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SEASONAL STUDIES OF FLORIDA SUBLITTORAL MARINE ALGAE

Arthur C. Mathieson and Clinton J. Dawes

ABSTRACT

The seasonal occurrence and reproduction of the sublittoral seaweed populations at four Florida sites are described. A total of 180 taxa were collected, including 105 Rhodophyceae, 49 Chlorophyceae, and 26 Phaeophyceae. The two southern sites in the Florida Keys showed higher numbers of species than the two northern sites off the central West Coast of Florida. The red algae were the most diverse group at each site. Green algae were more numerous than brown algae at the two Florida Key sites. Several of the species recorded represent extensions of known distributional ranges. Peak numbers of species were recorded during the winter-spring, when maximum nutrients and low temperatures were apparent. The station with the widest temperature fluctuation showed the most dramatic seasonality. The monthly occurrence and reproduction of each seaweed at the four sites are summarized.

The sublittoral marine algae of Florida are primarily known from scattered floristic studies (see Earle, 1972 for a summary), as only a few published accounts (Phillips and Springer, 1960; Dawes and Van Breedveld, 1969; Earle, 1969; Croley and Dawes, 1970; Ballentine, 1972) summarize detailed seasonal observations or ecological studies. Croley and Dawes (1970) described the shallow sublittoral flora (0 to 10 m) at Content Key in the Florida Keys, based on a 2½ year study employing SCUBA diving and permanent line transects. Phillips and Springer (1960) recorded seasonal collections (over a year period) from limestone reefs off Pinellas County-West Coast of Florida. SCUBA techniques were employed in 35-60 feet. Earle (1969) summarized many seasonal observations and collections (by dredging and SCUBA diving) of sublittoral brown algae from the Eastern Gulf of Mexico. She also gave a detailed summarization of environmental data for the area. Ballantine (1972) described the seasonal occurrence and abundance of algal epiphytes on shallow seagrass communities near Anclote Key. Dawes and Van Breedveld (1969) summarized a comprehensive seasonal account of the deep water algae (0-80 m) at 11 stations off the West Coast of Florida. Monthly collections were made, over a 28 month period, by dredging and trawling.

In the present paper we describe the seasonal occurrence and reproduction of the sublittoral algae at four Florida sites. Two of the locations were in the Florida Keys, while the other two were off the central West Coast of Florida (Fig. 1). The floristic studies were conducted in association with a detailed ecological study of three Florida *Eucheuma* species (Dawes, et al., 1974).

METHODS AND MATERIALS

Monthly collections were made from September 1971 to August 1972 at the four study sites. Representative samples of all conspicuous algae were obtained monthly at each station. Collections were made by free diving at Bahia Honda and Molasses Keys. The Homosassa and Anclote Keys sites are offshore locations. Hence free and SCUBA diving techniques were used at the former site, while SCUBA was used at the latter. A complete set of voucher specimens was prepared monthly for each site; they are deposited in the Herbaria of the University of South Florida (USF) and the University of New Hampshire (NHA). Earle (1969), Humm and Taylor (1961), and Taylor (1928, 1960) served as the primary sources of identification. The nomenclature of Taylor (1960) was employed in most cases. The

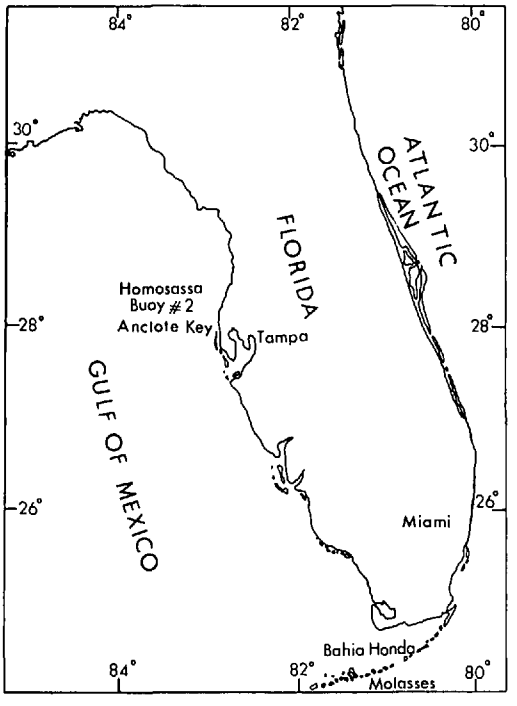

Figure 1. Location of four study sites.

occurrence of reproductive structures was also recorded for each voucher specimen. A variety of environmental parameters, such as temperature, salinity, nutrients, and pH, were determined when each of the sites was occupied (Dawes, et al., 1974).

Description of Stations

A detailed description of the Molasses, Bahia Honda, and Anclote Key sites is summarized by Dawes, et al. (1974). Earle (1969) and Fagerberg (1972) give general accounts of the seaweed populations and the habitat at the Homosassa station. The latter site is at Channel Marker #2 (28°41'5"N latitude, 82°29'13"W longitude) off the Homosassa River. The substrate at all four sites consists of a continuous limestone base, with a sand and/or silt covering. Outcroppings of limestone and coral are also evident at the Anclote site. The collections at the Homosassa site were made from the base of the buoy, and from the adjacent calcareous sand-shell substrate. Extensive mats of *Thalassia testudinum* are present at the Homosassa site, and the plant serves as a host for a variety of epiphytes. The collections from Molasses Key, Bahia Honda Key, and the Homosassa Channel Marker were made in 0-4.0 m, while those at Anclote Key were obtained in 9.2-9.5 m.

Table 1 summarizes a variety of environmental parameters at the four sites. Bahia Honda and Molasses Keys had the highest

Table 1. Summary of environmental parameters (August 1971-August 1972)

Parameter	Molasses Key	Bahia Honda Key	Anclote Key	Homosassa Buoy #2
Temperature (C)				
maximum	32.0 (August)	32.0 (August)	32.0 (August)	26 (October)
minimum	19.0 (February)	20.0 (February)	16 (March)	11 (February)
average	26.9	27.2	24.8	19.0
Salinity (‰)				
maximum	42 (August)	42 (August)	36 (October, April, June and July)	36 (November)
minimum	37 (October, November and June)	37 (October, November and June)	34 (October)	29 (December)
average	38.7	38.9	35.2	31.0
pH				
maximum	8.9 (June)	9.1 (June)	8.6 (March, June)	9.0 (June)
minimum	7.6 (May)	8.0 (May)	7.3 (October)	7.8 (October)
average	8.33	8.37	8.02	8.26

Table 2. Total taxa collected

Stations	Green	Brown	Red	Station total
Bahia Honda Key	31	11	56	98
Molasses Key	32	9	71	112
Homosassa Buoy #2	17	18	32	68
Anclote Key	16	9	38	63

Table 3. Floristic affinities of different stations

Stations	Bahia Honda	Molasses Key	Homosassa Channel Marker #2	Anclote Key
Bahia Honda Key	98	64	41	27
Molasses Key	64	101	31	26
Homosassa Channel Marker #2	41	31	67	22
Anclote Key	27	26	22	63

temperature and salinity regimes, with peaks in the summer and lows in the winter-spring. The salinities at the Anclote Key station were lower than those at Bahia Honda and Molasses Keys, but they were higher and more stable than at the Homosassa Channel Marker. The maximum water temperature at the Anclote Key site was the same as at Molasses and Bahia Honda Keys, but the average and minimum values were lower. The Homosassa site showed the lowest temperature regimes. No temperature readings were taken during June-August, 1972 at the latter site. Thus, the average temperature is probably not very representative. The pH values ranged from 7.6-8.9 at Molasses Key, 8.0-9.1 at Bahia Honda Key, 7.3-8.6 at the Anclote Key site, and 7.8-9.0 at Homosassa. The nutrient levels at the four sites studied were relatively low and they have been previously summarized by Dawes, et al. (1974).

