

GOLDEN JUBILEE CELEBRATIONS

Souvenir

2000

**Issued at the National Symposium on
Eco - Friendly Mariculture Technology
Packages - An Update, held at
Mandapam Camp, 25 - 26 April 2000
to mark the Golden Jubilee Celebration of
Staff Recreation Clubs**

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Marine plants of Mandapam coast and their uses

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Introduction:

In the sea 3 types of plants occur and they are Phytoplanktons, Seaweeds or Marine Algae and Seagrasses. Phytoplanktons are microscopic and free floating forms and they are the primary producers of the sea. Seaweeds or Marine Algae are macroscopic, attached or free floating plants. They form one of the important marine living renewable resources. They are primitive plants without any true root, stem and leaves. They belong to the Division Thallophyta of Plant Kingdom. Marine algae are classified into four groups namely Chlorophyceae (green algae), Phaeophyceae (brown algae), Rhodophyceae (red algae) and Cyanophyceae (blue-green algae) based on the type of pigments, morphological, anatomical and reproductive structures. Seagrasses are the marine flowering plants belonging to two families Hydrocharitaceae and Potamogetonaceae under the group Phanerogams. They grow in the shallow coastal waters in tropical and temperate zones. Seagrasses have a well developed creeping rhizome, bearing branched or unbranched roots at each node and erect shoot bearing several foliage leaves.

Seaweeds

Seaweeds occur in the intertidal, shallow and deep waters of the sea upto 180 m depth and also in estuaries and backwaters. They grow on dead corals, rocks, stones, pebbles, other substrates and as epiphytes on seagrasses. Several species of green, brown and red algae with luxuriant growth occur along the southern Tamil Nadu coast from Rameswaram to Kanyakumari covering 21 islands of Gulf of Mannar. In Gujarat coast seaweeds occur abundantly in Okha, Dwarka,

Porbandar, Veraval, Diu and Gopnath areas. Rich seaweed beds are present at Mumbai, Ratnagiri, Goa, Karwar, Varkala, Vizhinjam, Visakhapatnam and coastal lakes of Pulicat and Chilka. Seaweeds also occur abundantly in Lakshadweep and Andaman-Nicobar Islands. More than 10,000 species of marine algae have been reported all over the world. In India about 220 genera and 740 species of marine algae were recorded of which 60 species are of economic value. In Mandapam area 180 species of seaweeds are growing, of which about 40 species are economically important. They are the species of *Enteromorpha*, *Ulva*, *Caulerpa*, *Codium* (green algae); *Colpomenia*, *Hydroclathrus*, *Cystoseira*, *Hormophysa*, *Sargassum*, *Turbinaria* (brown algae), *Asparagopsis*, *Gelidiella*, *Gracilaria*, *Sarconema*, *Hypnea*, *Acanthophora* and *Laurencia* (red algae).

It is estimated from the seaweed resources survey conducted so far by the Central Marine Fisheries Research Institute, National Institute of Oceanography and other research organisations at different maritime states of India and Lakshadweep that the total standing crop of seaweeds in the intertidal and shallow waters is 91339 tonnes (wet wt.) consisting of 6000 tonnes of agar yielding seaweeds, 16000 tonnes of algin yielding seaweeds and remaining edible and other seaweeds. The standing crop of seaweeds in deep waters (5 to 22 m depths) from Dhanushkodi to Kanyakumari was estimated as 75373 tonnes (wet wt.) in an area of 1863 sq. km. The biomass of economically important seaweeds of Gulf of Mannar is estimated as 8445 tonnes (wet wt.).

Seaweeds contribute to primary production of the sea and hence seaweed beds

are considered to be highly productive and dynamic eco-system. Seaweed vegetation provides an ideal habitat, food and shelter to various marine animals. They act as breeding, nursery and feeding grounds for many epiphytic fauna. The hapteron or holdfast of marine algae binds the sediments together and prevent coastal erosion. The calcareous algae such as *Halimeda*, *Acetabularia*, *Neomeris* (green algae), *Padina*, *Zonaria*, *Pocockiella* (brown algae) *Liagora*, *Liagoropsis*, *Galaxaura*, *Scinaia*, *Actinotrichia*, *Amphiroa*, *Jania*, *Cheilosporum*, *Corollina*, *Lithophyllum*, *Lithothamnion* (red algae) are responsible for the formation of coral reefs and atolls. Calcareous algae are also responsible for the formation of beach rock which is formed by binding of sand particles by calcite deposits.

