



## CHAPTER 2

### MATERIALS AND METHODS

#### Study site

Koh Samui is the largest island on the west coast of the Gulf of Thailand, locating between latitude  $9^{\circ} 20' - 9^{\circ} 35' N$  and longitude  $99^{\circ} 55' - 100^{\circ} 05' E$  (Figure 2). Sudara and Nateekanjanalarp (1989) reported that coral reefs scattered around this island. Seagrasses distribute along the west coast at Yai Point, Chon Khram Point and Hin Com Point, and along the east coast at Chaweng Beach.

At Yai Point, on the northwestern of Koh Samui, the living corals are found about 1,000 meters from the shore and inside this zone sandy beach, dead corals and macro-algae are scattered. The living corals (between 3.5 meters in depth) are found in many forms. The predominant are massive and encrusting, other corals which can be found are Non-acropora submassive and foliose while *Acropora* are almost absent in this area (Sudara and Nateekanjanalarp, 1989). Outside the living coral zone, small seagrass bed of *Halodule sp.* and *Halophila spp.* is found on the soft sediment area.

Chon Khram Point, located at the middle part of the west coast of Koh Samui. This area is of rocky shore next to that is the dead corals and macroalgae of approximately 200-300 meters in width. The living corals outside the dead coral zone are at the shallow area of about 2 meters in depth. The Non-acropora massive coral is the dominant

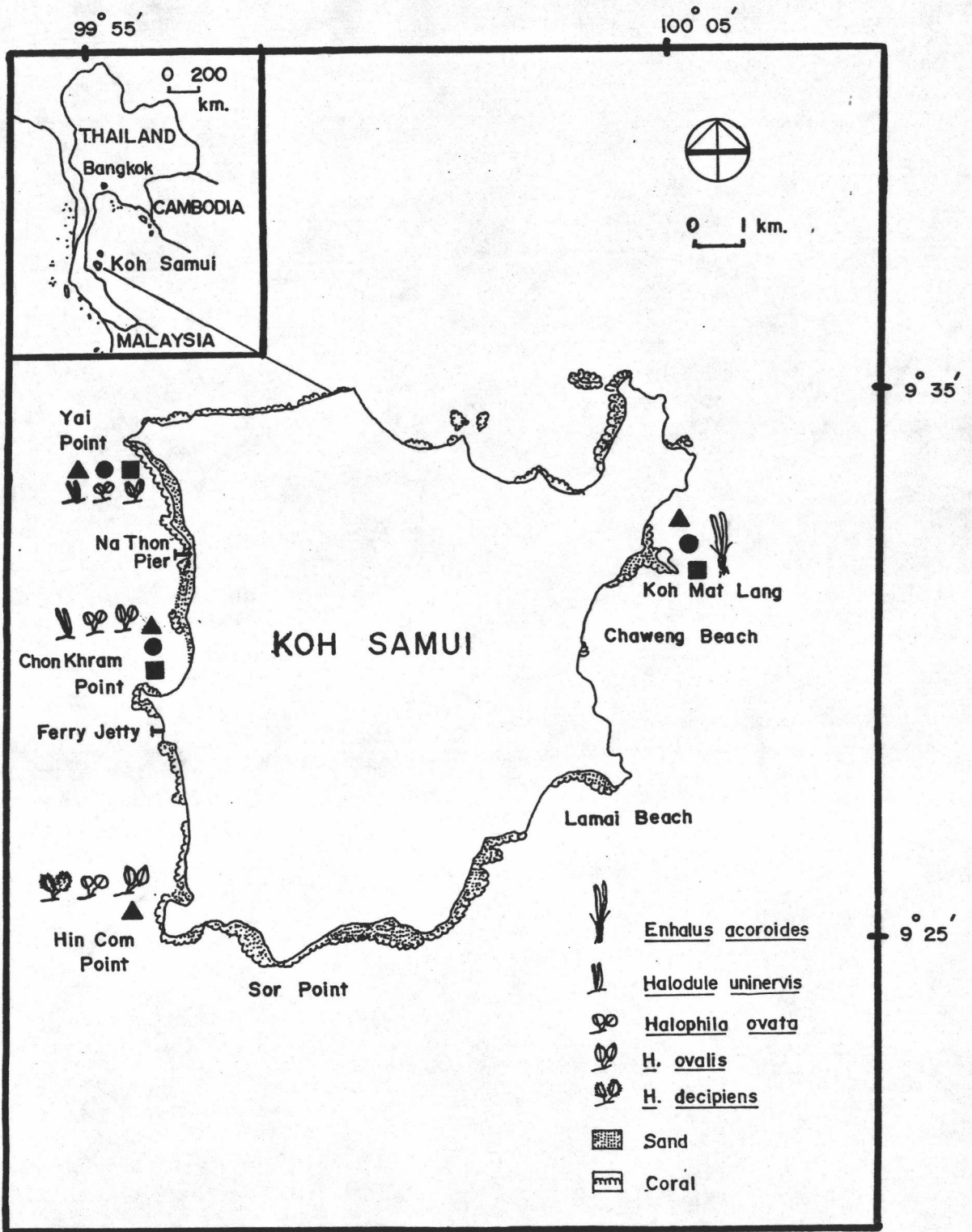


Figure 2 Seagrass study sites at Yai Point, Chon Khram Point, Hin Com Point and Chaweng Beach of Koh Samui. ▲ Line transect, ■ Beam trawl, ● Zooplankton.