Species Composition

A total of 180 taxa of seaweeds were collected at the four sites, including 105 Rhodophyceae, 49 Chlorophyceae, and 26 Phaeophyceae. *Polysiphonia boldii* is newly recorded from the state of Florida; it was first described and recorded from Texas (Wynne and Edwards, 1970). The *Eucheuma* plants found at Bahia Honda Key probably represent an undescribed species or an ecotype of *Eucheuma nudum* (Dawes, et al., 1974); it is designated as the Bahia Honda form in the present account. The most common *Eucheuma* species on the West Coast of Florida appears to be *E. nudum* (Dawes, et al., 1974); the latter plant is designated as this species pending a taxonomic clarification of the Florida *Eucheuma* species[1]).

Several of the species found at Homosassa (*Diplochaetae solitaria* and *Dictyota indica*) and Anclote Key (*Dictyota ciliolata*, *Spatoglossum schroederi*, *Spermothamnion gorgoneum* and *S. turneri* variety *variable*) represent northern extensions of distributional ranges on the West Coast of Florida, for they have not been previously recorded north of Cape Ramano (Earle, 1972). The occurrence of *Ceramium strictum* and *Helminthocladia calvadosii* in the Florida Keys, represents a southern extension of their known distribution on the West Coast of Florida, for they were previously unknown south of Cape Ramano (Earle, 1972). However, they are known from other southerly areas in the Caribbean (Taylor, 1960).

The number and kinds of seaweeds encountered at each site are summarized in Table 2. Molasses Key had the most diverse flora with 112 taxa. Ninety-eight taxa were found at Bahia Honda Key, 67 at the Homosassa Channel Marker and 63 at the Anclote Key site. The red algae were the most diverse group at each station. Green algae were more numerous than brown algae at Bahia Honda and Molasses Keys—i.e. the two southernmost sites. In contrast at the two northernmost sites (Homosassa and Anclote), the brown algae were either more diverse than the green algae (Homosassa) or they were proportionally more significant on a seasonal basis (Anclote) than at the two Florida Key sites.

[1] Mr. Donald Cheney, of the University of South Florida, Tampa, is presently completing a detailed taxonomic study of the Florida *Eucheuma* species.

Table 4. Seasonal occurrence and reproduction of seaweeds at Homosassa Channel Marker #2. (A = aplanospore, Cp = carpospore, G = gametangia, Ps = plurilocular sporangia, R = receptacle, Sp = spermatia, T = tetraspore, Us = unilocular sporangia, x = present.)

Chlorophyta	S	O	N	D	J	F	M	A	M	J	J	A
Anadyomene stellata (Wulfen) C. Agardh	x	x	x	x	x	x	x	x		x	x	x
Caulerpa ashmeadii Harvey	x	x	x	x	x	x	x	x		x		x
Caulerpa cupressoides (West) C. Agardh	x	x	x	x	x	x	x	x		x		x
Caulerpa lanuginosa J. Agardh				x			x					
Caulerpa mexicana (Sonder) J. Agardh					x							
Caulerpa paspaloides (Bory) Greville											x	x
Caulerpa prolifera (Forsskål) Lamouroux	x	x		x	x	x	x	x		x	x	x
Codium taylori Silva					x			x				
Diplochaete solitaria Collins	x					x	x	x				
Halimeda incrassata (Ellis) Lamouroux	x	x	x	x	x	x	x	x		x	x	x
Penicillus capitatus Lamarck	x	x	x	x	x	x	x			x	x	x
Penicillus dumetosus (Lamouroux) Blainville	x	x	x	x	x		x				x	x
Penicillus lamourouxii Decaisne				x							x	x
Phaeophila dendroides (Crouan) Batters				x								
Pseudotetraspora antillarum Howe								A		x		
Rhipocephalus phoenix (Ellis *et* Solander) Kützing			x								x	x
Udotea conglutinata (Ellis *et* Solander) Kützing	x	x	x	x	x	x	x	x		x	x	x
Subtotal	9	8	8	11	10	8	10	9		8	9	11
Phaeophyta												
Cladosiphon occidentalis Kylin				x	x	x	x	x				
Dictyota dichotoma (Hudson) Lamouroux	T	x	x		x	x		x		x	x	x
Dictyota divaricata Lamouroux		x										
Dictyota indica Sonder in Kützing				x			x					
Ectocarpus confervoides (Roth) Le Jolis	x			Ps								
Giffordia mitchellae (Harvey) Hamel				x	Ps	Ps	x	x				
Giffordia rallsiae (Vickers) Taylor								Ps				
Myriotrichia occidentalis Børgesen											x	
Nemacystus howei (Taylor) Kylin						x	x					
Padina vickersiae Hoyt	T	T	T	T,Sp	T	x	x	x		x		T
Rosenvingea intricata (J. Agardh) Børgesen					x	x	x					
Sargassum filipendula C. Agardh		x	x	x	R	R				x		x
Sargassum pteropleuron Grunow	x							x				x
Sphacelaria fusca (Hudson) C. Agardh					x	x	x	x				
Sphacelaria tribuloides Meneghini						x						
Sporochnus bolleanus Montagne											x	

Table 4. (Continued)

Phaeophyta	S	O	N	D	J	F	M	A	M	J	J	A
Sporochnus pedunculatus (Hudson) C. Agardh					x	x	x	Us		x		
Stictyosiphon subsimplex Holden							x	x				
Subtotal	4	4	3	6	8	10	9	9		4	3	4
Rhodophyta												
Acrochaetium sp.		x										
Centroceras clavulatum (C. Agardh) Montagne			x					x				
Ceramium byssoideum Harvey	x		T	x		x		x				x
Chondria baileyana (Montagne) Harvey								x				
Chondria dasyphylla (Woodward) C. Agardh							x	T				
Chondria leptacremon (Melvill) De Toni								Cp				
Dasya corymbifera J. Agardh	T											
Dasya pedicellata (C. Agardh) C. Agardh		x	T									
Dasya rigidula (Kützing) Ardissone				x	x							
Digenia simplex (Wulfen) C. Agardh	T,Cp,Sp	x	x	Sp	Sp	T	x	x		x	x	x
Eucheuma acanthocladum (Harvey) J. Agardh											x	
Eucheuma nudum J. Agardh												x
Fosliella atlantica (Foslie) Taylor	x	x	x	x	x	x	x	x		x	Cp	x
Goniotrichum alsidii (Zanardini) Howe							x					
Griffithsia tenuis C. Agardh											Cp	
Herposiphonia secunda (C. Agardh) Ambronn								T				
Jania capillacea Harvey	x	x	Cp	x	x			x		x	Cp	x
Laurencia intricata Lamouroux	Cp	x	x	x	x	x		T		x		x
Laurencia obtusa (Hudson) Lamouroux	x				x	x				x		
Laurencia poitei (Lamouroux) Howe		x		x			x	x		x		x
Lomentaria baileyana (Harvey) Farlow										x		
Lophosiphonia cristata Falkenberg				T	x	x					x	
Polysiphonia binneyi Harvey							T,Cp,Sp					
Polysiphonia haplacantha Harvey				x		x	x	x		x		
Polysiphonia havanensis Montagne			Cp					x				
Polysiphonia gorgoniae Harvey		x				x		x			x	
Polysiphonia ramentacea Harvey											x	
Polysiphonia subtilissima Montagne				T								
Solieria tenera (J. Agardh) Wynne *et* Taylor	x	x	x	T,Cp	Cp							x
Spyridia filamentosa (Wulfen) Harvey			x					x			x	

Table 4. (Continued)

Rhodophyta	S	O	N	D	J	F	M	A	M	J	J	A
Wrightiella blodgettii (Harvey) Schmitz								Sp				
Wurdemannia miniata (Draparnaud) Feldmann *et* Hamel		x		x	x	x	x					x
Subtotal	8	10	10	12	9	9	8	16		8	9	9
TOTAL	21	22	21	29	27	27	27	34		20	21	24

Table 3 compares the floristic affinities of the four sites. The floras at Bahia Honda and Molasses Keys showed the highest number of species in common (i.e. 64 species). The Homosassa site showed more affinities to the Florida Key sites than to Anclote. Twenty-two of the species found at Homosassa Buoy #2 were also recorded at Anclote Key.

