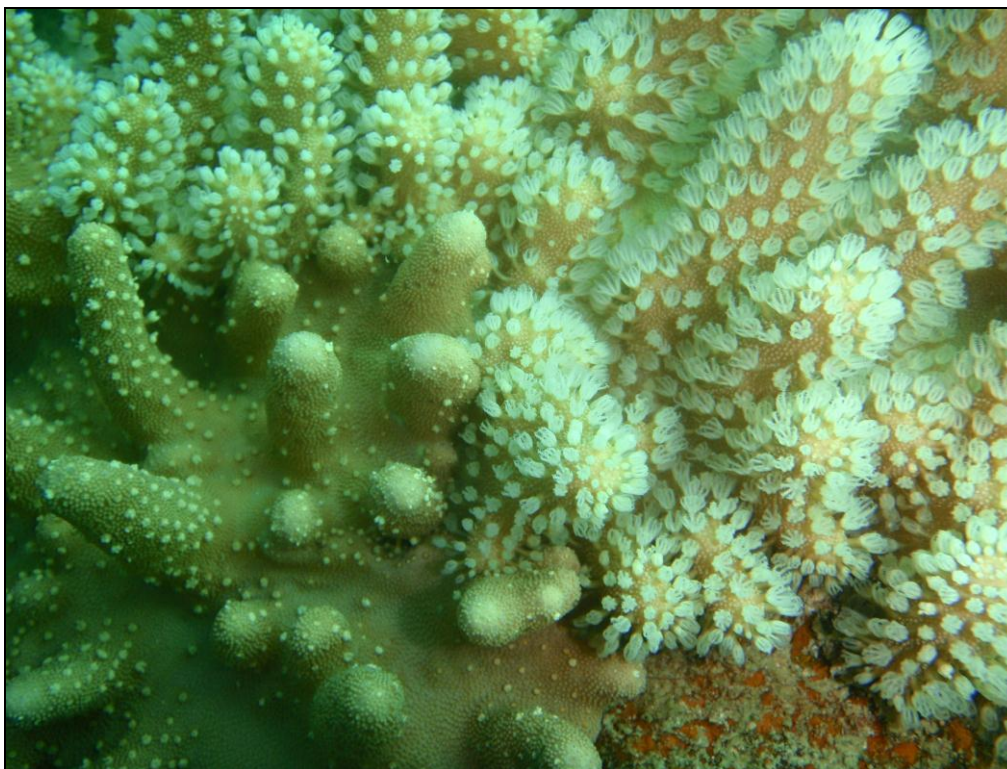


Koh Tang Marine Environmental Assessment



Report on marine resources and
habitats

Marine Conservation Cambodia
January 2011



1 – Hard and soft corals, Koh Tang 2011

In Partnership With:



Report By:

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ABSTRACT

Upon request Marine Conservation Cambodia (MCC) undertook a series of marine surveys that can now also be used as the base line for a continual monitoring program to assess the health of the marine ecosystems around the Island of Koh Tang, which lies within the province of Preah Sihanouk, Cambodia. A Total of 19 Sites have been surveyed by the MCC survey Team between the 3rd and 6th of January using the Reef Check methodology. Results of this study indicate that at the 17 sites surveyed the overall hard coral cover on the fringing reefs surrounding the shoreline of Koh Tang Island is around 19%. Rock and rubble, which are potentially suitable settling grounds for coral larvae, were also dominant substrates. Several damages to corals have been observed mainly resulting from inappropriate fishing methods. Bleaching did occur in low intensity and should be closely monitored. Overfishing has been observed for both fish and invertebrates. It is clear that the Marine Resources around Koh Tang Island are under strain and need active protection to stop the degradation of the Coral Reefs and High Biodiversity Areas.

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Acknowledgements

Marine Conservation Cambodia (MCC) has been working on conservation and community livelihoods in collaboration with the Royal Government of Cambodia Fisheries Administration (RGC FiA), local authorities and local communities since 2008. Our Marine Monitoring and Marine Research programs around Koh Rong and Koh Rong Samloem are now well underway: we are currently undertaking marine surveys around Koh Rong Samloem to monitor the Seahorse populations and the coral reefs to assist the FiA in the creation of Fisheries Management areas, Cambodia's equivalent to Marine Protected Areas (MPAs).

Close collaboration with the FiA and international institutions such as the FAO Regional Fisheries Livelihoods Programme (RFLP) proved that MCC is now respected and credited as a leader in conservation and community work in Cambodia. As such, we were requested to set up the first base line surveys for a continued monitoring program around the Island of Koh Tang.

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All MCC staff and boat crew that joined the research trip and contributed to its success; Koh Tang residents for their hospitality.

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List of Abbreviations and Acronyms

FAO	Food and Agriculture Organization of the United Nations
FiA	Fisheries Administration
ICM	Integrated Coastal Management
KRS	Koh Rong Samloem
KT	Koh Tang
MCC	Marine Conservation Cambodia
MPA	Marine Protected Area
RCAF	Royal Cambodian Army Forces
RFLP	Regional Fisheries Livelihoods Programme
RGC	Royal Government of Cambodia

INTRODUCTION

It is necessary to note that there is growing scientific and public awareness of the widespread depletion of marine habitat-forming species, one of the major species being corals. This loss inevitably leads to the decline in the abundance and diversity of reef fish and plants through the loss of structural heterogeneity (Jones et. al, 2004; Bruno & Selig, 2007). Cambodia's economy is largely dependant on the Coastal and Marine sector (Wheeler et.al), of which, coral reefs play an integral role as they provide critical habitat for a great diversity of marine species. Additionally, this plays a significant role for Fisheries because reef fishes are the most valuable species in international and national markets (a great part of the national households rely on the primary sector, including Fishery as the main source of employment and income (Wheeler et.al). Therefore they are the most targeted species by legal and illegal fishermen (Kim et al, 2004). Moreover, coral reef ecosystems also support local tourism by attracting eco-tourists who come to see these spectacular environments (Kim et al, 2004).

A variety of human activities including destructive fishing practices, overfishing, coastal development and agricultural run-off have all led to the recent global decline of reef-building corals. More significantly for Cambodia, this decline has placed its natural resources at risk (Kim et al, 2004, GCRMN, 2004). Information about Cambodia's reef systems is sparse and poorly documented thus far (Kim et al, 2004). Hence, this study aims to provide information on the current health and biodiversity of the marine environment around Koh Tang Island and has set up the first baseline surveys for a continual marine monitoring program around the island of Koh Tang.

Koh Tang (also known as Tang Island) is an island off the coast of Preah Sihanouk Province in the Gulf of Thailand. The island is approximately 43 km southwest off the coast of Cambodia (**Figure 1**). The inhabitants on the island are Cambodian military personnel.

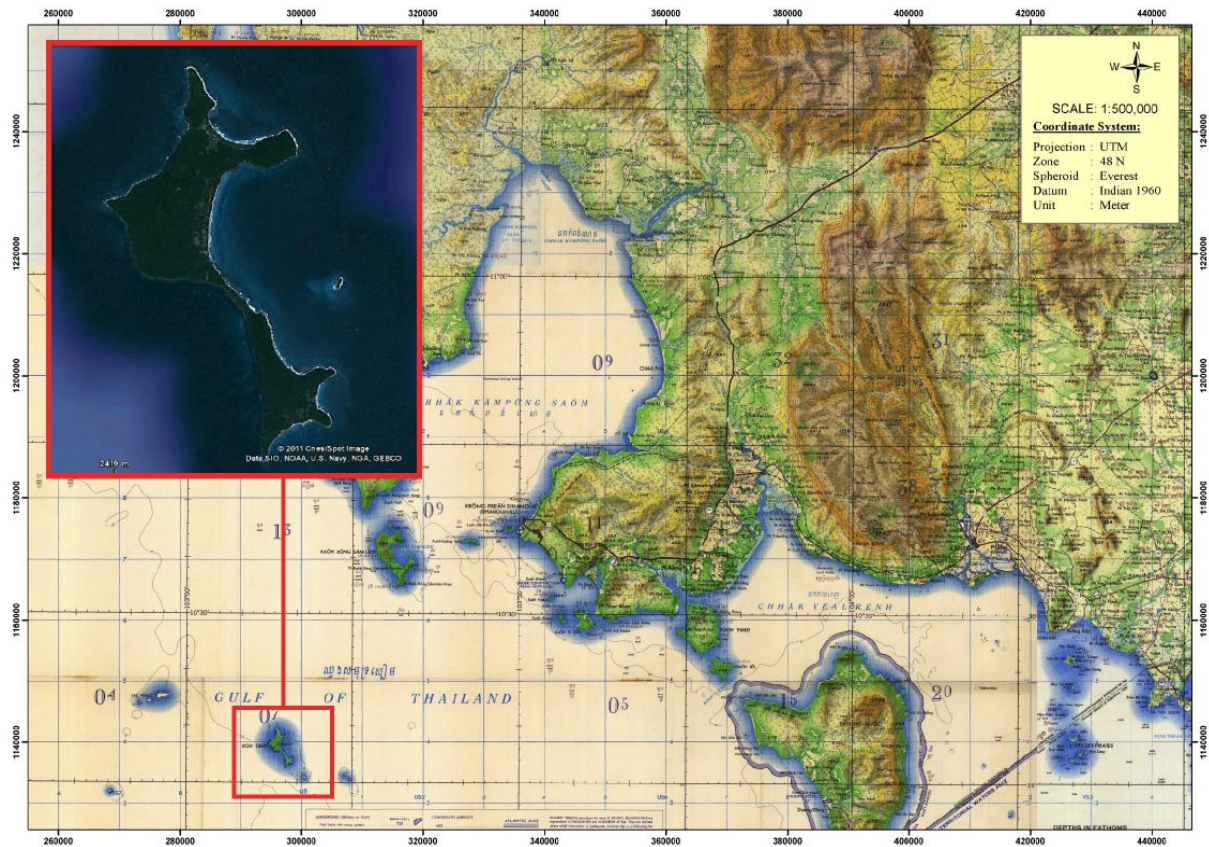


Figure 1 – Map of coastal Cambodia and close-up on Koh Tang.

