PROCEEDINGS OF THE SYMPOSIUM

ON

LIVING RESOURCES *of* THE SEAS AROUND INDIA

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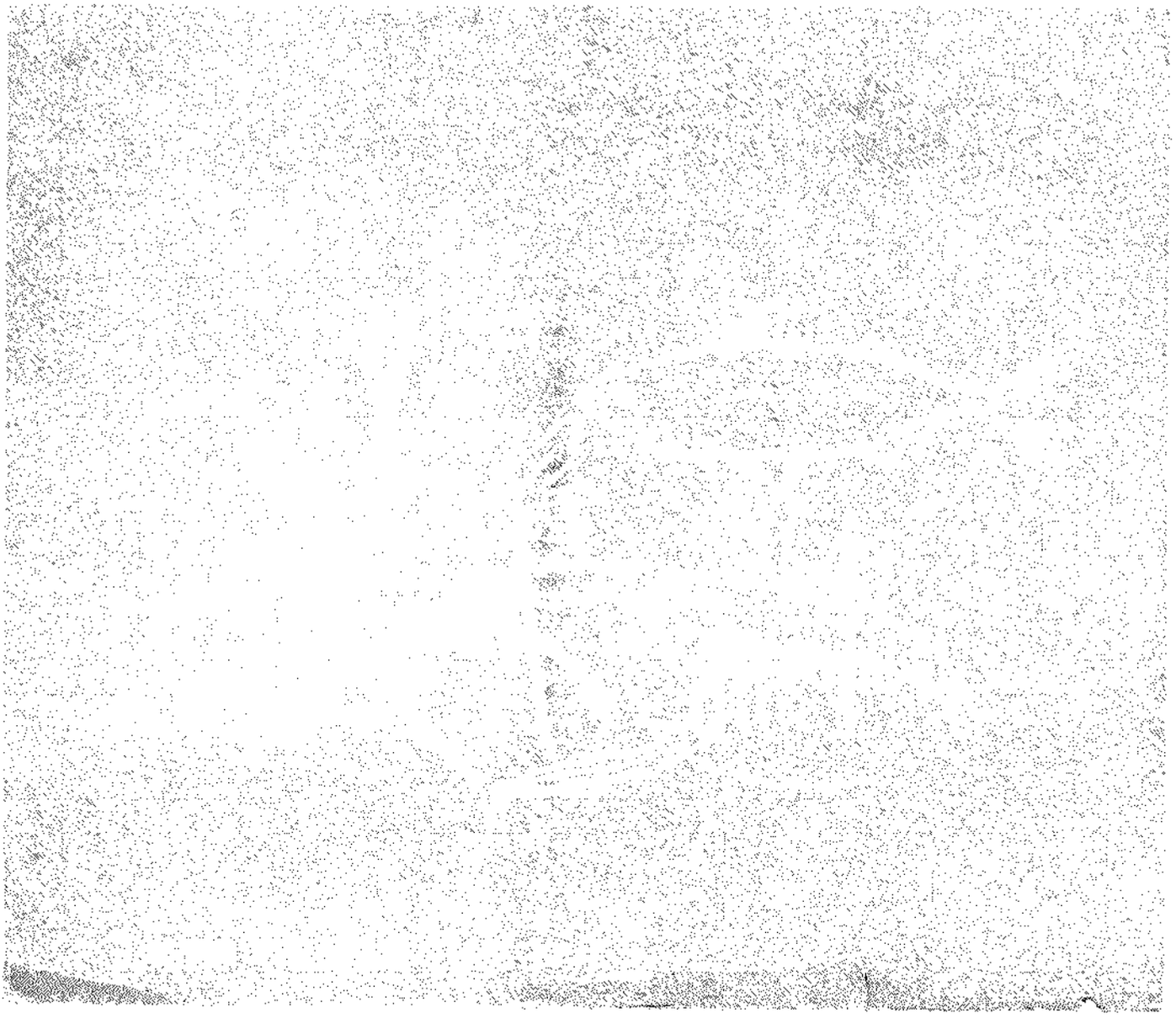