Of the 180 taxa recorded 20 were present at all four sites. The cosmopolitan species included *Dictyota dichotoma, Sargassum filipendula, S. pteropleuron, Caulerpa cupressoides, C. prolifera, Halimeda incrassata, Penicillus capitatus, P. dumentosus, Rhipocephalus phoenix, Udotea conglutinata, Ceramium byssoideum, Dasya pedicellata, Fosliella atlantica, Goniotrichum alsidii, Jania capillacea, Laurencia intricata, L. obtusa, Polysiphonia binneyi, P. subtilissima,* and *Wurdemannia miniata.*

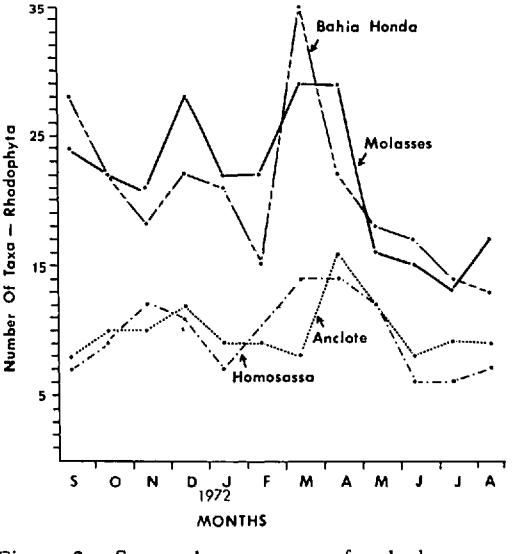

Figure 2. Seasonal occurrence of red algae.

Tables 4-7 give a detailed summarization of the species composition at each site. Several of the seaweeds were restricted to a single location. For example 7 of the 26 species of brown algae (*Cladosiphon occidentalis, Giffordia mitchellae, G. rallsiae, Myriotrichia occidentalis, Nemacystus howei, Sphacelaria tribuloides, Sporochnus bolleanus,* and *Stictyosiphon subsimplex*) were only collected at Homosassa Buoy #2—the site with the most diverse brown algal flora. Each of the latter species, except *S. bolleanus,* is a common epiphyte on *Thalassia testudinum.* Many of the red and green algae were restricted to Bahia Honda or Molasses Keys. The deep water flora at Anclote Key also showed several species, including *Botryocladia occidentalis, Callithamnion byssoides, Caloglossa leprieurii, Chrysymenia enteromorpha, Fauchea hassleri, Gracilaria blodgettii, Halymenia agardhii, H. floresia, H. pseudofloresia, Pterocladia americana, Scinaia complanata, Spermothamnion* spp., *Cladophora gracilis, Derbesia vaucheriaeformis, Dictyota ciliolata, Giffordia conifera,* and *Spatoglossum schroederi,* that were not found at the other three sites.

SEASONAL OCCURRENCE AND REPRODUCTION

Figure 2 illustrates the seasonal occurrence of red algae at the four study sites. A bimodal pattern was recorded at each of the sites, with peak numbers occurring in the spring and fall. The seasonal occurrence of brown and green algae is shown in Figures

Table 5. Seasonal occurrence and reproduction of seaweeds at the Anclote Key site. (A = aplanospore, Cp = carpospore, G = gametangia, Ps = plurilocular sporangia, R = receptacle, Sp = spermatia, T = tetraspore, Us = unilocular sporangia, x = present.)

Chlorophyta	S	O	N	D	J	F	M	A	M	J	J	A
Bryopsis hypnoides Lamouroux			x		x		x	x			x	x
Caulerpa cupressoides (West) C. Agardh			x								x	
Caulerpa mexicana (Sonder) J. Agardh	x			x				x		x		x
Caulerpa peltata Lamouroux										x		x
Caulerpa prolifera (Forsskål) Lamouroux										x		x
Caulerpa racemosa (Forsskål) J. Agardh var. *clavifera* (Turner) Weber van Bosse				x	x							
Cladophora gracilis (Griffiths ex Harvey) Kützing								x				
Codium decorticatum (Woodward) Howe										x	x	x
Codium isthmocladum Vickers								x				
Codium taylori Silva	x	x	x	x	x		x	G	x	G	x	x
Derbesia vaucheriaeformis (Harvey) J. Agardh		x	x				x					
Halimeda discoidea Decaisne		x	x	x			x				x	x
Halimeda incrassata (Ellis) Lamouroux	x											x
Penicillus capitatus Lamarck	x											
Penicillus dumetosus (Lamouroux) Blainville	x											
Rhipocephalus phoenix (Ellis *et* Solander) Kützing	x											
Udotea conglutinata (Ellis *et* Solander) Kützing	x	x	x	x			x			x		x
Subtotal	7	4	6	5	3		5	5	1	6	4	9
Phaeophyta												
Dictyota ciliolata Kützing							x					
Dichotoma dichotoma (Hudson) Lamouroux		x	x	T	x			x	T		x	x
Giffordia conifera (Børgesen) Taylor								x	Ps			
Rosenvingea intricata (J. Agardh) Børgesen								x				
Sargassum filipendula C. Agardh		x	x	x	x		x	R	x	x	x	
Sargassum pteropleuron Grunow		x										
Spatoglossum schroederi (Mertens) Kützing				x								
Sphacelaria fusca (Hudson) C. Agardh		x		x			x					
Sporochnus pedunculatus (Hudson) C. Agardh									x			
Subtotal		3	3	4	2		3	4	4	1	2	1
Rhodophyta												
Acrochaetium sp.									x			
Botryocladia occidentalis (Børgesen) Kylin	x		x	T	x					x	x	x

Table 5. (Continued)

Rhodophyta	S	O	N	D	J	F	M	A	M	J	J	A
Callithamnion byssoides Arnott in Hooker								x				
Caloglossa leprieurii (Montagne) J. Agardh		x										
Ceramium byssoideum Harvey		x	T	x	x		x		T			
Ceramium fastigiatum (Roth) Harvey								T			T	
Champia parvula (C. Agardh) Harvey			x				x	x			Cp	
Chrysymenia enteromorpha Harvey				Cp			x					
Crouania attenuata (Bonnemaison) J. Agardh								x				x
Dasya pedicellata (C. Agardh) C. Agardh								x				
Erythrotrichia carnea (Dillwyn) J. Agardh		x										
Eucheuma nudum J. Agardh	Cp, T	Cp, T,Sp	Cp, T,Sp	Cp, T,Sp	Cp, T,Sp	Cp	x	x	x	x	x	x
Eucheuma acanthocladum (Harvey) J. Agardh										x	x	x
Fauchea hassleri Howe *et* Taylor			T									
Fosliella atlantica (Foslie) Taylor			x				x					
Goniotrichum alsidii (Zanardini) Howe							x					
Gracilaria blodgettii Harvey	Cp,Sp			x								
Gracilaria mamillaris (Montagne) Howe	x			x								
Gracilaria verrucosa (Hudson) Papenfuss	x											x
Halymenia agardhii De Toni										x		
Halymenia floresia (Clemente) C. Agardh										x		
Halymenia pseudofloresia Collins *et* Howe	x			x	x		x	x	x			
Hypnea musciformis (Wulfen) Lamouroux								x				
Jania capillacea Harvey									x			
Kallymenia perforata J. Agardh				x			x	x	x			
Laurencia intricata Lamouroux									x		x	x
Laurencia obtusa (Hudson) Lamouroux		x	x	x	x		x	x	x			
Lomentaria baileyana (Harvey) Farlow		x	T		x		x	Cp				
Peyssonnelia rubra (Greville) J. Agardh			x				x					
Polysiphonia binneyi Harvey									T			
Polysiphonia gorgoniae Harvey		Cp										
Polysiphonia havanensis Montagne			x	x			T		x			
Polysiphonia subtilissima Montagne								T,Cp				
Pterocladia americana Taylor										x		