Koh Tang Island has some interesting historical events such as:

The Mayaguez Incident: The island was the site of the last combat action during the U.S. involvement in Southeast Asia during the 1960s and 1970s. On May 15, 1975, U.S. Marines on board U.S. Air Force helicopters landed on the island in hopes of finding the crew of the SS Mayagüez. The crew of the merchant vessel were not on the island as U.S. Intelligence had reported but had been transferred from the ship to the nearby Cambodian port town of Sihanoukville, also known as Kampong Saom. The seizure of the vessel by Khmer Rouge forces and subsequent assault on Koh Tang became known as the Mayaguez Incident.

The Foxy Lady: On the evening of 13 August 1978 the Foxy Lady, a Chinese sailing junk which had been blown off course while sailing from Singapore to Bangkok, was discovered

taking shelter on the western side of Koh Tang by Khmer Rouges gunboats. The Khmer Rouges fired on the Foxy Lady killing Canadian crewman Stuart Glass. The other two crewmen, Englishman John Dewhirst and New Zealander Kerry Hamill dived into the water and were picked up by the Khmer Rouges boats. Dewhirst and Hamill were later transported to S-21 prison in Phnom Penh where they were tortured and forced to write confessions. Dewhirst was executed in late August and Hamill was executed in October 1978.

The main goals of this survey were:

- To determine the general distribution of coral reefs around Koh Tang Island and to conduct baseline quantitative surveys on the abundance and distribution of reef health indicators such as fish and invertebrates.
- To determine the general reef condition in terms of visible impacts.
- To identify sites for future monitoring programs.
- To identify areas with high biodiversity and healthy coral reefs for the purpose of management and conservation in view of the interest to develop the area as a sustainable eco-tourism destination.

I. METHODOLOGY

Standard Reef Check monitoring was applied for the survey sites around Koh Tang Island in order to assess the abundance, diversity and composition of selected fish, invertebrate and benthic species. This methodology was used as it provides rapid assessment of coral reef condition and health. Furthermore, it is quick and reliable and based on pre-defined criteria and descriptors.

a. Location of survey sites and reasons for their selection

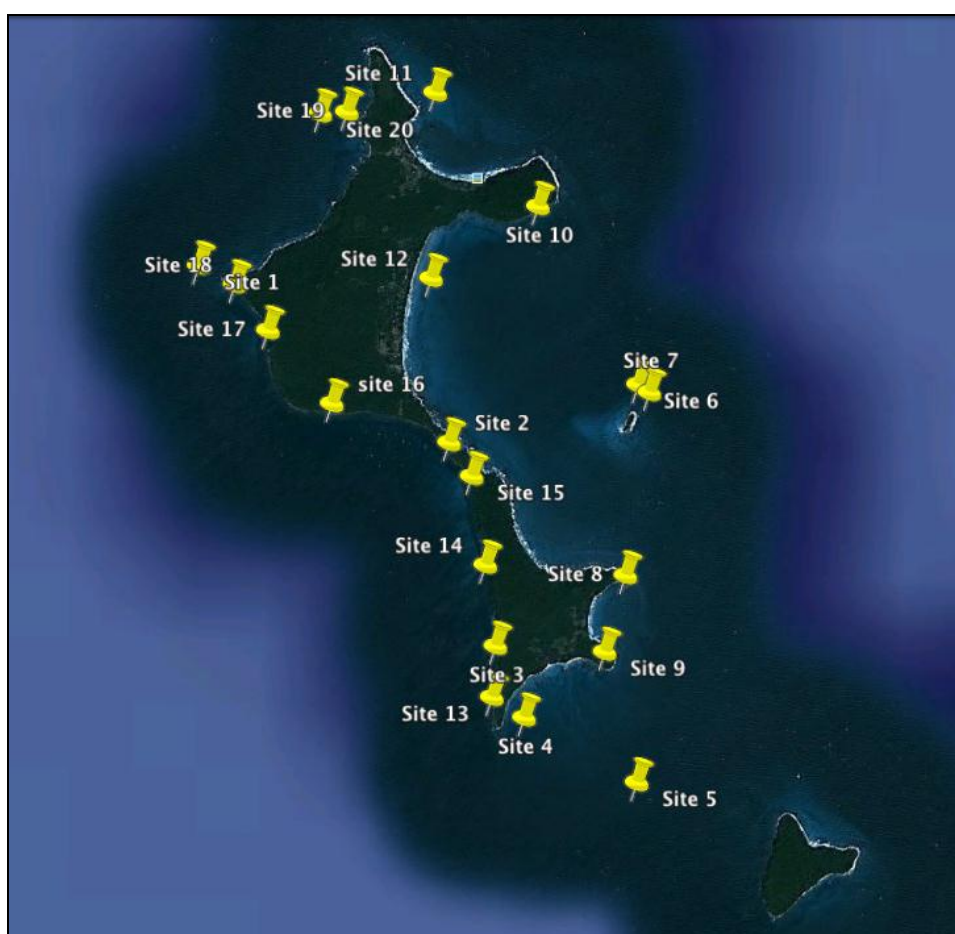
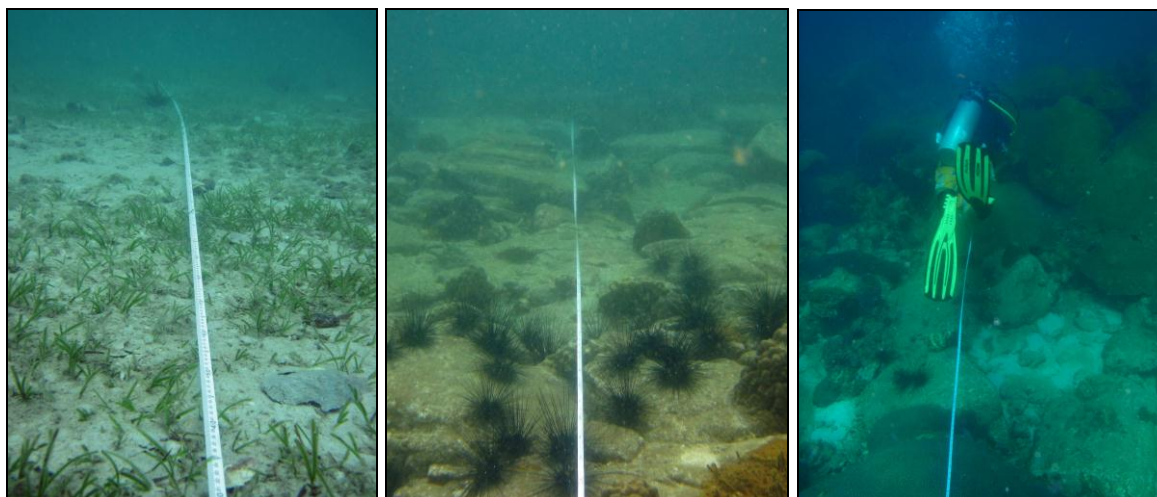


Figure 2 – Location of survey sites (Google Earth 2011).

For this study, 18 survey sites were chosen surrounding Koh Tang Island (**Figure 2**). Due to weather conditions at the time of the surveys only 17 full surveys were completed and 3 spot

check dives were completed at sites where the conditions made transect surveys difficult to conduct. The sites around Koh Tang were randomly chosen in advance to get the best overall view of the shoreline area then adapted to suit the conditions at the time of surveying (**Photo 2, 3 and 4**). Generally the sites were in a similar distance from each other, with exception of sites #6 (exposed) and #7 (sheltered). Moreover, these survey sites were specifically chosen to be on opposite sides of the small island on the east side of Koh Tang in order to assess the diversity/health on both sides of the small island. In addition, the starting point of each site was chosen at random and four 20-meter (m) transects were laid parallel to the coastline to make up one complete segment. Each 20m segment was separated by a minimum gap of 5m. In these 5m gaps no data was recorded, as this is needed to ensure independence for each 20m section and provide reliable statistics.

The recorded data has been transferred to standard data forms.



2, 3 and 4 – Setting up transects around Koh Tang, January 2011.

b. Type of data collected at each survey site / transect

An overall description of each site was recorded. This included: Basic information, natural and human impact, historical facts and protection enforcement. Based on their effectiveness as indicators of overall reef health, certain target species have been chosen by Reef Check. A history of overfishing, aquarium collection, nutrient pollution and sedimentation can all be

indicated by these variables. More specifically, the Reef Check methodology designates three different transects: a fish belt transect, an invertebrate belt transect, and a substrate line transect.