Uses of Seaweeds

Seaweeds contain different vitamins, minerals, trace elements, protein, iodine, and bioactive substances. They are the only source for the production of phytochemicals such as agar (China grass), carrageenan and algin. Agar is extracted from red algae such as *Gelidiella*, *Gracilaria*, *Gelidium* and *Pterocladia*. Some other red algae viz. *Eucheuma*, *Chondrus*, *Hypnea* and *Gigartina* are used for the production of carrageenan. Algin is manufactured from brown algae like *Sargassum*, *Turbinaria*, *Cystoseira*, *Laminaria*, *Undaria*, *Macrocystis* and *Ascophyllum*. These phytochemicals are used as gelling, stabilising and thickening agents in food, pharmaceutical, confectionary, dairy, textiles, paper, paint, varnish industries etc. Other chemical products such as mannitol, iodine, laminarin, fucoldin are also obtained from marine algae.

Many protein rich seaweeds like *Ulva*, *Enteromorpha*, *Caulerpa*, *Codium*, *Monostroma* (green algae); *Sargassum*, *Hydroclathrus*, *Laminaria*, *Undaria*, *Macrocystis* (brown algae); *Porphyra*, *Gracilaria*, *Eucheuma*, *Laurencia* and

Acanthophora (red algae) are used as human food in countries like Japan, China, Korea, Malaysia, Thailand, Indonesia, Philippines and other southeast Asian countries in the form of soup, salad, curry etc., In Japan, China and Korea *Ulva*, *Enteromorpha*, *Monostroma* and *Porphyra* are added in soup and *Undaria* and *Laminaria* are eaten in dried form. In Philippines *Caulerpa lentillifera* is consumed as salad while *Codium tomentosum*, *Eucheuma denticulatum* and *Kappaphycus alvarezii* in the form of curry. The seaweed food products such as jelly from *Gelidiella* and *Gracilaria*; jam from *Ulva* and *Enteromorpha*; pickle and wafer from *Gracilaria*, *Hypnea*, *Acanthophora* and *Laurencia* can be prepared and marketed.

The food value of seaweeds depends on the minerals, trace elements, protein and vitamins present in them. Marine algae have all essential aminoacids needed in the human diet which are not available in vegetable food materials. In India seaweeds are not eaten except the jelly prepared from agar (China grass) and porridge prepared from *Gracilaria edulis* in the coastal areas of Ramanathapuram District. Agar is added in the preparation of following food stuffs - Ice cream, Tomato Sauce, Jams, Jelly, Marmalade, Blancmange and Lime jelly.

Seaweeds are cheap source of minerals and trace elements. Hence meal could be prepared by grinding the cleaned and washed seaweeds. It can also be mixed with fish meal and used in different parts of the world as fertilizer for various land crops. In India, freshly collected and cast ashore seaweeds are used as manure for coconut plantation either directly or in the form of compost in coastal areas of Tamil Nadu and Kerala. Seaweed manure has been found superior to farm yard manure. The high amount of water soluble potash, other minerals and trace elements present in seaweeds are readily absorbed by plants and they control deficiency diseases. The carbohydrate and other organic matter present

in the marine algae alter the nature of soil and improve the moisture retaining capacity.

The liquid seaweed fertilizer obtained from seaweed extract is used as foliar spray for inducing faster growth and yield in leafy and fleshy vegetables, fruits, orchards and horticultural plants. There are several medicinal properties of seaweeds. Marine algae were considered to be of medicinal value in the Orient as early as 3000 B.C. The Chinese and Japanese used them in the treatment of goitre and other glandular diseases. Though the Romans believed seaweeds to be useless, they also used them to heal wounds, burns, scurvy and rashes. The British used *Porphyra* to prevent scurvy during long voyages.

