

## **CHAPTER III METHODOLOGY**

**In this study, the main process can be primarily divided into two sections.**

Section 1. Survey and assessment of coral reef condition at Koh Tao

Section 2. Division of coral reef zoning and study of activity utilization of marine resource in each study site.

### **3.1 Survey and assessment of coral reef condition**

#### **Materials**

##### **Section 1. The devices were used in field study.**

1. SCUBA diving gears
2. Digital camera (Canon PowerShot G11 + Housing)
3. The length measurer longer than 30 meters
4. Global Positioning System device (GPS)
5. Underwater sled

##### **Section 2. The apparatus were used in the laboratory study**

1. Computer (Window operative system)
2. Text book for corals taxonomy (Corals of The World)

Data survey from Department of Fisheries in 1999 and Office of Marine and Coastal Resources Conservation in the present show that coral reef is found around Koh Tao. In this study focus on coral reef area always utilization only. The exploration of natural reefs resources was initially observed to determine on assessment of coral reef condition by measuring the ratio of living coral cover per dead coral cover on seabed substrates, coral classification for calculating on coral

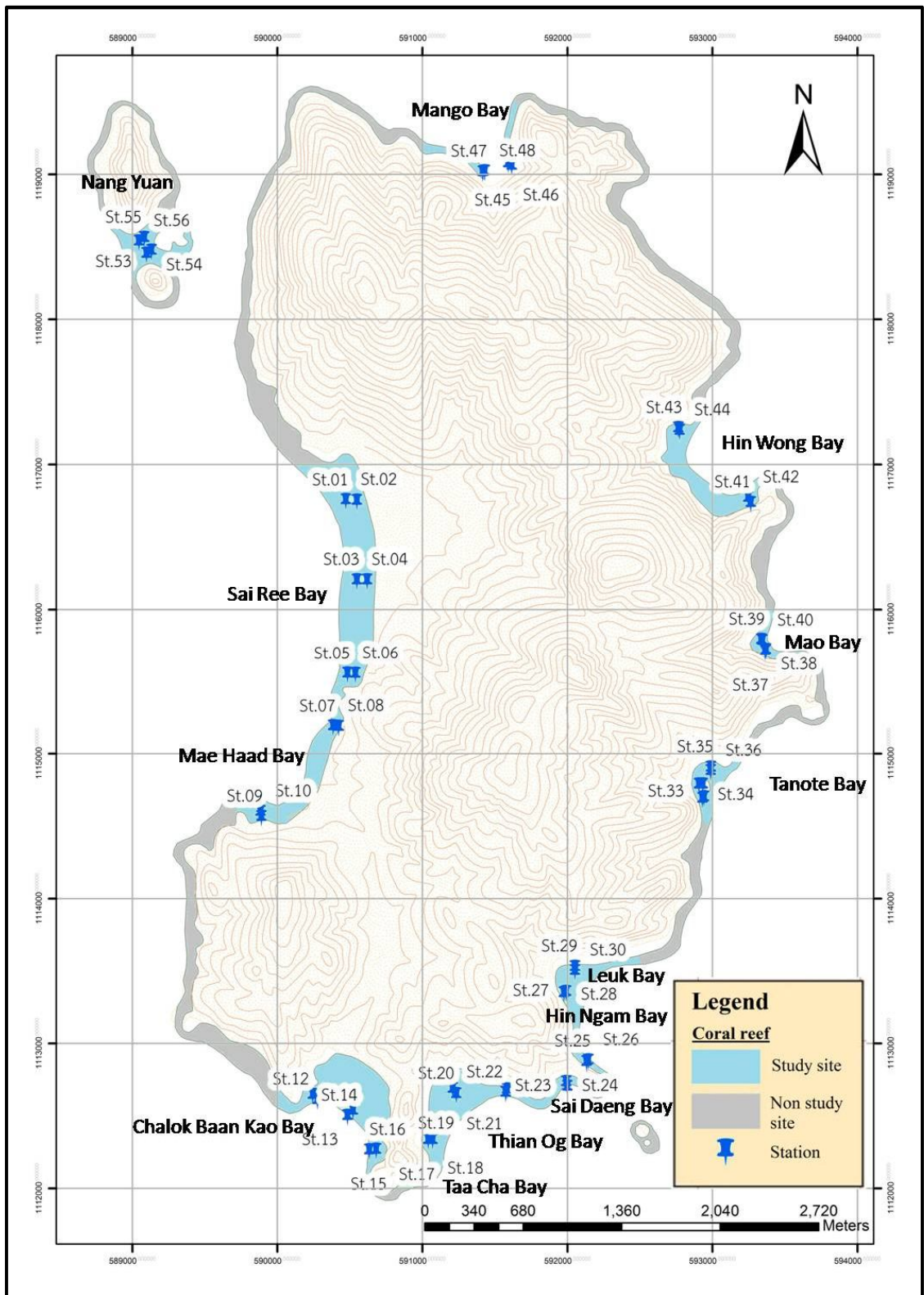
diversity index ( $H'$ ) and determining on the number of living coral fragments in each site. Technically, data collection and analysis were addressed to approach on those purposes.

