

DISTRIBUTION OF SEAWEEDS OFF KATTAPADU - TIRUCHENDUR COAST, TAMIL NADU

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Abstract

The present paper deals with the distribution of seaweeds and seagrasses during the deep sea survey conducted in the first sector from Kattapadu to Tiruchendur in Tamil Nadu coast between December 1986 and March 1987 covering an area of 650 sq.km. In this survey, 58 species of marine algae were recorded, of which 7 belong to Chlorophyta, 12 to Phaeophyta and 39 to Rhodophyta. Three species of seagrasses viz. *Cymodocea serrulata*, *Halophila ovalis* and *H.ovata* were also recorded at the depths ranging from 5.5 to 21.5 m. *Halimeda macroloba*, *Dictyota bartayresiana*, *D.Maxima*, *Gracilaria corticata* var. *corticata*, *G. edulis*, *Sarcodia indica*, *Sarconema filiforme*, *Solieria robusta*, *Hypnea esperi* and *H. Valentiae* were found to be dominant and widely distributed. Hydrological data were also collected from area surveyed. The atmospheric and bottom water temperature varied from 25.0 to 36.8°C and 26.0 to 31.8°C respectively. The pH ranged from 8.3 to 8.6 and the salinity from 26.39 to 33.43‰. The dissolved oxygen ranged from 3.42 to 6.47 ml/l. The phosphate content varied from 0.05 to 0.15 µg atm/l, silicate from 4.00 to 12.00 µg atm/l, nitrate from 0.25 to 1.00 µg atm/l and nitrite from 1.05 to 3.99 µg atm/l.

Introduction

The phytochemicals such as agar and sodium alginate are manufactured exclusively from seaweeds. Algin yielding seaweeds are available in large quantity from the natural beds to meet the raw material requirement of indigenous algin industries. But the resources of agar yielding seaweeds available in shallow waters of Indian coasts are insufficient to meet the demand of agar industries. Previous investigations were made mostly on the distribution of seaweeds only from nearshore areas of east and west coast of India and Lakshadweep and Andaman-Nicobar Islands to locate the seaweed growing areas and to assess the standing crop of seaweeds (Kaliaperumal, *et al.*, 1987). Hence it has become necessary to study the distribution of seaweeds and to locate new seaweed beds from deep waters.

Very few attempts were made earlier to study the distribution of seaweeds occurring in deep waters at Tuticorin area (Varma, 1960; Mahadevan and Nagappan Nayar, 1967). In order to know the distribution and standing crop of seaweeds growing in deep waters from Dhanuskodi to Kanyakumari in the Gulf of Mannar region of Tamil Nadu, the Central

Table 1. List of seaweeds and seagrasses recorded and their occurrence along the transects from Kattapadu to Tiruchendur.

Sl. No.	Name of the species	Species Occurring upto 10 m depth	Species occurring above 10 m depth 17 m depth	Species occurring between 5.5 and	Transact number and station number in which species occurred	Total number of stations occurred
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Green algae						
1.	<i>Chaetomorpha littorea</i>			+	T1S26, T2S1, S8, T4S5, T11S8	5
2.	<i>Cladophora fascicularis</i>			+	T2S1, T5S11, T6S12	3
3.	<i>C. tranquebarensis</i>			+	T3S1, T5S1, T6S12	3
4.	<i>Acetabularia caliculus</i>		+		T1S26	1
5.	<i>Codium dwarkenese</i>			+	T4S7, T5S14	2
6.	<i>C. tomentosum</i>		+		T4S4, T12S6, S10	3
7.	<i>Halimeda macroloba</i>			+	T2S2, T3S4, T4S4, T5S1, T6S4, S5, S6, T11S15	8
Brown algae						
8.	<i>Ectocarpus irregularis</i>		+		T12S4, S6, S8, S10	4
9.	<i>Dictyota bartayresiana</i>			+	T4S6, S7, T5S14, T6S11, S12, S14, T7S7, S8, T11S10, S13, S15	11
10.	<i>D. dichotoma</i>			+	T1S16, T3S4, T6S10, S11, T12S8	5
11.	<i>D. dichotoma</i> var. <i>intricata</i>		+		T3S8, T4S5	2
12.	<i>D. maxima</i>		+		T11S10, S12, T12S4, S6, S8, S17	6
13.	<i>Padina pavonica</i>	+			T4S7, T11S13	2