In order to complete the fish belt transect, divers recorded fish in an area 2.5m on each side of the transect and 5m above. Since fish get easily disturbed by divers the fish belt transect was completed first. In order to record an accurate assessment of the fish population, this portion of the survey was conducted by swimming slowly along the transect, counting the indicator families and species.

The same four 5m wide and 20m long segments were used for the invertebrate belt transect. The divers executed this portion of the survey by swimming slowly in an S-shape pattern on each side of the transect counting the indicator invertebrates. To reassure accurate results, surveyors looked into holes, burrows and cavities.

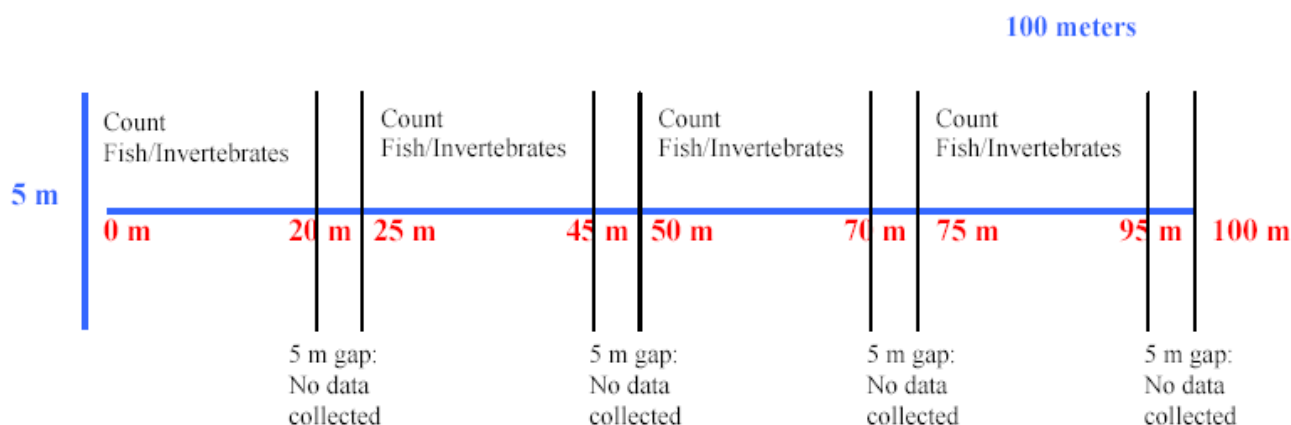


Figure 3 - Fish and invertebrate belt transect count method (in Hodgson et al, 2006)

This transect was used again to conduct the substrate line transect. In a 0.5m interval along the tape, points were sampled to determine the substrate of the reef. The benthic categories used in this assessment included: hard coral, soft coral, recently killed coral, nutrient indicator algae, sponge, rock, rubble, sand, silt/clay and other. Moreover, coral bleaching, anchor damage, dynamite damage, general damage and trash were also estimated along the transect line by the surveyors.

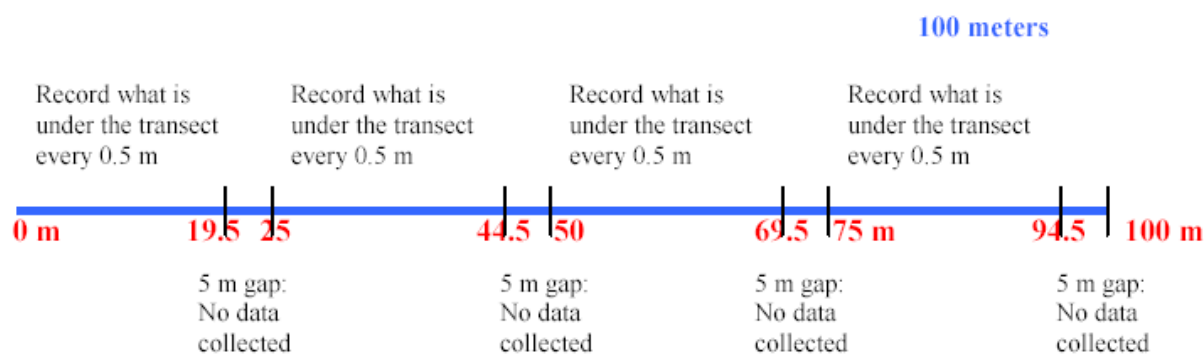


Figure 4 - Point intercept transect count method to determine benthic cover (in Hodgson et al, 2006).

Of note, two of the chosen sites for the surveys had to be aborted due to strong currents. Nevertheless, notes and photos were taken by the divers even though these sites have not been used in the analysis.

Also of importance, on survey site 12, the Reef Check methodology was not applied. This survey site was known to be a seagrass bed, therefore, given this distinguishing feature it was decided to operate in a quadrantal search pattern instead. Along the transect line 12 points were chosen, from each point a quadrant of 5x5m was then surveyed.

After data had been collected using the reef check methodology, divers swam along the transect and collected extra information on species present at the survey sites. The purpose of this was to create a database list with all marine species that were witnessed during the surveys around Koh Tang Island. Included in these lists are species seen on previous diving trips to Koh Tang Island dating back to 2007. This can be used in the future to obtain a complete inventory of Marine species present around the Island.

c. Data entry & analysis

To determine the cover percentages of each survey site, the mean percentage of substrate cover, of the four transects was calculated. The total cover composition around Koh Tang Island was estimated by the average composition of all survey sites.

Coral damage was noted in an empiric way by qualifying it in 4 levels of damage: 0- none, 1- low, 2- medium and 3- high. The damage per site has than been estimated as the mean of the four transects. A stacked column graph has then been used to compare coral damages between sites.

Bleaching was estimated for coral Population and Colony. The mean percentage of all sites was calculated by the average bleaching around the Island.

For the Fish and invertebrate transect, the mean number of individuals per square meter has been calculated for each site. Sites have been compared than using the Stacked column graph. In case of the invertebrates, the *Diadema* urchins, due to their elevated number, have been analyzed in separate to allow a proper analyze of the rest of indicator invertebrates.

There was marine survey data collected from Koh Tang in 2004 but without the full information on locations, number of surveys and datasheets used it has been impossible to make a scientific comparison between 2004 and the present study from Koh Tang Island.

II. RESULTS

The results from these surveys are shown in a graphical format and aim to provide a picture of Koh Tang's coral reef status.

a. Substrate Composition (Figure 5)

The main substrate covers encountered on surveys were rock, coral and rubble. The average hard coral cover over all 19 surveyed sites was found to be 19%. The highest coral cover was found on Site 14 with 52.5%, while on Site 6 a negligible amount was recorded (0.625%). Hard coral cover is an indicator of general reef health as they are reef builders and it is recognized that reef fish diversity is directly correlated to it. Rock was the dominant substrate

with an average cover of 56%. Site 15 had a particularly high rock cover (95%). Rock constitutes an important part of reefs as it provides settling ground for coral larvae. There was a low percentage of recently killed coral (<1.25% for all sites). Large areas of shattered coral were seen on several of the sites (for example Site 6), which was likely caused by high dynamite fishing activities in the past. On all 19 sites, no Nutrient Indicator Algae was noted. This leads to the conclusion that there is no sign of eutrophication in this area. This is to be expected as there is no agriculture run-off or other nutrient enriching activities on Koh Tang. Cover of sponges and soft corals was generally low (< 5%) with exception of Site 2, which had a sponge cover of 10.5%. Lastly, sand cover was in general low, with exception of the seagrass survey site where it was 46.7%.

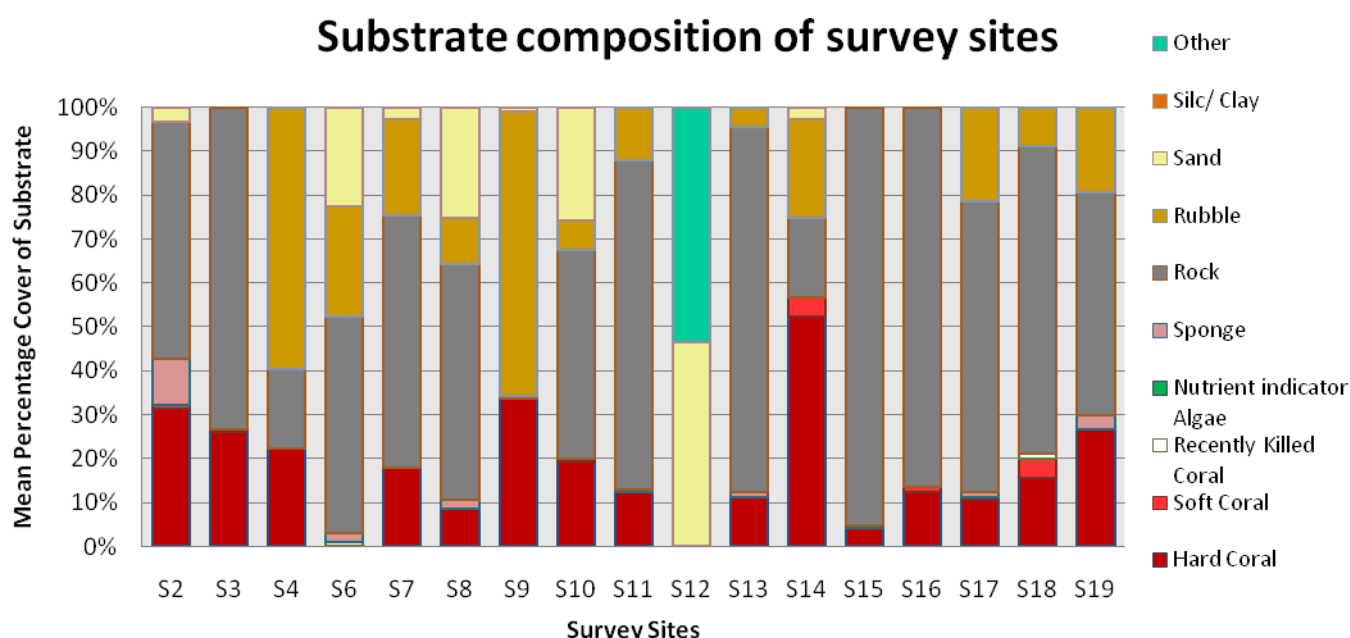


Figure 5 - Composition of mean percentage of substrates cover at the 19 surveyed sites. Sites 1 and 5 have been eliminated from this analysis as there were no applicable survey results.

