

EFFECT OF REPEATED HARVESTING ON THE GROWTH OF SARGASUM SPP AND TURBINARIA CONOIDES OCCURRING IN MANDAPAM AREA

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Abstract

Studies were made on the effect of repeated harvesting on the growth of *Sargassum cristaeifolium*, *S. ilicifolium*, *S. polycystum*, *S. wightii* and *Turbinaria conoides* occurring at Mandapam coast for a period of 2 years during June 1986 to November 1988. The growth of these algin yielding seaweeds depended on the period of harvesting and interval between one harvest and next. The maximum standing crop with plants of maximum stature was found during the period September to January in these brown algae. An interval of 7 months is required for the regrowth of these plants to harvestable size and the suitable season for commercial exploitation of these algae is September to January.

Introduction

In India, the brown algae *Sargassum* and *Turbinaria* are used for the production of sodium alginate by the seaweed industries. At present *Sargassum cristaeifolium*, *S. ilicifolium*, *S. polycystum*, *S. wightii* and *Turbinaria conoides* *T. decurrens* and *T. ornata* are being exploited from the natural seaweed beds in the southeast coast Rameshwaram to Kanyakumari and used as raw material for manufacturing sodium alginate. Studies were made by various workers (Valson, 1955; Umamaheswara 1969; Umamaheswara Rao, and Kalimuthu, 1972; Kaliaperumal and Kalimurthu, 1976, Kaliaperumal *et al.*, 1977; Chennubhotla *et al.*, 1978, 1982 ; Kalimuthu, 1980) on the growth and algin contents in species of *Sargassum* and *Turbinaria* growing at Mandapam area. Some information is available on the effect of repeated harvesting on the growth of agar yielding seaweeds. Hence investigation on this aspect was undertaken during 1986-88 in *Sargassum cristaeifolium*, *S. ilicifolium*, *S. polycystum*, *S. wightii* and *Turbinaria conoides* growing at Krusadai Island, Pudumandam and Kilakkarai in the vicinity of Mandapam and the results obtained are presented in this communication.

Table 1 Harvested biomass of *Sargassum cristaefolium* from Krusadai Island

Month of harvest	Quadrat number and seaweed biomass (g wet wt/m ²)											
	1	2	3	4	5	6	7	8	9	10	11	12
July '87	2650	2260	3850	1600	550	1270	1680	2300	2385	5120	2640	412
August	490											
September	1220	2000										
October	170	310	700									
November	100	890	700	2500								
December	500	340	550	400	1700							
January '88	150	93	100	120	670	2240						
February	15	35	35	40	10	55	70					
March	55	95	95	90	Trace	Trace	115	85				
April	105	125	80	110	75	160	90	140	265			
May	300	273	200	290	210	325	340	410	725	1250		
June	630	760	935	830	895	1040	750	845	1070	920	1220	
July	720	810	610	710	745	840	580	830	810	530	755	1600

Table 2 **Harvested biomass of *Sargassum ilicifolium* from Krusadai island**

Month of harvest	Quadrat number and seaweed biomass (g wet wt/m ²)											
	1	2	3	4	5	6	7	8	9	10	11	12
July '86	260	1740	4770	1120	3560	3900	3160	3660	3520	5340	3580	3400
August	140											
September	Trace	270										
October	Trace	Trace	555									
November	10	30	115	110								
December	40	50	110	75	370							
January '87	35	140	20	75	375	1000						
February	Trace	15	60	15	60	50	200					
March	30	50	25	73	75	40	125	100				
April	50	90	50	100	75	40	20	55	80			
May	Trace	10	30	30	Trace	Trace	40	Trace	Trace	Trace		
June	Trace	90	80	80	Trace	15	50	55	80	75	200	
July	63	40	55	45	Trace	85	55	Trace	Trace	Trace	90	75

Material and Methods

Plants of *Sargassum cristaefolium* C.A. Agardh, *S. ilicifolium* (Turner) C. Agradh and *Turbinaria conoides* Kuetzing grow abundantly on the subtidal reef at Krusadai Island. *S. polycystum* C. Agradh and *T. conoides* occur on the subtidal reef at Kilakkarai. The intertidal rocks at Pudumadam bear luxuriant growth of *S. wightii* (Greville) J. Agradh. For studying the effect of repeated harvests on the growth of these algae, 12 permanent quadrats (1 sq.m area each) were marked randomly for each species in their natural beds by fixing four iron pegs at the four corners of the quadrats. At the start of the experiment the plants were hand picked from these 12 quadrats leaving the basal portion of the plants as followed in commercial harvesting. After one month period, the first quadrat with one month regrown plants was harvested. In the second month the first and second quadrats with one month and two months regrown plants respectively were harvested. The method of harvesting was continued till the end of the experiment for a period of 1 year to study the effect of harvesting every month. The wet weight of the harvested plants from each quadrat was taken every month. This study was made for a period of one year for *S. cristaefolium* and *S. ilicifolium* occurring at Krusadai island and *S. polycystum* and *T. conoides* growing at Pudumadam and Krusadai Island respectively.