### **3.1.1 The data collection involved in coral reef ecosystem.**

In this study, the Photo Belt Transect method was applied to gather the sample information due to short-time usage, diminishing the risk of prolonging staying under water (Lam *et al.*, 2006). Moreover, the quality of pictures was considerable as reliable evidence because it could be traced for correction (Department of Marine and Coastal Resources, 2010).

The investigation of coral reef was randomly conducted on the parallel shoreline, and the selected sites were based on the areas where have been utilized widely around Koh Toa. As regards the preliminarily observe experiment, the interesting regions, where presented the edge and flat coral communities, could be divided into 56 station in 14 study sites, namely 1. Sai Ree Bay (6 stations), 2. Mae Haad Bay (4 stations), 3. Chalok Baan Kao Bay (6 stations), 4. Taa Cha Bay (2 stations), 5. Thian Og Bay (4 stations), 6. Sai Daeng Bay (2 stations), 7. Hin Ngam Bay (2 stations), 8. Leuk Bay (4 stations), 9. Tanote Bay (6 stations), 10. Mao Bay (4 stations), 11. Hin Wong Bay (4 stations), 12. Mango Bay ( 4 stations), 13. The Eastern Nang Yuan (4 stations), and 14. The Western Nang Yuan (4 stations). (figure 3-1).

At an individually selected site, the line transect method was used to assemble information (English *et al.*, 1997), and there were three lines which were manipulated. Each line was generally positioned parallel to the coastal line in distance of 30 meters. Hence, the totally observed distance was 90 meters. In term of experimental operation, data recording in each station was basically carried out submerging condition to determine some specific information, that is, 1. To measure the depth of the survey distance, 2. To take some photos of observed region, amounting for 180 pictures per station with picture size of 50x50 square centimeters and 3. To count the number of coral branches or coral fragments in the site.

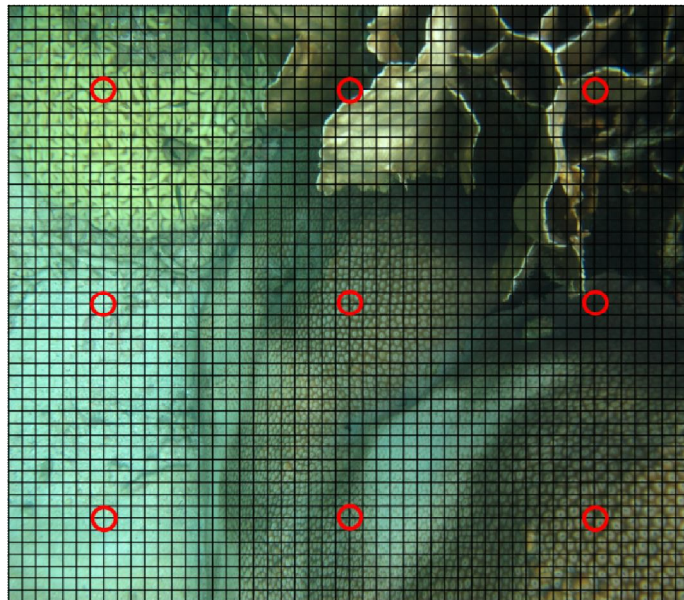


**Figure 3-1** Map showing the study sites of coral reef observation around Koh Tao and Koh Nang Yuan

### 3.1.2 Data analysis

(1) The recorded data from sample pictures of corals were traced using fix point method. Initially, the range of the number of 5-9 points, which were counted on the transparent slide, depended on the density of corals appearing on the pictures (figure 3-2). Subsequently, these marked points were used as raw data to calculate the percentage proportion of living coral cover on ocean seafloor habitats and substratum types (i.e. sandy, rocky and old rubble).