Table 5. (Continued)

Rhodophyta	S	O	N	D	J	F	M	A	M	J	J	A
Scinaia complanata (Collins) Cotton								Sp,Cp	Cp			
Solieria tenera (J. Agardh) Wynne *et* Taylor	x	x	Cp	Cp	Cp		x		x			
Spermothamnion gorgoneum (Montagne) Bornet												x
Spermothamnion turneri (Mertens) Areschoug var. *variabile* (C. Agardh) Ardisson	x	x					x	T				
Wurdemannia miniata (Drapar-naud) Feldmann *et* Hamel		T	x								x	x
Subtotal	7	9	12	11	7		14	14	12	6	6	7
TOTAL	17	16	22	18	12		22	23	17	13	12	17

3 and 4. A distinct winter-spring peak of brown algae was recorded at Homosassa (Fig. 3). None of the other three sites showed a comparable pattern. The green algae did not show a clear-cut seasonal pattern (Fig. 4). Even so peaks of green algae were recorded at Bahia Honda and Molasses Keys during the winter and spring; the same peaks were not apparent at Homosassa or Anclote.

Figure 5 summarizes the total number of species per month at the four sites. The seaweed populations at Bahia Honda and Molasses Keys showed an almost identical pattern with peaks in September, December, March-April. Minimal populations were evident during the summer. Peak populations were recorded at Homosassa from December to April, with a maximum in April; thereafter a conspicuous decrease was apparent. The populations at Anclote Key showed the

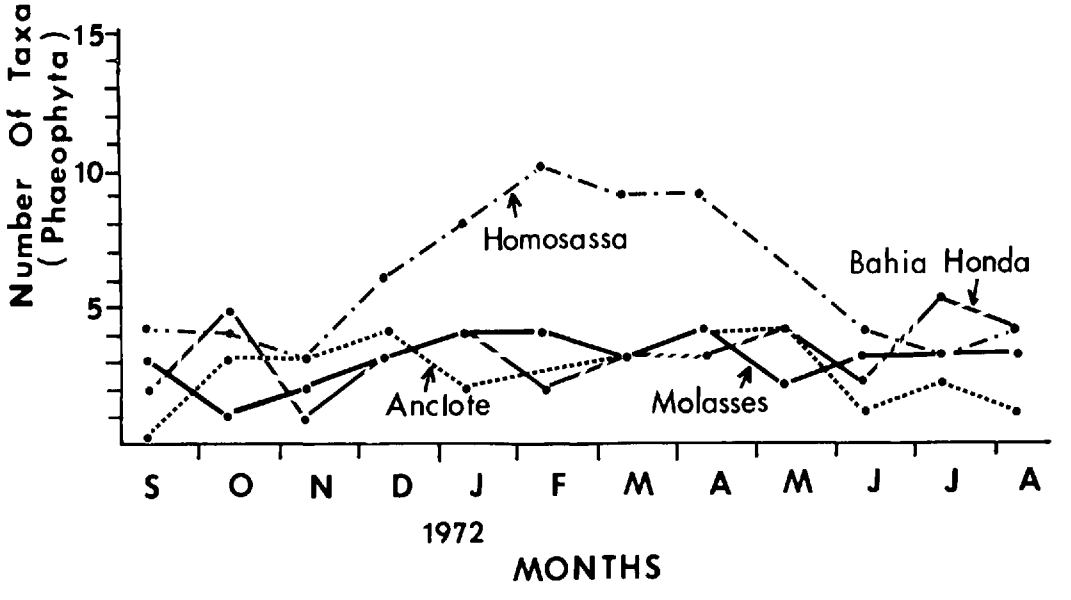

Figure 3. Seasonal occurrence of brown algae.

Table 6. Seasonal occurrence and reproduction of seaweeds at Molasses Key. (A = aplanospore, Cp = carpospore, G = gametangia, Ps = plurilocular sporangia, R = receptacle, Sp = spermatia, T = tetraspore, Us = unilocular sporangia, x = present.)

Chlorophyta	S	O	N	D	J	F	M	A	M	J	J	A
Batophora oerstedi J. Agardh										x		x
Bryopsis duchassaignii J. Agardh				x								
Caulerpa cupressoides (West) C. Agardh	x	x	x	x				x		x	x	x
Caulerpa paspaloides (Bory) Greville								x				
Caulerpa prolifera (Forsskål) Lamouroux	x	x						x				
Caulerpa racemosa (Forsskål) J. Agardh		x	x	x	x	x	x	x	x	x	x	x
Caulerpa racemosa (Forsskål) J. Agardh var. *clavifera* (Turner) Weber Van Bosse	x											
Caulerpa sertularioides (Gmelin) Howe	x	x	x	x	x	x	x	x	x	x	x	x
Cladophora fuliginosa Kützing											x	
Cladophoropsis membranacea (C. Agardh) Børgesen	x	x	x	x	x	x		x	x		x	
Cymopolia barbata (L.) Lamouroux	x		x	x	x		x	x				
Dasycladus vermicularis (Scopoli) Drasser	x	x		x				x	x	x	x	x
Dictyosphaeria cavernosa (Forsskål) Børgesen		x		x			x	x	x	x	x	x
Diplochaete solitaria Collins	x	x		x			x	x				
Enteromorpha lingulata J. Agardh						x						
Halimeda discoidea Decaisne	x	x	x	x	x	x	x	x	x	x	x	x
Halimeda incrassata (Ellis) Lamouroux		x	x	x	x	x	x	x	x	x	x	x
Halimeda opuntia (L.) Lamouroux	x	x	x	x			x		x	x	x	x
Monostroma oxyspermum (Kützing) Doty			x									
Neomeris annulata Dickie									x			x
Penicillus capitatus Lamarck	x	x		x	x	x	x	x	x	x	x	x
Penicillus dumetosus (Lamouroux) Blainville	x	x	x	x	x	x	x	x	x	x	x	x
Phaeophila dendroides (Crouan) Batters		x	x	x								
Pringsheimiella scutata (Reinke) Schmidt *et* Petrak		x										
Pseudotetraspora antillarum Howe							x					
Rhipocephalus phoenix (Ellis *et* Solander) Kützing	x	x		x	x	x						x
Udotea conglutinata (Ellis *et* Solander) Lamouroux	x	x	x	x	x	x	x	x	x	x	x	x
Udotea flabellum (Ellis *et* Solander) Lamouroux										x		
Valonia macrophysa Kützing			x						x			x
Valonia ventricosa J. Agardh	x	x		x		x	x	x		x	x	
Subtotal	15	18	13	18	10	11	13	16	13	14	14	15
Phaeophyta												
Dictyota cervicornis Kützing					x	x	x	T		x		
Dictyota dichotoma (Hudson) Lamouroux	T	x	x	x	x	x	x	x	x	x	x	x
Dictyota divaricata Lamouroux												x
Dictyota linearis (C. Agardh) Greville											x	
Lobophora variegata (Lamouroux) Womersley	T		x	x	x	x	x	x	x	x	x	x

