Artificial propagation of soft coral *Sinularia kavarattiensis* (Octocorallia: Alcyonacea) in India

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The soft corals which belong to the order Alcyonacea are important members of the coral reef ecosystem. They are found widely distributed in the tropical waters and play a significant role in the global reef ecology. They are colonial forms akin to scleractinian corals and are the most beautifully coloured components of the coral reefs. Most of the species are found in the continental shelf and slope; however a few are also found at great depths. The Alcyonaceans appear in varied shapes, sizes and colours. The shapes range from tree-like branching encrustations to lamellate, disc-like and plate-like forms. The polyp bearing portion is usually restricted to the terminal parts of the colony called capitulum, lobes and lobules, while the basal portion of the colony is a sterile stalk without polyps.

The coral reefs of the Indian waters are also known for its rich diversity of soft corals. The soft corals are a rich source of biologically active compounds as most of them are found to possess anti-bacterial, anti-inflammatory, anti-tumour and cytotoxic properties. The discovery of prostaglandins from a Caribbean gorgonid *Plexaura homomalla* in 1969 and from the soft coral *Sarcophyton crassocaule* in the year 2000 triggered off a global search for alcyonaceans of pharmaceutical value.

The dynamic appearance and colouration have also made them important additions in the marine aquarium, particularly in the reef tanks which is gaining lot of popularity the world over. However, most of the soft corals used in the marine aquarium trade are collected from the wild, which in the long run will not be sustainable. The propagation and culture of soft corals in captivity is the only solution to meet the demand of the hobbyists. The propagation in captive conditions also helps in restoration of degraded reefs.

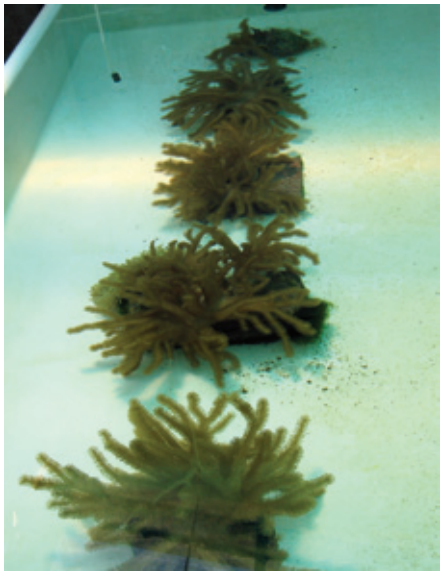
Culture potential of *Sinularia kavarattiensis*

The soft coral *Sinularia kavarattiensis* was first reported from the Gulf of Mannar region by Rani Mary George *et al*. (2007) who also gave a description of this species in the light of scanning electromicrographs of the sclerites, to facilitate easy identification. This species contain bioactive compounds such as sesquiterpene which has anti-fouling properties and furano-sesquiterpene which can inhibit the proliferation of several human cancer cell lines. Besides, *S. kavarattiensis* can also add value to the reef tanks due to its beautiful tree-like and branched appearance. The development of suitable propagation technique is therefore imperative to ensure a steady supply of raw material to the pharmaceutical industries and more so for replenishment in areas where the reefs are degraded.

Maintenance of parent colonies of *S. kavarattiensis*

The propagation studies on *S. kavarattiensis* were carried out in the wet laboratory at the Mandapam Regional Centre of CMFRI. The broodstock or the parent colonies were maintained in 1 tonne capacity rectangular FRP tanks, using filtered seawater. The level of water in the culture tank was maintained at about 45 cm. Water exchange was done at the rate of 10 % daily and the broodstock tanks were well aerated. Supplementary feed was not provided since *S. kavarattiensis* is a photosynthetic soft coral and harbor symbiotic algae called Zooxanthellae in their

tissues. The water temperature ranged from 24-31°C, salinity from 32-34 ppt and the pH ranged from 7.9 to 8.1 during the culture period.



Parent colonies of *Sinularia kavarattiensis*

A close view of the parent colonies with extended polyps

Fragmentation

The fragmentation or cutting is done either by slicing down to the base of the colony and removing small portions along with the base, or alternatively by removal of only the lobes which subsequently attaches and develops into new colonies. In the former method, the attachment is achieved much faster *i.e.* in a span of two weeks, since the fragment has a base. In the case of lobes, the time taken for attachment is about 3 to 4 weeks. Only healthy parent colonies are used for the removal of explants. The fragmentation of lobes was done by two methods:

(i) ***Fragmentation using scissor***: In this method, the lobes of the parent colonies were removed using a sharp sterilized scissor.

(ii) ***Fragmentation by tying noose***: In this method, noose was made around the lobes using cotton thread. The noose was tightened on alternate days and the lobe got detached from the parent colony in about 20-25 days. The advantage in this method is that it leaves no injury to either the parent or the lobe that was removed.