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THE SPONGE RESOURCES OF INDIA

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ABSTRACT

Marine sponges are found in fair abundance in the Indian region. Of about 305 species recorded from the coasts of India a variety of *Spongia*, viz., *Spongia officinalis* var. *ceylonensis* Dendy appears to have commercial possibilities. It is widely distributed in the shallow water areas of Gulf of Mannar, Palk Bay and Laccadive Archipelago. In view of its softness, absorbent power, elasticity combined with its size and shape its suitability for commercial purpose is pointed out. The abundance, distribution, etc., are given in this paper. The possible steps to be adopted for the exploitation of the same are also briefly discussed.

INTRODUCTION

SPONGES—more specifically, skeletal elements of some species of horny sponges (Order Keratosida) have been in use from ancient times. According to Pliny sponges were used as painting brushes and mops. Roman soldiers carried sponges with them as substitutes for drinking vessels. The reference in the Bible ".. .. and filled a spunge full of vinegar...." (St. Mark XV: 36) may give further emphasis to the prevalence of this custom. The sponges were supposed to have even healing properties, as was held by Arnold in 13th Century, who introduced widespread administration of "burnt sponge" for tuberculosis of lymphatic glands.

In the modern age, sponges find their place in a number of household uses. Besides this, painters, brick-layers, decorators, lithographers and jewellers also use them in no lesser quantities. But the introduction of inexpensive synthetic products in place of natural sponges and the widespread disease ('blight' or wasting disease) seen in some natural grounds of the Atlantic are the two major threats the sponge fishery is facing now.

The commercially important species are widely distributed in the warmer waters between Lat. 40° N and 40° S of the equator. Until 1841 the world's supply of commercial sponge was solely from the Mediterranean. Later some French merchants, who got stranded in Bahamas, started exploiting the sponges found there. Subsequently their commercial exploitation spread to Florida and other places along the American coast. Other areas which have the potential, but have not yet developed a fishery of commercial importance, include Philippines, Australia, Japan, New Zealand, Seychelles, Madagascar, Cape Verde Island, Azores, Madeira and Bermudas.

SPECIES SUPPORTING THE FISHERY

Of the large number of extant species only a few are commercially esteemed. For, as far as commercial needs are concerned the depth, geographical origin, mode of collection, etc., of the species are more important and these often give rise to much complication, to which is added the confusion of different local terms being used by fishermen to denote the same species of sponge fished from place to place.

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Commercial sponges fall mainly under two genera; *Spongia* Linnaeus (1759) and *Hippiospongia* de Laubenfels (1936). In *Spongia* the primary fibres are 'cored' with foreign matter whereas in *Hippiosongia* there are no fibres of the ascending type. The latter has ramifying subdermal canals and the dermis adheres firmly to the main reticulation. The major commercial species with their common names and distribution, are as follows:

Species	Common name	Distribution
Genus *Hippiospongia* de Laubenfels, 1936		
H. lachne de Laubenfels, 1936	Sheep wool	Bahamas, Cuba, Florida, Honduras, Jamaica
H. gossypina Duchassaing and Michellotti, 1864	Velvet	do.
Genus *Spongia* Linnaeus, 1759	..	..
S. zimocca ssp. *barbara* Duchassaing and Michelotti, 1864	Yellow	Bahamas, Cuba, Florida, Honduras, Jamaica and Mediterranean
S. officinalis ssp. *mollissima* Schmidt, 1862	Turkey solid or Turkey cup	Mediterranean
S. officinalis ssp. *adriatica* Schmidt, 1862	Turkey toilet	do.
S. officinalis ssp. *dura* Hyatt, 1877	Hard head	Bahama, Cuba and Honduras
S. officinalis ssp. *obliqua* Suchassaing and Michelotti, 1864	Reef Sponge	Bahama, Cuba, Florida and Honduras.
S. graminea Hyatt, 1877	Grass sponge	do.
S. graminea spp. *tempa* Laubenfels and Storr, 1958	Gulf grass	Gulf of Menico
S. agaricina Pallas, 1766	Elephant ear	Mediterranean
S. cheiris de Laubenfels and Storr, 1958	Glove or finger sponge	Florida
S. anclotea de Laubenfels and Storr, 1958	Anclote yellow	do.
S. sterea de Laubenfels and Storr, 1958	Wire sponge	do.

