CHAPTER 3

RESULT

Plant community structure

I. Distribution of seagrasses

Five species of seagrasses were found at Koh Samui. They were *Halodule uninervis* (both wide and narrow varieties), *Halophila ovata*, *H. ovalis*, *H. decipiens* and *Enhalus acoroides*. At Yai Point the seagrasses were found outside the area of the living corals at the depth between 5-8 meters (Figure 5). The area of seagrass bed was about 300 meters wideand 500 meters in length. Species composition were *Halodule uninervis* (wide variety), *Halophila ovalis* and *H. ovata*. All of these three species were found throughout the summer. However only *H. uninervis* and *H. ovata* were found in the winter.

At Chon Khram Point, the seagrasses, *Halodule uninervis*, *Halophila ovalis* and *H. ovata* were found in the fore reef area (Figure 6). *Halodule uninervis* (wide variety) dominated the area. The area of seagrasses bed was about 500 meters wide and 1,000 meters in length. Among these three species of *H. uninervis*, *H.ovalis*, and *H. ovata* which occured throughout the year *Halodule uninervis* (wide variety) was the most dominant species but. *Halodule uninervis* (narrow variety) was found only in the summer

At Hin Com Point, the seagrass bed was found in 3-3.5 meters

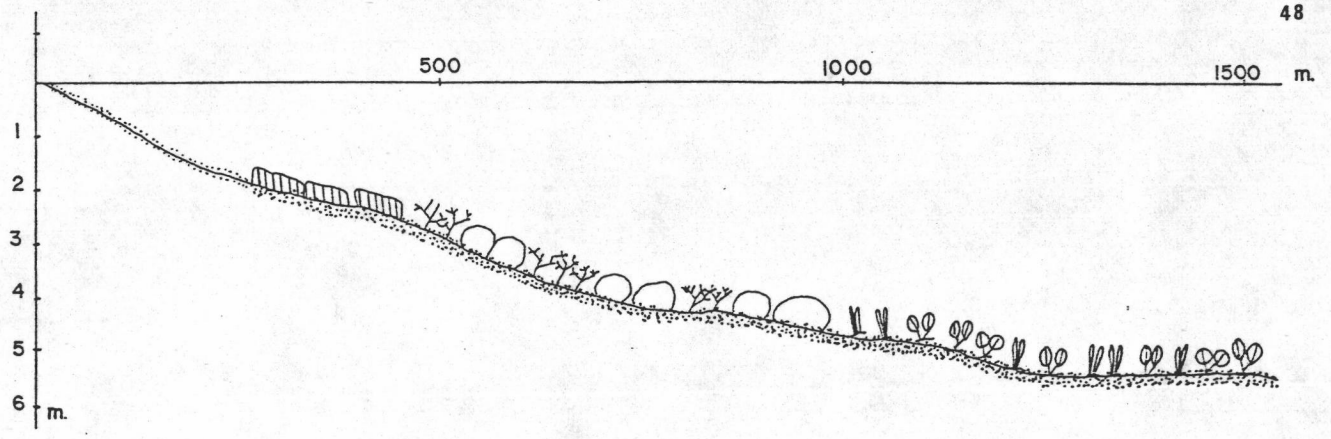


Figure 5 Shore profile of Yai Point, Koh Samui

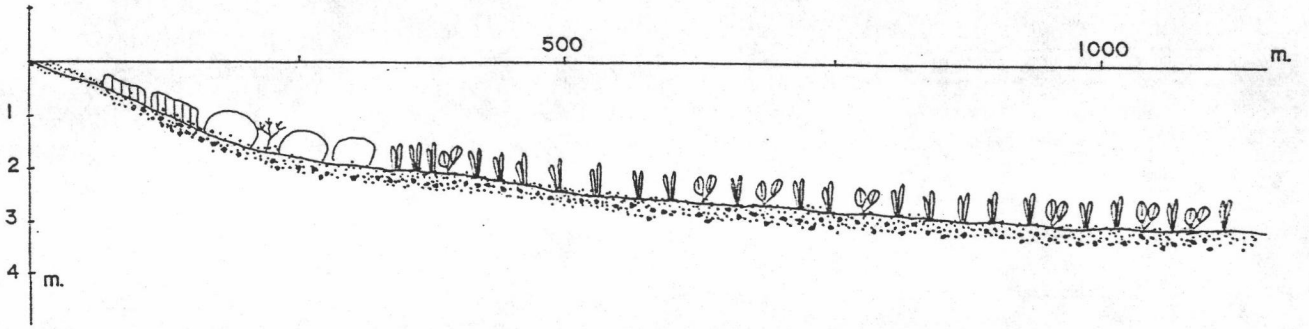


Figure 6 Shore profile of Chon Khram Point, Koh Samui

Fine-medium sand

Halodule uninervis

Halophila ovalis

Halophila ovata

Medium-coarse sand

Coral massive

Acropora submassive

Dead coral

Beach

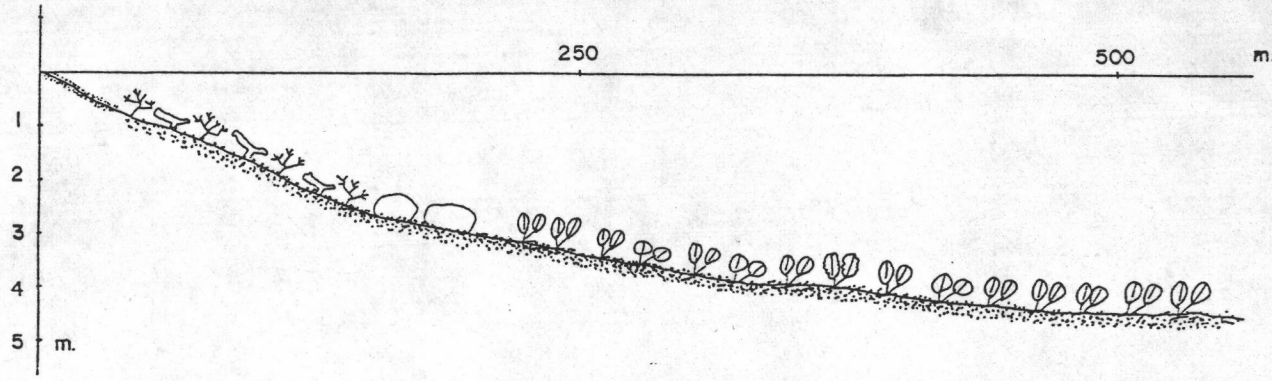


Figure 7 Shore profile of Hin Com Point, Koh Samui

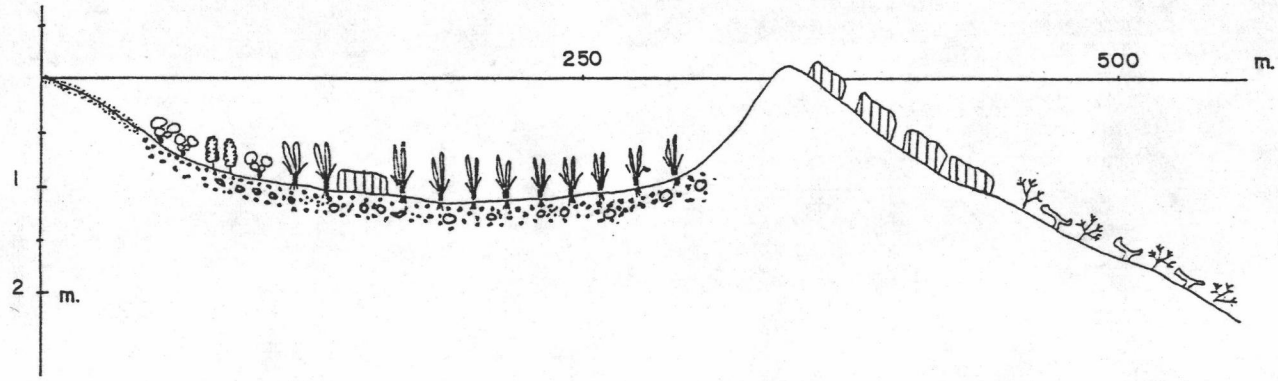
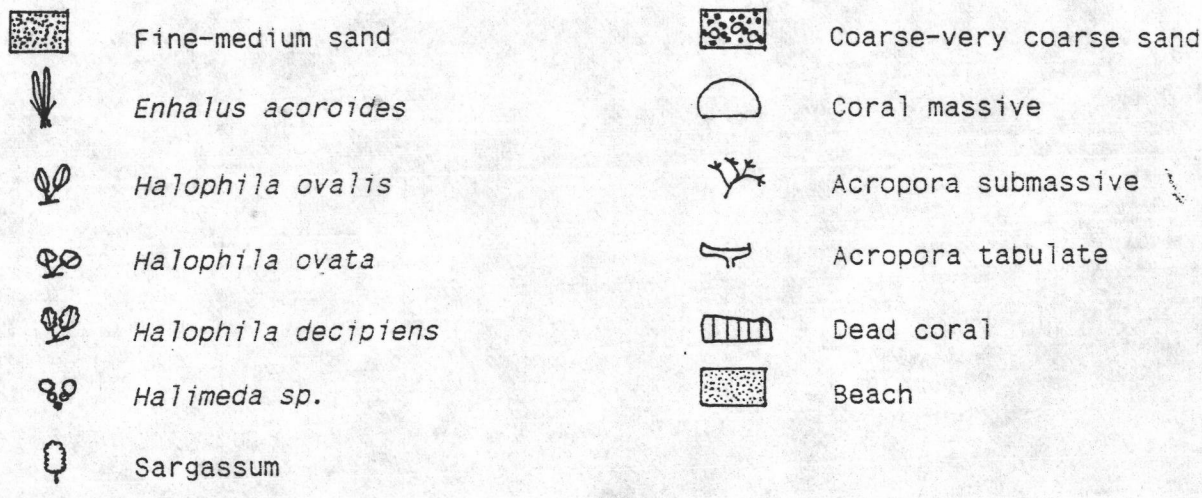


Figure 8 Shore profile of Chaweng Beach, Koh Samui



depth outside the reef (Figure 7). The species composition in this area were *Halophila decipiens*, *H. ovalis* and *H. ovata*. *H. ovalis* was the most dominant species. It should be noted that the seagrasses in these area disappeared during the rainy and winter seasons. Thus all the observation was carried out only during the summer time.

At Chaweng Beach, only one species of seagrass *Enhalus acoroides* was found throughout the year in the area of reef flat, mixed with *Sagassum* and *Halimeda* algae (Figure 8). This was the only one reef flat in Koh Samui with the seagrass could be found at 0.5-1 meters depth.

II. Seagrass biomass

Yai Point

The biomass and percent coverage of seagrasses were determined during the summer and winter seasons (Table 4 and 5). Although there was no significant differences of biomass betweem two seasons, however, the average percent coverage were higher in the summer while the higher average values of biomass was recorded in the winter (Table 6).

Although the percent average of *H. uninervis* was not high but it was in both seasons. In winter, the percent coverage and the biomass of this species showed the simple linear relationship (Table 7).

The lower average ratio of shoot:root and rhizome was found in

Table 4 Seagrass biomass (g. dry wt./square meters) at Yai Point, Koh Samui, 23/04/1988 (summer).

POSITION (m.)	SPECIES	DRY WEIGHT					% COVER OF SEAGRASS	% OF SHOOT	% OF ROOT & RHIZOME	RATIO OF SHOOT:ROOT&RHIZOME
		ROOT	RHIZOME	SHOOT	TOTAL OF ROOT & RHIZOME	TOTAL BIOMASS				
0	*H. ovalis*	0.388	0.459	1.271	0.847	2.118	30	60	40	1 : 0.67
10	*H. uninervis*	0	0.002	0.002	0.002	0.004	25	50	50	1 : 1
	H. ovalis	0.136	0.183	0.745	0.319	1.064	10	70	30	1 : 0.43
	H. ovata	0.009	0.010	0.045	0.019	0.064	25	70	30	1 : 0.43
20	*H. uninervis*	1.020	1.944	2.980	2.964	5.944	20	50	50	1 : 1
	H. ovata	0.006	0.010	0.036	0.016	0.052	10	69	31	1 : 0.44
	H. ovalis	0.035	0.055	0.238	0.090	0.328	10	73	27	1 : 0.37
30	*H. uninervis*	0.736	1.328	3.528	2.064	5.592	60	63	37	1 : 0.59
40	*H. uninervis*	0.728	1.952	2.220	2.680	4.900	30	45	55	1 : 1.22
50	*H. uninervis*	0.320	2.020	1.640	2.340	3.980	30	41	59	1 : 1.44
60	*H. uninervis*	0.667	3.857	3.776	4.524	8.300	50	45	55	1 : 1.22
	H. ovalis	0.028	0.040	0.264	0.068	0.332	10	80	20	1 : 0.25
	H. ovata	0.003	0.006	0.023	0.009	0.032	10	72	28	1 : 0.38
70	*H. ovalis*	0.064	0.094	0.676	0.158	0.834	10	81	19	1 : 0.23

Table 5 Seagrass biomass (g.dry wt./square meters) at Yai Point, Koh Samui, 08/01/1989 (winter).