Table 1 (Continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
14.	<i>P. tetrastromatica</i>	+			T5S1	1
15.	<i>Spatoglossum asperum</i>	+			T2S3	1
16.	<i>Sargassum ilicifolium</i>		+		T3S8, T6S8	2
17.	<i>S. tenerrimum</i>		+		T4S10, T6S5	2
18.	<i>S. wightii</i>		+		T6S7	1
19.	<i>Sargassum</i> sp.			+	T2S4, T6S5	2
	Red algas					
20.	<i>Scinaia bengalica</i> l			+	T3S1, T4S7, T7S7	3
21.	<i>Chondrococcus hornemanni</i>	+			T3S1	1
22.	<i>Jania iyengarii</i>	+			T1S1, T3S1, S4	3
23.	<i>Lithothamnion fruticulosum</i>			+	T3S4, TS4	2
24.	<i>Cryptonemia coriacea</i>		+		T12S8	1
25.	<i>Grateloupia comorinii</i>		+		T7S7	1
26.	<i>G. filicina</i>		+		T11S12	1
27.	<i>Halymenia floresia</i>		+		T11S12, T12S5	2
28.	<i>H. venusta</i>		+		T11S11	1
29.	<i>Gracilaria corticata</i> var. <i>corticata</i>			+	T1S1, S26, T2S1, S2, S5, T5S14, T6S11, S12, T7S7, S9, T8S3, T11S12	12
30.	<i>G. edulis</i>	+			T5S14, T8S3, T11S9, S10, S12, T12S6	6
31.	<i>G. pygmaea</i>		+		T4S3	1
32.	<i>G. textorii</i>	+			T5S14, T8S3	2
33.	<i>G. verrucosa</i>		+		T1S26, T4S10, T7S10	3

Table 1 (Continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
34.	<i>Gracilaria</i> sp.		+		T4S5	1
35.	<i>Gracilariopsis sjoestedtii</i>		+		T6S12	1
36.	<i>Sarcodia indica</i>			+	T2S1, S2, S5, T3S4, T8S3	5
37.	<i>Sarconema filiforme</i>			+	T2S5, T3S4, T4S2, S4, T6S4, T8S3, T12S8	7
38.	<i>S. furcellatum</i>			+	T1S1, T12S5	2
39.	<i>Solieria robusta</i>			+	T3S4, T4S2, S4, T6S3, T8S3, T11S12, T12S2, S4	8
40.	<i>Hypnea esperi</i>			+	T1S1, T4S2, S3, S4, S8, T11S12, T12S17,	7
41.	<i>H. musciformis</i>			+	T1S1, T6S8	2
42.	<i>H. pannosa</i>	+			T3S4	1
43.	<i>H. valentiae</i>			+	T1S26, T2S1, T3S4, T4S7, T5S14, T6S5, S12, S14, T11S9, S10, S11, S12, S13, S14, T12S2, S4, S8, S10	18
44.	<i>Gymnogongrus pygmaeus</i>			+	T3S4, T11S12	2
45.	<i>Gastroclonium iyengarii</i>			+	T3S4, S8	2
46.	<i>Ceramium miniatum</i>			+	T3S1, T4S4, S7, T11S8	4
47.	<i>Haloplegma duperreyi</i>	+			T2S1	1
48.	<i>Spyridia insignis</i>	+			T1S1, T3S4	2
49.	<i>Wrangelia argus</i>	+			T1S4, T3S4	2
50.	<i>Acanthophora muscoides</i>	+			T3S4	1
51.	<i>A. spicifera</i>	+			T3S1	1