Indian Variety of *Spongia officinalis* Linnaeus (Pl. I & Fig. 2)

A variety (*ceylonensis* Dendy, 1905) of this much-esteemed species of *Spongia* is widely distributed in the shallow waters of Gulf of Mannar, Palk Bay and Arabian Sea. The shape of the variety is not constant and may vary considerably according to the habitat. Globular or hemispherical body pattern is common in Gulf of Mannar and specimens reaching a diameter of 300 mm are also met with.

The colour, in living specimens, is dark grey with pale interior. The surface is highly conulose. The length of a conule and its distribution may vary from specimen to specimen as well as from place to place. Usually small (up to 0·8 mm) conules are uniformly found distributed at intervals of 1 to 2 mm. But in specimens collected from areas of high silt fall, they may attain a height

of 3 mm or even more. Oscules are also subjected to high degrees of variation and may vary from 2 to 7 mm in diameter with or without a prolonged oscular rim.

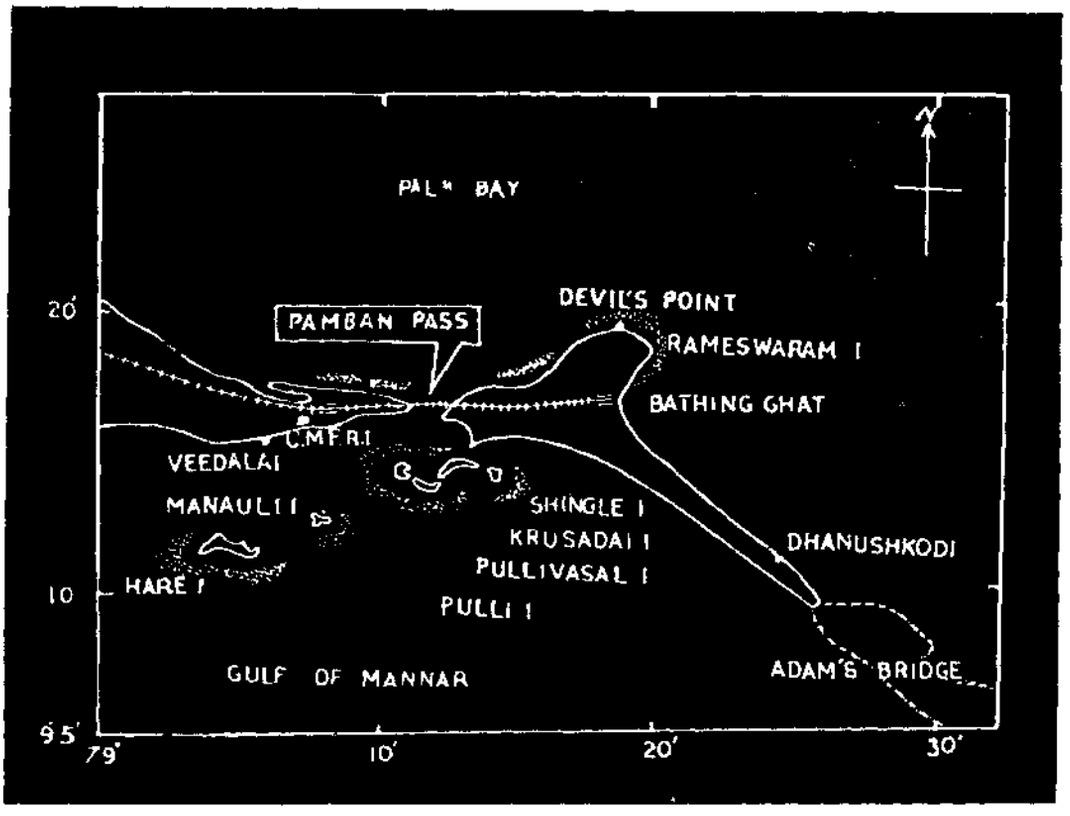

FIG. 1. Map showing Rameswaram Island and nearby areas in the Gulf of Mannar and Palk Bay. Reefs are marked by white dots.