POSITION (m.)	SPECIES	DRY WEIGHT					% COVER OF SEAGRASS	% OF SHOOT	% OF ROOT & RHIZOME	RATIO OF SHOOT:ROOT&RHIZOME
		ROOT	RHIZOME	SHOOT	TOTAL OF ROOT & RHIZOME	TOTAL BIOMASS				
0	*H. uninervis*	1.828	4.564	9.200	6.392	15.592	30	59	41	1 : 0.69
	H. ovalis	0.032	0.148	0.300	0.180	0.480	10	62	38	1 : 0.61
10	*H. uninervis*	0.740	1.864	3.340	2.604	5.944	20	56	44	1 : 0.78
20	*H. uninervis*	1.508	4.456	3.156	5.964	9.120	15	35	65	1 : 1.86
	H. ovalis	0.02	0.048	0.124	0.072	0.196	5	63	37	1 : 0.59
30	*H. uninervis*	1.05	2.512	1.816	3.564	5.380	20	34	66	1 : 1.94
	H. ovalis	0.060	0.232	0.736	0.292	1.028	5	72	28	1 : 0.39
40	*H. ovalis*	0.04	0.420	0.744	0.248	1.208	5	79	21	1 : 0.27
50	*H. uninervis*	0.412	1.960	1.060	2.372	3.432	25	31	69	1 : 2.23
60	*H. uninervis*	0.97	1.736	0.924	2.712	3.636	25	25	75	1 : 3
	H. ovalis	0.016	0.032	0.084	0.048	0.132	5	65	35	1 : 0.54
70	*H. uninervis*	0.19	0.928	0.069	1.124	1.400	5	20	80	1 : 4
	H. ovalis	0.13	0.080	0.356	0.212	0.568	5	63	37	1 : 0.49

Table 6 Mean percent cover and total biomass of seagrasses at Yai Point.

Sources	Mean percent cover	Mean total biomass (g.dry wt./square meters)
Two season, all species	31.56%	5.10
Summer, all species	41.25%	4.19
Winter, all species	21.88%	6.01

Table 7 Correlation Coefficient Test between percent cover with total biomass, shoot and root & rhizome at Yai Point.

Sources	Total Biomass	Shoot (Above ground)	Root & Rhizome (Below ground)
All season, all species	0.33	0.38	0.24
All season, *Halodule uninervis*	0.23	0.33	0.07
All season, *Halophila spp.*	0.50	0.51	0.55
Summer, all species	0.56	0.62	0.48
Summer, *Halodule uninervis*	0.50	0.63	0.33
Summer, *Halophila spp.*	0.54	0.49	0.59
Winter, all species	0.75 *	0.72 *	0.73 *
Winter, *Halodule uninervis*	0.54	0.57	0.45
Winter, *Halophila spp.*	-0.14	-0.15	0.02

* Significant = 0.05

Table 8 Average ratio of shoot : root & rhizome in different species of seagrasses at Samui Island (April 1988 to January 1989).

Sites	Species of seagrass	Average ratio of Root and Rhizome Shoot : Root & Rhizome
Yai Point	Halodule uninervis	1 : 1.61
	Halophila spp.	1 : 0.44
Chon Khram Point	H. univervis	1 : 1.07
	Halophila spp.	1 : 0.58
Hin Com Point	Halophila spp.	1 : 0.58
Chaweng Beach	Enhalus acoroides	1 : 2.45

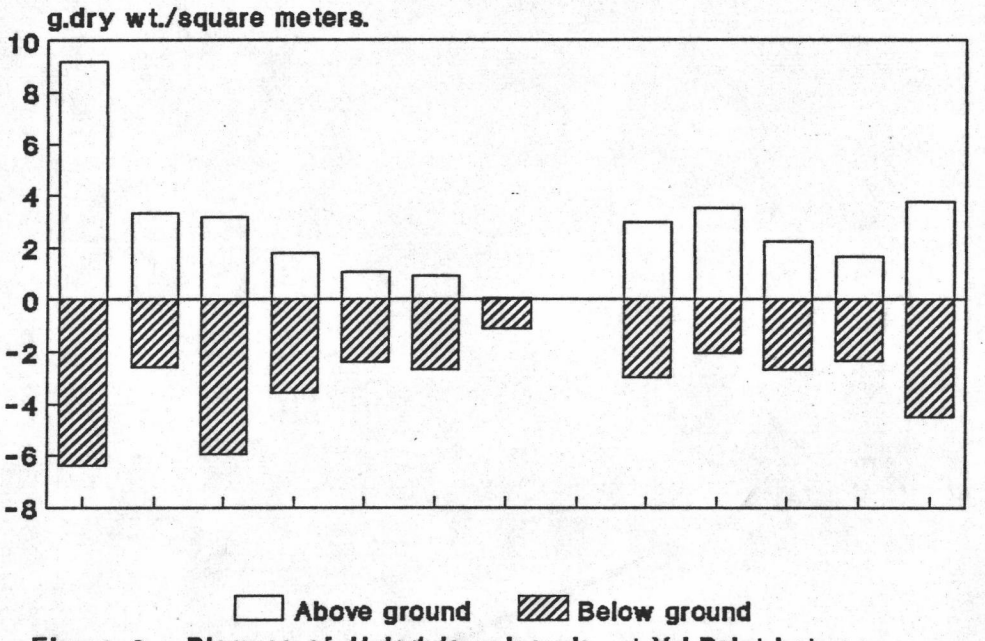


Figure 9 Biomass of *Halodule uninervis* at Yai Point between above ground and below ground.

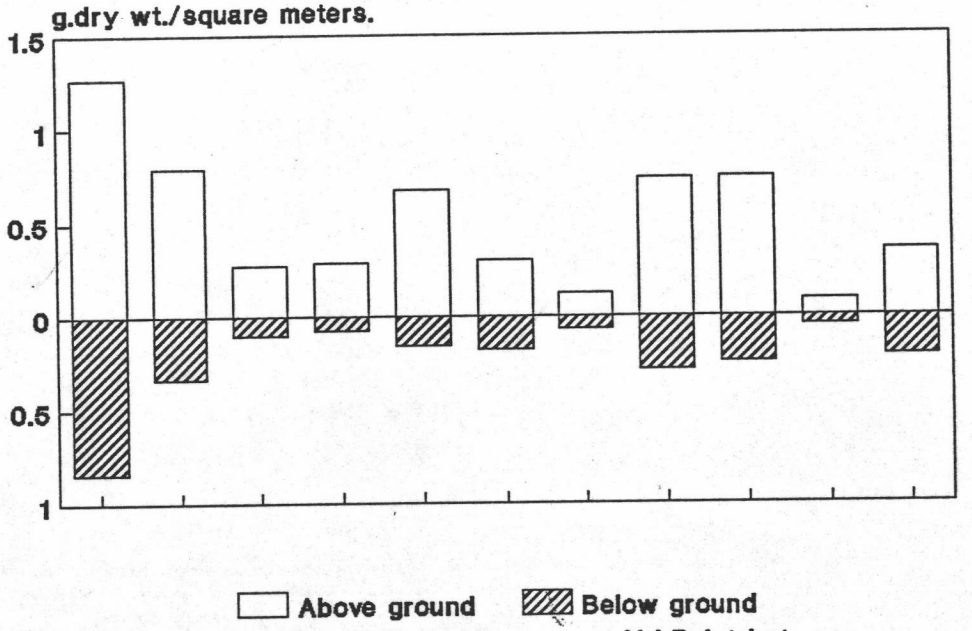


Figure 10 Biomass of *Halophila spp.* at Yai Point between above ground and below ground.

Halodule uninervis not *Halophila spp.* (Table 8). Most of the biomass of *H. uninervis* was found in root and rhizome more than shoot (Figure 9), whereas the major biomass of *Halophila spp.* was found in the shoot (Figure10).

Chon Khram Point

Tables 9-11 showed the biomass and percent coverage of seagrasses at Chon Khram Point from three seasons (summer, rainy and winter). High percent coverage and biomass of seagrasses were found here as compared to Yai and Hin Com Points. There were slight variations in the biomass among the three seasons. High biomass was observed in the rainy season and declined toward the summer and winter. The percent coverage, on the other hand, was high during the summer and declined in the rainy and winter seasons (Table 12).

Halodule uninervis play and important role as the dominant species throughout the year in terms of percent coverage and biomass. *H. uninervis* showed the simple linear relationship between percent coverage and biomass in all the seasons (Table 13), but the percent coverage and biomass of *Halophila spp.* were not closely related.

Comparing the everage ratio of shoot:root and rhizome, the low value (1:1.07) was recorded in *H. uninervis*, while in the *Halophila spp.* was 1:0.58 (Table 8). It was evidenced that the above and below groung portion of *H. uninervis* contributed equally to the biomass (Figure 11). Whereas the above ground portion of *Halophila spp.* contributed to most of the biomass (Figure12).

Table 9 Seagrass biomass (g.dry wt./square meters) at Chon Khram Point, Koh Samui, 24/04/1988 (summer).

POSITION (m)	SPECIES	DRY WEIGHT					% COVER OF SEAGRASS	% OF SHOOT	% OF ROOT & RHIZOME	RATIO OF SHOOT:ROOT&RHIZOME
		ROOT	RHIZOME	SHOOT	TOTAL ROOT & RHIZOME	TOTAL BIOMASS				
0	*H. uninervis*	26.160	31.825	56.260	57.985	114.245	80	49	51	1 : 1.04
10	*H. uninervis*	2.640	1.769	1.744	4.409	6.153	30	28	72	1 : 2.57
	H. ovata	0.001	0.001	0.006	0.002	0.008	5	75	25	1 : 0.33
20	NO seagrass	0	0	0	0	0	0	0	0	-
30	*H. uninervis*	7.000	10.000	16.400	17.000	33.400	70	50	50	1 : 1
40	*H. uninervis*	10.123	15.369	15.000	25.492	40.492	70	38	62	1 : 1.63
50	*H. uninervis*	7.320	13.232	20.972	20.552	41.524	50	50	50	1 : 1
60	*H. uninervis(wide)*	16.160	26.668	23.568	42.828	66.396	50	36	64	1 : 1.77
	H. uninervis(narrow)	0.004	0.020	0.020	0.024	0.044	10	50	50	1 : 1
	H. ovalis	0.320	0.440	0.508	0.760	1.268	10	40	60	1 : 1.50
	H. ovata	0.002	0.004	0.014	0.006	0.020	10	70	30	1 : 0.43
70	NO seagrass	0	0	0	0	0	0	0	0	-
80	*H. ovata*	0.020	0.020	0.092	0.040	0.132	5	70	30	1 : 4.43
	H. ovalis	0.760	0.788	1.392	1.548	2.940	5	48	52	1 : 1.08
	H. uninervis	3.880	8.760	28.916	12.640	41.556	50	70	30	1 : 0.43
90	*H. uninervis(wide)*	22.80	53.744	36.216	76.544	112.760	75	22	68	1 : 3.09
	H. uninervis(narrow)	0.005	0.007	0.028	0.012	0.040	5	70	30	1 : 0.43
95	*H. uninervis*	1.760	13.184	33.852	14.944	48.796	70	70	30	1 : 0.43
	H. ovalis	0.012	0.015	0.045	0.027	0.072	5	62	38	1 : 0.61
100	*H. uninervis*	14.320	19.084	14.248	33.404	47.652	70	30	70	1 : 2.33
105	*H. uninervis*	2.640	23.256	28.232	25.896	54.128	80	52	48	1 : 0.92
110	*H. uninervis*	3.120	17.176	33.272	20.296	53.568	90	62	38	1 : 0.61
115	*H. uninervis*	4.360	22.012	35.668	26.612	62.280	90	57	43	1 : 0.75
120	*H. uninervis*	2.440	6.428	13.616	8.868	22.484	70	61	39	1 : 0.64
130	*H. ovalis*	0.016	0.020	0.060	0.036	0.096	10	62	38	1 : 0.61
	H. uninervis	3.600	0.036	3.052	3.636	6.688	40	46	54	1 : 1.17
135	*H. uninervis*	3.520	5.016	6.700	8.536	15.236	50	44	56	1 : 1.27
140	*H. uninervis*	2.880	8.480	6.124	11.360	17.484	50	35	65	1 : 1.86
145	*H. uninervis*	0.920	3.532	6.736	4.452	11.188	50	60	40	1 : 0.67
150	*H. uninervis*	1.960	9.360	7.552	11.320	18.872	50	40	60	1 : 1.50

Table 10 Seagrass biomass (g.dry wt./square meters) at Chon Khram Point, Koh Samui, 23/09/1988 (rainy).

POSITION (m)	SPECIES	DRY WEIGHT					% COVER OF SEAGRASS	% OF SHOOT	% OF ROOT & RHIZOME	RATIO OF SHOOT:ROOT&RHIZOME
		ROOT	RHIZOME	SHOOT	TOTAL ROOT & RHIZOME	TOTAL BIOMASS				
0	*H. uninervis*	2.264	8.124	12.572	10.388	22.960	25	55	45	1 : 0.82
10	*H. uninervis*	0.884	2.020	5.680	2.904	8.584	50	66	34	1 : 0.52
	H. ovata	0.016	0.020	0.060	0.036	0.096	5	63	37	1 : 0.59
20	*H. uninervis*	10.932	23.260	29.976	34.192	64.168	20	47	53	1 : 1.12
	H. ovata	0.001	0.002	0.005	0.003	0.008	5	63	37	1 : 0.59
30	*H. uninervis*	2.868	26.156	47.120	29.024	76.144	70	62	38	1 : 0.61
40	*H. uninervis*	6.912	46.956	101.376	53.868	155.244	90	65	35	1 : 0.54
	H. ovalis	0.078	0.117	0.328	0.196	0.524	5	63	37	1 : 0.59
50	*H. uninervis*	3.480	15.240	43.856	18.720	62.576	80	70	30	1 : 0.43
	H. ovalis	0.016	0.240	0.428	0.256	0.684	5	63	37	1 : 0.59
60	No seagrass	0	0	0	0	0	0	0	0	-
70	*H. uninervis*	0.028	0.348	1.116	0.376	1.492	70	75	25	1 : 0.33
	H. ovalis	0.376	0.812	6.280	1.188	7.468	5	84	16	1 : 0.22
80	*H. ovata*	0.004	0.005	0.234	0.090	0.324	5	72	28	1 : 0.39
	H. ovalis	0.096	0.112	0.348	0.208	0.556	15	63	37	1 : 0.59
90	*H. uninervis*	2.320	10.300	45.608	12.620	58.228	85	78	22	1 : 0.28
100	*H. ovata*	0.005	0.009	0.034	0.014	0.048	5	71	29	1 : 0.37
	H. uninervis	3.488	45.920	82.736	49.408	132.144	95	63	37	1 : 0.59

Table 11 Seagrass biomass (g.dry wt./square meters) at Chon Khram Point, Koh Samui, 07/01/1989 (winter).