(2) For coral classification, the observed coral reefs were identified into Family and Genus or Species levels.



**Figure 3-2** The picture illustrating the fix point method for coral reef taxonomy

### 3.1.3 Assessment of coral reef condition

Basically, the estimation of coral reef condition was computed following the ratio of covering rates of living corals per dead corals (table 3-1).

**Table 3-1** The computation of coral reef condition using the ratio of covering rates of living corals per dead corals.

Covering rate		Condition	Criteria
Living corals	Dead corals		
3	1	very good	5
2	1	good	4
1	1	fair	3
1	2	poor	2
1	3	very poor	1

**Source:** Department of Fisheries (1999)

In each study sites, diversity Index of coral reef was calculated using Shannon's Diversity Index ( $H'$ ) formula (Shannon and Weaver, 1949)

$$H' = - \sum_{i=1}^s P_i \ln P_i$$

Where  $P_i (=N_i/N)$  was defined as the number of individual coral species ( $N_i$ ) divided by the total number of corals in study site ( $N$ ).

### 3.2 Coral reef zoning and study of activity utilization.

Ecological information of coral reef and activity patterns in utilization were integrated and subsequently applied as suitable criteria to declare coral reef zoning. Importantly, the achievement on this issue was mainly for conservative purpose, which could be used to regulate on activity utilization.

#### 3.2.1 Coral reef zoning

As regards the regional estimation, the criteria, which was previously mentioned in table 3-1, was applied, and it was defined as the proportion of the covering rates of living corals per dead corals (Department of Fisheries, 1999). In

zoning regulation, coral reef communities were considerable in the sustainable protected area, where was obviously be divided in two crucial groups for management such as: defined as area where coral condition was described from fair to very good levels and poor to very poor

### **3.2.2 Study of activity utilization**

#### **3.2.2.1 Field observation**

At an individual site, the aquatic and terrestrial observations were carried out in order to study of reef zone utilization patterns. Basically, each observation was selectively applied depending on the appropriate of recently conditional seabed, resulting to obtain the protective strategies, which could aid diminishing the risk of the negative effect of utilization. In this study, the classification of regional usages was divided into two fascinating groups, including dive zone and intensive use zone.

(1) Dive zone was the safety dining location for SCUBA diving and snorkeling. However, the risk regions in observed sites were limited concerning the space and depth. Furthermore, the environmental factor especially physical parameters were measured such as depth, temperature, vision, submerging environment, and water motion (Wilks and Davis, 2000).

(2) Development zone had been become a supported place to develop several facilities, and the level of negative effects was controlled into acceptable. In general, this zone was defined as piers and beaches, where were served plentiful coming tourists.

#### **3.2.2.2 In-depth interview**

Technically, the qualitative in-depth interview was employed observing the participant attitudes associated with limited spaces and activity patterns in coral reef zoning. This method effectively stimulated participants showing their personal opinions, which were difficult explanation such as thinking, believing and intending, and the outcomes would surprisingly reflect some interestingly unexpected information. During interview, the test duration should wisely be controlled owing to

prolonging period in observation. Therefore, the purposive sampling was implemented using the interview guide (Appendix B) with two target groups of the representative participants (table3-2).

**Table 3-2** Identification of participants involved in coral reef zoning at Koh Tao

<b>Participant groups</b>	<b>Criteria</b>	<b>Target groups</b>
Primary stakeholder	People who were directly attained the negative effects from limitation of coral reef zoning as well as activity utilization patterns on their business operating on the adjacent coral habitats.	1) SCUBA diving shop 2) Travel agencies 3) Long-tailed boat drivers 4) Resort and hotel
Secondary stakeholder	People who were local leaders or influence person on developing communities, and rural inhabitants who were indirectly obtained the negative effect from limitation on coral reef zoning and activity utilization patterns	1) Government officers - Marine Fisheries Management Unit - Office Marine Conservation and Rehabilitation Division 2) Private organizations - Save Koh Tao Conservation Group 3) Representative citizens - Local people who exist at Koh Tao - Tourists

From the regional observation and in-depth interview, the fascinating outcomes, which were derived from individually observed eight persons, were inferred to classify the area usage. In addition to this, some problems were clearly analyzed and eventually applied as considerable patterns in limitation of coral reef zoning, resulting to decrease the negative effect of activity utilization patterns.