group (Sudara and Nateekanjanalarp, 1989). Outside this zone, the small seagrass bed with *Halodule sp.* as the dominant species mixed with *Halophila spp.* occurred on the soft sediment.

Hin Com Point located at the southwest corner of Koh Samui. The near shore reef is about 1,000 meters in length paralleled to the shore. The coral zone was about 100-200 meters wide. The dominant corals are massive coral and *Acropora submassive*. The turf algae was found to grow cover this community. Outside the reef, only the small seagrasses of *Halophila spp.* grew on soft sediment.

On northeastern side of Koh Samui, Chaweng Beach, is located opposite to Koh Mudlung. This is a protected area clear with water and long white sandy beach. The living coral zone located at 200-300 meters from the shore. There are mangrove strand near shore in the nearby area. The dominant corals are *Acropora submassive* and tabulate (40%) while Non-*acropora* massive coral is present as the minor component (Sudara and Nateekanjanalarp, 1989). Between the mangrove and the living coral zone, the largest seagrass *Enhalus acoroides* grew on the hard substrates.

#### Sampling period

According to the impact of monsoons, the climatic conditions can be divided into 3 periods, the intermonsoon (summer) from February to May, the southwest monsoon (rainy) from June to October and the northeast monsoon (winter) from November to January. The samples were collected at the end of each period, i.e., in April 1988, September 1988 and January 1989.



## Methodology

### I. The distribution of seagrasses

A preliminary visual survey to identify the areas of seagrass beds and its boundaries was done by using modified Manta Board reconnaissance technique as recommended for the coral reefs survey of the ASEAN-Australia; Coastal Living Resources Project (Dartnall and Jones, 1988). The other related informations were obtained from the local fishermen and fisheries officers from those area.

### II. The biomass of seagrasses

Following the manual for ASEAN-Australia, Coastal Living Resources Project (Dartnall and Jones, 1986) on seagrass studies, at each site, a line transect was fixed by compass bearing. On each transect line, samples were collected using 0.25 m<sup>2</sup>-quadrat at every 5 or 10 meters interval in distance depending on the character of seagrass at each site. At each quadrat, prior to any collection within the quadrat, percent coverage of seagrasses was estimated and recorded. Then, by cutting with a knife along the 4 sides of quadrat, all the seagrass, consisting of leaves, stems, roots and rhizomes, along with any associated organisms were carefully collected by hands, put in plastic bag and preserved with 10% formalin seawater solution for laboratory analysis.

At the same time, ambient environmental parameters, i.e., depth (m.), DO (ppm.), T (°C), S (ppt.) and pH, were measured. A



sediment sample was also collected for grain size and oxidizable organic content analysis.

At the laboratory, the sample of each quadrat was cleaned. Plant samples were sorted and identified to species level. Animal samples were kept with 10% formalin seawater solution for later identification.

Seagrass sample was divided into 2 parts, i.e., the part above the substratum (stem and leaves or shoot); and the part below the substratum (roots and rhizomes). Each part was dried in an oven at 40°C-50°C to constant weight and weighed.

For sediment analysis, sediment samples were separated into 2 portions for grain size and oxidizable organic content analyses according to the methodology described by Paphavasit (1981).

### III. Animal communities of the seagrass beds

#### Zooplankton

Zooplankton samples were collected in March 1988 and January 1989. The sampling routine was set up depending on sea condition and water level. During the intermonsoon period, samples were taken only during daytime at 2 sites, Chon Khram Point and Chaweng Beach. During the period of Southwest monsoon, the day samples were collected daytime at 2 sites, namely, Chon Khram Point and Chaweng

at Chon Khram Point while samples were collected both day and night at Chaweng beach. During the period of Northeast monsoon, only the day samples were collected at Yai Point while both day and night samples were collected at Chon Khram Point and Chaweng beach.

The samples were collected using zooplankton net mounted on the two sledge as designed by Suraphol Sudara (1988, personal contact) (Figure 3). Zooplankton net has mesh size of 0.5 mm., 50 cm. mouth diameter, and 100 cm. in length. The gear operated using two divers was pushed with speed of 1 knot over the seagrass bed against tidal current about 100 m. in distance. The collected samples were preserved in 10% formalin-seawater solution.