POSITION (m.)	SPECIES	DRY WEIGHT					% COVER OF SEAGRASS	% OF SHOOT	% OF ROOT & RHIZOME	RATIO OF SHOOT:ROOT&RHIZOME
		ROOT	RHIZOME	SHOOT	TOTAL ROOT & RHIZOME	TOTAL BIOMASS				
0	*H. uninervis*	1.136	4.412	3.700	5.548	9.248	10	40	60	1 : 1.50
	H. ovalis	0.024	0.072	0.156	0.096	0.252	5	62	38	1 : 0.61
10	*H. uninervis*	1.846	7.487	6.589	9.324	15.823	20	41	59	1 : 1.44
20	*H. uninervis*	0.108	0.760	3.460	0.868	4.328	10	78	20	1 : 0.25
30	*H. uninervis*	14.840	38.820	25.672	53.660	79.332	80	32	68	1 : 2.13
	H. ovata	0.200	0.400	1.632	0.600	2.232	5	73	27	1 : 0.37
40	*H. uninervis*	7.983	20.433	20.216	28.426	48.642	60	42	58	1 : 1.38
50	*H. uninervis*	3.768	17.176	36.268	20.944	57.212	75	63	37	1 : 0.59
	H. ovalis	0.004	0.008	0.024	0.012	0.036	5	67	33	1 : 0.49
60	No seagrass	0	0	0	0	0	0	0	0	-
70	*H. uninervis*	2.315	6.097	13.98	8.412	22.392	30	62	38	1 : 0.61
80	*H. uninervis*	0.956	5.648	11.940	6.604	18.544	20	63	36	1 : 0.56
90	*H. uninervis*	2.940	20.104	14.076	23.044	37.120	50	38	62	1 : 1.63
100	*H. uninervis*	4.600	25.796	24.212	30.396	54.608	60	44	56	1 : 1.27

Table 12 Mean percent cover and total biomass of seagrasses at Chon Khram Point.

Sources	Mean percent cover	Mean total biomass (g.dry wt./square meters)
Two season, all species	50.58%	40.92
Summer, all species	59.52%	38.98
Rainy, all species	45.00%	53.75
Winter, all species	39.09%	31.80

Table 13 Correlation Coefficient Test between percent cover with total biomass, shoot and root & rhizome at Chon Khram Point.

Sources	Total Biomass	Shoot (Above ground)	Root & Rhizome (Below ground)
All season, all species	0.80 *	0.72 *	0.76 *
All season, *Halodule uninervis*	0.76 *	0.68 *	0.71 *
All season, *Halophila spp.*	0.02	-0.05	0.29
Summer, all species	0.73 *	0.75 *	0.63 *
Summer, *Halodule uninervis*	0.70 *	0.74 *	0.57 *
Summer, *Halophila spp.*	0.38	0.32	0.45
Rainy, all species	0.97 *	0.96 *	0.95 *
Rainy, *Halodule uninervis*	0.97 *	0.95 *	0.94 *
Rainy, *Halophila spp.*	-0.08	-0.10	0.01
Winter, all species	0.98 *	0.95 *	0.89 *
Winter, *Halodule uninervis*	0.98 *	0.93 *	0.88 *

* Significant = 0.05

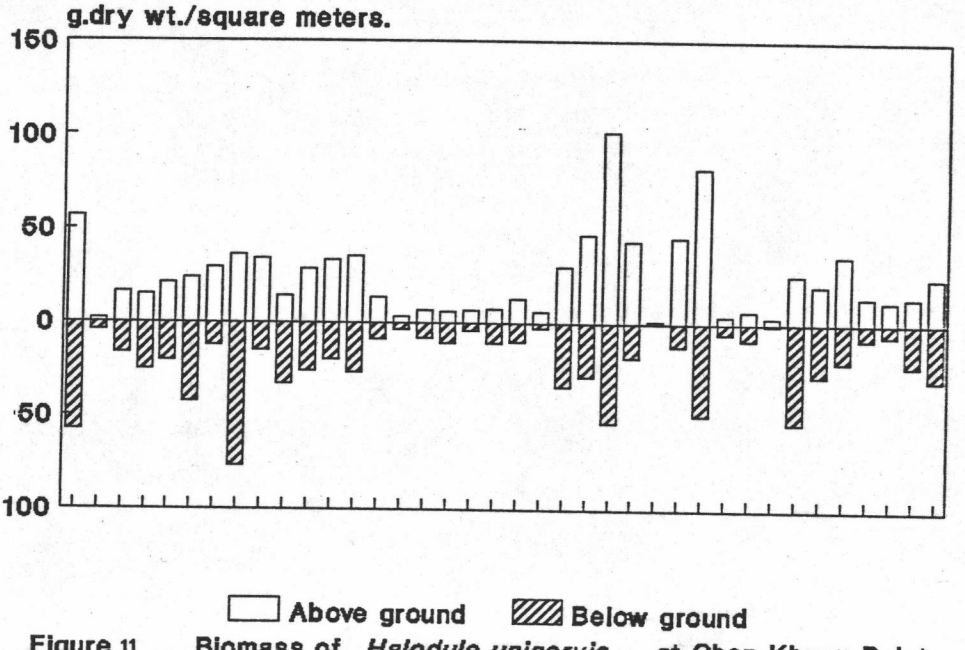


Figure 11 Biomass of *Halodule uninervis* at Chon Khram Point between above ground and below ground.

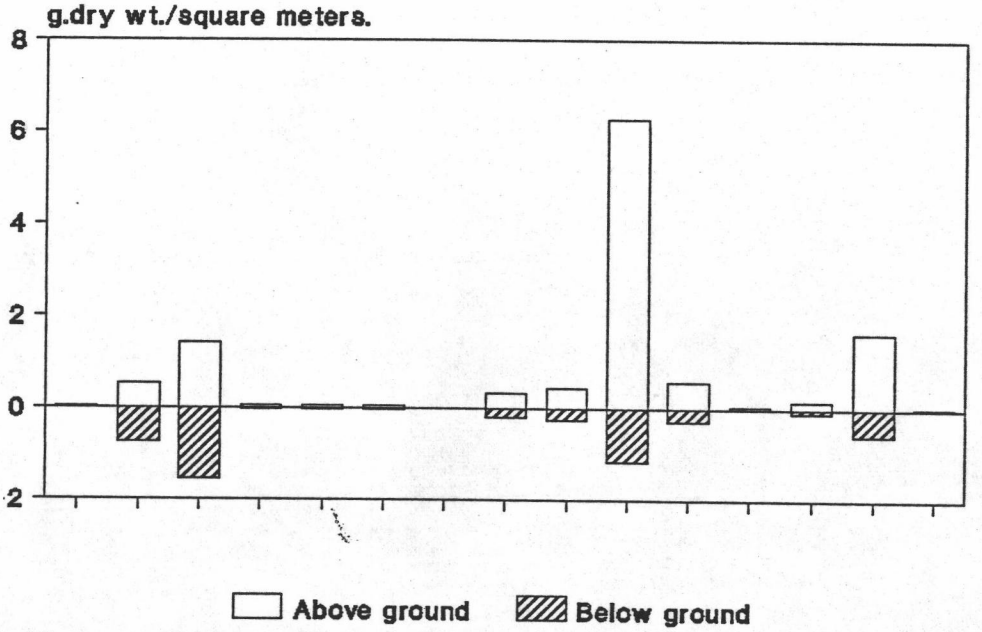


Figure 12 Biomass of *Halophila spp.* at Chon Khram Point between above ground and below ground.

Hin Chom Point

The biomass and percent coverage of seagrasses during the summer were presented in table 14. The percent coverage and biomass did not show the simple linear relationship (Table 15). The average value of biomass was low while the mean percent coverage was not so low.

The lower average ratio of shoot:root and rhizome of *Halophila spp.*, 1:0.58, was found at Hin Com Point as compared to the value recorded at Yai Point (Table 8). Most of the biomass of the seagrasses belong to this genus was represented in the shoot portion (Figure 13).

Chaweng Beach

The biomass and percent coverage of *Enhalus acoroides* was presented in Table 16 to 18. The highest biomass was recored at this site due to *E. acoroides* being the largest species. Highest biomass was found in the summer followed by the winter and rainy seasons respectively (Table 19). Significance seasonal varitions in biomass were observed. The percent coverage and biomass showed the simple linear relationship (Table 20)

The lowest average ratio of shoot:root and rhizome was found in *E. acoroides* (Table 8). It is evidenced that the below ground portion especially the rhizome in *E. acoroides* contributed most of the biomass of this species (Figure 14).

Table 14 Seagrass biomass (g.dry wt./square meters) at Hin Com Point, Koh Samui, 24/04/1988 (summer).

POSITION (m.)	SPECIES	DRY WEIGHT					% COVER OF SEAGRASS	% OF SHOOT	% OF ROOT & RHIZOME	RATIO OF SHOOT:ROOT&RHIZOME
		ROOT	RHIZOME	SHOOT	TOTAL OF ROOT & RHIZOME	TOTAL BIOMASS				
10	*H. decipiens*	0.005	0.013	0.026	0.018	0.044	10	59	41	1 : 0.69
	H. ovalis	0.060	0.148	0.416	0.208	0.624	10	67	33	1 : 0.50
20	*H. ovalis*	0.026	0.112	0.216	0.138	0.354	5	61	39	1 : 0.64
	H. ovata	0.002	0.003	0.007	0.005	0.012	5	58	42	1 : 0.72
30	*H. ovalis*	0.064	0.112	0.400	0.176	0.576	20	69	31	1 : 0.45
40	*H. ovalis*	0.322	0.722	1.740	1.044	2.784	50	63	37	1 : 0.59
50	*H. ovalis*	0.016	0.092	0.296	0.108	0.404	30	73	27	1 : 0.37
	H. decipiens	0.031	0.087	0.178	0.118	0.296	10	60	40	1 : 0.66

Remark, *Halophila spp.* mean percent cover = 28.0% , and mean total biomass = 1.02 g.dry wt./square meters.

Table 15 Correlation Coefficient Test between percent cover with total biomass, shoot and root & rhizome at Hin Com Point.

Source	Total Biomass	Shoot (Above ground)	Root & Rhizome (Below ground)
Summer, *Halophila spp.*	0.81	0.82	0.79

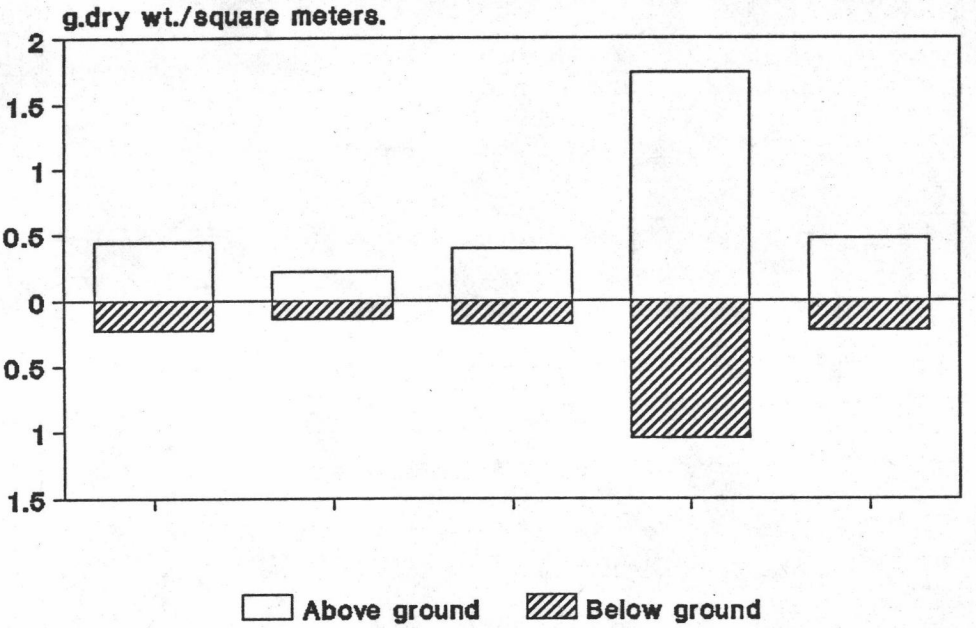


Figure 13 Biomass of *Halophila spp.* at Hin Com Point between above ground and below ground.