b. Impact on Coral

When assessed individually, each coral damage category was found to be low with the exception of anchor damage on Sites 4 and 8 which was high. However, when the coral damage categories are summed together, the damage was moderate to high at most of the sites. Site 8 had the highest amount of coral damage (**Figure 6, Photo 5 and 6**) and only Site

9 had no visible coral damage. The effects of fishing in the form of discarded nets or other trash were found on most of the sites, however when present, it was relatively low. Visible signs of invertebrate collection were found on most sites.

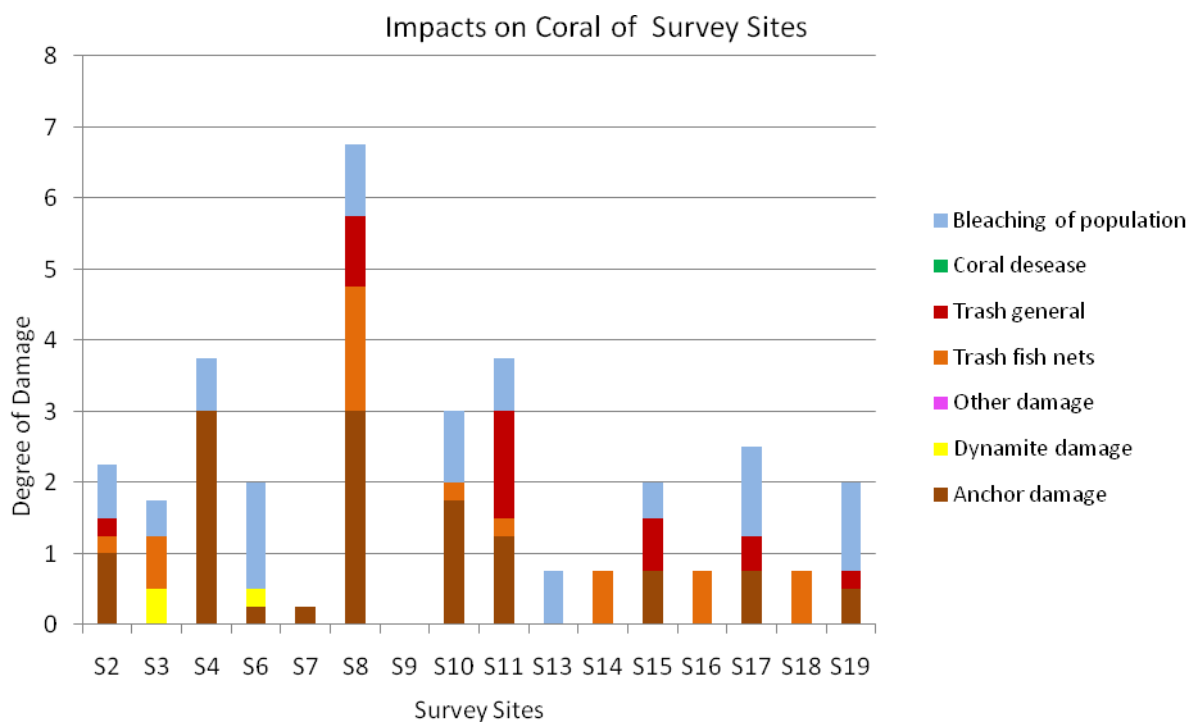


Figure 6 - Composition of mean percentage of coral damage of 7 different categories of the 19 surveyed sites. Damage was categorized in 4 groups: 0-none, 1-low, 2-medium and 3-high. Sites 1 and 5 have been eliminated from this analysis as there were no applicable survey results. Site 12 was eliminated as there were no corals at this Site.



5 and 6 – Coral rubble, Koh Tang 2011. Destructive fishing techniques such as dynamite fishing cause serious damages to coral reefs.

c. Bleaching Impact

This study has revealed that Coral bleaching does occur around Koh Tang Island even if minimal (**Photo 7 and 8**). The mean percentage of Coral Population that was affected by bleaching did not reach 7%, yet even from this amount approximately 27% did affect Coral colony (**Figure 7 and 8**).



7 and 8 – Although it is not widespread, bleaching does occur around Koh Tang.

Estimated Percentage of Coral Population Affected by Bleaching around Koh Tang Island

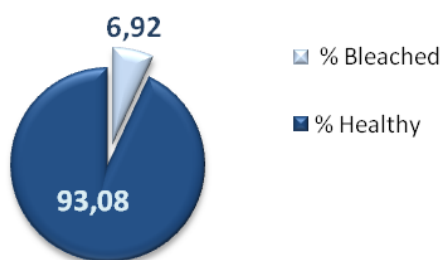


Figure 7 - Mean percentages of Coral Population that are affected or not by Bleaching.

Estimated Percentage of Coral colony affected by Bleaching around Koh Tang Island

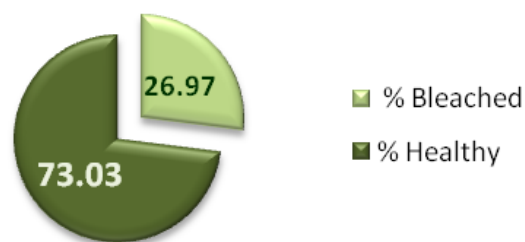


Figure 8 - Mean percentages of Coral Colony that are affected or not by bleaching

d. Fish Survey

As it can be noticed in **Figure 9** there was great variability of species diversity and abundance between the Sites. It was found that Humphead wrasse, Bumphead parrotfish and Baramundi cod, were completely absent from all sites, though sightings of Baramundi cod have been made around Koh Tang within the previous 2 years. The numbers of Groupers recorded during the survey dives was very low on all sites, though juvenile Groupers are not recorded when specifically using reef check methodology and a high number of juvenile Groupers were seen to be present on all sites, the reef check methodology allows only the indication of groupers larger than 30cm for its analysis. Sweetlips were very low or have not even been seen on survey sites (**Photo 9**). Only one rare animal, a spotted eagle ray, was sighted on Survey site 6. The number of Butterfly fish was low on all sites (less than 10 individuals/100m²). The numbers of snapper were those who presented a greater variability changing between 75.75 and 0.5 individuals per 100m². Followed by other parrotfish which on some sites, such as site 6 and 7, reached 0.25 individuals while on Site 15 it reached 100 times that number (25.5ind/100m²)