The primary fibres run parallel with one another, each ending in a conule on the surface. Fusion or division is rarely seen. These primaries contain a central core of arenaceous objects (Fig. 2). The abundance of such objects also is greatly influenced by the surroundings. The average diameter of a primary fibre is 0·04 mm. The primaries are connected with one another by secondaries, whose diameter is almost uniform (0·028 mm). The mesh size is about 0·17 mm.

QUALITIES OF COMMERCIAL SPONGES

The "bath-sponge" available in market is only the bleached skeleton from which the living soft parts have been removed. The basic pattern of the skeleton is a reticulation with rectangular meshes. The mesh size, thickness of the fibre, etc., may vary from species to species. Some fibres, technically called primaries, contain a central core of arenaceous objects, whose quantity, if it goes beyond certain limits, may affect the market value of any species.

The fibres, from chemical point of view, consist principally of spongin, an albuminoid related to conchiolin found in the shells of molluscs and fibronin and sericin, the main components of silk,

Its chemical formula has been established by Krukenberg as $C_{36}H_{48}N_9O_{12}$ (Minchin, 1900). Some types of spongin contain iodine (Iodospongin) and others chlorine and bromine.

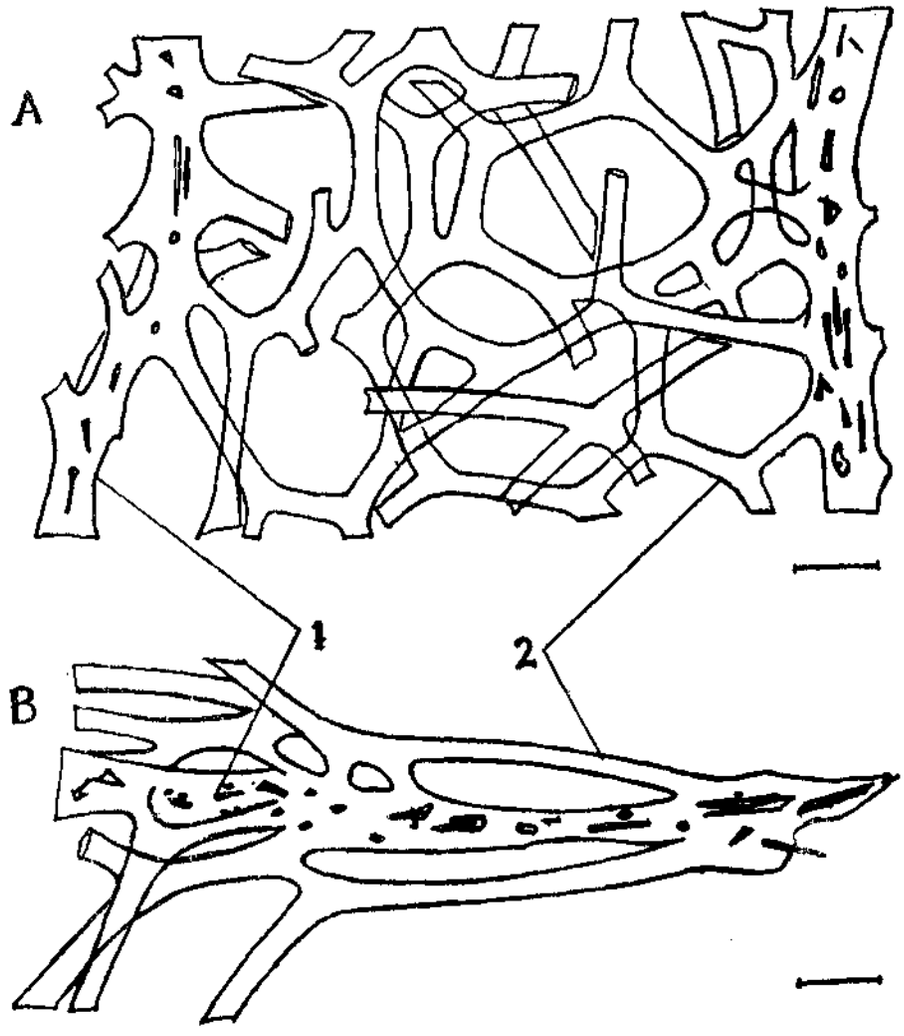

FIG. 2. A—Sketch showing the primaries and secondaries; B—Structure of a conule with (1) Primary fibres cored by arenaceous objects and (2) secondary fibres (Scale inset equal to 0·1 mm).