At the laboratory, the samples were sorted and identified to taxa. The identified samples were also counted by standardization to be individual numbers per 100 m.<sup>3</sup> of water volume passing through the net.

### **Benthos**

For benthic fauna analysis, the associated organisms with seagrasses as separated and kept in 10% formalin-seawater solution were sorted and identified to genus or species level.

### **Shrimps, Crabs and Fishes**

Shrimps, crabs and fishes existing in the seagrass area were also investigated. Only 2 seasons, intermonsoon and Northeast monsoon, that the investigation of these animals could be carried out. Due to the Southwest monsoon effect, the wave action was too strong to

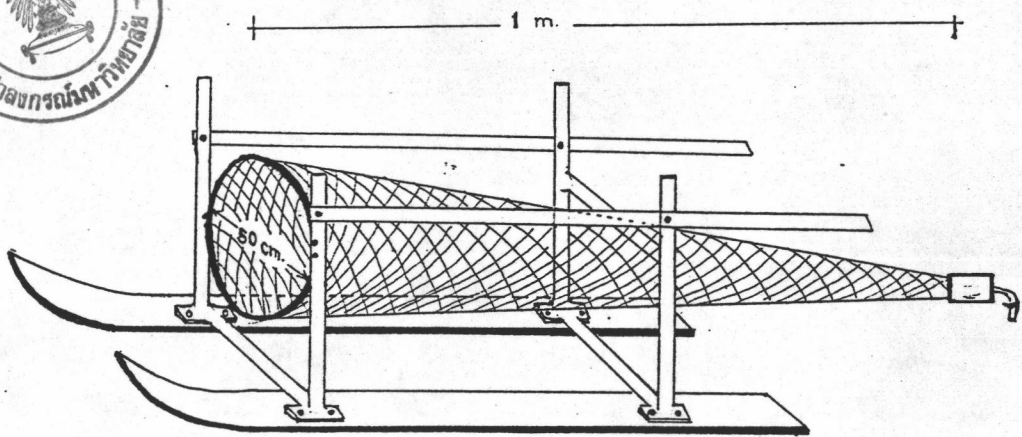


Figure 3 Modified zooplankton net for collecting zooplankton overlying the seagrass beds.



Figure 4 Beam trawl for collecting juveniles of shrimps, crabs and fishes.



collect the samples. The samples were collected only at Chaweng Beach and Chon Khram Point in April 1988 (intermonsoon) while they were taken at Chaweng beach, Chon Khram Point and Yai Point in January 1989 (Northeast monsoon).

The samples were taken using a beam trawl as described by Dartnall and Jones (1986). The trawl net had mesh size of 2 mm, length of 6 meters and cod end of 1 meter in length (Figure 4). Samples were taken during both day and night time. The gear was towed with speed of 1 knot for 5 minutes, against tidal current at the seagrass area. After washing from the cod end, the samples were preserved with 10% formalin-seawater solution.

At the laboratory, the samples were identified to species level. Also, these samples were counted and measured in the total length (cm.) of fishes and shrimps, and carapace length (cm.) of crabs.

#### IV. Data analysis

The analysis of data was carried out using Statistical Processing System (S.P.S.) computer package as developed by the Department of Mathematics, Faculty of Science, Chulalongkorn University.

The analyses were done as the following :

1. To calculate the sample mean ( $\bar{X}$ ), variance ( $S^2$ ) and standard deviation (SD) of percent coverage of seagrasses; total biomass of seagrasses at all sites and in all seasons; and ratio of root (including rhizome) with shoot.

2. To test the significant differences of biomass of seagrasses between seasons and among the various sites.

- Using T-test ( $\sigma^2 = \sigma^2$ ) at Yai Point.
- Using one way analysis of variance (ANOVA) at Chon Khram Point.
- Using T-test ( $\sigma^2 \neq \sigma^2$ ) at Chaweng Beach.

3. To determine the relationships between percent coverage with total biomass, shoot (above ground) and root and rhizome (below ground) using the correlation and coefficient test (r) and testing the simple linear relationship.

4. To determine the relationship between total biomass with the environmental parameters (included depth, DO, temperature, salinity, pH, grain size and percent oxidized organic content) using the coefficient of determination ( $R^2$ ) which was the square of sample correlation coefficient. Coefficient of determination can describe precisely how much of the variability in the observed biomass (y) is due to variation in the independent variables (x).

5. Similarity index was used to test the differences of fauna community between seasons at each sites.

$$S_j = \frac{2 \times C}{A + B} = \text{Index of similarity}$$

when A = number of species found in the sample A

B = "\_\_\_\_\_ " B

C = "\_\_\_\_\_ " A and B