Table 16 Seagrass biomass (g.dry wt./square meters) at Chaweng Beach, Koh Samui, 25/04/1988 (summer).

POSITION (m.)	SPECIES	DRY WEIGHT					% COVER OF SEAGRASS	% OF SHOOT	% OF ROOT & RHIZOME	RATIO OF SHOOT:ROOT&RHIZOME
		ROOT	RHIZOME	SHOOT	TOTAL OF ROOT & RHIZOME	TOTAL BIOMASS				
0*	*Enhalus acoroides*	52.010	350.415	148.693	402.425	550.118	50	27	73	1 : 2.70
10*	*E. acoroides*	49.920	233.648	104.444	283.568	388.012	60	27	73	1 : 2.70
20	*E. acoroides*	141.740	800.116	169.688	941.864	1111.532	80	15	85	1 : 5.67
30	*E. acoroides*	68.428	427.656	196.104	496.084	692.188	70	28	72	1 : 2.57
40	*E. acoroides*	109.592	30.632	169.424	140.224	309.648	70	55	45	1 : 0.82
50*	*E. acoroides*	87.048	444.876	159.840	531.924	691.764	50	23	77	1 : 3.35
60*	*E. acoroides*	73.748	421.720	164.292	495.468	659.760	30	25	75	1 : 3
70	*E. acoroides*	51.488	331.948	170.388	383.356	553.744	50	31	69	1 : 2.23
80*	*E. acoroides*	42.940	249.204	114.852	292.144	406.996	25	28	72	1 : 2.57
90	*E. acoroides*	102.415	600.413	386.015	702.828	1088.843	80	35	65	1 : 1.86

* REMARK : Some flowers were found at this sampling time

Table 17 Seagrass biomass (g.dry wt./square meters) at Chaweng Beach, Koh Samui, 22/09/1988 (rainy).

POSITION (m.)	SPECIES	DRY WEIGHT					% COVER OF SEAGRASS	% OF SHOOT	% OF ROOT & RHIZOME	RATIO OF SHOOT:ROOT&RHIZOME
		ROOT	RHIZOME	SHOOT	TOTAL OF ROOT & RHIZOME	TOTAL BIOMASS				
0	*Enhalus acoroides*	35.822	220.825	93.671	256.647	350.318	50	27	73	1 : 2.70
10	*E. acoroides*	27.728	213.912	100.956	241.640	342.596	50	29	71	1 : 2.45
20	*E. acoroides*	26.144	163.368	124.280	189.512	313.792	70	40	60	1 : 1.50
30	*E. acoroides*	29.860	179.160	83.608	209.020	292.628	50	29	71	1 : 2.45
40	*E. acoroides*	9.560	41.076	42.640	54.290	93.276	30	42	58	1 : 1.38
50	*E. acoroides*	9.748	140.376	73.740	150.124	223.864	40	33	67	1 : 2.03
60	*E. acoroides*	16.096	66.472	51.848	82.568	134.424	60	39	61	1 : 1.56
70	*E. acoroides*	19.552	91.788	32.324	111.340	143.664	20	23	77	1 : 3.30
80	*E. acoroides*	41.960	133.528	70.195	175.488	245.683	10	29	71	1 : 2.45
90	*E. acoroides*	25.132	102.623	30.394	127.755	158.149	20	19	81	1 : 4.26

Table 18 Seagrass biomass (g.dry wt./square meters) at Chaweng Beach, Koh Samui, 08/01/1989 (winter).

POSITION (m.)	SPECIES	DRY WEIGHT					% COVER OF SEAGRASS	% OF SHOOT	% OF ROOT & RHIZOME	RATIO OF SHOOT:ROOT&RHIZOME
		ROOT	RHIZOME	SHOOT	TOTAL OF ROOT & RHIZOME	TOTAL BIOMASS				
0	*Enhalus acoroides*	45.822	139.412	95.205	185.234	280.439	40	34	66	1 : 1.94
10	*E. acoroides*	32.480	100.196	54.176	132.676	186.852	30	39	71	1 : 1.82
20	*E. acoroides*	52.732	185.376	76.548	238.108	314.656	50	24	76	1 : 3.16
30	*E. acoroides*	68.413	201.489	80.838	269.902	350.285	60	23	77	1 : 3.35
40	*E. acoroides*	2.768	21.284	9.384	24.052	33.436	10	28	72	1 : 2.57
50	*E. acoroides*	35.300	212.948	457.812	248.248	706.060	90	65	35	1 : 0.54
60	*E. acoroides*	6.194	60.336	16.532	66.530	89.256	20	25	76	1 : 3
70	*E. acoroides*	58.413	195.419	69.590	253.832	328.422	50	28	72	1 : 2.57
80	*E. acoroides*	38.418	128.551	103.412	166.969	270.381	40	38	62	1 : 1.63
90	*E. acoroides*	28.589	119.415	102.488	148.004	250.492	40	40	60	1 : 1.50

Table 19 Mean percent cover and total biomass of seagrasses at Chaweng Beach.

Sources	Mean percent cover	Mean total biomass (g.dry wt./square meters)
All season	46.45	355.38
Summer	56.50	645.26
Rainy	40.0	229.84
Winter	43.0	251.03

Table 20 Correlation Coefficient Test between percent cover with total biomass, shoot and root & rhizome at Chaweng Beach.

Sources	Total Biomass	Shoot (Above ground)	Root & Rhizome (Below ground)
All season	0.66 *	0.72 *	0.54 *
Summer	0.52	0.54	0.44
Rainy	0.46	0.69	0.33
Winter	0.98 *	0.85 *	0.86 *

* Significant = 0.05

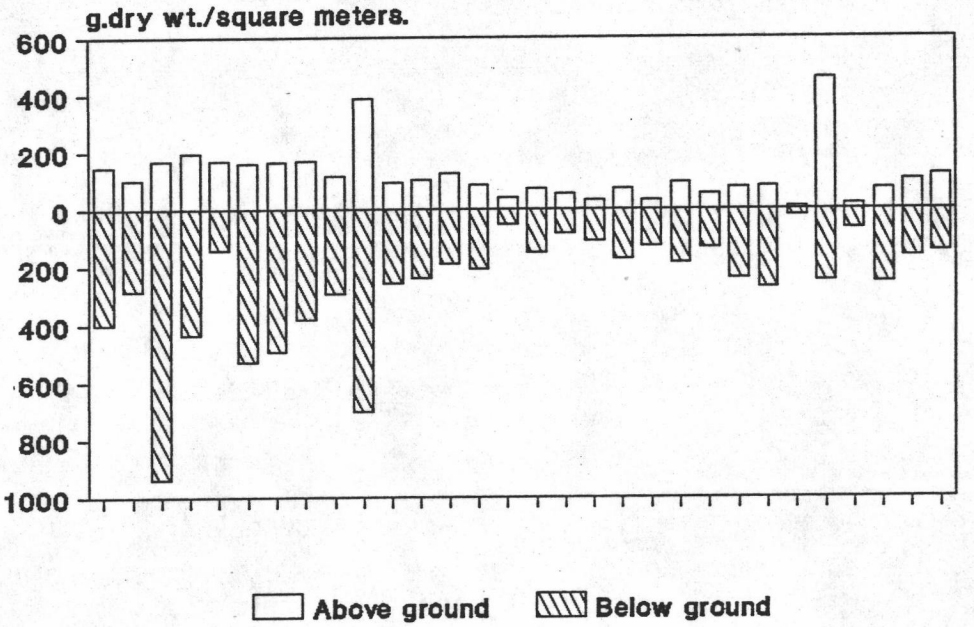


Figure 14 Biomass of *Enhalus acoroides* at Chaweng Beach between above ground and below ground.

Animal community structure

I. Zooplankton

Zooplankton composition in the water overlying seagrass beds was presented in Table 21. The eight major groups were found, namely the nematode, mollusc, cephalopod, polychaete, chaetognath, crustacea, sipunculid and fish larvae.

Yai Point

The day samples in winter showed that the calanoid copepod was the most dominant group with the density of 5042 indiv./100 $m.^3$, representing 70.1% of all the zooplankton collected. Chaetognaths rank in the second with the density of 1080 indiv./100 m^3., representing 15% of the zooplankton collected. The other groups were found only in small number (Table 21).

Chon Khram Point

At this site, zooplanktion collections could be carried out within all three seasons, summer, rain and winter. From the summer collection, 10 groups, with the total density of 7371 indiv./100 $m.^3$, composed of the juvenile of cephalopods, polychaetes lavae, ostracods, calanoid, cyclopoid and harpacticoid copepods, nauplii of copepods, mysis, cumaceans, zoea of brachyurans and sipunculids. Nauplii of copepods and cyclopoid copepods showed high abundance of 33.1% and 16.7% of the zooplankton collected, respectively. The other

Table 21 Zooplankton collected from the seagrass beds at Koh Samui (indiv./100 cubic meter).

TAXA GROUPS	Yai Point		Chon Khram Point								Chaweng Beach										Total	
	Summer (Day)		Summer (Day)		Rain (Day)		Winter (Day)		Winter (Night)		Summer (Day)		Rain (Day)		Rain (Night)		Winter (Day)		Winter (Night)			
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No.	%	No	%	No.	%	No	%
Nematode	11	0.2																			11	0.01
Polychaete larvae			41	5.6					41	0.8	143	6.6							31	0.2	256	0.40
Gastropod larvae											82	3.8	41	1.2					866	6.4	989	1.60
Pelecypod larvae	61	0.8									224	10.3					5	1.5	244	1.8	534	0.90
Juvenile of Cephalopod			41	5.6																	41	0.05
Ostracod	112	1.6	41	5.6	21	0.8	51	5.0	102	2.1	600	27.6	1243	39.3	795	3.3			2536	18.8	5501	9.20
Calanoid copepod	5042	70.1	41	5.6	703	28.5	245	24.0	3167	64.3	163	7.5	82	2.6	2078	8.5	249	75.0	336	2.5	12106	20.20
Cyclopoid copepod	82	1.1	123	16.7	41	1.7			31	0.6	122	5.6	21	0.7	530	2.2	26	7.8	570	4.2	1546	2.60
Harpacticoid copepod	11	0.2					285	28.0	11	0.2	41	1.9			183	0.7			1767	13.1	2298	3.80
Nauplii	163	2.3	245	33.1	133	5.4			31	0.6	21	1.0			41	0.1	31	9.3			665	1.10
Parisite copepod											61	2.8									61	0.10
Mysidacea - egg					41	1.7	51	5.0	11	0.2					1079	4.5			1365	10.1	2547	4.20
- Zoea	51	0.7													367	1.5					418	0.70
- adult			82	11.0	723	29.3	51	5.0	204	4.2	21	1.0	102	3.2	4237	17.3			519	3.8	5939	9.90
Cumacea			41	5.6	21	0.8			21	0.4	61	2.8			143	0.6			31	0.2	318	0.50
Tanaidacea							21	2.0			163	7.4	1365	43.2	652	2.7			71	0.5	2272	3.80
Isopod											204	9.4	163	5.2	41	0.1			285	2.1	693	1.20
Amphipod	11	0.2			82	3.3	153	15.0	194	3.9	204	9.4	122	3.9	41	0.1			4115	30.5	4922	8.20
Euphausid									11	0.2											11	0.01
Zoea of Shrimp					224	9.1	31	3.0	82	1.7					2771	11.3			143	1.1	3251	5.40
Mysis of Shrimp	224	3.1									41	1.9			41	0.1			346	2.6	652	1.10
Caridean Shrimp							92	9.0	234	4.8					265	1.1			173	1.3	764	1.30
Zoea of Brachyura			41	5.6	397	16.1			82	1.7			21	0.7	9289	37.9	5	1.5			9835	16.40
Megalop of Brachyura									11	0.2											11	0.01
Zoea of Anomura	11	0.2			61	2.5									1589	6.5					1661	2.80
Megalop of Anomura									31	0.6											31	0.05
Lucifer hensenI	326	4.5			21	0.8			275	5.6					61	0.3	5	1.5			668	1.10
Acetes sp.															122	0.5					122	0.20
Sipunculid			41	5.6																	41	
Chaetognath	1080	15.0					21	2.0	367	7.5	21	1.0			82	0.3	11	3.4	11	0.1	1593	2.70
Fish egg									21	0.4											21	0.02
Fish larvae							21	2.0							102	0.4			102	0.7	225	0.40
Total	7185	100.0	737	100.0	2468	100.0	1022	100.0	4927	100.0	2172	100.0	3160	100.0	24509	100.0	332	100.0	13511	100.0	60023	100.00

groups were Mysis, juvenile of cephalopods, polychaetes larvae, ostracods, cumaceans, zoea of brachyurans and sipunculids (Table 21).

The predominant groups of zooplankton collected in the rainy season were the adult of mysidaceans (29.3%), calanoid copepods (28.5%) and zoea of brachyurans (16.1%). The total number of zooplankton was 2468 indiv./100 m^3.

In winter, the zooplankton abundances during the day and night collections were significantly different with the density of 1022 and 4927 indiv./100 m^3., respectively. The harpacticoid and calanoid copepods were dominant with density of 285 and 245 indiv./100 m^3. in the day sample. Others were amphipods 15%, caridean shrimps 9%,, ostracods, egg of mysidaceans, adult of mysidaceans 5%, zoea of shrimps 3%, chaetognaths, tanaids and fish larvae 2% (Table 21).

High species diversity of zooplankton were found in the night sample. The highest density of calanoid copepods was 3167 indiv./100 m^3. or 64.03%. The minority zooplankton were chaetognaths 7.5%, *Lucifer henseni* 5.6%, caridean shrimps 4.8%, amphipods 3.9% and ostracod 2.1% (Table 21).

