INTERNSHIP REPORT

PROJECT:

SEAWEED CULTIVATION

Internship Program at:
(CSIR- National Institute of Oceanography, Dona Paula, Goa-India)

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MSc Part II Zoology

CONTENTS

INTRODUCTION

The National Institute of Oceanography (NIO), one of the 37 constituent laboratories of the Council of Scientific & Industrial Research (CSIR), New Delhi, has its main campus in Dona Paula, Goa, with regional facilities in Kochi, Mumbai, and Vishakhapatnam. CSIR-NIO after the International Indian Ocean Expedition (IIOE) in the 1960s, was founded on January 1st, 1966. Since then, the Institute has developed into a renowned international multidisciplinary oceanographic research institute. The main objective of research has been to observe and comprehend the unique oceanographic features of the Indian Ocean. So far, more than 5000 academic articles have published the findings.

One hundred technical support employees and two hundred scientists are authorized to work for the institute. The classic four disciplines of oceanography—biologic, chemical, geological/geophysical, and physical—as well as ocean engineering, marine instrumentation, and marine archeology—represent the main research fields.

The institute's Goa headquarters and regional centre's both house a large number of cutting-edge laboratories. Additionally, it runs two research vessels with multimodal oceanographic observation capabilities, the RV Sindhu Sankalp (56 m) and RV Sindhu Sadhana (80 m).

The institute boasts the best collection of printed literature on maritime sciences in the nation thanks to its library, which houses 15,000 books and 20,000 back issues of academic journals.

The institute carries out applied research funded by industry in addition to basic research. These investigations include the gathering of oceanographic data, the evaluation of environmental impact, and the modeling of environmental impact. The institute also offers consulting services on a variety of topics, such as coastal zone laws and marine environmental preservation.

The CSIR-NIO acts as a cutting-edge centre of instruction in ocean sciences thanks to its huge group of experts and enough infrastructures for ocean research.

There is an oceanography school there that is part of the Academy of Scientific & Innovative Research (AcSIR). In addition, many colleges acknowledge it as a centre for doctoral research.

SEAWEED

Seaweeds or macroalgae refers to the thousands of species of macroscopic, multicellular, marine algae. These includes some type of Rhodophyta (red), Phaeophyta (brown) and Chlorophyta (green) macroalgae. Seaweed species such as kelps provide essential nurser habitat for fisheries and other marine species and thus protect food sources; other species such as planktonic algae play an important role to capture carbon, producing at least 50% of earth's oxygen. Seaweed's appearance resembles non-woody terrestrial plants. The various parts of a seaweed consist of a thallus including lamina (sorus, pneumatocyst, kelp), stipe, holdfast (haptera). Seaweed has a variety of uses, for which it is farmed or foraged.

• Seaweed is consumed across the world particularly in East Asia and Southeast Asia as well as in South Africa, Belize, Peru, Chile and Scotland. Gim, nori and zicai are sheets of dried Porphyra used in soups, sushi and onigiri (rice balls). Chondrus crispus (Irish moss or carrageenan moss) is used in food additives, along with Kappaphycus and Gigartinoid seaweed.

• Alginates are used in wound dressings and dental moulds. In microbiology, agar is used as a culture medium. Carrageenans, alginates and agaroses with other macroalgal polysaccharides have biomedicine applications.

• Other seaweed maybe used as fertilizer, compost for landscaping or to combat beach erosion through burial in beach dunes. It is also under consideration as a potential source of bioethanol.

SEAWEED CULTIVATION

The technique of growing and collecting seaweed is known as seaweed farming or seaweed agriculture. It includes the administration of naturally occurring batches. In its most advanced version, it entails total control over the algae's life cycle. Eucheuma spp., Kappaphycus alvarezii, Gracilaria spp., Saccharina japonica, Undaria pinnatifida, Pyropia spp., and Sargassum fusiforme are the top seven cultivated seaweed taxa. Gracilaria is grown for agar, Eucheuma and Kappaphycus alvarezii for carrageenan (a gelling agent), while the remaining plants are grown for food. China, Indonesia, and the Philippines are the nations that produce the most seaweed.