The colour of the skeleton varies considerably depending on environmental factors and this, merely on aesthetic reasons, can affect the market value of the end-product. Generally light colours are preferred, but such differences, to a certain extent, can be rectified by artificial bleaching.

Several terms like "forms", "cuts" etc. are in use for denoting the size and shape of the sponge. Small sponges are preferred for surgical or toilet purposes, for bath, medium-sized ones, and for cleaning large ones are often utilized. For the Indian variety globular or hemispherical body shape is quite common.

The resiliency of sponges, *i.e.*, the property which causes them to recoil after being pressed, depends upon the size of fibres and the mesh work. This may directly influence the absorptive power of any sponge and those which can absorb and retain a large volume of water are much valued. The most absorbent sponge has fine meshes, slender fibres and close texture. Sponges with extensive subdermal and main canals may inhibit the absorption and retention of water considerably.

In quality, the skeleton of *Spongia officinalis* var. *ceylonensis* compares well with that of any commercially esteemed species of Mediterranean or of Gulf of Mexico.

Sponge Culture

The increasing commercial demand and the consequent greater exploitation of the natural sponge beds eventually brought in its wake attempts to enhance the natural yield by cultivating sponges. The reconstructive growth, scientifically called regeneration, in sponges has been well known from the days of Aristotle and this has been taken advantage of to develop techniques in cultivating them in the selected grounds of Mediterranean or of Gulf of Mexico. The attempts of Cavolini in 1785–90 and of O. Schmidt in 1862–64* require mention in this context, especially of the latter, for the experiments conducted by him in the Bay of Socolizza in the Adriatic have laid the foundation for modern sponge farming.

Subsequent to this there had been sporadic attempts to culture the sponges in different parts of Atlantic. Experiments conducted by H. F. Moore in 1901–05 in Florida and by British Government in Bahamas and Honduras were all quite sufficient to demonstrate the practicability of commercial sponge farming.

Rectangular pieces of sponges, $2'' \times 4'' \times \frac{1}{2}''$ in size, from healthy sponges are used in cultivation. These pieces are fastened with a string to rock pieces or cement discs and kept in selected areas. Normally they start regenerating and within a few days adhere firmly to the substratum and grow. But there is no uniformity in the planting methods used in different places and hence the success depends upon selecting the method most suitable for a particular ground. In Bahamsas it is found that from such a cutting a marketable size could be obtained within 4 years.

Growth normally is expressed in terms of a growth factor, *i.e.*, the number of times the sponge increases in volume per year. According to the experiments conducted by Crawshay (1939) in British Honduras, the increase may range from doubling to trebling its volume. According to him a growth factor less than 2 is low, 2 is average, while 2·5 is good. Experiments conducted by Storr (1964) in the Gulf of Florida also suggested a growth factor of 2·3 and hence a sponge would require about 3 years to reach a legal size of 5″ in diameter.

Nothing is known definitely about the life span of sponges, but certain records have indicated that Wool sponge can live up to 25 years. It is also proved that by the repeated cutting and plantnig the original sponge material could be kept living indefinitely under favourable conditions.

Distribution and Abundance of Cultivable Variety in Gulf of Mannar and Palk Bay

The locally available variety is cultivable and is widely distributed both in Gulf of Mannar and in Palk Bay where the bottom is composed of rocks with loose sand filling the interspaces. Dead and semi-fossilised coral reefs also afford a suitable substratum for the larvae to settle and develop. Shallow areas of the Gulf south of Tuticorin Light House, the lagoons adjacent to the various islands in the Gulf; the reefs of Palk Bay are all suitable grounds.