Chaweng Beach

In summer, the day sample was collected only with a low density of zooplankton of 2172 indiv./100 m^3. (Table 21). The ostracods had the high density of 600 indiv./100 m^3. (27.6%), the others had the density of 21-224 indiv./100 m^3. or 1.0 - 10.3% .

In the rainy season, differences in the day and night collec-

tions were observed with a high density of 24,509 indiv./100 m^3. in the night sample and a low density of 3,160 indiv./100 m^3. in day sample. Higher species diversity were found during the night (20 taxa groups) as compared to the day sample (9 taxa groups) (Table 21). The main components of zooplankton found in the day sample were tanaidaceans with the density of 1,365 indiv./100 m^3. (or 43.2%) and ostracods (1,243 indiv./100 m^3., 39.3%). There were two distinctive groups in the night samples, zoea of brachyurans with the density of 9,289 indiv./100 m^3. or 37.9% and mysidaceans with the density of 5,683 indiv./100 m^3. or 23.3%. Most of the crabs, zoea were portunid crabs. Three stages of mysidceans were found, egg, zoea and adult (Table 21), with the density of adult (17.3%), followed by egg (4.5%) and zoea (1.5%).

High diversity and abundance in the night collection were also observed during the winter. The highest density was recorded at 13,511 indiv./m^3. Amphipods dominated with high density of 4,115 indiv./100 m^3. or 30.5%, followed by ostracods 2,536 indiv./100 m^3. or 18.8%, harpacticoid copepods 1,767 indiv./100 m^3. or 13.1% and egg of mysids 1,365 indiv./100 m^3. or 10.1%.

Only 7 taxa groups with the total number of individuals of 332 indiv./100 m^3. were found in the day samples. Calanoid copepods was the major component (249 indiv./100 m^3. or 75 %). The others (25%) were nauplii of copepods 9.3%, cyclopoid copepods 7.8%, chaetognaths 3.4 %, pelecypods lavae 1.5 %, zoea of brachyurans 1.5 % and *Lucifer henseni* 1.5 % . Pelecypod larvae, chaetognaths, calanoid and cyclopoid copepods were found both of the day and night samples in this season.

II. Benthic Fauna

Yai Point

On the mixed seagrass bed of *Halolule uninervis*, *Halophila ovalis* and *H. ovata* at Yai Point the total abundance of benthic animals were collected with the density of 167 indiv./m^2. from the summer and winter season (Table 22). The average number of benthic faunas was presented in Table 23 and Figure 15 .

Low similarity (36%) in the benthic compositions was found between the summer and winter samples (Figure 16). In summer 31, benthic species and with density of 84 indiv./m^2. were recorded. This comprised of peracaridean crustaceans 57.1%, polychaetes 26.2%, pelecypods 8.3%, gastropods 3.6%, decapod crustaceans 2.4% and Echinoderms 2.4% (Table 22). Amphipod was the most abundant group in peracaridean crustacea which composed of seven families. Two important families were Corophiidae and Isaeidae. Others were Ampeliscidae, Ischyroceridae, Leucothoidae, Lysianassidae and Gammaridae (Table 27). The second dominant group was the polychaetes, representing 9 families. Eunicidae was the highest in term of density (6 indiv./m^2), the rest were in the range of 1-3 indiv./m^2. Other polychaetes were in the families of Capitellidae, Lumbrineridae, Nereidae, Onuphidae, Ophelidae, Phyllodocidae, Polynoidae and Syllidae (Table 24).

In winter, a total of 35 species were recorded but of low

Table 22 Total number of species and individuals of benthic faunas collected from the seagrass beds at four sites of Koh Samui (individuals/square meters). S = Summer, R = Rain and W = Winter.

TAXA GROUPS	Yai Point					Chon Khram Point							Hin Com Point			Chaweng beach						
	S		W		Total	S		R		W		Total	S		Total	S		R		W		Total
	No.	%	No.	%		No.	%	No.	%	No.	%		No.	%		No.	%	No.	%	No.	%	
Polychaeta	22	26.2	35	42.2	57	5	12.2	80	49.6	65	43.9	150	6	10.3	6	12	9.4	97	30.8	114	32.6	223
Gastropoda	3	3.6	16	19.3	19	9	22.0	12	7.5	18	12.2	39	11	19.0	11	42	32.8	8	2.5	29	8.3	79
Pelecypoda	7	8.3	5	6.0	12	16	39.0	14	8.7	24	16.2	54	4	6.9	4	4	3.1	3	1.0	15	4.3	22
Peracaridea	48	57.1	24	28.9	72	5	12.2	41	25.5	35	23.6	81	31	53.5	31	59	46.1	200	63.5	164	46.9	423
Decapoda	2	2.4			2	3	7.3	4	25.0			7	2	3.4	2	7	5.5	1	0.3			8
Echinodermata	2	2.4	3	3.6	5	3	7.3			4	2.7	7	4	6.9	4	1	0.8			1	0.2	2
Miscellaneous - taxa								10	6.2	2	1.4	12				3	2.3	6	1,9	27	7.7	37
Total number of individuals	84	100.0	83	100.0	167	41	100.0	161	100.0	148	100.0	350	58	100.0	58	128	100.0	315	100.0	350	100.0	793
Total number of species	31		35			31		49		46			25			42		30		50		

Miscellaneous taxa = Turbellaria , Sea anemone and Sipunculid.

Table 23 Average number of benthic faunas collected from the seagrass beds at four sites of Koh Samui (individuals/square meters).

TAXA GROUPS	Yai Point		Chon Khram Point		Hin Com Point		Chaweng beach		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Polychaeta	29	33.7	50	43.1	6	10.3	74	28.0	159	30.3
Gastropoda	10	11.6	13	11.2	11	19.0	26	9.8	60	11.5
Pelecypoda	6	7.0	18	15.6	4	6.9	7	2.7	35	6.7
Peracaridea	37	43.0	27	23.3	31	53.4	141	53.4	236	45.0
- Mysidacea	1	1.2							1	0.2
- Isopoda	1	1.2	1	0.9	1	1.7	8	3.0	11	2.1
- Amphipoda	33	38.3	22	19.0	30	51.7	45	17.2	130	24.8
- Tanaidacea	2	2.3	4	3.4	0	0	88	33.2	94	17.9
Decapoda	1	1.2	2	1.7	2	3.5	3	1.1	8	1.5
Echinodermata	3	3.5	2	1.7	4	6.9	1	0.4	10	1.9
Miscellaneous taxa			4	3.4			12	4.6	16	3.1
Total	86	100.0	116	100.0	58	100.0	264	100.0	524	100.0

Miscellaneous taxa = Turbellaria , Sea anemone and Sipunculid

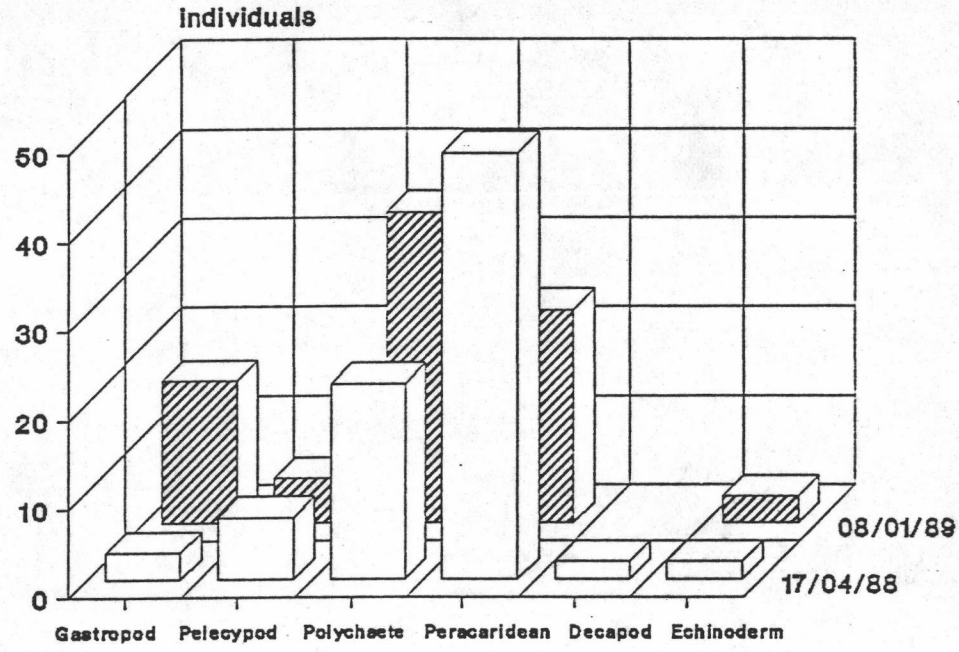


Figure 15 Comparison of benthic faunas at Yai Point, Koh Samui (percent of coverage number from two seasons).

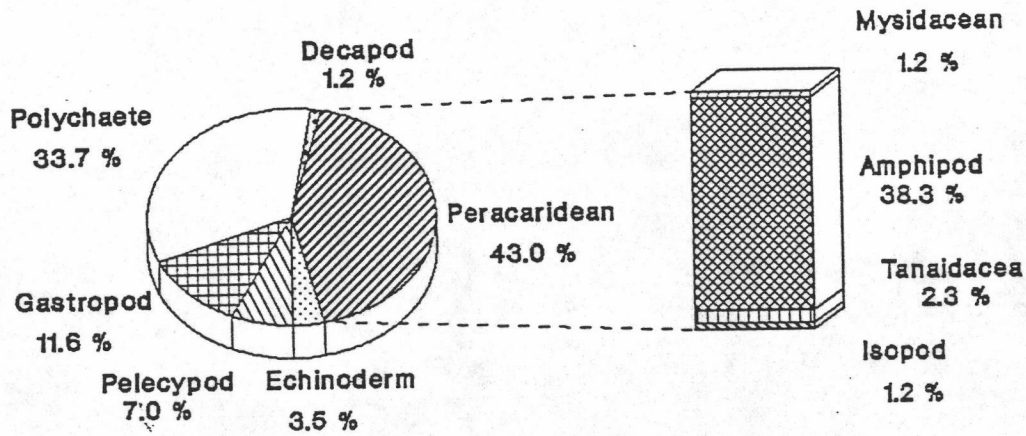


Figure 16 Abundance of benthic faunas at Yai Point, Koh Samui (summer and winter).

density (83 indiv./m^2). The representatives were polychaetes 42.2%, peracaridean crustaceans 28.9%, gastropods 19.3%, pelecypods 6% and echinoderms, 3.6% (Table 22). Polychaetes being the dominant group comprised of 11 families with the highest density of Nereidae (18 indiv./m^2). Others were Capitellidae, Dorvillidae, Eunicidae, Goniadidae, Lumbrineridae, Magelonidae, Nereidae, Ophelidae, Phyllodocidae, Spionidae and Syllidae (Table 24). Peracaridean crustacea was the second dominant group with amphipod as the major component. Corophiidae was the major amphipods and others in the families Ampeliscidae, Ampethoidae, Aoridae and Isaeidae (Table 24).

Chon Khram Point

Mixed seagrasses of 3 species, *H. uninervis*, *H. ovata* and *H. ovalis* appeared in this area of which *H. uninervis* was the most dominant species in terms of percent cover and biomass. Similarities in term of species diversity were found in the rainy and winter seasons (Figure 17). The distinct in differences in species compositions were observed for the summer and winter seasons. Thirty one species and the with density of 41 indiv./m^2 were recorded in summer. Fourty-nine species and with the density of 101 indiv./m^2 and 46 species and with the density of 148 indiv./m^2 were recorded for the rainy and winter seasons respectively (Table 22). The average number of benthic faunas from three seasons was presented in Table 23 and Figure 18 .

In the summer, pelecypod was the most abundant group (39%) represented by 5 families: Mytilidae, Thyasiridae, Lucinidae, Chamidae

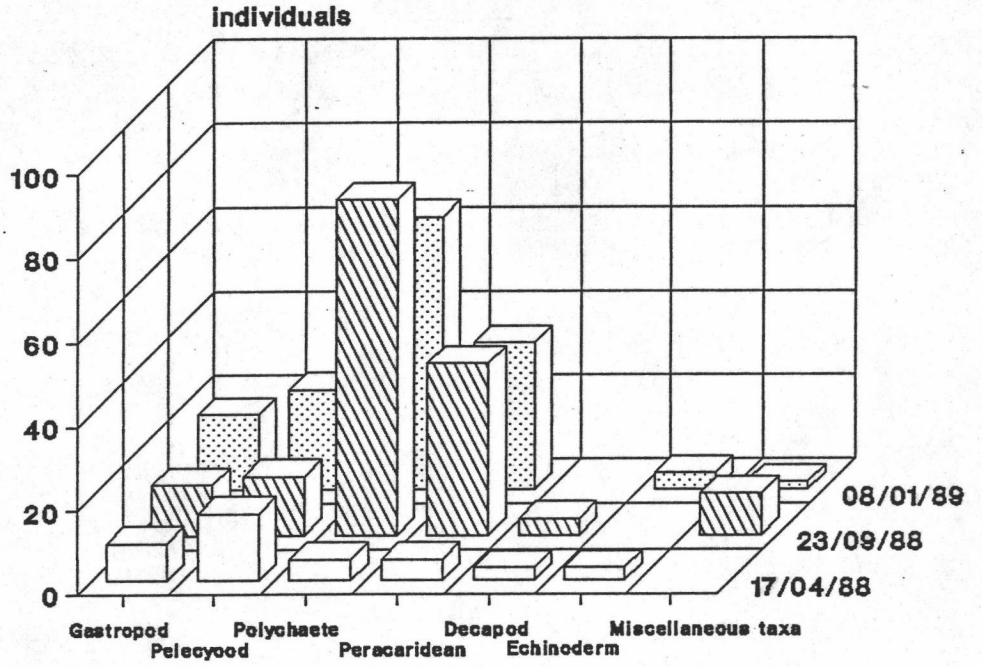


Figure 17 Abundance of benthic faunas at Chon Khram Point, Koh Samui (summer, rain and winter).