The various red algae particularly *Corallina officinalis*, *C. rubens* and *Alsidium helminthocorton* were employed as vermifuges in ancient times. Dulse is a laxative and also used to reduce fever. Several red algae such as *Chondrus crispus*, *Gracilaria*, *Gelidium*, *Pterocladia* have been used to treat various stomach and intestinal disorders. The stipes of *Laminaria cloustoni* have been used to aid in child birth by distending the uterus during labour. A number of marine algae have been found to have anticoagulant and antibiotic properties. Carrageenan is used in ulcer therapy and alginates are found to prolong the rate of activity of certain drugs. Species of *Sargassum* were used for cooling and blood cleaning effect. *Hypnea musciformis* was employed as vermifuge or worm expelling agent and *Centroceras clavulatum* as cathartic agent. The iodine rich seaweeds such as *Asparagopsis taxiformis* and *Sarconema furcellatum* can be used for controlling goitre disease caused by the enlargement of thyroid gland. Many bio-active compounds can also be obtained from seaweeds. The fuel gas for domestic use can be produced from the brown alga *Sargassum*.

The red algae *Geldiella acerosa*, *Gracilaria edulis*, *G. foliifera* and *G. crassa* and

brown algae *Sargassum* spp *Turbinaria* spp and *Cystoseira trinodis* are exploited at present from Mandapam coast and they are used as raw material by Indian seaweed industries for the production of agar, alginates and liquid seaweed fertilizer. The seaweed resources of Mandapam area should also be made use for the production of other phytochemicals such as carrageenan, seaweed food products like jam, jelly, pickle and wafer and feed for farm animals.

Seagrasses

In the world 13 genera and 52 species of seagrasses are distributed. In India 6 genera and 14 species of seagrasses are distributed in different regions of east coast, west coast, Lakshadweep and Andaman-Nicobar Islands. They are *Enhalus acroides*, *Halophila beccarii*, *H. decipiens*, *H. ovalis*, *H. ovalis f. subsp. ramamurthiana*, *H. ovata*, *Thalassia hemprichii* (Hydrocharitaceae), *Cymodocea rotundata*, *C. serrulata*, *Halodule pinifolia*, *H. uninervis*, *H. wrightii* and *Syringodium isoetifolium* (Potamogetonaceae). In Gulf of Mannar and Palk Bay regions of Mandapam except *Halophila ovalis f. subsp. ramamurthiana*, all other 13 species are growing.

Seagrass beds are highly productive and form a dynamic eco-system. Seagrasses serve as sediment traps apart from stabilising the bottom sediments thereby improving the water quality. They are also involved in cycling of nutrients of their environment. They provide food and shelter for diverse organisms. In tropical waters parrot fishes (*Sparidae*) and surgeon fishes (*Acanthuridae*), dugong and green turtles are the main consumers and in the temperate waters mainly waterfowl geese and ducks graze the intertidal seagrass beds. In Gulf of Mannar and Palk Bay region *Halothurian* inhabitat the seagrass beds and *Halodule* and *Cymodocea* beds form a major browsing grounds for dugongs. Apart from being an important nursery ground for

commercially important fishes, seagrass beds harbour many species of crustaceans, molluscs, gastropods, worms and echinoderms. Seagrasses provide rich habitat for the macro and micro-algae as epiphytes

Uses of seagrasses

Some of the seagrasses such as *Halophila ovalis* are used as medicine to treat various skin diseases, burns, and boils. Unripe fruits of *Enhalus acoroides* are eaten and used for preparing salads. The rhizome of *Cymodocea* called "Kadal Karumbu" are also eaten by the local people. Fresh leaves of various seagrasses are used as green manure for coconut plantation.

Conclusion

Any damage to seaweeds and seagrasses habitats would result in their destruction. Increasing anthropogenic pressure on these marine habitats will definitely pose a serious threat to their very existence. Hence remedial measures are urgently needed to protect and conserve these important ecosystems and their resources for posterity and sustainable uses. Management plans are very essential to conserve the seaweeds and seagrasses which are facing threats by various factors. The Government should also pay much attention to the vital seaweeds and seagrasses ecosystems which in turn will promote the fishery potential of India.