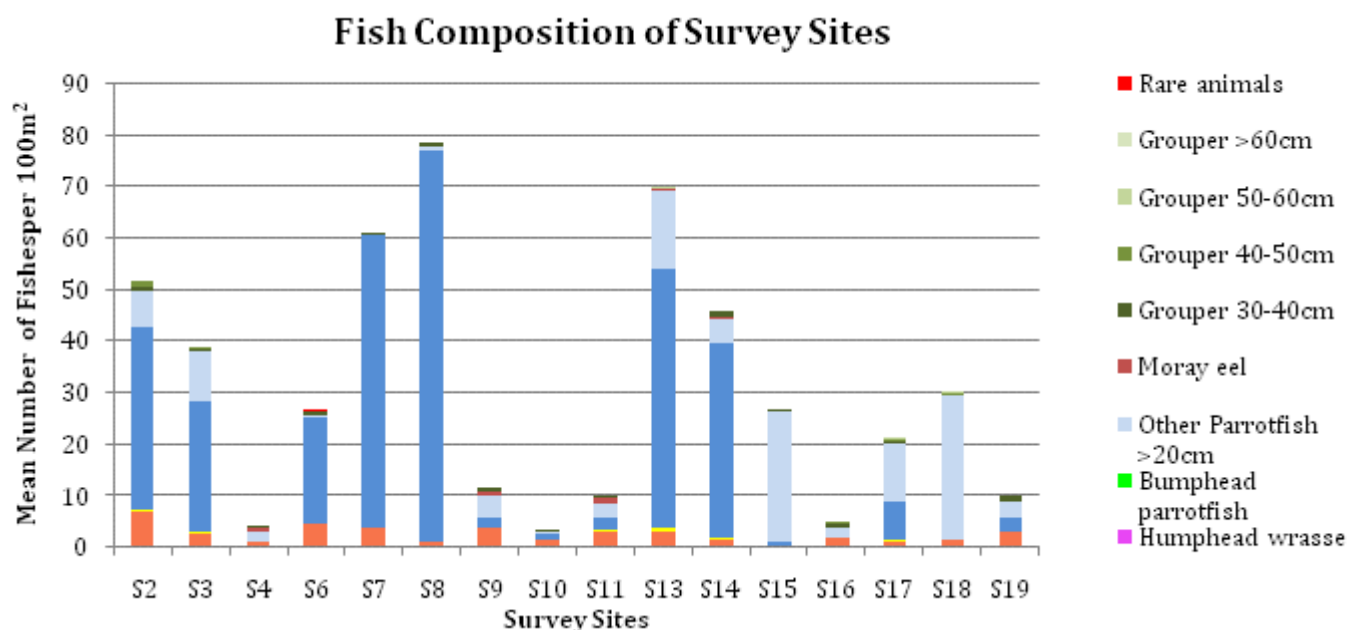
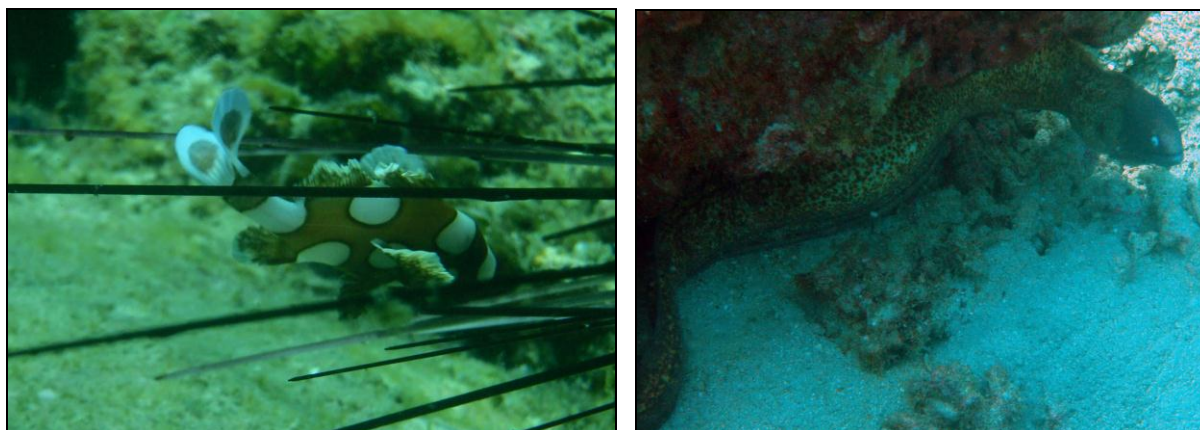


Figure 9 - Fish Composition of Survey Sites. Mean number of individuals /100m² has been calculated for each site. Sites 1 and 5 have been eliminated from this analysis as there were no applicable survey results.



9 and 10 – Juvenile sweetlips and moray eel, KT 2011

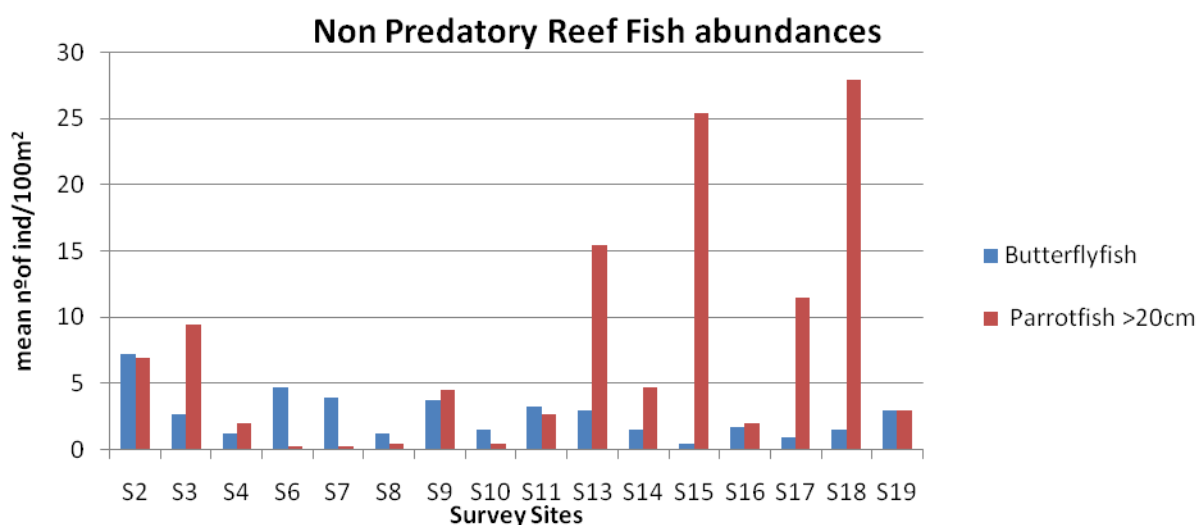


Figure 10 - Non Predatory Fish Composition of Survey Sites. Mean number of individuals /100m² has been calculated for each site. Sites 1 and 5 have been eliminated from this analysis as there were no applicable survey results.

e. Invertebrate Survey (Figure 11)

With the invertebrates it is possible to observe that there are also differences in species diversity and abundance between the survey sites. Site 6 was the one with the lowest specie richness and abundance. Crown of Thorns starfish (**Photo 12**) can form a major threat to coral reefs when they reach unusually high numbers. Fortunately, they were only found on Site 2 and 14 in scarcity. Sea Cucumber abundances were low (<5 individuals /100m²) for all survey sites indicating severe over-harvesting. Triton shells and Banded Coral Shrimps were almost not existent 2 and 1 individual respectively were found during the survey. No lobster has been seen during survey period. Giant clams (*Tridacna* spp.) (**Photo 12**) are important reef filter

feeders that contribute to the reef structure and rugosity. These organism have been found in very low abundances (<10 ind per hectare) and mostly of small size. This may result from a severe overharvesting as these are an important local food source and have been traditionally harvested for centuries. The number of Pencil sea urchins (**Photo 11**) was less than expected to find based on the data published by Kim et al.(2004). The highest number of these sea urchins was 12 individuals per hectare and there were many sites were none has been found. It was noticed that in general on sites were Pencil sea urchins were found there were no or very few Collector sea Urchins and vice versa.

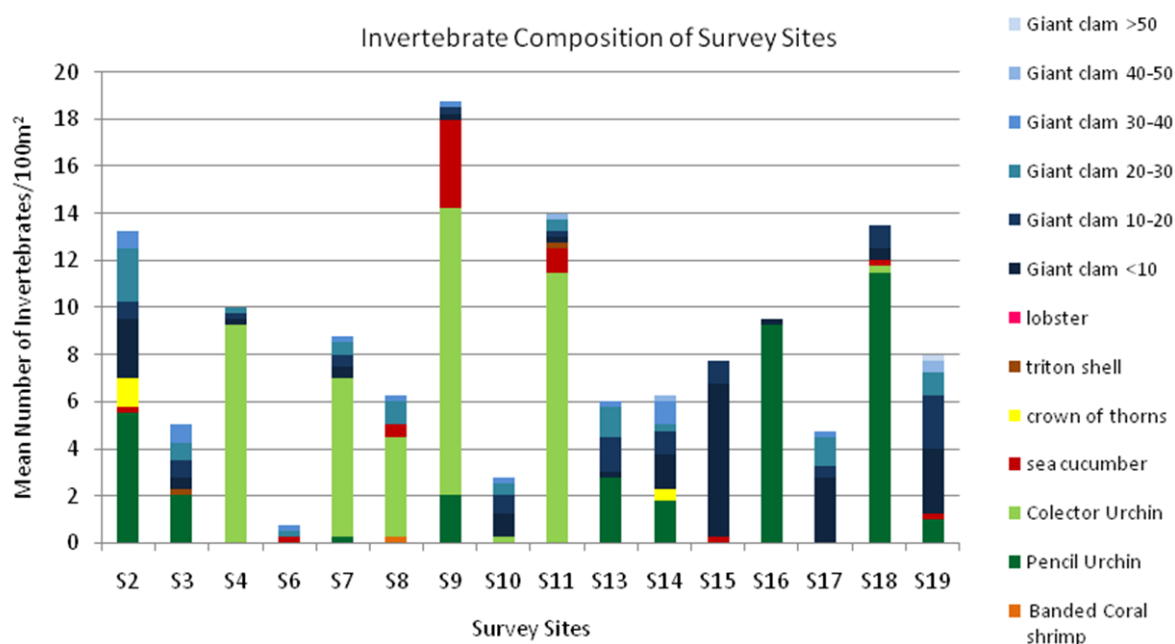
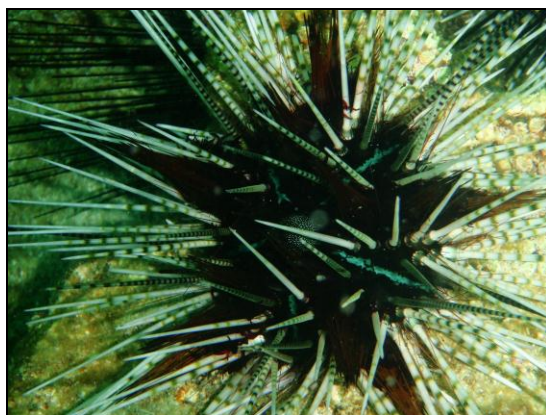


Figure 11 - Invertebrate Composition of Survey Sites. Mean number of individuals /100m² has been calculated for each site. Diadema Urchins have been analyzed separately due to their elevated number. Sites 1 and 5 have been eliminated from this analysis as there were no applicable survey results.