Table 1 (Continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
52.	<i>Chondria armata</i>		+		T1S26, T4S6, T5S14, T6S14	4
53.	<i>C. dasyphylla</i>		+		T6S12, T7S7	2
54.	<i>Herposiphonia sutuposa</i>		+		T11S9, S10, S14	3
55.	<i>Laurencia papillosa</i>			+	T4S7, T5S14	2
56.	<i>L. pinnatifida</i>		+		T6S12	1
57.	<i>Polysiphonia coacta</i>		+		T12S8	1
58.	<i>P. tuticorinensis</i>		+		T2S4, T3S1, T4S5, S10 T11S8, S11	6
Seagrasses						
1.	<i>Cymodocea</i>	+			T1S4, T2S5	2
2.	<i>Halophila ovalis</i>			+	T2S2, T4S1, S4, T5S4, S5, S7, T6S11, T7S7, S9, T12S6	10
3.	<i>H. ovata</i>	+			T2S4	1

+ present

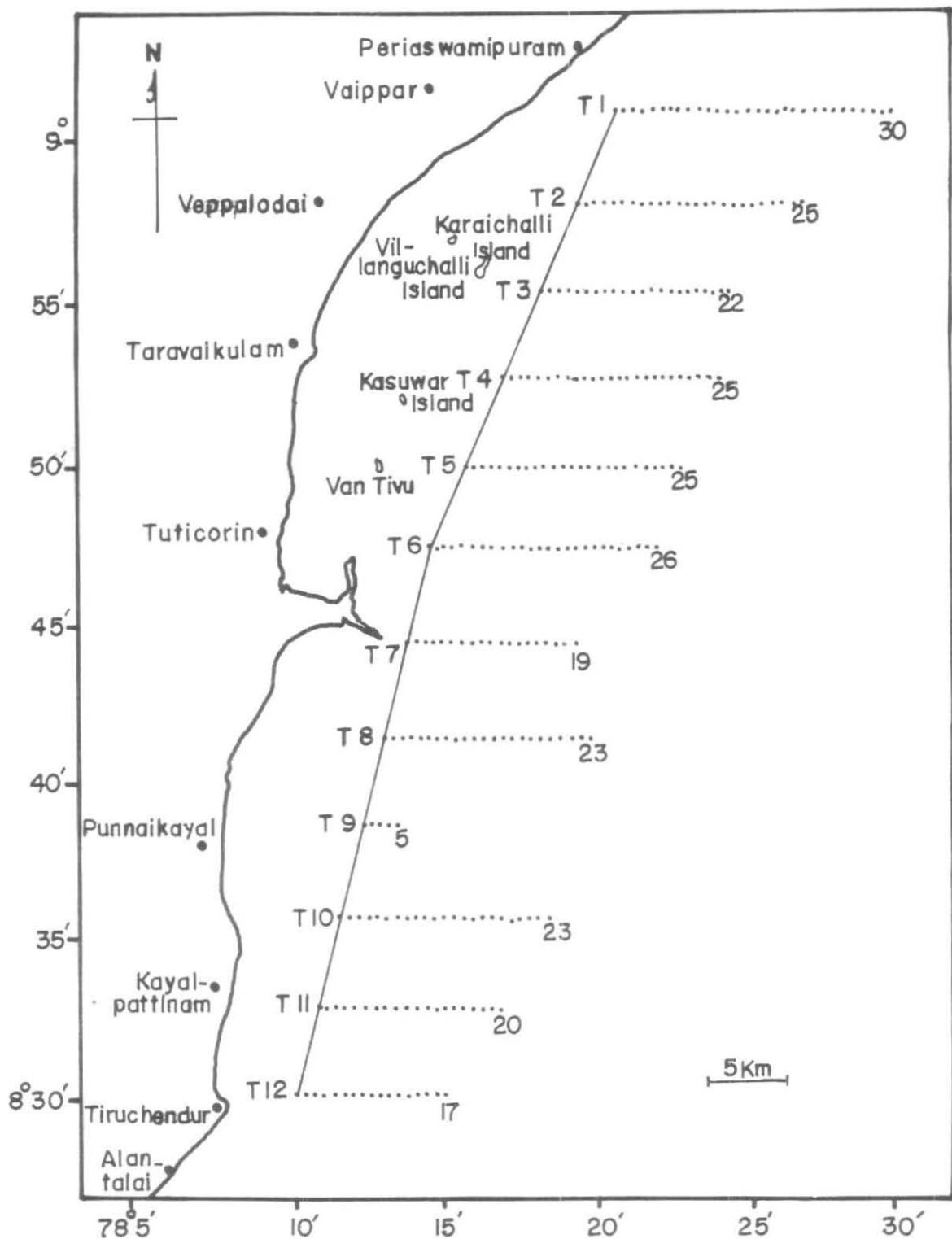


Fig. 1. Map showing the location of transects in the area surveyed from Kattapadu to Tiruchendur