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* Crawshay, 1939.

An analysis of 20 sq. m of the sea bottom in the Rameswaram Bed fetched an average of 510 gm of dry sponge from specimens ranging from 10 to 30 cm in size; and hence its abundance can be estimated from this.

Sponges require clear water and suitable attachment for their luxurient growth. But many of them can tolerate smothering or burial to certain limits and this capacity also may vary considerably with age-specimens just attached may be affected more with sediments. (Mc Dougall, 1945; de Laubenfels, 1947, 1950; Bakus, 1968). Since the commercial species grow attached to the upper parts of the substratum unlike other species which prefer the lower surfaces of rocks, etc., the factor of sedimentation would affect the former more.

The production of larvae in this variety in the Gulf is spread over a period of 6 months from September to March and the number of larvae extruded may show two peaks, one at the beginning and other at the end of this period. In the month of November, December, January and February the production of larvae comes to a standstill and the reason may be the lowering of temperature (24-25° C). during these months (normal 29° C.).

This reproductive season actually coincides with the north-east monsoon. During these months the inshore waters of Palk Bay become turbulent. Silt churned up from the sea bottom make the life of the benthic animals, especially of the sponges, rather difficult. But the richness of this variety in the Bathing Ghat area of the Rameswaram Island (Fig. 1) is attributed to the relatively protected nature of the area from the action of the north-east monsoon. During the south-west monsoon also this area is protected by the south-eastern projection of this Island (Dhanushkodi region). Thus the larvae liberated during September-March period may find this area quite suitable for their settling and subsequent growth.

Conclusion and Suggestions

As this variety is moderately abundant in the Gulf of Mannar and Palk Bay it is worthwhile to attempt their exploitation on an experimental basis. If successful, the harvestable quantity could be increased by adoption of measures to cultivate them in suitable areas of Gulf of Mannar and Palk Bay. This may further help not only in bettering the quality of this variety but also in maintaining a constant supply throughout the year.

Taking the relative luxurient growth in the natural condition as the criterion, the best area for such an experimental cultivation would be the shallow waters of Rameswaram Island. Raw materials for planting, especially rectangular coral blocks, are locally available with the minimum expense. Larger specimens which are available in plenty there can also be used for slicing. For cultivating these bits the most suitable period in the Rameswaram ground is September-October when the north-east monsoon wind subsides and hence the silt fall and roughness are minimised. During the south-west monsoon that follows, too, this area is least affected. Hence a piece planted in September-October may get nearly 6 months of calm weather and by this time they can come to normalcy both physically and physiologically.

One drawback which is observed in this variety, is that it may incorporate such calcareous particles like shells, bits of corals etc. into its skeleton. When such a skeleton is processed these calcareous particles are liable to get dissolved off and the cavity thus formed inside the sponge may make it less durable and so less valuable commercially. But this can be rectified considerably by cultivating them on coral blocks, whereby the possibilities of contact with minute particles of the substratum are minimised.

Summary

The Indian variety of sponge *Spongia officinalis* (var. *ceylonensis*, Dendy, 1905), distributed widely in the shallow water areas of Gulf of Mannar, Palk Bay and Arabian Sea is described. This