11 – Pencil sea urchin, KT 2011

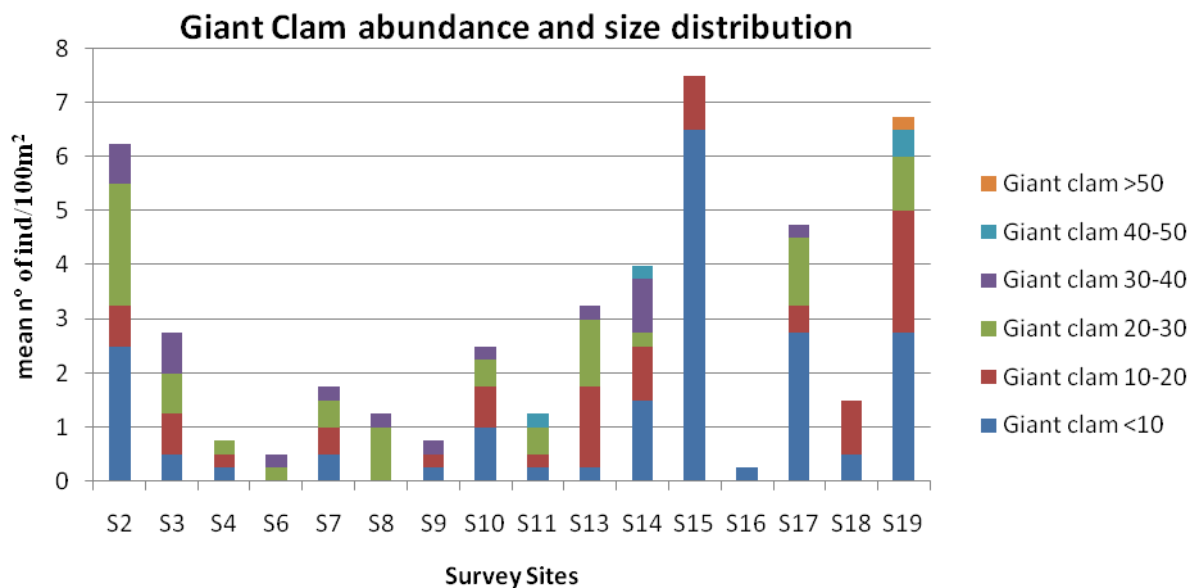
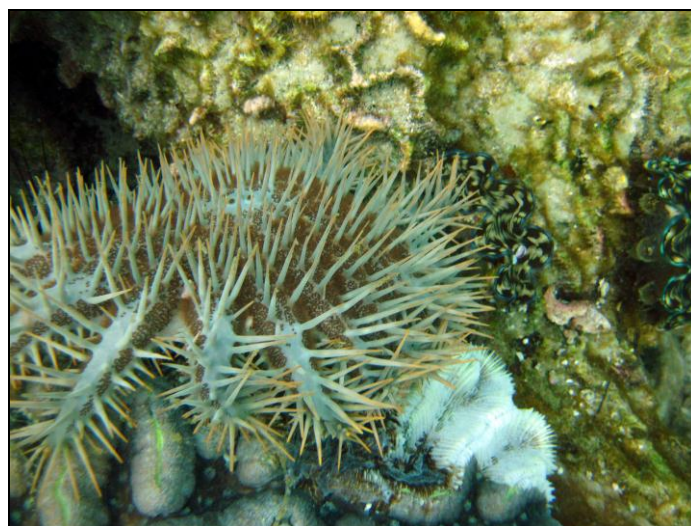


Figure 12 - Giant Clam abundance and size distribution. Mean number of individuals /100m² has been calculated for each site.. Sites 1 and 5 have been eliminated from this analysis as there were no applicable survey results.



12 – Crown of Thorns starfish and giant clams, KT 2011

High abundances of long-spine (*Diadema*) sea urchins were found on most surveys sites (**Figure 13**). Sites 7 and 10 had particularly high densities of these urchins while on site 15 was not found a single individual. These Sea urchins as they are algal-grazing, can play an important role in keeping the reefs clean of algae when there are few herbivorous fish around to fulfill this role.

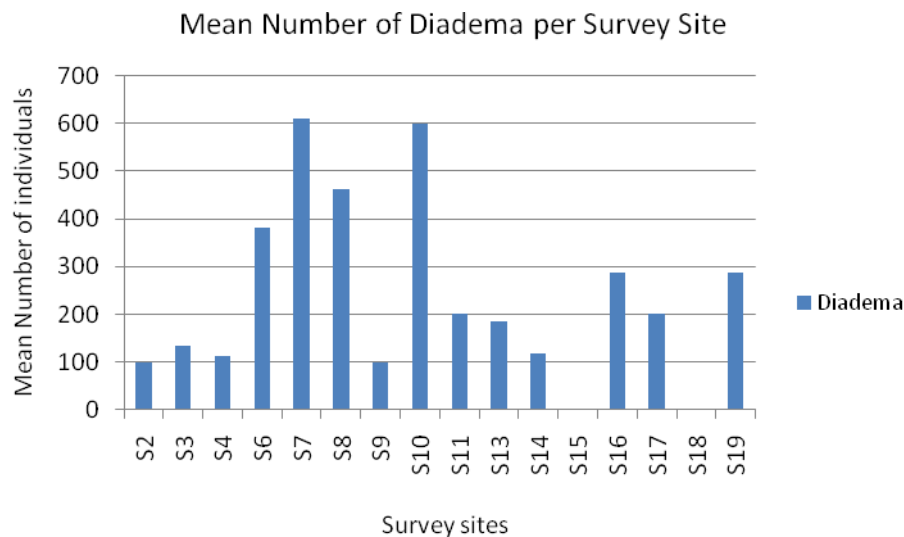


Figure 13 - Distribution of Diadema urchins of Survey Sites. Mean number of individuals /100m² has been calculated for each site. Sites 1 and 5 have been eliminated from this analysis as there were no applicable survey results.

III. FISHING AND OTHER ACTIVITIES

a. Type of boats and activities

- Fishing: Some small local vessels from Kampong Som were seen, most using long lines and squid lines in the offshore areas around Koh Tang (**Photo 13**).



13 – Local Khmer vessels, KT 2011

- Trawling: Some large trawling vessels were seen moored close to the shoreline of Koh Tang. These vessels were unmarked and we were unable to identify the location they came from (**Photo 14**).



14 – Unidentified trawlers, KT 2011

- Squid fishing with lights: Many Koh Kong vessels with Thai markings were seen moored close to the Island during the day and then seen fishing offshore at night using the lights and encircling nets (**Photo 15 to 18**).



15 – The lights used to attract squids can be observed on the right side of the vessel (KT 2011).



16



17



16, 17 and 18 - Many vessels were found mooring in the same area (KT 2011)

- Squid fishing with lights: Many Vietnamese vessels were seen moored around the islands. During the day they were witnessed line fishing around the reefs and at night offshore fishing for squid using lights (**Photo 19 and 20**).



19



19 and 20 – Squid fishing with lights: Vietnamese vessels (KT 2011)

- Net fishing: Many Vietnamese/Khmer vessels using gillnets were seen fishing close to the reefs (**Photo 21**).



21 – Vietnamese vessel fishing with gillnets, KT 2011.

- Fishing with metal traps: Many Vietnamese vessels using metal fish traps were seen fishing within the high biodiversity areas and reefs.



22



22 and 23 – Fishing with metal traps, Vietnamese vessels.

- Air-supplied fishing and shell collecting: Vietnamese vessels using supplied air and collecting invertebrates, coral and fish were seen. This is a practice that needs to be stopped immediately as it is very destructive to the reef ecosystems. This vessel was identified by the Koh Tang Royal Cambodian Army Forces (RCAF) as an illegal poaching boat, but it was mentioned that this particular boat has a powerful engine which makes it very difficult to locate and catch.

There were four divers in the water when this boat was seen at one Survey Site. When realizing they were being witnessed fishing, they quickly pulled up all four divers: the

reactions of the crew and captain showed that they were clearly aware that what they were doing was illegal (**Photo 24 to 27**).



24 and 25 – Getting ready to dive



26 – Crew member pulling out the three other divers after seeing us



27 – The three remaining divers quickly got out of the water with full bags of shells (KT 2011).

- Dynamite fishing (illegal): This vessel was suspected of dynamite fishing but this could not be confirmed (**Photo 28**). Dynamite blasts were heard on many of the Survey Dives.



28 – Vessel suspected of dynamite fishing, KT 2011.

- Diving boats (foreign dive operators): Koh Tang is used as a diving destination by some of the foreign business owners from Kampong Som.



29 – Kampong Som dive operator moored around Koh Tang, KT 2011.