STATION NUMBER



Contour map showing the depths of stations surveyed
Stations with vegetation along the transects.

DEPTH OF STATIONS (m)

Marine Fisheries Research Institute and Central Salt & Marine Chemicals Research Institute have jointly surveyed the deep water seaweed resources in this region during the period 1986 to 1991. The data collected on the standing crop of seaweeds occurring in deep sea from off Kattapadu to Tiruchendur were already published (Chennubhotla *et al.*, 1989 and 1990). The present paper deals with the distribution of seaweeds in the deep waters between Kattapadu and Tiruchendur during the survey conducted in December '86 to March '87.

Materials and Methods

Twelve transects were established from Kattapadu to Tiruchendur at 5 km intervals (Fig. 1). In each transect seaweed and seagrass samples occurring in 1 sq m area were collected SCUBA diving at every 500 m intervals. Among the 12 transects surveyed, 5 to 30 stations were sampled and the depth ranged from 5.5 to 21.5 m (Fig. 2). The seaweed and seagrass samples were sorted out and identified to the level of species. Herbarium and fixed materials of all species were prepared.

Results

Out of 260 stations sampled in the 12 transects, vegetation was present only in 50 stations at depths ranging from 5.5 to 17 m. Seaweeds occurred only on coral or rocky substratum. Vertical distribution of the species along the transects showing greater number of quadrats containing vegetation include transect numbers 2, 4, 6, 11 and 12 with maximum number of 10 stations in transect number 6 (Fig. 2)

The vegetation consisted of 58 species of marine algae and 3 species of seagrasses. The list of these species and their occurrence along the transects is given in Table 1. Of these, 7 species belong to Chlorophyta, 12 to Phaeophyta and 39 to Rhodophyta. The dominant and widely distributed species were *Halimeda macroloba*, *Dictyota bartayresiana*, *D. maxima*, *Gracilaria corticata var. corticata*, *G. edulis*, *Sarcodia indica*, *Sarconema filiforme*, *Solieria robusta*, *Hypnea esperi* and *H. valentiae*. The distribution of these species in the area surveyed is given in Table 1. The distribution of seagrasses *Cymodocea serrulata*, *Halophila ovalis* and *H. ovata*) are also given in Table 1.

Hydrological Data

Data collected on hydrological parameters during the survey are given in Table 2. Water samples were collected between 08.00 and 12.20 hrs from the floor of the sea at the first, middle and last stations of each transect. Atmospheric temperature and bottom seawater temperature at the collection spots were recorded. The samples were analysed for pH, salinity, dissolved oxygen and nutrients such as phosphate, silicate, nitrate and nitrite.

Atmospheric temperature varied from 25.0 to 36.8°C. The seawater temperature ranged from 26.0 to 31.8°C with high value in the stations off Tiruchendur. The pH ranged from 8.3 to 8.6. Salinity varied from 26.39 to 33.43‰. In general, the salinity value was found to be higher in the water samples collected from the stations off Vaipar, Kayalpatnam and

Table 2. Hydrological data collected during the deep water seaweed resources survey from off Kattapadu to off Tiruchendur.