Table 6. (Continued)

Phaeophyta	S	O	N	D	J	F	M	A	M	J	J	A
Padina sanctae-crucis Børgesen					x							
Sargassum filipendula C. Agardh	x			R		x						
Sargassum pteropleuron Grunow								x				
Subtotal	3	1	2	3	4	4	3	4	2	3	3	3
Rhodophyta												
Acanthophora spicifera (Vahl) Børgesen				x				x				
Amphiroa fragilissima (L.) Lamouroux	x		x	x	x		x	x	x	x	x	Cp
Amphiroa rigida Lamouroux var. *antillana* Børgesen	x				x			x	x	x	x	Cp
Bostrychia tenella (Vahl) J. Agardh								T				
Bryothamnion seaforthii (Turner) Kutzing				Cp	x		Cp	x	x			
Bryothamnion triquetrum (Gmelin) Howe						x						
Centroceras clavulatum (C. Agardh) Montagne	x	x	x	x	x	x	x	x		x	x	
Ceramium byssoideum Harvey	T	x	x	T			x	x				
Ceramium strictum (Kützing) Harvey				x								
Champia parvula (C. Agardh) Harvey	T	T	x	x	T	Cp	x	T	x	x		x
Champia salicornioides Harvey		x	x	Cp	T	x	T	x		x		
Chondria dasyphylla (Woodward) C. Agardh						x		T				
Chondria littoralis Harvey	x	x		x								
Chondria sedifolia Harvey								T				
Corynomorpha clavata (Harvey) J. Agardh		x										
Crouania attenuata (Bonnemaison) J. Agardh		x			x	x	x	x	x			
Dasya caribica Børgesen									x			
Dasya crouaniana J. Agardh	x						x	x				
Dasya pedicellata (C. Agardh) C. Agardh	x		x	x	x	x	x	T				
Dasya ramosissima Harvey				x								
Dasya rigidula (Kützing) Ardissone							x			x	x	x
Digenia simplex (Wulfen) C. Agardh	x			x		x			x	x		x
Eucheuma gelidium (J. Agardh) J. Agardh	x					x	x	x				
Eucheuma isiforme (C. Agardh) J. Agardh	T	T	T	T	T	x	x	x	x	x	T	T
Fosliella atlantica (Foslie) Taylor	T	x			x		x					
Fosliella farinosa (Lamouroux) Howe										x		
Gelidiella acerosa (Forsskål) Feldmann *et* Hamel	T	Cp	x	Cp	x	x	x	x	x	x	x	x
Goniolithon spectabile Foslie			x									
Goniolithon strictum Foslie											x	x
Goniotrichum alsidii (Zanardini) Howe	x		x						x	x		
Gracilaria debilis (Forsskål) Børgesen	x	x		x	x	x		x				Cp
Gracilaria ferox J. Agardh		Cp	Cp		Cp			T				
Gracilaria verrucosa (Hudson) Papenfuss	T											
Griffithsia tenuis C. Agardh							x					
Helminthocladia calvadosii (Lamouroux) Setchell												x
Herposiphonia secunda (C. Agardh) Ambronn							x					

Table 6. (Continued)

Rhodophyta	S	O	N	D	J	F	M	A	M	J	J	A
Herposiphonia tenella (C. Agardh) Ambronn												x
Heterosiphonia gibbesii (Harvey) Falkenberg	x	x	x	x		x		x				
Heterosiphonia wurdemani (Bailey *ex* Harvey) Falkenberg	x											
Hypnea cervicornis J. Agardh			x	T	x	x	x	x				x
Hypnea cornuta (Lamouroux) J. Agardh				x		x						
Hypnea musciformis (Wulfen) Lamouroux					x	x		x				
Hypnea spinella (C. Agardh) Kützing									x			x
Jania adherens Lamouroux												x
Jania capillacea Harvey		x	x			x		x				
Jania pumilla Lamouroux										x		
Laurencia intricata Lamouroux	x	x	x	x	x	x	x	x	x	x	x	
Laurencia obtusa (Hudson) Lamouroux		x		x			x					
Laurencia papillosa (Forsskål) Greville	x	x	x	x	x	x	x		x	x	x	x
Laurencia poitei (Lamouroux) Howe	x	x	x	x	x	x	x	x	x		x	x
Liagora farinosa Lamouroux							x					
Lophosiphonia cristata Falkenberg							x					
Peyssonnelia rubra (Greville) J. Agardh									x		x	x
Polysiphonia binneyi Harvey			x	T			x					
Polysiphonia ferulacea Suhr								x				
Polysiphonia howei Hollenberg	x											
Polysiphonia subtilissima Montagne							x					
Polysiphonia tepida Hollenberg		x										
Taenioma macrourum Thuret							x					
Wrangelia bicuspidata Børgesen			x	x	x							
Wrangelia penicillata C. Agardh		x		x	x		x	x				
Wrightiella tumanowiczi (Gatty) Schmitz	T	x	T	x	T	x	x	x				
Wurdemannia miniata (Draparnaud) Feldmann *et* Hamel	x	x	x	x	x	x		x	x	x	x	x
Subtotal	24	22	21	28	22	22	29	29	16	15	13	17
TOTAL	42	41	36	48	36	35	45	49	31	31	30	35

most pronounced seasonal cycle of species numbers and biomass, with fall and spring peaks and a winter minimum. *Giffordia conifera* was one of the major components of the spring bloom at the Anclote Key site. During May, 1972 it formed a dense cloud of detached plants throughout the water column, except for the top meter and on the bottom. The local shrimp fishermen indicate that the bloom is a yearly phenomenon; they designate the plant as "gumbo."

Tables 4-7 summarize the monthly occurrence of seaweeds at the four study sites. Most of the green algae appear to be perennials or aseasonal annuals that are represented by successive generations of new plants during a year. A few green algae, such as *Cladophora delicatula, C. gracilis, Enteromorpha lingulata, E. plumosa, Monostroma oxyspermum,* and *Pseudotetraspora antillarum,* are distinct seasonal annuals, for they are only found during a limited period of the year. Most of the brown algae found at Molasses and Bahia Honda Keys appear to be perennials or aseasonal annuals. In contrast a large number of seasonal annuals, such as *Cladosiphon occidentalis, Ectocarpus confervoides, Giffordia mitchellae, G. rallsiae, Myriotrichia occidentalis, Nemacystus howei, Rosenvingia intricata, Sporochnus bolleanus,*

Table 7. Seasonal occurrence and reproduction of seaweeds at Bahia Honda Key. (A = aplanospore, Cp = carpospore, G = gametangia, Ps = plurilocular sporangia, R = receptacle, Sp = spermatia, T = tetraspore, Us = unilocular sporangia, x = present.)