A total of 20 fragments along with the base were removed from four parent colonies. The fragments that were removed from the parent colony were maintained in FRP tanks with clean filtered seawater and ample aeration. The injury in the cut areas of the parent colony as well as of the detached fragment was found to completely heal in about 20 days.

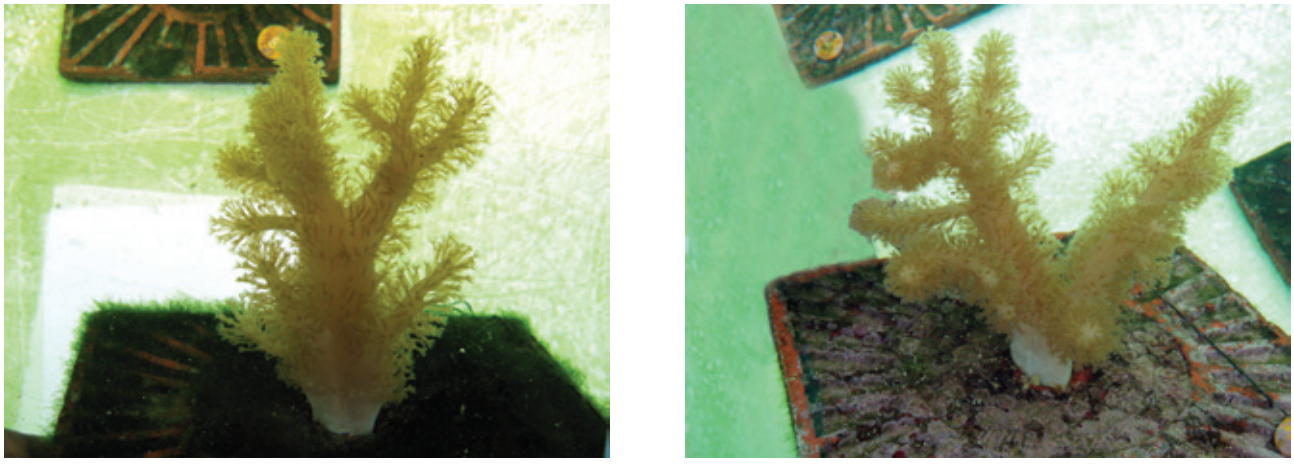
Planting and attachment

Two types of substrata were used for the attachment of the fragments namely the compressed red clay tile and concrete blocks. A small depression was made at the centre of the substrata and the fragments that were removed were placed in the depression, one on each substratum. In the present study, no adhesives were used for the attachment of fragments. The substrata with the fragments were then placed in rectangular FRP nursery tanks of 1 tonne capacity with a water level of 45 cm. About ten percent of water was exchanged daily. The time taken for attachment did not vary with the two types of substrata studied. The fragments were found to attach to the substratum in about 2 weeks.

Growth of fragments in laboratory conditions

The basal circumference and the number of lobes were the parameters used for estimating the growth of the soft coral colonies. The growth was assessed

Newly developed colonies of *S. kavarattiensis* using fragment detached from the base on compressed red clay tile



Newly developed colonies of *S. kavarattiensis* developed from the detached lobes on compressed red clay tile

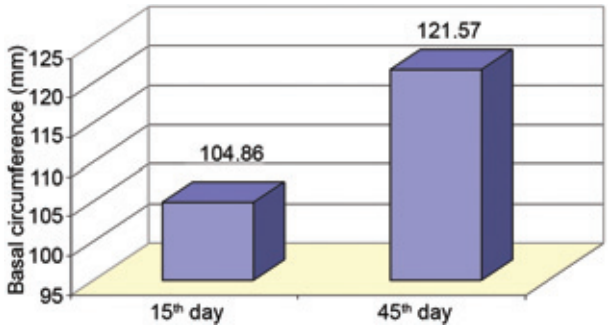


Fig. 1. Increment in basal circumference of *S. kavarattiensis* colonies cultured in the laboratory