Date of collection	Transenct & Station No.		Depth (m)	Time of collection	Temperature (C)		pH	Salinity (‰)	Oxygen (ml/l)	Nutrients(ug atm/l)			
					AT	SWT				Phosphate	Silicate	Nitrate	Nitrite
27-12-'86	T1	S12	7.0	10.50	30.0	29.8	8.34	30.20	4.04	0.08	7.50	0.50	1.47
do	--	S13	10.0	11.00	30.0	28.6	8.42	30.48	4.36	0.08	7.00	0.25	1.68
do	--	S26	14.5	12.00	30.0	28.8	8.37	30.00	4.07	0.10	9.00	0.50	1.16
do	--	S30	14.0	12.20	30.0	28.8	8.36	30.52	4.81	0.15	6.00	0.50	1.47
2-1-'87	T2	S1	5.5	09.30	25.5	27.0	8.43	33.26	6.47	0.05	11.00	1.00	1.47
do	--	S10	10.0	10.20	28.0	28.1	8.41	33.43	6.35	0.05	11.00	0.50	1.47
do	--	S20	11.0	11.00	26.8	28.6	8.44	33.18	6.41	0.05	11.00	0.75	1.47
22-1-'87	T3	S1	6.0	08.50	27.4	27.3	8.38	27.89	6.22	0.06	6.00	0.50	1.26
do	--	S10	12.0	09.40	27.5	27.8	8.44	31.23	5.42	0.05	5.00	0.50	2.52
do	--	S20	15.0	10.20	27.7	27.9	8.36	29.23	5.20	0.05	4.00	0.50	1.47
6-1-'87	T4	S1	6.0	08.25	27.5	27.3	8.41	27.90	5.65	0.06	11.00	0.50	1.47
do	--	S10	12.0	09.20	28.3	27.5	8.45	30.10	6.25	0.05	12.0	1.00	1.68
do	--	S20	13.5	10.00	28.3	27.5	8.44	29.90	5.50	0.05	11.00	0.50	1.26
8-1-'87	T5	S1	6.0	08.00	26.1	27.0	8.44	28.88	4.64	0.05	7.50	0.75	1.05
do	--	S6	11.0	08.30	25.9	27.4	8.46	30.05	3.42	0.05	7.00	0.75	1.89
do	--	S20	16.0	09.50	30.0	28.2	8.46	30.10	4.41	0.05	7.00	0.75	1.78
17-12-'86	T6	S1	10.0	08.30	27.0	28.0	8.35	30.51	4.95	0.06	8.00	1.00	1.89
do	--	S3	11.0	09.00	27.0	27.0	8.43	31.83	5.33	0.05	6.00	0.75	1.89

Tiruchendur. The dissolved oxygen ranged from 3.42 to 6.47 ml/l. The phosphate concentration varied from 0.05 to 0.15 $\mu\text{g atm/l}$ with high values off Kattapadu. The silicate ranged from 4.00 to 12.00 $\mu\text{g atm/l}$ with high values from the stations off Vaipar and Veppalodai. The nitrate varied from 0.25 to 1.00 $\mu\text{g atm/l}$ and nitrite from 1.05 to 3.99 $\mu\text{g atm/l}$ with high values from Punnakayal to Tiruchendur. There was no marked variation in the value obtained for temperature and pH in the water samples collected from surface in nearshore area and deep water of Tuticorin. But in general, the salinity was found low and dissolved oxygen high in the present investigation when compared with the earlier study (Marichamy and Siraimetan, 1979).

Discussion

The area covered in the present survey is quite extensive. Seaweed growth was always found associated with coral or rocky substrate. Eleven species of Seaweeds occurred only upto 10 m depth. Twenty three species of algae were found to grow only above 10 m depth. The remaining 24 species of algae recorded at various depths ranging from 5.5 to 17 m (Table 2).

The following 16 species recorded by Varma (1960) from the pearl beds off Tuticorin were also found in the present survey. They are *Dictyota dichotoma*, *D. maxima*, *D. bartayresiana*, *Spatoglossum asperum*, *Acanthophora spicifera*, *Heterosiphonia stuposa*, *Laurencia papillosa*, *Lithothamnion fruticulosum*, *Polysiphonia tuticorinensis*, *Sargassum wightii*, *Gracilaria edulis*, *Halymenia floresia*, *Hypnea valentia*, *H. musciformis*, *H. pannosa* and *Sacconema filiforme*. The following new taxa have been reported from the present survey: *Cladophora tranquebarensis*, *Acetabularia calyculus*, *Codium dwarkense*, *C. toentosum*, *Dictyota dichotoma* var. *intricata*, *Halymenia venusta*, *Gracilaria pygmaea*, *G. textorii*, *Gracilaria* sp., *Gracilariopsis sjoistedtii*, *Sarcodia indica*, *Solieria robusta*, *Hypnea esperi*, *Gastroclonium iyengarii*, *Ceramium miniatum*, *Spyridia insignis*, *Acanthophora muscooides*, *Chondria dasyphyra*, *Laurencia pinnatifida* and *Polysiphonia coacta*.