Chlorophyta	S	O	N	D	J	F	M	A	M	J	J	A
Acetabularia crenulata Lamouroux	x	x	x				x					x
Avrainvillea nigricans Decaisne	x											
Batophora oerstedi J. Agardh	x	x			x		x	x	x			x
Caulerpa cupressoides (West) C. Agardh	x	x	x	x	x	x	x	x		x	x	x
Caulerpa lanuginosa J. Agardh	x	x	x	x	x	x	x	x		x		
Caulerpa paspaloides (Bory) Greville		x		x							x	
Caulerpa prolifera (Forsskål) Lamouroux		x										
Caulerpa sertularioides (Gmelin) Howe	x	x	x	x							x	
Cladophora delicatula Montagne							x					
Cladophoropsis membranacea (C. Agardh) Børgesen				x		x		x				x
Dasycladus vermicularis (Scopoli) Krasser	x	x	x	x	x	x	x		x	x	x	x
Dictyosphaeria cavernosa (Forsskål) Børgesen	x	x	x	x	x	x	x	x	x	x	x	
Diplochaete solitaria Collins				x	x		x			x		
Enteromorpha lingulata J. Agardh							x					
Enteromorpha plumosa Kützing							x					
Halimeda discoidea Decaisne	x			x	x		x		x	x	x	x
Halimeda incrassata (Ellis) Lamouroux	x	x	x	x	x	x	x	x		x	x	x
Halimeda monile (Ellis *et* Solander) Lamouroux	x	x									x	
Halimeda opuntia (L.) Lamouroux	x			x		x			x			
Penicillus capitatus Lamarck	x	x	x	x	x	x	x		x	x	x	x
Penicillus dumetosus (Lamouroux) Blainville	x	x	x	x	x	x	x	x		x	x	x
Penicillus lamourouxi Decaisne			x			x	x				x	
Phaeophila dendroides (Crouan) Batters				x			x					
Rhipocephalus phoenix (Ellis *et* Solander) Kützing	x	x		x		x	x	x		x	x	x
Siphonocladus rigidus Howe												x
Udotea conglutinata (Ellis *et* Solander) Lamouroux	x	x		x	x	x	x	x	x		x	x
Udotea flabellum (Ellis *et* Solander) Lamouroux			x			x						
Valonia macrophysa Kützing						x						
Valonia ocellata Howe	x			x	x		x					
Valonia utricularis C. Agardh								x				
Valonia ventricosa J. Agardh	x			x	x		x	x				
Subtotal	18	15	11	18	13	14	20	11	7	11	13	11
Phaeophyta												
Cystoseira myrica (Gmelin) J. Agardh				x	x		x	x				
Dictyota cervicornis Kützing					x		x	x				
Dictyota dichotoma (Hudson) Lamouroux	x	x	x	x	x	x	x		x	x	x	x
Dictyota divaricata Lamouroux											x	x
Dictyota indica Sonder in Kützing								x			x	
Dictyota linearis (C. Agardh) Greville		x				x			x	x		x
Ectocarpus confervoides (Roth) Le Jolis		x							x			
Lobophora variegata (Lamouroux) Womersley											x	
Padina vickersiae Hoyt		x							x			

Table 7. (Continued)

Phaeophyta	S	O	N	D	J	F	M	A	M	J	J	A
Sargassum filipendula C. Agardh		x		R								x
Sargassum pteropleuron Grunow	x				x							
Subtotal	2	5	1	3	4	2	3	3	4	2	5	4
Rhodophyta												
Acanthophora spicifera (Vahl) Børgesen	x	x	x	x		x	x	x			x	
Amphiroa fragilisima (L.) Lamouroux				x			x		x		x	x
Amphiroa rigida Lamouroux var. *antillana* Børgesen	x						x	x	x	x	x	
Centroceras clavulatum (C. Agardh) Montagne		x	x	x		x	x	x		x	x	
Ceramium bysoideum Harvey	x	x	x	x			x					
Ceramium fastigiatum (Roth) Harvey	x	x	x	x	x	x		x	x			
Ceramium nitens (C. Agardh) J. Agardh	T	x		x				x				
Ceramium rubrum (Hudson) C. Agardh							x					
Champia parvula (C. Agardh) Harvey	x	T	x	x		x	T	x	x	x		
Chondria baileyana (Montagne) Harvey							x					
Chondria cnicophylla (Melvill) De Toni	T											
Chondria dasyphylla (Woodward) C. Agardh							x	Sp				
Chondria leptacremon (Melvill) De Toni	x			x	Cp		x					
Chondria littoralis Harvey	x	x		x	x		x	x				
Chondria tenuissima (Goodenough *et* Woodward) C. Agardh		x	x			x			x	T	x	
Crouania attenuata (Bonnemaison) J. Agardh							x					
Dasya caraibica Børgesen		x				x	x					
Dasya crouaniana J. Agardh	T						x					
Dasya pedicellata (C. Agardh) C. Agardh	x	x	x	x	x		x	x		x	x	x
Dasya rigidula (Kützing) Ardissone					x			x				
Digenia simplex (Wulfen) C. Agardh	x	x	x	x	x	x	x	x		x	x	x
Eucheuma sp. (= Bahia Honda form)	T	T	T	T	T	T	T	x	x	x	x	T
Fosliella atlantica (Foslie) Taylor		x	x				x		x			
Fosliella farinosa (Lamouroux) Foslie										x		
Gelidiella acerosa (Forsskål) Feldmann *et* Hamel									x			
Goniolithon spectabile Foslie							x					
Goniolithon strictum Foslie			x								x	x
Goniotrichum alsidii (Zanardini) Howe							x	x	x	x		
Gracilaria ferox J. Agardh	x	x										
Gracilaria verrucosa (Hudson) Papenfuss									x			
Herposiphonia pecten-veneris (Harvey) Falkenberg	x	x		x	x		x					
Heterosiphonia gibesii (Harvey) Falkenberg	x						x	x	x			
Hypnea cervicornis J. Agardh	x				x		x		x			x
Hypnea spinella (C. Agardh) Kützing									x			x
Jania capillacea Harvey					x	x	Cp	x	x	x	x	
Laurencia intricata Lamouroux	x	x		x	x	x	Cp	x	x	x	x	x
Laurencia obtusa (Hudson) Lamouroux				x	x							x
Laurencia papillosa (Forsskål) Greville	x	x	x	x	x		T	x	x	x	x	x
Laurencia poitei (Lamouroux) Howe	x	x	x	x	x	x	Cp	x	x	x	x	x
Lomentaria baileyana (Harvey) Farlow									x			
Lophosiphonia cristata Falkenberg	x						x	x				

Table 7. (Continued)

Rhodophyta	S	O	N	D	J	F	M	A	M	J	J	A
Lophosiphonia saccorhiza Collins *et* Harvey					T							
Polysiphonia binneyi Harvey	x			x	T		x	x		x		
Polysiphonia boldii Wynne *et* Edwards							Cp					
Polysiphonia gorgoniae Harvey	x											
Polysiphonia haplacantha Harvey	x			x	x		x					
Polysiphonia macrocarpa Harvey	x											
Polysiphonia opaca				x	x		T	x				
Polysiphonia ramentacea Harvey		x	x									
Polysiphonia subtilissima Montagne	x	x	x		x	x				x		x
Spyridia filamentosa (Wulfen) Harvey		x	x	x	x	x	x	x		x		
Wrangelia argus Montagne			x									
Wrangelia bicuspidata Børgesen	x						x					
Wrangelia penicillata C. Agardh	T				Cp		x			x		
Wrightiella tumanowiczi (Gatty) Schmitz						x						
Wurdemannia miniata (Draparnaud) Feldmann *et* Hamel		x	x	x		x			x		x	x
Subtotal	28	22	18	22	21	15	35	22	18	17	14	13
TOTAL	48	42	30	43	38	31	58	36	29	32	32	28

