellman den 4 nov Uppsala 1906).

In 1907, A.D. Cotton published "New or little- known marine algae from the East" (Referring to material collected by Ferguson in Ceylon). In 1911 W.R. Dunstan, published, "Report on 'beach moss'. In 1912 W. Zeh, published "New species of the genus *Ligora*" and In 1915 A. Grunow published "Additamenta ad cognitionem Sargassorum". During this period of Svedelius to Borgesen, little can be said about the details of research on the marine algae in Sri Lanka.

Børgesen visited India in 1927-28, made a short trip to Sri Lanka. He examined the coral reefs at Galle and collected algae near Galle. The results of his study were published in 1936 in an important paper on "Some marine algae from Ceylon" This paper has listed only 68 species of which 21 belong to the Chlorophyceae, 8 to the Phaeophyceae and 39 to the Rhodophyceae. His list included 27 species which are not included in Murray's list.

In 1952 the Ministry of Fisheries and Industries became interested in the study of marine algae. Accordingly M. Durairathnam made a survey of the marine algal beds and marine algal resources of the Sri Lankan coast. The above mentioned investigations were divided into three stages (a) Systematic identification of all marine algae, (b) Regional distribution of all marine algae, (c) Sorting of varieties which are of commercial value. For the purpose of his work the coast of Sri Lanka was divided into 8 sections; (1) Jaffna coast and lagoon, (2) Jaffna Island and the surrounding area, (3) Palk bay between Punri and Vidateltivu, (4) Region Mannar and Kalpitiya, (5) Puttalm lagoon, (6) Region between Kalpitiya and Ambalangoda, (7) Region between Ambalangoda and Hambantota, and the (8) East coast. As a result of his extensive investigations, many publications had been made (1961a.). He has listed 174 species of marine algae that belong to the Chlorophyceae, the Pheophyceae and the Rhodophyceae. Of these 54 species have not been recorded in Sri Lanka before which included 10 species that belong to Chlorophyceae, 11 to the Pheophyceae and 34 to the Rhodophyceae

After Durairathnam, few researchers have worked on algal taxonomy and diversity. Later research dealt specially on economic aspects of algae and most studies had been confined to the Northern peninsula. In 1966, Misra has published "Phaeophyceae in India" in which he described 17 genera and 42 species of brown algae extracted from the works of Boergesen (1936, 1937) and Durairathnam (1961). Eric Coppejans (1996) did some seaweed collections along the Southern coast that have been deposited in the herbarium at Gent in Belgium.

PART B-New Perspectives

There had been neither extensive surveys carried out on the algal diversity nor on their abundance in the recent times. As a result, no attempts have been made to confirm the presence of species detected in earlier works either. Thus a large gap has been created in the marine algal research in Sri Lanka. A recent project on a grant by the National Science Foundation of Sri Lanka has attempted to study the ecological and anthropogenic impacts on algal diversity and abundance in addition to a taxonomic survey along the Southern coast.(de Silva and Mallikarachchi,1999) However the study is principally restricted to 4 reef sites along the Southern coast of Sri Lanka while a large proportion of algal communities remain unexplored.

Many environmental factors are identified to have impacts on algal diversity and abundance. They are the nature of the substratum, tidal patterns and their intensity changes over years, wave forces and exposure duration, water turbidity, micro environments of nutrient loadings through inflows with effluents,

temperature changes, reef structure, etc. Global climatic changes could have long-term impacts on many of the above factors affecting the rich biodiversity of some of our marine algal populations. There are many research programs dealing with impacts of Global Climatic changes on coastal ecosystems. It's therefore vital that Sri Lankan marine algal communities should also come under long-term monitoring programs. De Silva and Mallikarachchi (2002) have extensively studied the seasonal variations of algal diversity and abundance at 4 sites on the southern coast during the course of two successive years and the results illustrate the fact that human impacts such as coastal constructions like rock boulders, groynes, fishery harbors and settlements, sand and coral mining as well as release of domestic and hotel effluents into reef areas are affecting the marine algal flora adversely whereby a few species overtake many others thus diminishing the diversity. Furthermore within a span of less than 70 km., de Silva and Mallikarachchi have identified nearly 15 new species of algae suggesting that our marine algal flora remains still to be explored.

The dearth of an algal herbarium in Sri Lanka is a constrain for algal research. Therefore steps are underway to set up an Algal Herbarium at national level in collaboration with the National Herbarium of Sri Lanka and another supplementary algal herbarium at the University of Ruhuna. Collaborative national and international links on algal research have been established with experts at University of Gent in Belgium and University of Pune in India and Dr. Malik Fernando, a hobby collector from Sri Lanka. Special training programs in techniques in Phycology have also been proposed to be undertaken at the University of Gent as early as possible to fill the gap of lack of specialized personnel in Sri Lanka.

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References

- Barton, E.S. 1903. List of marine algae collected by professor Herdman in 1902. *Ceylon pearl Oyster Fisheries 1903 supplementary reports No. II.*
- Barton, E.S. 1904. *Rhipidosiphon* and *Callipsyigma*. *Journal of Botany* 42: 363-397
- Barton, E.S. 1904. The sporangia of *Halimeda*. *Journal of Botany* 42: 193-197
- Børgesen, F. 1936. Some marine algae from Ceylon. *Ceylon Journal of Science Section A botany* 12: 2
- Cotton, A.D. 1907. New or little-known marine algae from the East. *Bull. misc. Inf. R. bot. Gans. Kew*, 7: 260-264
- De Silva, M.P. and Mallikarachchi, M.A.U. 2002. Effects of some Environmental Factors on the Distribution Pattern of Algae on the Southern Coast of Sri Lanka. Abstract of 2nd *International Conference on Plants and Environmental Pollution (ICPEP-2)* In Lucknow, India.
- Dunstan, W.R. 1911, Report on 'beach moss'. *Trop. Ag.* 36(4): 358
- Durairatnum, M. 1961. Contribution to the study of the marine algae of Ceylon. *Fisheries Research Station, Ceylon, Bulletin* 10: 181
- Grunow, A. 1915. Additamenta ad cognitionem Sargassorum. *Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien* 65:329-448
- Murray, G. 1887. Catalogue of Ceylon Algae in the Herbarium in the British Museum. *Annals and Magazine of Natural History. London.*
- Ondaatje, W. C. 1853. Ceylone moss (*Gracilaria lichenoides*) (In observation on the vegetable products of Ceylon). *Appendix to the ceylone almanac and annual Register for 1853.* Colombo.
- Silva P.C., Basson, P. W. and Moe, R.L. 1996. Catalogue of Indian Ocean Algae. *University of California Publications in Botany* 79: 1259 p.
- Svedelius, N. 1906. (Über die Alganevegetation eines Ceylonischem Korallenriffs mit besonderer Rücksicht auf ihre Periodizität. *Botaniska Studier tillagnade F.R. Kjellman den 4 now Uppsala.*
- Svedelius, N. 1906. The genus *Caulerpa* of Ceylon (Ecological and systematic studies of the Ceylon species of *Caulerpa*). *Ceylon Marine Biological reports* No. 4.
- Zeh, W. 1912. New species of the genus *Ligora*. *Notizbl. Bot. Grat. Mus. Berl.* 49(5)