Results

Data collected on the biomass of *S. cristaefolium*, *S. ilicifolium*, *S. polycystum* and *S. wightii* are presented in Tables 1 to 4 and for *T. conoides* in Tables 5 and 6. The biomass of *S. cristaefolium* harvested initially from 12 quadrats during July '87 varied from 550 to 5120 g/m². The quadrats reharvested for the first time during September '87 - January '88 showed the maximum standing crop with fully grown plants and it varied from 700 to 2500 g/m². The quadrats reharvested for the first time and in successive months during the period May to July '88 also had high biomass (1220 to 1660 g/m² but the plants were young (Table 1).

The first harvest of *S. ilicifolium* was made from 12 quadrats in July '86 and the weight of the harvested plants varied from 260 to 5340 g/m². Maximum biomass of plants was obtained from the quadrats reharvested for the first time during the months September '86 to January '87 and it ranged from 110 to 1000 g/m². The quadrats reharvested for first time in all other months and in successive months in all quadrats had only less biomass (Table 2).

In *S. polycystum* the initial standing crop from 12 quadrats varied from 200 to 440 g/m² during June '87. The quadrats reharvested for the first time during November '87 to January '88 showed maximum biomass ranging from 550 to 1260 g/m² with

Table 3 Harvested biomass of *Sargassum Polycystum* from Kilakkarai

Month of harvest	Quadrat number and seaweed biomass (g wet wt/m ²)											
	1	2	3	4	5	6	7	8	9	10	11	12
July '87	265	260	265	260	200	220	370	300	265	260	440	400
August	240											
September	250	335										
October	65	50	15									
November	223	210	200	225								
December	260	390	270	270	550							
January '88	173	190	260	220	325	1260						
February	180	250	260	290	310	240	1000					
March	145	100	150	135	120	80	150	480				
April	155	55	60	Trace	95	90	85	90	210			
May	70	120	210	285	315	295	110	205	160	800		
June	175	110	180	190	190	210	210	240	290	290	750	
July	180	230	120	160	100	120	320	310	220	220	190	560

Table 4 Harvested biomass of *Sargassum wightii* from Pudumadam

Month of harvest	Quadrat number and seaweed biomass (g wet wt/m ²)											
	1	2	3	4	5	6	7	8	9	10	11	12
July '86	3430	5190	2160	1500	1370	2920	2300	1190	730	1130	1930	2990
July	840											
August	800	2930										
September	505	530	2560									
October	420	510	200	4000								
November	1060	1540	400	440	6380							
December	405	890	205	335	250	2900						
January '87	575	510	40	420	555	370	4500					
February	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace				
March	65	60	60	300	370	25	Trace	Trace	Trace			
April	430	510	240	940	800	365	45	230	75	40		
May	275	225	Trace	260	260	160	Trace	Trace	Trace	Trace	925	
June	260	245	160	485	140	640	65	150	60	40	810	1040
November '87	4300	4100	3000	3100	4200	1750	4150	4250	3500	3100	4260	3950
December	275											
January '88	940	3300										
February	570	140	860									
March	90	45	25	325								
April	Trace	Trace	Trace	Trace	60							
May	165	235	290	850	295	460						
June	130	145	180	170	105	100	240					
July	420	220	110	270	110	105	130	320				
August	540	105	Trace	300	405	100	320	Trace	340			
September	445	550	180	540	290	330	150	560	190	220		
October	640	520	540	380	350	160	110	240	165	120	1760	
November	170	175	50	75	200	120	210	230	160	200	150	2500

well grown plants. The quadrats reharvested for the first time during April to June '88 showed maximum biomass ranging from 550 to 1260 g/m² with well grown plants. The quadrats reharvested for the first time during April to June '88 had young plants with slightly high biomass of 560 to 800 g/m² (Table 3).