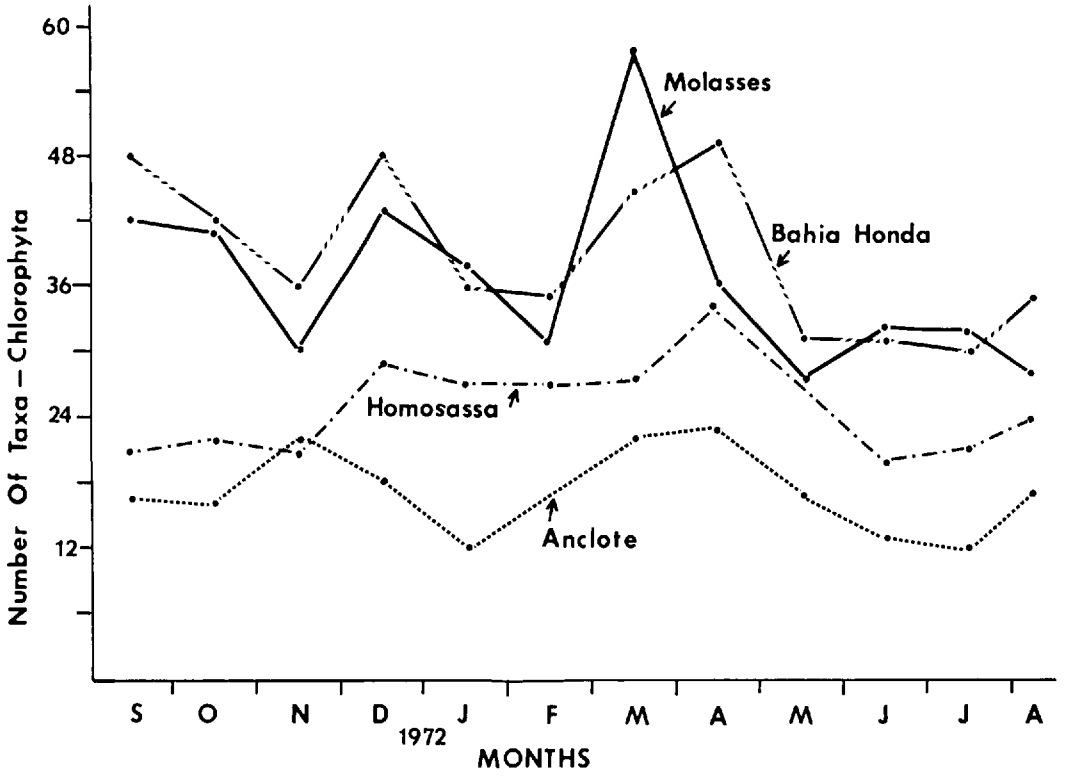

Figure 4. Seasonal occurrence of green algae.

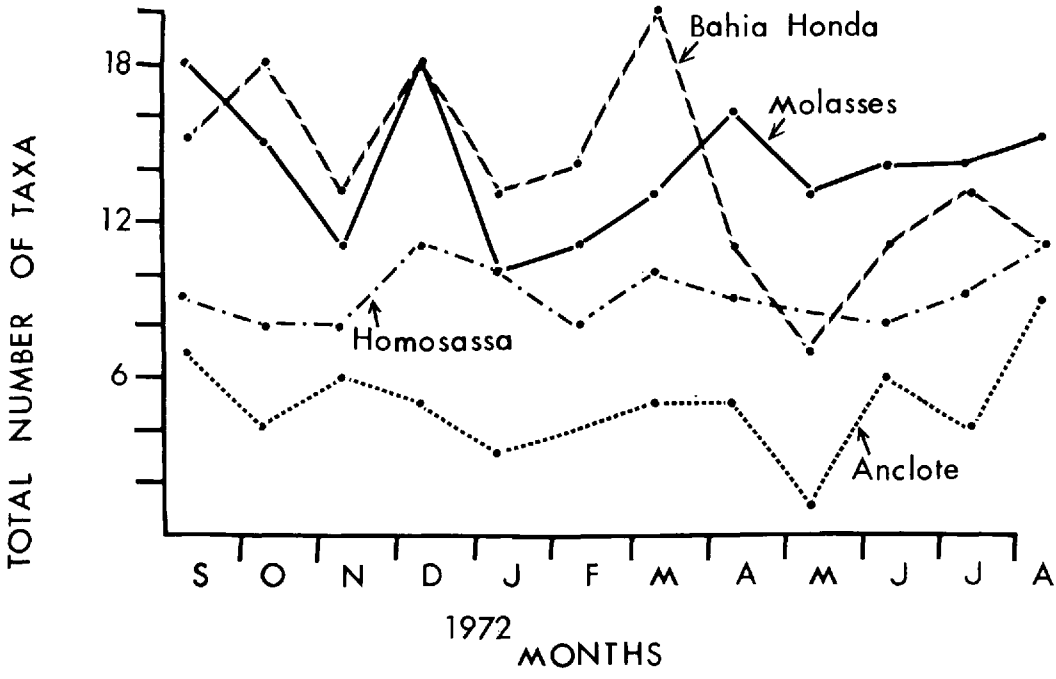

Figure 5. Total number of species per month at the four study sites.

S. pedunculatus, and *Stictyosiphon subsimplex*, were found at Anclote Key and Homosassa Buoy #2.

Perennial and annual populations of red algae were evident at each of the four sites. *Acanthophora spicifera*, *Amphiroa* spp., *Botryocladia occidentalis*, *Digenia simplex*, *Eucheuma gelidium*, *E. isiforme*, *Fosliella* spp., *Gelidiella acerosa*, *Goniolithon* spp., *Jania* spp., *Laurencia papillosa*, *L. poitei*, and *Wurdemannia miniata* are common perennials. *Ceramium strictum*, *Callithamnion byssoides*, *Chondria baileyana*, *C. dasyphylla*, *C. leptacremon*, *C. sedifolia*, *Crouania attenuata*, *Dasya* spp., *Eucheuma nudum*, the Bahia Honda form of *Eucheuma*, *Helminthocladia clavadosii*, *Hypnea* spp., *Lomentaria baileyana*, several of the *Polysiphonia* spp., *Scinaia complanata*, *Spermothamnion* spp., *Wrangelia* spp., and *Wrightiella blodgettii* are common seasonal annuals. Some of the red algae, such as *Chondria littoralis*, *Eucheuma nudum*, the Bahia Honda form of *Eucheuma* and *Gelidiella acerosa* can also be described as pseudoperennials (Knight and Parke, 1931), for the basal portions of their fronds are capable of regenerating intact plants. The longevity of many of the algae could not be assessed, because of their infrequent occurrence.

Tables 4-7 also summarize the seasonal reproduction of the seaweeds at the different sites. Very few reproductive structures were observed on the green algae even though each specimen was examined microscopically. Thus, only one aplanospore-bearing plant of *Pseudotetraspora antillarum* was found during April at the Homosassa site, and gametangial populations of *Codium taylori* were recorded in April and June at Anclote Key. Several of the brown algae (*Ectocarpus confervoides*, *Giffordia mitchellae*, *Giffordia rallsiae*, *Sargassum filipendula*, and *Sporochnus pedunculatus*) showed a peak period of reproduction in the winter-spring—particularly at the Homosassa site. Tetrasporic plants of *Dictyota* spp., *Lobophora variegata* and *Padina vickersiae* were

found intermittently throughout the year. The only male brown alga recorded was represented by a collection of *Padina vickersiae;* it was found in December at the Homosassa site. Tetrasporic and cystocarpic specimens of several red algae were found at each of the four sites. In contrast spermatangial plants were rare; spermatangia were only observed with *Chondria dasyphylla, Digenia simplex, Eucheuma nudum, Gracilaria blodgettii, Scinaia complanata, Polysiphonia binneyi* and *Wrightiella blodgettii. Gracilaria blodgettii, Polysiphonia binneyi, Polysiphonia subtilissima,* and *Solieria tenera* showed a simultaneous occurrence of two of the three major reproductive phases (spermatangial, cystocarpic and tetrasporic) in a single monthly collection.[2]