Two operators currently run regular tourist diving trips to Koh Tang: *EcoSea Dive* and *Scuba Nation*, both located in Kampong Som. One operator runs occasional trips: *The Dive Shop Cambodia*. *Marine Conservation Cambodia* runs occasional Research Trips to Koh Tang

b. Presence on-site

Site #	Fishing: local vessels	Trawling: Foreign/Khmer vessels? Unidentified	Squid fishing with lights: Vietnamese vessels	Squid fishing with lights: Thai /Koh Kong vessels	Fishing with metal traps: Vietnamese vessels	Net fishing: Vietnamese vessels	Air-supplied fishing: Vietnamese vessels	Dynamite fishing
1		4 Moored		3 Moored				
2			3 Moored		1 vessel active			
3							1 Vessel Active	
4		4 Moored					1 Vessel Active	
5					1 Active			
6			3 Moored					
7			7 Moored					
8							1 vessel active	
9							1 Vessel Active	
10			9 Moored					
11	2 Moored							
12								
13							1 vessel active	
14				2 Moored				
15				3 Moored				
16					1 Active			
17	2 Moored							
18				5 Moored				
19					3 Moored	1 Active		1 Suspected
20			3 Moored					1 Suspected

IV. Discussion and Conclusions

Using previous experience and the results of the surveys it is clear that the Marine Resources at Koh Tang Island are under strain and need active protection to stop the degradation of the Coral Reefs and High Biodiversity Areas. There are clear areas of higher Biodiversity but these areas show clear signs of overfishing and destructive fishing.

Koh Tang has the potential to attract tourism to enjoy both the beauty of the Island and its surrounding reefs. However, protection measures must be put into place as soon as possible to allow a recovery of existing damage and prevent the continued decline of the marine resources around Koh Tang Island. As it stands, the health of the marine environment is degraded and as such would directly affect the satisfaction of tourism users seeking “tropical island experiences” including visiting the coral reefs. This is also shown in Internet reviews and forums where Cambodia is often mentioned in a negative way in regards to its snorkeling and diving locations.

Dynamite was heard on many of the dives, and illegal and destructive fishing was witnessed at many of the sites; the fishing vessels were clearly identified as Vietnamese fishing vessels. After discussions with the RCAF, it was clear that they were aware of the decline in marine resources. With the right assistance, the RCAF would be more than willing to assist in the protection of the coral reefs and high biodiversity areas but currently lacks the resources to properly address the issue of protection and patrolling.

GENERAL CONCLUSION

Immediate support to the RCAF on Koh Tang Island should be given and monitored to assist in a Protection Program for the marine ecosystems surrounding the Island. With this in place, an increase in marine resources and marine environment health should be seen within one year and increase respectively over consecutive years.

Koh Tang has the potential to attract a great number of visitors with the Marine Environment being one of the greatest attractions. The Surveys that were undertaken can be used as a baseline to monitor the recovery of the Marine Environment over the coming months and years once protection measures are in place.

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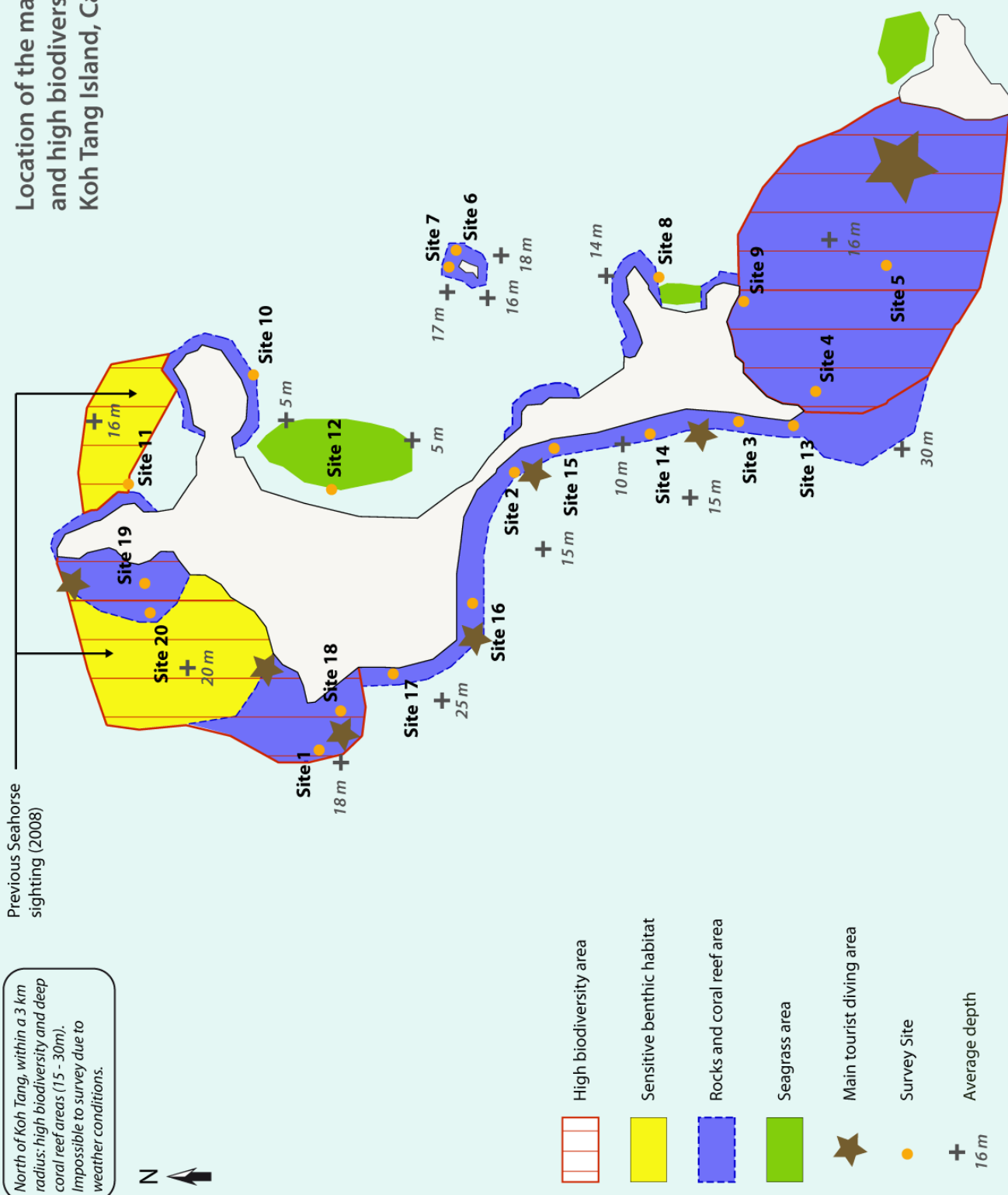
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ANNEX 1 – Location of the main marine habitats and high biodiversity area





Location of the main marine habitats and high biodiversity areas around Koh Tang Island, Cambodia

M. Skopal, 2011








Annex 2 – Species noted on the Koh Tang Research Expedition

Order	Family	Species	Common Name	Photo Location	Picture	Reference
Perciformes	Apogonidae	Apogon cavifrons	Caviti Cardinalfish	Koh Rong		Ref. 1 & 2
Perciformes	Apogonidae	Apogon endekataenia	Sixstripe Cardinalfish	Koh Rong		Ref. 1 & 2
Perciformes	Blenniidae	Ecsenius bicolor	Bicolor blenny	Koh Tang		
Perciformes	Blenniidae	Petroscirtes variabilis	Variable Fangblenny			

Perciformes	Caesionidae	Caesio cuning	Redbelly yellowtail fusilier	Koh Rung Samleom		Ref. 1 & 2
Perciformes	Caesionidae	Caesio teres	Blue & Yellow fusilier	Koh Rong		Ref. 1 & 2
Perciformes	Caesionidae	Pterocaesio digramma	Double-lined fusilier			Courtesy of FishBase.org
Perciformes	Caesionidae	Pterocaesio tessellata	Narrowstripe fusilier	Koh Rong		Ref. 1 & 2



Perciformes	Caesionidae	Pterocaesio tile	Bluestreak fusilier	Koh Rong		Ref. 1 & 2
Perciformes	Callionymidae	Dactylopus dactylopus	Fingered Dragnet	Koh Rung Samleom		Ref. 1 & 2
Perciformes	Carangidae	Gnathanodon speciosus	Golden trevally	Koh Koun		Ref. 1 & 2
Perciformes	Chaetodontidae	Chaetodon octofasciatus	Eight-Banded Butterflyfish	Koh Rong		Ref. 1 & 2
Perciformes	Chaetodontidae	Chelmon rostratus	Long-Beaked Coralfish	Koh Rong		Ref. 1 & 2

Perciformes	Chaetodontidae	Parachaetodon ocellatus	Ocellated coralfish	Koh Tang		Ref. 1 & 2
Perciformes	Chaetodontidae	Heniochus acuminatus	Longfin Bannerfish	Koh Rong		Ref. 1 & 2
Rajiformes	Dasyatidae	Dasyatis kuhlii	Bluespotted stingray	Koh Koun		Ref. 1 & 2
Rajiformes	Dasyatidae	Taeniura lymna	Blue-spotted Ribbontail Ray	Koh Koun		Ref. 1 & 2
Tetraodontiformes	Diodontidae	Cyclichthys orbicularis	Orbicular Burrfish	Condor Reef		Ref. 1 & 2