Seaweeds are utilised in India as a raw material to make agar, alginate, and liquid seaweed fertiliser (LSF). The marine states of Tamil Nadu, Karnataka, Andhra Pradesh, and Gujarat each have a few LSF industries, approximately 20 agar factories, and about 10 algin industries. The manufacturing of agar uses the red algae Gelidiella acerosa, Gracilaria edulis, G. crassa, G. foliifera, and G. verrucosa, while the creation of alginates and liquid seaweed fertiliser uses the brown algae Sargassum spp.,

Turbinaria spp., and Cystoseira trinodis. The amount of seaweeds being utilised is insufficient to supply the Indian seaweed businesses' needs for raw materials. Seaweeds such as Gracilaria edulis, Hypnea musciformis, Kappaphycus alvarezii, Enteromorpha flexuosa and Acanthophora spicifera can be successfully cultivated in long-line ropes and nets by vegetative propagation method. This activity has a potential to provide income and employment to about 200,000 families.

OBJECTIVE

To work as an intern for the Seaweed Cultivation Project and gain knowledge of the various methods and techniques for growing seaweed, as well as the various factors that influence the growth and regulation of seaweed and the various advantageous uses of seaweed.

WORK DONE

I worked on The Seaweed Cultivation Project, which was led by Dr. Manohar Cathrine Sumathi and Dr. Ravi Singh Baghel. Other interns Miss Rashmi Anurlekar and Miss Caren Noronha, as well as project associates Mr. Viraj Vaigankar, Mr. Charles Po, and Mr. Manish, was also involved. Essentially, three sites or areas were set aside for the cultivation of seaweed. Dona Paula Beach, Hollanth Beach, and Bogmalo Beach were located in Vasco.

At each location, rafts were lowered into the water to grow seaweeds. Using thick ropes, four sturdy bamboo sticks were tied together in a square to make the rafts. The rafts were supported by floaters to support buoyancy.

SPECIES CULTIVATED

Gracilaria cortica, Gracilaria edulis, Gracilaria deblis, Gracilaria cortica var. cylindica, Gracilaria Salicornia, Solaria spp., Kappaphycus alvarezii and Ulva spp.

METHODS:

Two methods were used in cultivating the seaweeds:

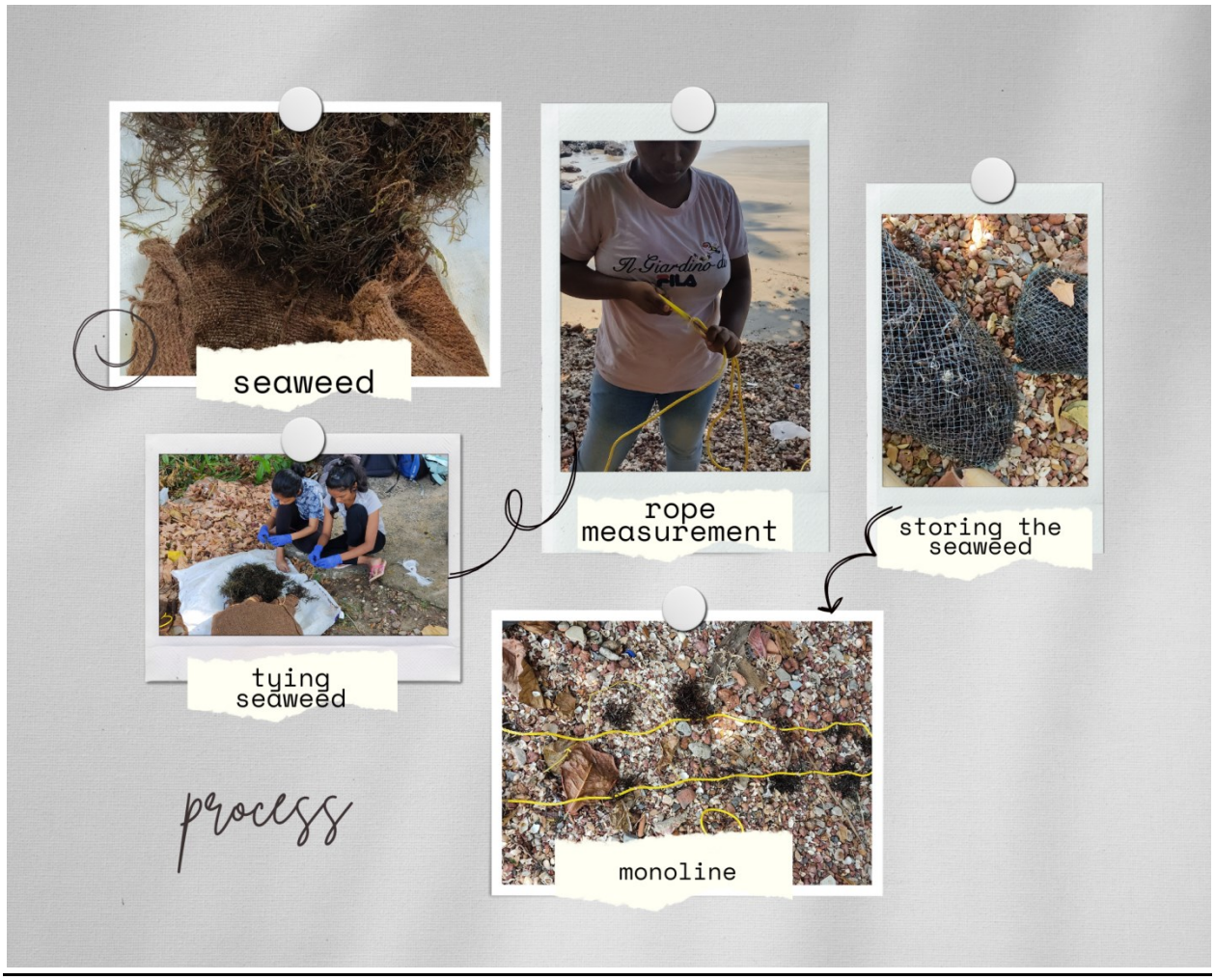
• Monoline: In this method, a nylon rope measuring about 5-6 m was cut. Small pieces of samples of seaweeds were first tied with a thread and then these samples were seeded on the nylon rope. Each rope contained about 200-300 g of the sample. This method is time consuming.