A comparison of the seaweed flora recorded in the present survey with that of the earlier studies by Varma (1960) and Mahadevan and Nagappan Nayar (1967), revealed that only certain species are widely distributed now. They are *Halimeda*, *Spatoglossum*, *Padina*, *Sargassum*, *Gracilaria* and *Hypnea*. The list of algae given by Mahadevan and Nagappan Nayar (1967) which included the 3 genera viz. *Gelidium*, *Porolithon* and *Cystophyllum* were not found in the present survey. Fifty one species listed by Varma (1960) could not be recorded in the present survey. It is probable that some of the species might have been lost due to changes in the environmental conditions over a long period of time. Same number of (55 species) of algal species was recorded in the survey of the intertidal and shallow water area (upto 4 m depth) from Kattapadu to Tiruchendur (Anon, 1978). It is also evident that 20 algae recorded in the present survey were found in the intertidal and shallow water region from Kattapadu to Tiruchendur. *Chaetomorpha littorea*, *Cladophora macroloba*, *Dictyota bartayresiana*, *Padina tetrastratica*, *Spatoglossum asperum*, *Sargassum wightii*, *Grateloupia filicina*, *Gracilaria Corticata* var. *corticata*, *G. verrucosa*, *Solieria robusta*,

Hypnea musciformis, *H. valentiae*, *Gymnogongrus pygmaeus*, *Spyridia insignis* *Wrangelia argus*, *Acanthophora spicifera*, *Chondria armata*, *Herposiphonia stupos*a and *Laurencia papillosa* were recorded in the intertidal and shallow water region from Kattapadu to Thiruchndur.

The resources of economically important seaweeds namely *Sargassum* near Tuticorin and *Grcilaria edulis*, *Spatoglossum asperum*, *Hypnea pannosa*, *H. valentiae*, *Halymenia floresia* near Tiruchendur indicate that they could be exploited for the phycocolloid industry.

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LITERATURE CITED

- Anon 1978 A report on survey of marine algal resources of Tamil Nadu, 1971-76. CSMCRI, Bhavnagar, pp 1-137.
- Chennubhotla, V.S.K., N. Kaliaperumal, S. Kalimuthu, J.R. Ramalingam, S. Krishna Pillai, K. Subbaramaiah, K. Rama Rao & P.V. Subba Rao 1989 Seaweed resources off Tamil Nadu coast : Kattapadu-Tiruchendur. *Mar. Fish. Infor. Serv. T. & E Ser.*, 96: 10-11
- Chennubhotla, V.S.K., N. Kaliaperumal, S. Kalimuthu, J.R. Ramalingam, K. Subbaramaiah, K. Rama Rao & P.V. Subba Rao 1990 Seaweed resources of the Tuticorin-Tiruchendur coast, Tamil Nadu, India. *J.mar. biol. Ass. India*, 32 (1&2): 146-149
- Kaliaperumal, N., V.S.K. Chennubhotla & S. Kalimuthu, 1987. Seaweed resources of India. In: *Seaweed Research and Utilization in India*. CMFRI Bulletin 41: 51-54.
- Mahadevan, S. & K. Nagappan Nayar, 1967. Underwater ecological observation in the Gulf of Manmar off Tuticorin. *J. mar. biol. Ass. India* 9 (1): 147-163.
- Marichamy, R. & Pon Siraimetan 1979 Hydrological studies in the coastal waters off Tuticorin, Gulf of Mannar *J. mar. biol. Ass. India* 21 (1&2): 67-76.
- Varma, R.P. 1960. Flora of pearl beds off Tuticorin *J. mar. biol. Ass. India* 2 (2):221-225.

