

Reprint

**PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON
AQUACULTURE FOR 2000 AD
NOVEMBER 1994**

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COMMERCIAL EXPLOITATION OF SEaweEDS IN INDIA AND NEED FOR THEIR LARGE SCALE CULTIVATION

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ABSTRACT

The general distribution of seaweeds along the east and west coasts of India, Lakshadweep and Andaman-Nicobar islands is given. The standing crop of seaweeds in all these areas is estimated as more than 1,00,000 tons (wet wt.). The quantity of seaweeds growing in the shallow water areas (0 to 4.0 m depth) of southwest coast of Tamil Nadu was estimated as 22,000 tons (wet wt.) in an area of 17,125 ha and from deep waters (5.0 to 22.0 m depth) was 75,372 tons (wet wt.) from an area of 1,863 sq.km. Monthly data were collected during the four years 1989, 1990, 1992 and 1993 from different seaweed landing Centres in Tamil Nadu coast on the quantity of seaweeds harvested from the natural seaweed beds. During the above period, the quantity of agar yielding seaweeds (*Gelidiella acerosa*, *Gracilaria edulis*, *G. crassa* and *G. foliifera*) collected varied from 595 to 1289 tons (dry wt.) and algin yielding seaweeds (*Sargassum* spp. and *Turbinaria* spp.) varied from 3043 to 5160 tons (dry wt.). The need for undertaking commercial scale cultivation of seaweeds, particularly agar yielding plants is emphasized due to paucity of raw material to the Indian Seaweed Industries.

INTRODUCTION

Seaweeds or marine algae is one of the commercially important marine living renewable resources. They are the only source for production of phytochemicals such as agar, carrageenan and algin which are widely used in several industries mostly as gelling, stabilizing and thickening agents. They are also used as human food, animal feed and fertilizer. In India, seaweeds are now used mostly as raw material for production of agar and sodium alginate (Silas *et al* 1986). Luxuriant growth of several species of green, brown and red algae occur along the south east coast of Tamil Nadu from Mandapam to Kanyakumari, Gujarat coast, Lakshadweep and Andaman-Nicobar Islands. Fairly rich seaweed beds are present in the vicinity of Bombay, Karwar, Ratnagiri, Goa, Varkala, Vizhinjam, Visakhapatnam and in coastal lakes Chilka and Pulicat (Kaliaperumal *et al* 1987).

About 800 species of marine algae have been recorded from different parts of Indian coast including Lakshadweep and Andaman-Nicobar Islands. Of these nearly 60 species are commercially important seaweeds. From the seaweed resources survey conducted so far in the maritime states and Lakshadweep by CMFRI, CSMCRI and NIO, it is estimated that the total standing crop of seaweeds in the intertidal and shallow waters

Table 1 Estimated standing crop of seaweeds from Indian waters

State	Quantity of seaweeds shallow waters	(wet wt in tons) deep waters
Gujarat	19,445	Not surveyed
Maharashtra	20,000	“
Goa	2,000	“
Karnataka	Negligible	“
Kerala	1,000	“
Tamilnadu	22,044	75,373
Andhra Pradesh	7,500	Not surveyed
Orissa	5	“
Lakshadweep	19,345	“
Andaman-Nicobar	Not surveyed	“
Total	91,345	75,373

is 91345 tons (wet wt) and 75373 tons in deep water (Table 1) consisting of 6000 tons of agar yielding seaweeds and 16000 tons of algin yielding seaweeds and the remaining quantity of edible and other seaweeds. The quantity of seaweeds growing in the shallow water areas (0 to 4.0 m depth) of southeast coast of Tamil Nadu was estimated as 22000 tons (wet wt) in an area of 17,125 ha (Anon 1978) and from deep waters (5.0 to 22.0 m depth) was 75372 tons (wet wt) from an area of 1863 sq.km (Anon 1989, 1990, 1993 a and 1993 b). The Central Marine Fisheries Research Institute has also carried out seaweed resources survey in 63 estuaries and backwaters from Madras to Athankarai in Tamil Nadu and Pondichery during 1988-89. The agar yielding seaweeds *Gracilaria arcuata* and *G. verrucosa* and carrageenan yielding seaweed *Hypnea valentiae* occur in harvestable quantities in certain estuaries.

A number of agar and algin producing seaweed industries are situated at different places in the maritime states of Tamil Nadu, Andhra Pradesh, Kerala, Karnataka and Gujarat. At present red algae *Gelidiella acerosa*, *Gracilaria edulis*, *G. crassa*, *G. foliifera* and *G. verrucosa* are used for extraction of agar and species of *Sargassum* and *Turbinaria* for sodium alginate. All these seaweed industries depend on the raw materials being exploited from natural seaweed beds occurring in the southeast coast of Tamil Nadu from Rameswaram to Kanyakumari and Gulf of Mannar islands. The commercial harvesting of seaweeds from these areas is going on since 1966 (Silas and Kalimuthu, 1987). Data collected by the CMFRI on the seaweed landings of Tamilnadu from 1978 to 1988 have been already published (Kalimuthu *et al* 1990).

Table 2 Data collected on seaweed landings (dry wt in tons) from Tamilnadu coast.