Discussion

The species composition at Bahia Honda and Molasses Keys is very similar to that described for Content Key (Croley and Dawes, 1970) and the Dry Tortugas (Taylor, 1928). One would anticipate such a similarity, for each of the four sites is in the Florida Keys. Surprisingly the Homosassa site showed more affinities to the southern sites (Bahia Honda and Molasses Keys) than to the adjacent Anclote Key station. However, it should be recalled that the Anclote Key site was deeper than the other three sites. Many of the species in common to Homosassa and the Florida Keys (see Tables 4, 6 and 7) have a cosmopolitan distribution (Taylor, 1957, 1960). Thus, they are probably flexible to a variety of environmental factors such as temperature and salinity. The marine algae found at Anclote Key were very similar to those described by Phillips and Springer (1960) and Dawes and Van Breedveld (1960) from moderate depths (10-20 m) off the Central West Coast of Florida. The species composition at the Anclote Key site also showed many similarities to the offshore flora in North Carolina (Schneider and Searles, 1973), for it was dominated by many of the same red algae (e.g. *Scinaia complanata, Kallymenia perforata, Gracilaria blodgettii, G. mamillaris, Solieria tenera, Eucheuma isiforme,* and *Botryocladia pyriformis*).

A comparison of the deep water stations (30-70 m) of the Hourglass Cruises (Dawes and Van Breedveld, 1969) with the more shallow Anclote (9 m) and Homosassa (4 m) sites shows that fewer tropical and perennial species are present at the latter sites. Dawes and Van Breedveld (1969) emphasize that the large number of perennial and tropical algae in deep waters (30-60 m) is correlated with stable temperature and salinity conditions and reduced turbidities. In contrast shallow water stations with more wide-ranging hydrographic conditions (particularly temperatures) show a more pronounced seasonality. Many of the perennial tropical species found at Anclote Key were reduced to residual basal portions during the winter.

Earle (1969, 1972) and Humm and Taylor (1961) have also described the existence of a diverse offshore flora in the Gulf of Mexico, as well as pronounced seasonal fluctuations in the northern Gulf. Earle (1972) emphasizes that the offshore summer temperatures (25-30°C) of the Gulf are tropical, according to Setchell's (1915) definition. In contrast the average temperature for inshore waters of the northern Gulf are approximately equal to the summer temperatures in New England; in addition they drop markedly in the winter. Earle (1972) states that 50 species with New England affinities, thrive during the winter in the northern Gulf, but they do not occur in the southern Gulf. Many of the latter species are summer annuals at Cape Cod, Massachusetts.

Thirty-four of the 180 species we recorded extend northward to southern New England or the arctic (see Taylor, 1957 for distributional data). Seventeen of the latter species occurred at Homosassa and Anclote Key, 16 at Bahia Honda and 15 at Molasses Key. The equality of "temperate" species at the

[2] Specimens of *Agardhiella tenera* (J. Agardh) Schmitz from the southern coasts of North America and the West Indies have been transferred by Wynne and Taylor (1973) to *Solieria tenera* (J. Agardh) Wynne et Taylor.

four sites may, in part, be a reflection of differential depths and substrates, as well as the rather central location of the Anclote and Homosassa stations on the West Coast of Florida.

Earle (1969) emphasizes that the Phaeophyta can be used as biological indicators of floral affinities in the Eastern Gulf of Mexico. She records an average of about 13% Phaeophyta in several tropical and subtropical American areas, with 22% at Beaufort, North Carolina, and 33% from the Northeastern United States. A compilation of our data shows 11.2% Phaeophyta at Bahia Honda, 8.04% at Molasses, 25.4% at Homosassa and 14.3% at the Anclote site. The values at Bahia Honda and Anclote are somewhat low, as compared to other geographical areas. However, it should be recalled that Earle's average values are based on rather broad geographical areas (e.g. Bermuda, Virgin Islands, Northeastern United States) rather than a single site. In addition the data from the Anclote Key site is probably also low, because of the depth of the location (9 m).

As suggested previously we have also observed pronounced seasonal cycles at each site. Peak species numbers were recorded during the winter-spring when maximum nutrients and low temperatures were apparent. Minimum species numbers were evident during the summer when high temperatures and low nutrients were evident. The station with the widest temperature variation (Homosassa) showed the most dramatic seasonality. In contrast the Florida Key sites showed less temperature variation and a more limited biological fluctuation. The brown algae were the major contributors in the winter-spring peak at Homosassa and the Anclote Key sites, presumably because of their cold water affinities. A greater number of green and red algae were found in the Florida Keys. Fewer of these species are temperate annuals.

Several annuals, such as *Pseudotetraspora antillarum*, *Chondria baileyana*, *C. dasyphylla*, *C. leptacremon*, and *Dasya pedicellata*, occurred earlier in the Florida Keys than at Anclote Key or the Homosassa site. The differential temperature regimes between the northerly and southerly sites probably account for the phenologies recorded. Coleman and Mathieson (in press) have recorded a similar situation on the north and south side of Cape Cod, which is a major phytogeographic boundary on the East Coast of North America (Setchell, 1922). The seasonal occurrence of most species in common to Bahia Honda and Molasses Keys was very similar. Differences were primarily a reflection of varying abundances at the two sites. Most species in common to Anclote Key and Homosassa showed a similar seasonal occurrence. However, a few species, such as *Rosenvingia intricata* and *Sporochnus pedunculatus* occurred earlier at Homosassa than at Anclote Key. *Eucheuma acanthocladum* was collected earlier at Anclote Key than at Homosassa. Differential light regimes may account for the varying depth responses.

In most cases the reproductive information is inadequate to make any detailed evaluation. However, a few generalizations can be summarized as follows:

(1) many of the annual brown algae showed a synchronized cycle of peak reproduction and growth in the winter-spring.
(2) most of the perennial species showed differential seasonal cycles for their reproduction and growth.
(3) vegetative reproduction is probably a major means of repopulation for many of the algae—e.g. *Caulerpa*, *Penicillus*, *Gracilaria*, and *Hypnea* spp.
(4) many perennial species (e.g. *Chondria littoralis*, *Botryocladia occidentalis*, *Eucheuma nudum*, *Sargassum filipendula*, *S. pteropleuron*) are capable of regenerating intact plants from the basal portions of their fronds.

A comparison of the species diversity at the three shallow water sites (Bahia Honda, Molasses, and Homosassa) shows a con-

spicuous difference between the northern and southern locations. For example, there are almost twice as many species at both Bahia Honda and Molasses Key as at Homosassa Buoy #2. Earle (1972) also records a greater species diversity in the southern than the northern Gulf of Mexico, which she interprets as being due to the greater prevalence of hard substrate and the more stable hydrographic conditions in the former areas. A similar gradient of species diversity is evident along the Northeastern Coast of North America (Mathieson, et al., 1969).

The importance of diving (both free and SCUBA) to the present study cannot be overemphasized, for it has allowed direct observations and collections of specimens on a monthly basis throughout a year. Thus, several of our collections represent extensions of known distributional ranges as well as new records to Florida. Many of these specimens might not have been found if typical dredging techniques were employed. In addition we have been able to record a variety of unique phenological events, such as the bloom of pelagic populations of *Giffordia conifera* and the "seeding" of young *Eucheuma nudum* plants (Dawes, et al., 1974) at Anclote Key. The magnitude of these events would not have been apparent if direct observations were not employed.

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