• Tube net: In this method, a net in the shape of a tube is cut into desired sizes required. Then a rope is inserted in between and one end of the net is tied to the rope. A PVC pipe of suitable diameter is inserted in the net and the samples are seeded in the net manually. This pipe acts as a funnel to make sure that the net is fully filled and there are no spaces left in between. After filling the other end is tied to the rope. This is the simplest and easiest method of cultivation.

After the monolines and tube nets are ready, these are tied to the raft horizontally from one end to another. Then, these rafts are inserted in the sea with the help of divers. Apart from the samples inserted these sites, some samples made were also transported to other sites outside Goa located in Maharashtra and Karnataka. While seeding the samples, the samples were kept wet using sea water only to keep it hydrated, since drying of seaweeds results in fast mortality. The growth of seaweeds at Dona Paula and Bogmalo beach were pleasing and showed a good growth rate at each cycle, whereas the seaweeds at Hollant beach showed a very poor growth rate due to harsh water currents, pollution and growth of other undesired seaweeds such as *Sargassum*

TABULATION

SITE	DATE	SPECIES OF SEAWEEDS CULTIVATED	MONOLINES MADE	TUBE NETS MADE
Dona Paula Beach	**15th November, 2022 5th December, 2022 7th December, 2022 21st December, 2022 22nd December, 2022 12th January, 2023 13th January, 2023**	***Gracilaria cortica, Gracilaria edulis, Gracilaria deblis, Gracilaria Salicornia, Solaria spp., Kappaphycus alvarezii and Ulva spp.***	**94**	**29**
Hollant Beach	***6 th January, 2023 17 th January, 2023 23rd January, 2023***	***Gracilaria cortica var. cylindica, Kappaphycus alvarezii, Gracilaria deblis and Gracilaria Salicornia***	**16**	**7**
Bogmalo Beach	**23rd December, 2022 27th January, 2023 18th January, 2023**	***Kappaphycus alvarezil***	**33**	**2**


seaweed
rope measurement
storing the seaweed
tying seaweed
process
monoline

CONCLUSION

The Seaweed Cultivation Internship intended in giving knowledge about the different types of seaweeds which are cultivable and can show significant amount of growth rate if subjected to proper conditions and environment to thrive in. Moreover, it gave me knowledge about the different methods which can be used to cultivated the seaweeds which are suitable for many different species of seaweeds. It also helped in gaining knowledge about the different factors that affect the growth and regulation of the seaweeds. This is further helpful in setting up a seaweed cultivation farm, since seaweeds have enormous number of uses from food industry to biomedical industry and also can raise job opportunities