	1989				1990				1992				1993						
	G.a	G.e	G.c	S	T	G.a	G.e	S	T	G.a	G.e	G.f	S	T	G.a	G.e	G.f	S	T
Rameswaram	22	2	-	18	40	53	1	12	2	45	4	-	178	45	52	7	-	53	70
Pamban	63	52	-	134	8	64	26	40	-	63	9	-	374	25	67	26	-	15	3
Mandapam	-	37	2	-	-	-	10	-	-	-	6	3	-	-	-	-	-	-	-
Vedalai	8	233	-	301	10	1	88	647	122	4	85	-	1160	40	-	70	50	64	5
Seeniappa Darga	4	-	-	495	-	-	4	400	-	-	-	-	525	-	-	38	-	417	3
Periapattanam	1	-	-	256	-	-	-	425	-	-	-	-	410	-	-	-	-	360	-
Keelakarai	228	72	-	792	396	130	20	628	100	79	6	-	1034	50	104	4	-	86	-
Ervadi	25	-	-	265	5	49	3	25	-	55	3	-	545	-	58	1	-	930	5
Tharavaikulam	19	4	-	-	-	10	-	-	-	28	5	-	-	-	31	3	-	97	36
Valinokkam	-	-	-	30	-	-	-	105	-	-	-	-	122	-	-	-	-	57	-
Mundal	-	-	-	40	-	-	-	85	-	-	-	-	312	-	-	-	-	62	-
Kanyakumari area	-	-	-	775	-	-	-	500	-	-	-	-	340	-	-	-	-	780	-
Kattumavadi area	-	-	-	-	-	-	830	-	-	-	200	-	-	-	-	250	-	-	-
Total	370	400	2	3106	459	307	982	2867	224	274	318	3	5000	160	312	399	50	2921	122

G.a = *Gelidiella acerosa*, G.e = *Gracilaria edulis*, G.c = *Gracilaria crassa*, G.f = *Gracilaria foliifera*
 S = *Sargassum* sp. T = *Turbinaria* sp.

Table 3 Quantity of seaweeds exploited from Tamilnadu coast

Year	Agar yielding seaweeds (dry wt in tonnes)				Algin yielding seaweeds (dry wt in tonnes)		Total (dry wt in tonnes)
	<i>Gelidiella acerosa</i>	<i>Gracilaria edulis</i>	<i>Gracilaria crassa</i>	<i>Gracilaria foliifera</i>	<i>Sargassum</i>	<i>Turbinaria</i>	
1989	370	400	2	-	3106	459	4337
1990	307	982	-	-	2867	224	4380
1992	274	318	-	3	5000	160	5755
1993	312	399	-	50	2921	122	3804

Data collected during the years 1989, 1990, 1992 and 1993 from 13 seaweed landing centres in Tamilnadu coast on the quantity of agar yielding seaweeds *Gelidiella acerosa*, *Gracilaria edulis*, *G. crassa* and *G. foliifera* and algin yielding seaweeds *Sargassum* spp and *Turbinaria* spp exploited from the natural beds are presented in this paper. During the above four years period, the total quantity of seaweeds exploited varied from 3804 to 5785 tons (dry wt). The quantity of agar yielding seaweeds collected varied from 595 to 1289 tons and the algin yielding seaweeds from 3034 to 5160 tons (Table 2). The quantity of *Gelidiella acerosa* landed varied from 274 to 370 tons, *Gracilaria edulis* from 318 to 982 tons, *G. foliifera* from 3 to 50 tons, *Sargassum* spp from 2867 to 5000 tonnes and *Turbinaria* sp. from 122 to 459 tonnes. Two tons of

Gracilaria crassa was harvested only during the year 1989 (Table 3).

DISCUSSION

Now there are about 30 agar and algin manufacturing industries in India. The quantity of seaweeds now exploited from the natural seaweed beds from Tamil Nadu coast is insufficient to meet the raw material requirement of Indian Seaweed Industries. As many seaweed based industries are still coming up, there is an increasing demand for the raw material, particularly agarophytes, which the existing natural resources can not meet. With a view to develop suitable technology for commercial scale cultivation of algae for augmenting supply of raw material to seaweed industries, since 1964 CMFRI, CSMCRI and other research organisations have attempted experimental cultivation of agarophytes *Gelidiella* and *Gracilaria*; carrageenophytes *Hypnea* and *Acanthophora*; alginophytes *Sargassum*, *Turbinaria*, *Cystoseira* and *Hormophysa* and edible seaweeds *Caulerpa*, *Ulva* and *Enteromorpha* in different field environments using various culture techniques (Chennubhotla *et al* 1987). These experiments revealed that *Gelidiella acerosa* can be successfully cultivated on coral stones and *Gracilaria edulis*, *Hypnea musciformis*, *Acanthophora spicifera* and *Enteromorpha flexuosa* on long line ropes and nets.

The technology developed for commercial scale cultivation of *Gracilaria edulis* by CMFRI using coir rope net method (Chennubhotla and Kaliaperumal 1983 and Kaliaperumal 1993) and for *Gelidiella acerosa* by CSMCRI using coral stone method (Subbaramaiah 1990) can be taken up for large scale cultivation of these seaweeds by the fish farmers, seaweed suppliers, utilisers and private entrepreneurs by availing the financial assistance from Banks and funding agencies connected with rural development programmes. The commercial scale cultivation of seaweeds would not only augment supply of raw material to the seaweed industries but also provide employment to the coastal population and improve their economic status.

ACKNOWLEDGEMENTS

The authors express their sincere thanks to Dr. P.S.B.R. James, former Director, Central Marine Fisheries Research Institute, Cochin-14 and to Dr. P. Vedavyasa Rao, and Shri. R. Marichamy, Officer-in-charge, Regional Centre of CMFRI, Mandapam Camp for their encouragement and facilities provided for carrying out this work.

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