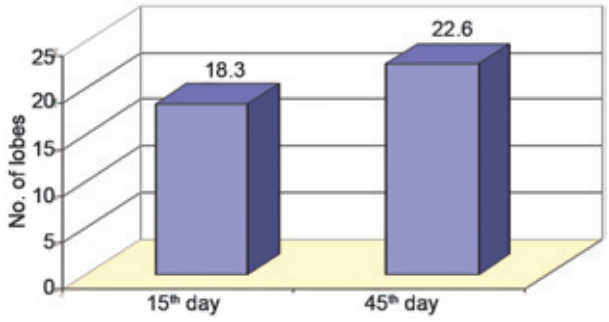
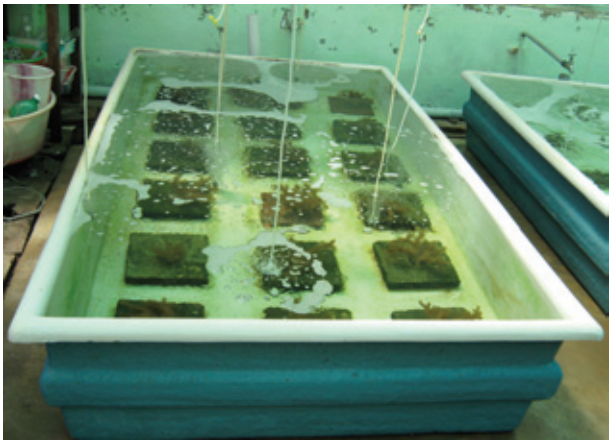


Fig. 2. Increment in the number of lobes of *S. kavarattiensis* colonies cultured in the laboratory

and recorded once in a fortnight. The mean increase in basal circumference was 16.71 mm in 30 days and the mean increment in the number of lobes was 4.3 in 30 days period. A survival rate of 100% of the newly developed colonies was obtained in the laboratory conditions.

Growth of explants in open sea

A total of ten well established colonies of *S.*



Newly developed colonies of *S. kavarattiensis* on concrete blocks suspended in an FRP tank

Boxes with developed colonies on concrete blocks being suspended in the Bay for culture

kavarattiensis attached to the concrete blocks were cultured in plastic boxes in open sea for a period of 80 days to assess the survival and growth. The colonies used for the study were 45 days old after fragmentation. The plastic culture boxes (64 cm length x 44 cm breadth x 32 cm height) which are perforated with slit-like openings on all sides and open on the top, allows free movement of water. The top portion of the box was covered with a net to prevent the entry of seaweeds/seagrasses which comes along with the waves and water currents. The culture boxes were suspended in the Palk Bay off Mandapam using nylon ropes tied to the casuarina poles at a depth of around 4 to 5 m. The boxes were periodically observed and cleaned to remove the fouling organisms. Supplementary feed was not provided and the growth was monitored once in a fortnight. Although all the culture boxes were suspended in the same locality, it was observed that the growth of all the colonies was not uniform. A survival rate of 100 % was achieved during the culture. The minimum increment in the basal circumference of *S. kavarattiensis* was 8 cm while the maximum increment was 13.5 cm during a culture period of 80 days (Fig. 3). Similarly, the minimum increment in the number of lobes was 33 while the maximum increment was 98 numbers during 80 days culture period (Fig. 4).

The study has shown that after an initial nursery phase of about 45 days, the well established colonies of *S. kavarattiensis* can be transplanted in areas wherever restoration is required. Since this species

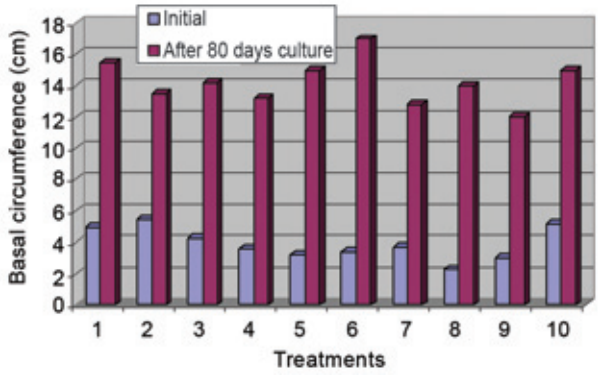


Fig. 3. Increment in basal circumference of *S. kavarattiensis* colonies cultured in open sea

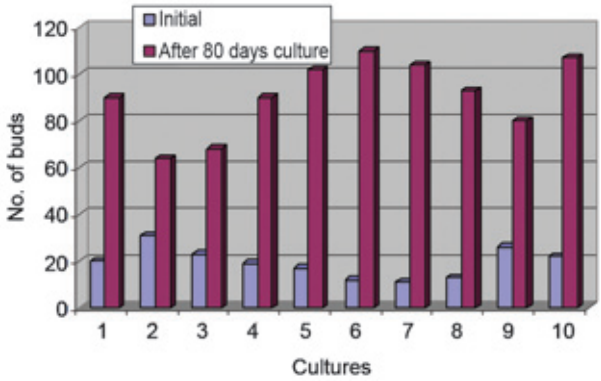


Fig. 4. Increment in the number of lobes of *S. kavarattiensis* colonies cultured in open sea

is a photosynthetic Alcyonacean, they can be maintained in the culture systems without supplementary feeding and therefore is less cumbersome to maintain for a longer duration. The success achieved in developing new, healthy coral colonies of *S. kavarattiensis* has proved that large number of colonies can be produced using simple propagation methods.