Tetraodontiformes	Diodontidae	Diodon lituratus	Black-Blotched Porcupinefish	Koh Rong		Ref. 1 & 2
Perciformes	Echeneidae	Echeneis naucrates	Sharksucker	Koh Rung Samleom		Ref. 1 & 2
Perciformes	Ephippidae	Platax orbicularis	Circular Batfish	Koh Tang		Ref. 1 & 2
Perciformes	Ephippidae	Platax teira	Longfin Batfish	Koh Rong		Ref. 1 & 2







Perciformes	Gerreidae	Gerres oyena	Blacktip Silver Biddy	Koh Rung Samleo m		Ref. 1 & 2
Perciformes	Gobiidae	Cryptocentrus cinctus	Banded Shrimpgoby	Koh Rong		Ref. 1 & 2
Perciformes	Gobiidae	Cryptocentrus leptcephalus	Pink-Spotted Shrimpgoby	Koh Rong		Ref. 1 & 2
Perciformes	Gobiidae	Gobius melanopus	Pink-speckled shrimpgoby			Courtesy of FishBase.org







Gobiesociformes	Gobiesocidae	<i>Diademichthys lineatus</i>	Urchin Clingfish			Ref. 1 & 2
Perciformes	Haemulidae	<i>Diagramma pictum</i>	Silver sweetlips	Koh Rong		Ref. 1 & 2
Perciformes	Haemulidae	<i>Plectorhynchus chaetodonoides</i>	Many Spotted Sweetlips	Koh Rong		Ref. 1 & 2
Perciformes	Haemulidae	<i>Plectorhynchus gibbosus</i>	Blubberlip	Koh Rong		Ref. 1 & 2
Beryciformes	Holocentridae	<i>Sargocentron rubrum</i>	Redcoat squirrelfish	Koh Rong		Ref. 1 & 2






Beryciformes	Holocentridae	Myripristis sp.				Courtesy of FishBase.org
Perciformes	Labridae	Chelinus chlorourus		Koh Rung Samleom		Ref 3
Perciformes	Labridae	Halichoeres chloropterus		Koh Rong		Ref. 1 & 2
Perciformes	Labridae	Halichoeres hortulanus		Koh Rung Samleom		Ref. 1 & 2
Perciformes	Labridae	Halichoeres leucurus		Koh Rong		Ref. 1 & 2











Perciformes	Labridae	Labroides dimidiatus	Bluestreak Cleaner Wrasse	Condor Reef		Ref. 1 & 2
Perciformes	Labridae	Thalassoma lunare	Moon wrasse			
Perciformes	Lethrinidae	Lethrinus sp.				Courtesy of FishBase.org
Perciformes	Lutjanidae	Lutjanus argentimaculatus	Mangrove red snapper	Koh Rung Samleom		Ref 1 & 2
Perciformes	Lutjanidae	Lutjanus decussatus	Checkered snapper			Ref 1 & 2






Perciformes	Lutjanidae	Lutjanus fuscus	Bigeye snapper	Koh Rong		Ref 1 & 2
Perciformes	Lutjanidae	Lutjanus lutjanus	Bigeye snapper	Picture From www.Fishbase.org		Courtesy of FishBase.org
Perciformes	Lutjanidae	Lutjanus vitta	Brownstripe snapper	Koh Rung Samleom		Ref. 1 & 2
Tetraodontiformes	Monacanthidae	Monacanthus chinensis	Fan-bellied leatherjacket	Koh koun		Ref. 1 & 2
Perciformes	Monodactylidae	Monodactylus argenteus	Diamond Fish	Koh Rong		Ref. 1 & 2






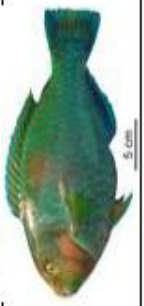
Mugiliformes	Mugilidae	<i>Crenimugil crenilabris</i>	Fringelip mullet	Koh Rong		Ref. 1 & 2
Perciformes	Mullidae	<i>Upeneus tragula</i>	Freckled goatfish	Koh Rung Samleom		
Anguilliformes	Muraenidae	<i>Siderea thyrsoides</i>	White-Eyed Moray	Koh Rong		Ref. 1 & 2
Rajiformes	Myliobatidae	<i>Aetobatus narinari</i>	Spotted Eagle Ray	koh Tang		Ref. 1 & 2
Perciformes	Nemipteridae	<i>Pentapodus paradiseus</i>	Paradise whiptail	Koh Rung Samleom		Ref. 1 & 2






Perciformes	Nemipteridae	Scolopsis bilineatus	Bridled Monocle Bream	Koh Rung Samleom		Ref. 1 & 2
Perciformes	Nemipteridae	Scolopsis margaritifer	Pearly Monocle Bream	Koh Rung Samleom		Ref. 1 & 2
Perciformes	Nemipteridae	Scolopsis monogramma	Monogram Monocle Bream	Koh Rung Samleom		Ref. 1 & 2
Perciformes	Nemipteridae	Scolopsis vosmeri	Whitecheek monocle bream	Koh Rong		Ref. 1 & 2
Tetraodontiformes	Ostraciidae	Rhynchostracion nasus	Shortnose Boxfish			

Pegasiformes	Pegasidae	Pegasus draconis	Dragon Sea Moth			Ref. 1 & 2
Perciformes	Pempheridae	Pempheris sp.	Sweeper	Koh Rong		Ref. 1 & 2
Siluriformes	Plotosidae	Plotosus lineatus	Striped eel catfish	Koh Tang		Ref. 1 & 2
Perciformes	Pomacanthidae	Pomacanthus annularis	Bluering angelfish	Koh Koun		Ref. 1 & 2



Perciformes	Pomacanthidae	<i>Abudefduf bengalensis</i>	Bengal Sergeant	Koh Rong		Ref. 1 & 2
	Pomacentridae	<i>Abudefduf sexfasciatus</i>	Scissortail sergeant	Koh Rung Samleom		Ref. 1 & 2
Perciformes	Pomacentridae	<i>Amphiprion perideraion</i>	Pink Anemonefish	Condor Reef		Ref. 1 & 2
Perciformes	Pomacentridae	<i>Amphiprion polymnus</i>	Saddleback Anemonefish			Ref. 1 & 2
Perciformes	Pomacentridae	<i>Dascyllus trimaculatus</i>	Threespot Dascyllus			Courtesy of FishBase.org


Perciformes	Pomacentridae	Cheiloprius labiatus	Big-lip damsel	Picture From www.Fishbase.org		Ref. 1 & 2
Perciformes	Pomacentridae	Dascyllus reticulatus	Reticulated Dascyllus	Koh Rung Samleom		
Perciformes	Pomacentridae	Chromis ternatensis	Ternate Chromis	Koh Rong		Ref. 1 & 2
Perciformes	Pomacentridae	Pomacentrus simsiang	Blueback Damsel	Koh Rong		Ref. 1 & 2
Perciformes	Scaridae	Scarus ghobban	Blue-barred parrotfish			Courtesy of FiA Cambodia
Perciformes	Scaridae	Scarus prasiognathos	Greencheek parrotfish			Courtesy of FiA Cambodia

Scorpaeniformes	Scorpaenidae	Scorpaenopsis Venosa	Raggy Scorpionfish	Koh Rong		Ref. 1 & 2
Perciformes	Serranidae	Cephalopholis boenak	Chocolate Grouper	Koh Rung Samleom		Ref. 1 & 2
Perciformes	Serranidae	Cephalopholis boenak	Chocolate Grouper			Courtesy of FiA Cambodia
Perciformes	Serranidae	Cephalopholis sonnerati	Tomato grouper			Courtesy of FiA Cambodia
Perciformes	Serranidae	Cromileptes altivelis	Humpback grouper	Koh Tang		Ref. 1 & 2

Perciformes	Serranidae	Diploprion bifasciatum	Doublebanded Soapfish	Koh Tas		Ref. 1 & 2
Perciformes	Serranidae	Epinephelus bleekeri	Duskytail grouper	Koh Rung Samleom		Ref. 1 & 2
Perciformes	Serranidae	Epinephelus merra	Honeycomb Grouper	Koh Rung Samleom		Ref. 1 & 2
Perciformes	Serranidae	Epinephelus quoyanus	Longfin grouper	Koh Rung Samleom		Ref. 1 & 2



Perciformes	Serranidae	<i>Epinephelus sexfasciatus</i>		Koh Rung Samleom		Ref. 1 & 2
Perciformes	Siganidae	<i>Siganus guttatus</i>	Golden Rabbitfish	Koh Rong		Ref. 1 & 2
Perciformes	Siganidae	<i>Siganus javus</i>	Java Rabbitfish	Koh Rong		Ref. 1 & 2
Perciformes	Siganidae	<i>Siganus virgatus</i>	Virgate Rabbitfish			Courtesy of FiA Cambodia
Pleuronectiformes	Soleidae	<i>Soleichthys heterorhinos</i>	Banded Sole	Koh Tang		Ref. 1 & 2

Perciformes	Sphyraenidae	Sphyraena flavicauda	Yellowtail barracuda		
Aulopiformes	Synodontidae	Synodus rubromarmoratus	Redmarbled Lizardfish		

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