The plants of *S. wightii* were harvested from 12 quadrats (separately for every year) at the start of the experiments in July '86 and November '87 and the biomass varied from 730 to 5190 g/m² and 1750 to 4300 g/m² respectively. During the two years study period, maximum biomass with well grown reproductive plants ranging from 1760 to 6380 g/m² occurred in the quadrats harvested for the first time from October to January. During first year although the biomass was slightly more 925 to 1040 g/m² in the quadrats harvested for the first time in May and June, the plants were young (Table 4).

The vegetation of *T. conoides* from Kilakkarai was harvested from 12 quadrats at the start of the experiment in August '87 and the biomass varied from 3150 to 7320 g/m². The quadrats reharvested for the first time in December '87, January, June and July '88 had maximum biomass ranging from 2050 to 3040 g/m². The plants reharvested during December and January were fully grown with reproductive structures while those harvested during July and August were young (Table 5).

The population of *T. conoides* from Krusadai Island was harvested from 12 quadrats (separately for every year) at the beginning of experiments in June '86 and August '87 and the biomass of harvested plants ranged from 1740 to 6700 g/m² and 4270 to 6980 g/m² respectively. During the two year period, maximum standing crop of plants ranging from 575 to 3140 g/m² was recorded from the quadrats reharvested for the first time in the months September to January. The quadrats reharvested for the first time and in successive months during May to July also had more biomass, but the plants were young and vegetative (Table 6).

Discussion

The present study indicates that regrowth of *Sargassum* and *Turbinaria* depends on the interval between one harvest to the other. These algin yielding seaweeds take about 7 months for their regrowth to harvestable size and attain maximum stature during the period September to January. It is evident from the present investigation that the peak growth period for *S. cristaefolium*, *S. ilicifolium*, *S. polycystum*, *S. wightii* and *T. conoides* is from September to January. The results obtained in the present study agree with the earlier findings on the growth behaviour of *S. ilicifolium* (Chennubhotla *et al.*, 1982), *S. polycystum* as *S. myriocystum* (Kalimuthu, 1980 and Chennubhotla *et al.*, 1982), *S. wightii* (Umamaheswara Rao, 1969) and *T. conoides* (Umamaheswara Rao,

Table 5 **Harvested biomass of *Turbinaria conoides* from Kilakkarai**

Month of harvest	Quadrat number and seaweed biomass (g wet wt/m ²)											
	1	2	3	4	5	6	7	8	9	10	11	12
August '87	5200	4500	6300	5500	3250	5700	4780	3150	4350	6230	6750	7320
September	725											
October	1200	1140										
November	510	850	660									
December	900	1320	920	2700								
January '88	260	205	170	115	2050							
February	275	250	550	Trace	Trace	650						
March	100	100	110	70	60	80	740					
April	120	55	40	70	75	125	Trace	350				
May	170	140	130	150	120	140	140	170	450			
June	240	235	305	280	260	340	385	470	290	603		
July	2690	2460	2220	2450	2495	1715	2600	2360	2765	2675	3040	
August	800	800	1500	800	1000	1000	1000	1000	900	800	1200	3000

Table 6 Harvested biomass of *Turbinaria conoides* from Krusadai island

Month of harvest	Quadrat number and seaweed biomass (g wet wt/m ²)											
	1	2	3	4	5	6	7	8	9	10	11	12
June '86	2540											
July	325											
August	260	360										
September	30	140	1540									
October	695	125	995	1960								
November	40	65	15	90	2400							
December	115	150	35	450	155	3140						
January '87	100	150	400	395	600	770	1720					
February	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace				
March	65	90	20	515	225	40	240	300	340			
April	120	235	120	360	240	210	260	110	600	915		
May	130	100	270	1250	1350	1400	650	450	630	1060	925	
June	65	90	45	100	Trace	Trace	100	140	Trace	130	140	220
August '87	6540	4600	5260	4320	4790	6290	4870	5920	6980	5220	4270	5250
September	620											
October	600	800										
November	250	325	575									
December	700	500	440	1250								
January '88	800	560	860	260	840							
February	250	150	175	280	180	1020						
March	245	390	265	350	280	215	480					
April	105	155	225	160	165	200	155	650				
May	4490	450	470	500	500	325	250	600	1900			
June	1720	1540	1370	1295	1330	1660	1665	1485	1450	2325		
July	1560	1780	1160	1760	1275	1840	1275	1340	1250	1860	3500	
August	400	550	450	650	350	450	500	400	650	550	600	1100

1969; Chennubhotla *et al.*, 1978) growing at Mandapam coast. The suitable period for commercial exploitation of these alginophytes is from September to January for obtaining maximum biomass with fully grown plants. The harvest should be avoided during February to August to ensure regrowth of these brown alga to harvestable size.

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