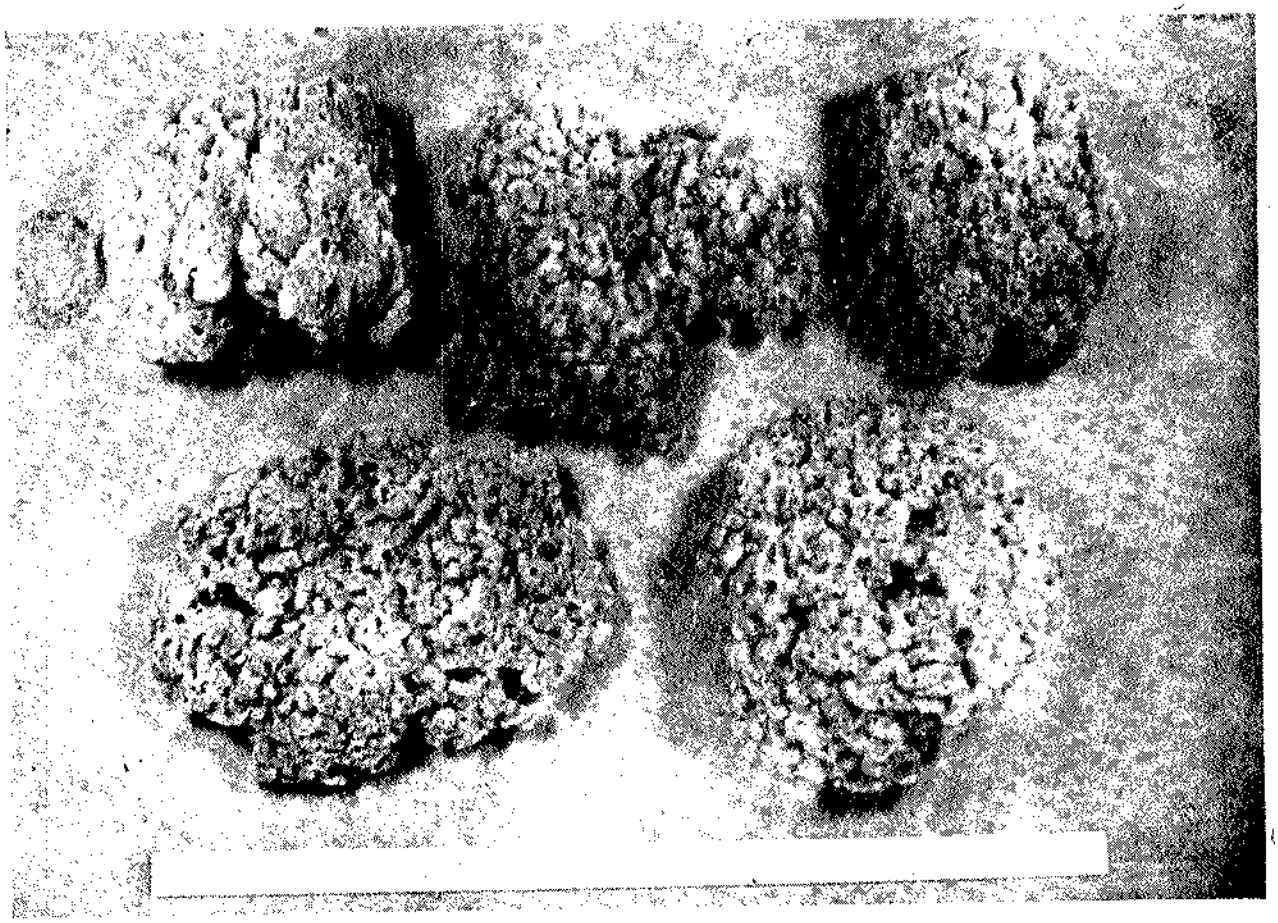

PLATE I. Specimens of *Spongia officinalis* var. *ceylonensis* Dendy, from Bathing Ghat area of the Rameswaram Island. Scale = 50 *cm*

variety grows to a size of 30 cm in diameter and the shape in most cases is hemispherical. The qualities of this sponge, *viz.*, size and shape, colour, resiliency, absorptiveness, durability, etc. are similar to those of other commercially esteemed species of the Gulf of Mexico or of the Mediterranean, and the possibility is suggested of the commercial exploitation of these resources of our shallow waters.

In order to increase the exploitable quantity so that it can sustain a full-fledged fishery throughout the year, steps to culture them in certain selected grounds of Gulf of Mannar are outlined. The most suitable place for such an experimentation would be the shallow areas of Rameswaram Island as the area is somewhat protected from the monsoon disturbances and so the sponge cuttings planted there would get the most suitable environment for regeneration. The raw materials needed, like coral blocks and entire specimens for slicing are also available here. This type of culture experiments may further help in bettering the quality in addition to the quantity of the end-product.

Acknowledgements

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