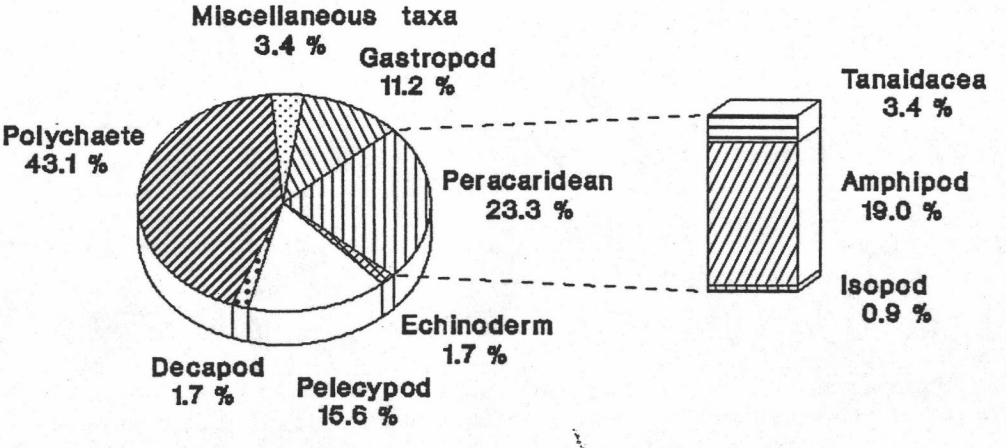


Figure 18 Comparison of benthic faunas at Chon Khram Point, Koh Samui (percent of average number from three seasons).

and Veneridae (Table 26). *Pillucina sp.* in the family Lucinidae was the most dominant. The other components were gastropods (22%) in 5 families of Potamididae, Triphoridae, Muricidae, Buccinidae and Nassaridae (Table 25). Four families of polychaetes comprised of Eunicidae, Nereidae, Onuphidae and Ophelidae were presented (Table 24). Others found were peracaridean crustaceans, decapods and Echinoderms.

The most dominant groups of benthic fauna during the rainy season were polychaetes 49.6%, peracaridean crustaceans 25.5%, pelecypod 8.7%, gastropods 7.5%, decapod crustaceans 2.5% and the other (sea anemone and sipunculid) 0.2% (Table 22). The polychaete diversity was incredibly high of 21 families (Table 24), with two major families of Nereidae and Capitellidae. Isopods, amphipods and tanaidaceans were the major constituents of peracaridean crustaceans. Amphipods in Family Corophiidae dominated by the amphipod fauna (Table 27).

Polychaetes (43.9%) was the dominant group in the winter as in the rainy season. Nereidae and Eunicidae were the two major families (Table 24). The other components were peracarideans with amphipods as majority 23.6%, pelecypods 16.2%, gastropods 12.2%, echinoderms 2.7% and sea anemone and sipunculid 1.4% (Table 22). One rare species of scaphopod, *Dentalium bisexangulatum* was found in this season (Table 25).

Hin Com Point

Mixed species of seagrasses with the genus *Halophila* occured at Hin Com Point. Peracaridean crustacean was the most abundant group

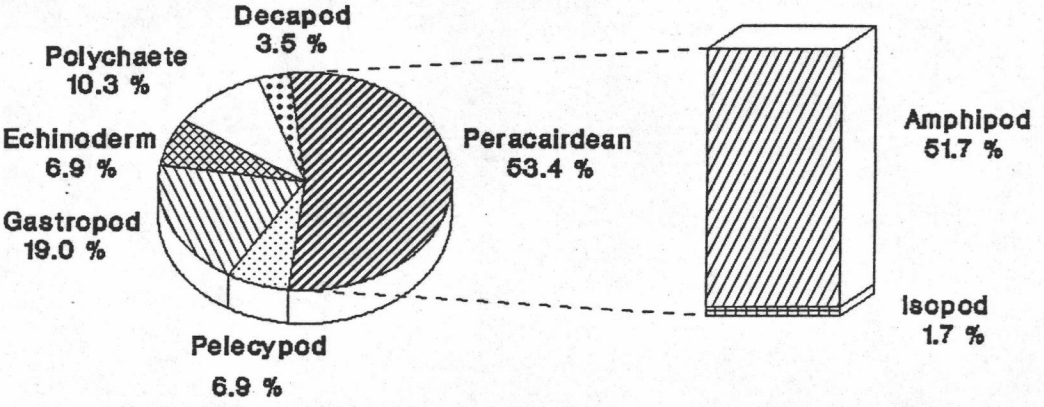


Figure 19 Comparison of benthic faunas at Hin Com Point, Koh Samui (percent of average number from one season).

from the summer samplings (53.5%). Most of these peracaridean crustaceans were amphipods represented by 7 families, Corophiidae and Isaeidae were two dominant groups (Table 27). Other components were gastropods 19%, polycahetes 10.3%, pelecypods 6.9%, echinoderms 6.9% and decapod crustaceans 3.4% (Table 22, Figure 19).

Chaweng Beach

The benthic fauna were abundant in the *Enhalus acoroides* bed with density of 128-350 indiv./m^2. (Table 22). The benthic species composition were quite similar thoughout the year especially the rainy and winter seasons. The average number of benthic faunas from these seasons was presented in Table 23 and Figure 20 . In summer, peracaridean crustacean was the most dominant group (46.1%) followed by gastropods 32.8%, polychaetes 9.4%, decapod crustaceans 5.5%, pelecypods 3.1%, Turbellaria 2.3% and Echinoderms 0.8% (Table 22). Of the peracaridean crustacean, tanaidaceans was the major component (54.2%), followed by isopod 25.4% and amphipod 20.4% (Table 27). Gastropods was second in term of abundance comprised of 10 families. The two most abundant groups were Cerithiidae and Pyreneidae (Table 25). *Clypeomorous humilis* in the familiy Cerithiidae was the most abundant.

Peracaridean crustacean was also the most dominant group (63.5%) (Figure 21) in the rainy season. In respective terms of abundance were polychaetes 30.8%, gastropods 2.5%, Turbellaria 1.9%, pelecypods 1% and decapod crustaceans 0.3% (Table 22). Majority of peracaridean crustacean was tanaidaceans. Other were amphipods

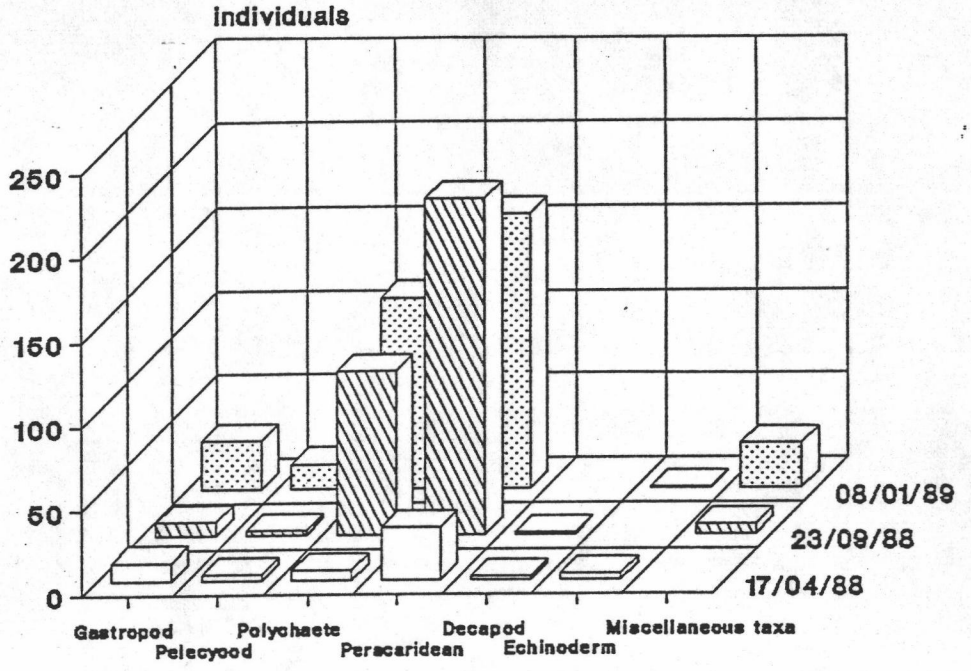


Figure 20 Comparison of benthic faunas at Chaweng Beach, Koh Samui (percent of average number from three seasons)

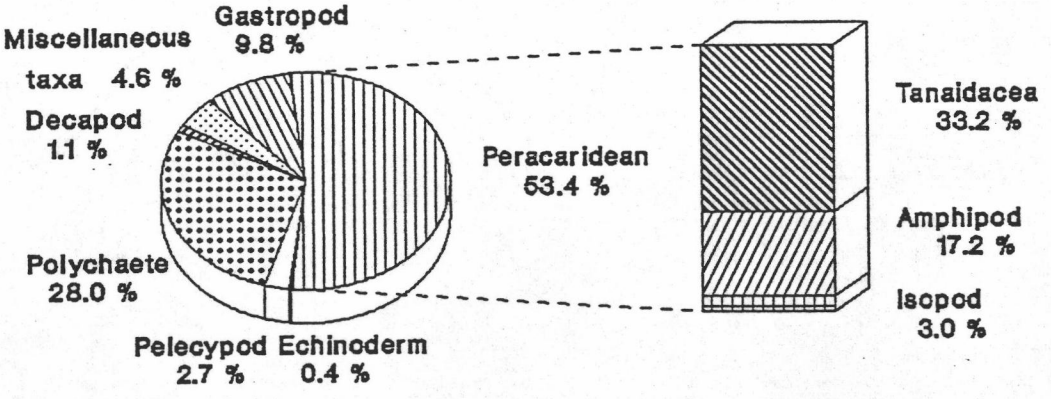


Figure 21 Abundance of benthic faunas at Chaweng Beach, Koh Samui (Summer, rain and winter).

Table 24 Polychaetes collected from the seagrass beds at four sites of Koh Samui individuals/square meters). S = Summer, R = Rain and W = Winter.

TAXA GROUPS	Yai Point		Chon Khram Point			Hin Com Point	Chaweng Beach			Total
	S	W	S	R	W	S	S	R	W	
Amphinomidae									4	4
Apharetidae				1				1		2
Arabellidae				1	1		1	3	2	8
Capitellidae	3	3		12	4		2	7	12	43
Chaetopteridae				1						1
Cirratulidae				2	2		1	1	2	8
Dorvillidae		1			1		1	2	3	8
Eunicidae	6	3	1	6	14	1	3	7	5	46
Glyceridae				1						1
Goniadidae		1								1
Hesionidae								1	2	3
Lumbrineridae	1	3		2	4			1	4	15
Magelonidae		2		5	7					14
Maldanidae				1	1			1		3
Nereidae	3	18	1	27	16	5	3	29	42	144
Onuphidae	2		2	1	4					9
Ophelidae	2	1	1	5	3			6	8	26
Orbiniidae				4	1			1		6
Oweniidae				2	1					2
Paraonidae				2						2
Phyllodocidae	2	1		1					2	4
Polynoidae	1				1				2	3
Sabellidae				1				15		16
Sigalionidae					2					2
Spionidae		1		1	2			4	11	19
Syllidae	2	1		2	2		1	16	14	38
Terbellidae								2		2
Unknown				2					1	3
Total number of individuals	22	35	5	80	65	6	12	97	114	436

Table 25 Gastropods and Scaphopods collected from the seagrass beds at four sites of Koh Samui (individuals/square meters). S = Summer, R = Rain and W = Winter.

TAXA GROUPS	Yai Point		Chon Khram Point			Hin Com Point	Chaweng beach			Total
	S	W	S	R	W	S	S	R	W	
CLASS GASTROPODA										
O. Archeogastropoda										
F. Trochidae										
Enida japonica		1								1
Euchretus atratus				1						1
F. Nerithidae										
Smaragdia soverbiana							1	1	1	3
Vittina pararella	1									1
O. Mesogastropoda										
F. Rissoidae										
Costalynia costulata		1								1
Pyramidelloides miranda		1		1						2
Rissoinia sp.		1								1
F. Potamididae										
Cerithidea sp.			1				1			2
F. Diastomidae										
Scaliola sp.							1			1
F. Cerithiidae										
Australaba picta							1			1
Bittium aleutaceum		1							1	2
Cerithium alveolum		4			4		1	1	3	13
C. bifasciatum									1	1
C. critinum						1				1
C. henleyi									1	1
C. kobelti					2				2	4
C. lutosum							5			5
C. patulum				1						1
Cerithium sp.							1			1
Clypeomorus humilis							10	1		11
Diala stricta						4				4
Diala sp.							1			1
Ochetoclava serninutum					1					1
Proclava pfeffei		1								1
Stylifera goniochila							1			1

Table 25 (continue).

TAXA GROUPS	Yai Point		Chon Khram Point			Hin Com Point	Chaweng beach			Total
	S	W	S	R	W	S	S	R	W	
F. Triphoridae										
Cautor maculosa			1							1
Inella multigyrata		2	1		3	2		1		9
Mastonia sp.			1							1
Notosinistor cingulifera		1								1
F. Epitonidae										
Amaea magnifera					2					2
Unknown		1			2				1	4
F. Eulimidae										
Lentigobalsis lentiginosus				4	1				1	6
										6
F. Strombridae										
Strombus canarium									1	1
O. Neogastropoda										
F. Muricidae										
Nucula sp.			1				1			2
F. Pyreneidae										
Pyrene ocellata							1			1
P. versicolor							13	4	12	29
Pyrene sp.									5	5
F. Buccinidae										
Cantharus sorbignyi			1	1						2
Manaria lirata						1	1			2
Neptuna vinosa			1							1
Prodotia gracilis			1							1
Siphonaria sp.	1									1
F. Nassaridae										
Nassarius sp.				1			1			2
Reticunassa dermestigma			1							1
F. Olividae										
Ancilla cylindrica							1			1
F. Mitridae										
Mitroprifex bronni							1			1
Vaxillium sp.					1					1
F. Terebridae										
Strioterebrum subtextile					1					1
O. Opisthobranchia										
F. Pyramidellidae										
Longchaeus teres				1		1				2
Unknown						2				2
F. Retusidae										
Colephysis villica	1									1
F. Scaphanderidae										
Acteocina exilis				1						1
Rhizorus ovulinus		1		1						2
F. Haminoeidae										
Aliculastrum cylindricum		1								1
CLASS SCAPHOPODA										
F. Dentalidae										
Dentalium bisexangulatum					1					1
Total number of individuals	3	16	9	12	18	11	42	8	29	148

Table 26 Pelecypods collected from the seagrass beds at four sites Koh Samui (individuals/ square meters). S = Summer, R = Rain and W = Winter.

TAXA GROUPS	Yai Point		Chon Khram Point			Hin Com Point	Chaweng Beach			Total
	S	W	S	R	W	S	S	R	W	
O. Protobranchia										
F. Nuculanidae										
Nuculana sp.					1	1				2
O. Pteromorphia										
F. Arcidae										
Barbatia yamamotoi		1							1	2
F. Mytilidae										
Brachyodontes straitula		2		4	12				6	24
Modiolus comptus				1	1				1	3
M. difficillis	2				7					9
M. elongatus									1	1
M. metcalfei	2			1	1		2			6
M. nitidus	1									1
M. vaiginus			1			1				2
F. Spondylidae										
Spondylus sp.	1									1
F. Limidae										
Limalia sp.						1				1
O. Heteroconchia										
F. Carditidae										
Cardita variegata				1						1
F. Sportellidae										
Anisodonta sp.									1	1
F. Thyasiridae										
Axinopsida sp.			1							1
F. Lucinidae										
Codakia sp.					1					1
Epicodakia divergens			1					1		2
Pillucina sp.			6							6
F. Galeomatidae										
Paralepida takii									1	1
F. Chamidae										
Chama sp.			1							1

Table 26 (continue).

TAXA GROUPS	Yai Point		Chon Khram Point			Hin Com Point	Chaweng Beach			Total
	S	W	S	R	W	S	S	R	W	
F. Cardiidae										
Fragum unedo									1	1
Microfragum sp.					1					1
Trachycardium isocardia								1		1
Vesticardium flava				1				1		2
F. Veneridae										
Dosinia biscocta			1							1
D. juvenilis						1				1
D. modesta			1							1
D. penicillata			1							1
Dosinia sp.			3							3
Pitra japonicum							1			1
P. lineolatum				1						1
F. Mactridae										
Mactra violacus									1	1
F. Samelidae										
Abra Kyurokusimana									2	2
F. Tellinidae										
Acropella isseli							1			1
Cadella delta	1									1
Fabulina minuta		1								1
Pinguitellina robusta				3						3
Unknown		1								1
F. Corbulidae										
Anisocorbula modesta				2						2
Total number of individuals	7	5	16	14	24	4	4	3	15	92

Table 27 Crustaceans collected from the seagrass beds at four sites of Koh Samui (individuals/square meters). S = Summer, R = Rain and W = Winter.

TAXA GROUPS	Yai Point		Chon Khram Point			Hin Com Point	Chaweng beach			Total
	S	W	S	R	W	S	S	R	W	
CRUSTACEA										
- Mysidacea	2									2
- Isopod										
Anthuridae	2									2
Cirolanidae			1			1			6	8
Sphaeromatidae				2			15	1	2	20
Total Isopod	2		1	2		1	15	1	8	30
- Amphipod										
Ampeliscidae	2	1	1	2	2	2				10
Ampithoidae		1		7	2	1	2	7	88	108
Aoridae		1							4	5
Corophiidae	20	17	1	17	17	12	3	3	10	100
Gammaridae					6	1			1	9
Hyalidae	1				1					1
Isaeidae	15	3	1	1	3	11	4		9	47
Ischyroceridae	2						1			3
Leucothoidae	1			1			1		2	5
Liljeborgiidae			1			1				2
Lysianassidae	1					2				3
Oedicerotidae					1					1
Podoceridae					2		1			3
Total Amphipod	42	23	4	28	34	30	12	10	114	297
- Tanaidacea	2	1		11	1		32	189	42	278
- Decapod										
Caridean shrimp			1	2		1				4
Anomura	1						4			5
Xanthidae										
Actumnus sp.							1			1
Zozymodes sp.							1	1		2
Pathenopidae			1				1			2
Pinnotheridae				1						1
Leucosidae										
Leucosia sp.	1		1	1		1				4
Total Decapod	2		3	4		2	7	1		19
Total	50	24	8	45	35	33	66	201	164	627

Table 28 Echinoderms collected from the seagrass beds at four sites of Koh Samui (individuals/square meters). S = Summer, R = Rain and W = Winter.

TAXA GROUPS	Yai Point		Chon Khram Point			Hin Com Point	Chaweng beach			Total
	S	W	S	R	W	S	S	R	W	
C.Asteroidea										
F.Astropectinidae										
Astropectin indicus						1				1
C.Ophiuroidea										
F.Ophiorichdae										
Macrophiotrix sp.						2				2
Ophiotrix sp.		2			2					4
F.Ophiocomidae							1			1
F.Ophiodermatidae					1				1	2
F.Amphiuridae										
Amphiura sp.	1	1			1					3
C.Echinoidea										
F.Echinilampadidae	1		3			1				5
Total (individuals)	2	3	3		4	4	1		1	18

Table 29 Miscellaneous taxas (Porifera, Cnidaria, Plathyhelminthes, Sipuncula and Bryozoa) collected from the seagrass beds at four sites of Koh Samui (individuals/square meters). + = present. S = Summer, R = Rain and W = Winter.

TAXA GROUPS	Yai Point		Chon Khram Point			Hin Com Point	Chaweng beach			Total
	S	W	S	R	W	S	S	R	W	
PORIFERA	-	-	-	-	-	-	+	+	+	
CNIDARIA (Sea anemone)				7	1				1	9
PLATHYHELMINTHES (Turbellaria)							3	6	23	32
SIPUNCULA				3	1				3	7
BRYOZOA	-	-	-	-	-	-	+	+	+	
Total number of individuals	-	-	-	10	2	-	3	6	27	48

(Ampithoidae and Corophiidae) 5% and 0.5% Sphaeromatid isopod. Sixteen families of polychaetes were found with 3 dominant groups from Nereidae, Syllidae and Sabellidae (Table 24).

Peracaridean crustacean was the most dominant group Thoughout the year as also observed in winter (46.9%) (Figure 21). Others comprised of polychaetes, 8.3% of gastropods, 7.7% of miscellaneous taxas (Turbellaria, sea anemone and sipunculid), 4.3% of pelecypods and 0.2% of echinoderms (Table 22). The major component of peracaridean crustacean was amphipods 69.5%. Others were tanaidaceans 25.6% and isopods 4.9% amphipods in 6 families. Ampithoidae was the most dominant, other amphipod families were Corophiidae, Aoridae, Gammaridae, Isaeidae and Leucothoidae. Two families of Isopod, Cirolanidae and Sphaeromatidae were found (Table 27). Fifteen families of polychaete were recorded with Nereidae as the dominant group (Table 24).

III. Nekton

Trawling surveys were carried out only at Yai Point, Chon Khram Point and Chaweng Beach. In addition comparisons of nekton composition were carried out between the seagrass bed and the sand flat at Chaweng Beach in the summer. The nektons in the seagrass bed were richer in terms of species and abundance as compared to the sand flat in Table 30 and Figure 22 In the seagrass beds, the catch comprised of crustaceans 69.9% and fishes 30.1%. Of the crustaceans, caridean shrimps were the major component (54.9%). In respective order of abundance were *Acetes sp.* 22.2% and *Peneaus spp.* 20.6%. Caridean shrimps were mainly smaller species, and in adult

Table 30 Nekton collected by beam trawl between seagrass beds and sand flat at Chaweng Beach, Koh Samui (individuals/trawl).

TAXA GROUPS	CHAWENG BEACH (10/04/88)		
	Enhalus acoroides No.	Sand No.	Total No.
SHRIMPS			
F. Penaeidae			
Peneaus sp.	147	29	176
Metapeneaus sp.	1		1
F. Sergestidae			
Acetes sp.	158	9	167
Lucifer henseni			
F. Mysidae			
Acanthomysis sp.			
Mesopodopsis sp.	13		13
Rhopalopthalmus sp.	2		2
Caridean Shrimps	391	130	521
Total number of shrimps (individuals)	712	168	880
FISHES			
F. Clupeidae			
Spratelloides sp.	17	98	115
F. Holocentridae			
Sargocentron rubrum	1		1
F. Gereidae			
Gerres sp.	3		3
F. Lutjanidae			
Lutjanus kasmira	1		1
L. monostigma	1		1
L. russelli	5		5
F. Teraponidae			
Pelates quadrilineatus	19		19
F. Lethrinidae			
Lethrinus sp.	5		5
F. Chaetodontidae			
Chelmon rostratus	1		1
F. Siganidae			
S. canaliculatus	237	4	241
S. virgatus	6		6
F. Bleniidae			
Petroscertes mitratus	3		3
F. Callionymidae			
Callionymus sp.	3		3
F. Monocanthidae			
Arceichthys hajam	5		5
Total number of fishes (individuals)	307	102	409
Total number of shrimps and fishes (individuals)	1019	270	1289

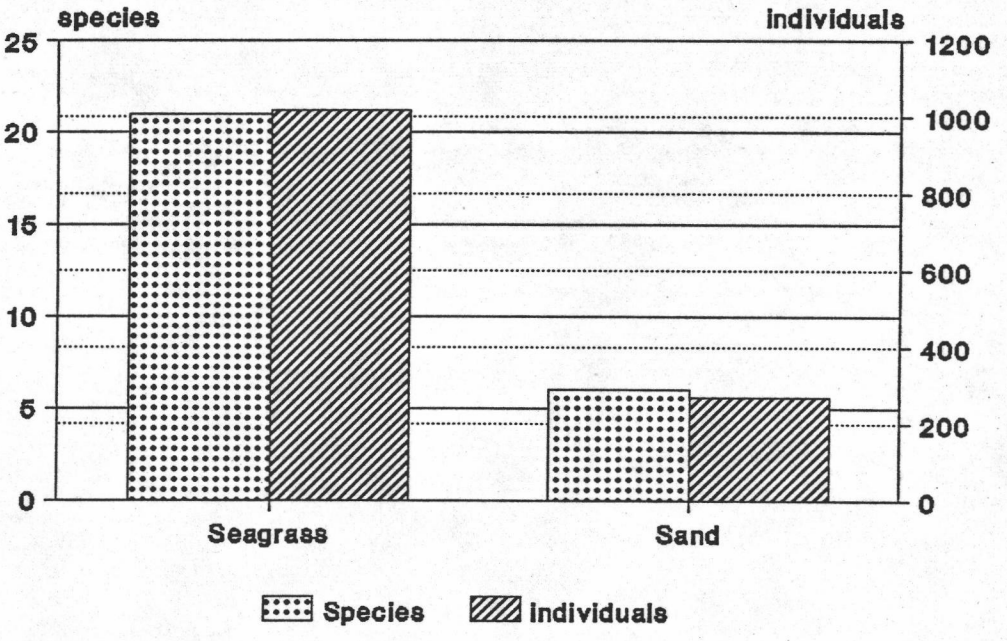


Figure 22 Comparison of juveniles of fishes and decapod crustaceans (species richness and abundance) between seagrass beds and sand flat at Chaweng Beach, Koh Samui.

forms, *Peneaus spp.* collected were mostly juveniles. A total of 14 species of fishes belonging to 11 families were caught from the sea-grass bed. Juveniles of *Siganus canaliculatus* was the major component (77%).

The catch, in the sand flat comprised of crustacea 62.2% and fishes 37.8%. Most of the crustaceans were the caridean shrimps (77%). Only 2 species from 2 families of fish were caught, *Spratelloides sp.* and *Siganus canaliculatus*

On the species compositions of nekton at each site as in Table 31,32, we found that in the Chon Khram Point and Chaweng Beach were quite similar both in the summer and winter. Nekton in the Yai Point and Chon Khram Point were distinct.

Yai Point

Caridean shrimps were the most dominant group in the summer, followed by the *Acetes sp.* , *Penaeus sp.* and *Rhophalopthalmus sp.* (Table 31). Fishes, namely, *Spratelloides sp., Gerres sp., Pelates quadrilineatus, Favonigobius sp.* and *Arceichthys hajam*, were found. Most of these fishes were in the juvenile stage with total lenght in the range of 1.5-4.2 cm.. Caridean shrimps and portunid crabs (*Portunus pelagicus* and *P. granulatus*) were found in a small number in winter (Table 31).

The most dominant fish species was *Favonigobius sp.*. Other species were *Plathycephalus sp., Pseudorhombus sp.* and *Arceichthys hajam* (Table 32).

Table 31 Decapods collected by beam trawl from the seagrass beds at three sites of Koh Samui (individuals/trawl, Lenght = Total lenght for shrimps and carapace lenght for crabs in centimeters).

TAXA GROUPS	Yai Point						Chon Khram Point						Chaweng Beach									Total
	Summer (Day)			Winter (Day)			Summer (Day)			Winter (Night)			Summer (Day)			Winter (Night)			Winter (Night)			
	No.	Lenght	L(ave.)	No.	Lenght	L(ave.)	No.	Lenght	L(ave.)	No.	Lenght	L(ave.)	No.	Lenght	L(ave.)	No.	Lenght	L(ave.)	No.	Lenght	L(ave.)	
SHRIMPS																						
F. Penaeidae																						
Peneaus sp.	5	1.9 - 2.5	2.2				4	0.8 - 1.3	1.0	56	1.0 - 5.5	2.24	115	1.0 - 3.0	1.34	32	0.85 - 1.65	1.75	1	2.15	2.15	213
Metapeneaus sp.																1	3.7	3.7				1
F. Sergestidae																						
Acetes sp.	6	1.5 - 2.5	2.03				10	0.9 - 1.2	1.05	95	0.65 - 1.65	1.1	12	0.9 - 1.7	1.38	146	0.95 - 1.75	1.38	276	0.8 - 1.4	1.17	545
Lucifer henseni							1	1.8	1.8	4	0.9 - 1.1	1.03										5
F. Mysidaae																						
Acanthomysis sp.										3	0.5 - 0.7	0.6							136	0.55 - 1.0	0.79	139
Mesopodopsis sp.																13	0.35 - 0.85	0.67				13
Rhopalopthalmus sp.	3	1.1 - 1.8	1.45				2	1.2 - 1.5	1.35	126	0.5 - 0.75	0.62				2	0.40 - 0.70	0/55	27	0.5 - 0.9	0.70	160
CARIDEAN SHRIMPS	51	0.8 - 1.55	1.15	7	1.0 - 2.8	1.53	237	0.6 - 1.5	1.01	1150	0.55 - 1.6	0.10				391	0.7 - 2.3	1.83	2000	0.9 - 1.85	1.18	3836
Total number of shrimps (individuals)	65			7			254			1434			127			585			2440			4912
CRABS																						
F. Leucosidae																						
Arcania sp.										3	0.2 - 1.4	0.60										3
F. Raninidae										8	0.2 - 0.3	0.24										8
F. Majidae										8	0.3 - 0.6	0.46							4	0.4 - 0.6	0.49	12
F. Parthenopidae											0.5 - 0.7	0.60										5
F. Portunidae																						
Thalamita sp.										5	0.3 - 1.15	0.60							2	0.6 - 0.8	0.70	7
Charybdis sp.										2	0.55 - 1.0	0.78							12			2
Portunus pelagicus				2	0.6 - 0.75	0.68				20	0.30 - 0.85	0.34								0.20 - 0.70	0.44	34
P. granulatus				1	0.20	0.20				16	0.20 - 0.30	0.23							8	0.20 - 0.30	0.25	25
F. Xanthidae																						
Species A										1	1.50	1.50										1
Species B										2	0.30 - 0.45	0.38										2
Sprcies C										2	0.30 - 0.40	0.35										2
F.Pinnotheridae										13	0.15 - 0.50	0.29										13
F.Ocypodidae										2	0.45 - 0.80	0.63										2
Total number of crabs (individuals)				3						87									26			116
Total number of shrimps and crabs (individuals)	65			10			254			1521			127			585			2466			5028

Table 32 Fishes collected by beam trawl from the seagrass beds at three sites of Koh Samui (individuals/trawl, Lenght = Total lenght in centimeters).

TAXA GROUPS	Yai Point						Chon Khram Point						Chaweng Beach									Total
	Summer (Day)			Winter (Day)			Summer (Day)			Winter (Night)			Summer (Day)			Summer (Night)			Winter (Night)			
	No.	Lenght	L(ave.)	No.	Lenght	L(ave.)	No.	Lenght	L(ave.)	No.	Lenght	L(ave.)	No.	Lenght	L(ave.)	No.	Lenght	L(ave.)	No.	Lenght	L(ave.)	
F. Clupeidae																						
Spratelloides sp.	1	3.7	3.7							1	3.5	3.5				17	3.2 - 6.0	4.23	1	3.1	3.1	20
F. Holocentridae																						
Sargocentron rubrum																1	4.7	4.7	1	11.5	11.5	2
F. Atherinidae																						
Atherina duodecimalis							2	2.5 - 2.7	2.6										45	2.9 - 10.8	4.64	47
F. Centropomidae																						
Psammoperca waigiensis							1	19.2	19.2													1
F. Apogonidae																						
Apogon sp.							1	7.5	7.5													1
F. Gereidae																						
Gerres sp.	2	1.2 - 1.4	1.3							12	1.2 - 1.5	1.35				3	0.9 - 1.3	1.13	545	0.9 - 1.2	1.13	562
F. Mullidae																						
Upeneus tragula							1	5.9	5.9										1	14.7	14.7	2
F. Serranidae																						
Epinephelus tauviana							1	13.5	13.5													1
F. Lutjanidae																						
Lutjanus kasmira													1	5.1	5.1							1
L. monostigma																1	9.6	9.6				1
L. russelli							7	5.0 - 7.0	5.19				4	2.2 - 6.7	4.23	1	2.5	2.5				12
L. vitta										1	5.2	5.2										1
F. Teraponidae																						
Pelates quadrilineatus	1	1.5	1.5				93	1.1 - 5.0	2.84	14	1.4 - 5.6	2.84	17	1.3 - 1.5	1.42	2	1.0 - 1.1	1.05	16	1.0 - 2.7	1.9	143
F. Nemipteridae																						
Scolopsis sp.							1	3.5	3.5													1
F. Lethrinidae																						
Lethrinus sp.							52	1.8 - 4.1	3.51							5	1.4 - 4.2	2.68				57
F. Chaetodontidae																						
Chelmon rostratus													1	4.8	4.8							1
F. Labridae																						
Halichoeres poecilopterus							3	2.3 - 11.9	5.67													3
F. Siganidae																						
Siganus sp.							458	2.4 - 3.8	3.22													458
S. canaliculatus							123	2.4- 10.3	3.64	3	3.9 - 4.3	4.13	219	1.7 - 5.3	2.35	18	2.2 - 4.2	2.64	6	5.7 - 11.9	9.97	369
S. virgatus							5	2.7 - 4.6	3.5				6	3.5 - 4.2	3.82							11
F. Gobiidae																						
Favonigobius sp	1	2.3	2.3	6	1.0 - 1.8	1.35	1	3.2	3.2	56	0.8 - 2.4	1.21										64
Unknown										1	1.8	1.8										11
F. Blenidae																						
Petroscertes mitratus							2	3.4 - 3.8	3.6				3	2.7 - 3.6	2.8				2	2.5 - 2.8	2.65	7
Petroscertes sp.							2	3.0 - 5.5	4.25													2
F. Plathycephalidae																						
Plathycephalus sp.				2	5.2 - 10.6	7.9																2
F. Callionymidae																						222
Callionymus sp.							6	2.4 - 4.4	3.5	1	1.3	1.3	3	2.6 - 3.2	2.83							10
F. Bothidae																						
Pseudorhombus arsius				1	10.6	10.6				1	7.1	7.1										2
F. Monocanthidae																						2
Arceichthys hajam	1	4.2	4.2	2	3.1 - 4.8	3.95	41	2.5 - 7.2	4.67				2	4.3 - 7.2	5.75	3	0.8 - 1.2	1.0	3	0.6 - 10.6	7.2	52
Total number of individuals	6			11			800			90			256			51			620			1834

Chon Khram Point

Caridean shrimps were the most dominant group in the summer with density of 237 indiv./trawl. Other shrimps (juvenile and subadult) such as *Acetes sp. Rhophalopthalmus sp.* and *Lucifer henseni* were also recorded. Juvenile of *Penaeus sp.* was less abundant. Eighteen species of fishes mostly in juvenile stage with the exception of the centropomids were found in this area (Table 32). The economic species siganid fish especially *Siganus sp.* was the most abundance of 458 indiv./trawl followed by *S. canaliculatus* (123 indiv./trawl). Other groups were teraponid (*Pelates quadrilineatus*, 93 indiv./trawl), lethrinid (*Lethrinus* sp., 52 indiv./trawl) and monocanthid (*Arceichthys hajam*, 41 indiv./trawl) (Table 32)

Adult caridean shrimps were also the dominant group in winter with the high density of 1150 indiv./trawl. *Rhophalopthalmus sp.* ranked in second followed by *Acetes sp., Lucifer henseni* and *Acanthomysis sp.*, respectively (Table 31). It should be noted that *Penaeus sp.* juvenile (56 indiv./trawl) were abundance as compared to summer season. Moreover 8 families of crabs were collected. Portunid juveniles were the most dominant group comprised of *Portunus pelagicus, P. granulatus, Thalamita sp.* and *Charybdis sp.*. Other crabs in the families: Pinnotheridae, Raninidae, Majidae, Parthenopidae, Xanthidae, Leucosidae (*Arcania sp.*) and Ocypodidae were collected (Table 31). The gobiid fish, *Favonigobius sp.* was the most abundant group. The less abundant groups were teraponid (*P. quadrilineatus* and gerrid (*Gerres sp.*), respectively (Table 32). Fourteen youngs cephalopods

were also found.

Chaweng Beach

The day and night samples in the summer at Chaweng Beach revealed the differences in nekton composition. The day samples showed that *Penaeus sp.* was the most dominant group with the high density of 115 indiv./trawl. *Acetes sp.* was less abundance (Table 31). *Siganus canaliculatus* was the most dominant among the 9 species of fish juveniles with the density of 219 indiv./trawl. Teraponid, *Pelates quadrilineatus* was also recorded (Table 32). Caridean shrimps were the most dominant group in the night samples with the density of 351 indiv./trawl. *Acetes sp.*, penaeid shrimp and mysid were the economically importance species in the samples (Table 31). Nine species of fish juveniles were recorded *Siganus canaliculatus* and *Spratelloides sp.* were abundant (Table 32).

In winter, only the night sampling was carried out. The nekton composition revealed adult caridean shrimps were the major group with 2,000 indiv./trawl. In respective orders of dominance were shrimps, *Acetes, Acanthomysis* and *Rhophalopthalmus sp.* Two families of crabs, the juveniles of Portunidae and Parthenipodidae were recorded. Portunid crabs were *P. pelagicus, P. granulatus* and *Thalamita sp.*. Most of fishes caught were in juvenile forms except for the atherinid (*Atherina duodecimalis*). The most abundant species was the gerried (*Gerres sp.*) with the highest density of 545 indiv./trawl. *A. duodecimalis* and *P. quadrilineatus* were also presented in the catch (Table 32).

Some environmental parameters in the seagrass beds

The environmental parameters recorded from different seagrass beds were presented in Table 33. The temperature ranges in the four sites were similar of 26.0-28.5 ^{o}C. The pH and salinity followed the same trends. The salinity ranged 30-33 ppt. These environmental factors were not closely related to seagrass biomass. However, the depth, grain size and oxidizable organic content varied among site. This contributed to the different in the distribution of seagrass species. *Enhalus acoroides*, the large seagrass species at Chaweng Beach grew on coarse substrate ranging from medium sand, coarse sand to coral rubbles with the depth of only 0.5-1.0 meters. The small species *H. uninervis, H. ovalis, H. ovata* and *H. decipiens* thrived well on fine sand to medium sand at the depth of 2.5-7.0 meters. These small species were found at the west coast of Koh Samui; Yai Point, Chon Khram Point and Hin Com Point. Biological factors such as competition might play an important role in determining the distribution of seagrasses.

Table 33 Range of some environmental factors in the seagrass beds of Koh Samui.

Sites	Depth (m.)	DO. (ppm.)	Temp. (C)	Salinity (ppt.)	pH	Grain size (mm.)	Oxidizable organic content (%)
Yai Point *Halodule uninervis* *Halophila ovalis* *H. ovata*	5.0-7.0	6.0-7.0	27.0-28.0	30	8.23-8.27	0.23-0.92	0.38-2.47
Chon Khram Point *Halodule uninervis* *Halophila ovalis* *H. ovata*	2.5-3.2	7.0-7.7	26.0-28.5	32	8.10-8.15	0.33-0.69	1.11-2.48
Hin Com Point *Halophila ovalis* *H. decipiens* H. ovata	4.2-4.5	6.0-6.5	27	30	8.00-8.14	0.35-0.51	0.14-0.31
Chaweng Beach *Enhalus acoroides*	.55-0.75	8.0-8.9	26.0-28.5	33	8.08-8.16	0.51-3.43	0.6-2.03