BI/IR_084

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
MIDWEST REGION
SHARK BAY DISTRICT

UNDERSTANDING THE DISTRIBUTION AND DIVERSITY OF CORAL REEF COMMUNITIES IN THE SHARK BAY MARINE PROTECTED AREAS

Field Program Report: SBMRP – 6/2008

Prepared by
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Department of
Environment and Conservation

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CONTENTS

LIST OF APPENDICES

LIST OF TABLES

ACKNOWLEDGEMENTS

DEC Collaboration

- Kelly Gillen , Regional Manager, Midwest Region
- Dr. Chris Simpson, Manager, Marine Science Program
- Brett Fitzgerald, District Manager, Shark Bay District
- Tim Grubba, Marine Park Coordinator, Shark Bay District
- Kevin Bancroft, Research Scientist, Marine Science Program
- Wayne Moroney, Marine Ranger, Shark Bay District

Funding and Resources

- Funding for this project was provided from the Shark Bay Marine Reserves Program and Marine Science Program budgets.
- Additional funding for ortho-photo mosaic photography used in the project has been provided through Natural Heritage Trust Extension – Bushcare Program (Commonwealth), Landgate (State) and Shark Bay Ecosystem Research Project (Florida International University).

1 INTRODUCTION

While the Shark Bay Marine Reserves Management Plan 1996-2006 (Department of Conservation and Land Management 1996) is anticipated to be reviewed within the next year, the Shark Bay Terrestrial Reserves Management Plan 2000-2010 (Department of Conservation and Land Management 2000) and the Shark Bay World Heritage Property Strategic Plan (Department of Environment and Conservation 2006) are currently being reviewed. This planning activity provides a window of opportunity for increased technical understanding to immediately inform management, for example, by identifying areas of high conservation value as well as potential human interactions with these values.

The distributions of perennial seagrass meadows in the Shark Bay marine protected areas (SBMPA) are reasonably well understood, there are very few data on ephemeral seagrasses and mangals, and no data on other important benthic communities such as coral reefs, filter-feeders, stromatolites, subtidal reef, beaches, rocky shore or intertidal shoreline reef. Although most marine ecological communities are of high conservation value in the SBMPA and the proposed extensions, our understanding of their distributions is limited. The spatial scale of the existing marine benthic habitat map is not at an adequate scale (ie. too broad) in some areas of the SBMPA for MPA management or environmental impact assessment.

New data obtained by this project, in conjunction with existing aerial photogrammetry and satellite imagery, will be used to determine the distribution and diversity of coral reef communities in the SBMPA. The data gathered and compiled through this project will be presented as an information layer for use in a GIS-based decision support system for the planning phases and the ongoing management of the SBMPA and the proposed extensions.

This field program report presents details of the 2008 field survey in Shark Bay to be undertaken by the DEC Shark Bay District (Principal contact, Tim Grubba, Marine Park Coordinator) and Marine Science Program (Principal contact Kevin Bancroft). The program will survey coral communities in targeted areas of Shark Bay.

1.1 OBJECTIVES

The objectives of this project are:

- to increase the current understanding of the distribution and diversity of coral reef communities in the SBMPA and the proposed extensions; and
- to produce a map/GIS information layer describing coral reef communities that will assist the planning phases of the Shark Bay Marine Reserves Management Plan, Shark Bay Terrestrial Reserves management Plan and the Shark Bay World Heritage Property Draft Strategic Plan.

2 METHODS

2.1 SITE SELECTION

Likely coral reef habitats have been identified from the existing broadscale habitat map, ortho-aerial photography and anecdotal information. Preliminary field survey locations have been selected on the east side of Dirk Hartog, Bernier and Dorre Islands, and the west side of Point Peron; see Table 1, Appendix I and Appendix II.

Additional survey locations may be selected opportunistically in the field. DEC, Department of Fisheries and WA Museum data lodged in the WA Habitat database will be used to identify further locations to be surveyed (Appendix III).

Table 1 A priori survey locations

Site Code	Site Name	Zone	Base	Figure (see Error! Reference source not found.)
PE1	Peron	General Use	Denham	Figure 1
PE2	Peron	General Use	Denham	Figure 2
PE3	Peron	General Use	Denham	Figure 2
TB1	Cape Inscription to Cape Levillian	General Use	Withnell	Figure 3
LE1	Cape Levillian south	General Use	Withnell	Figure 3
WI1	Withnell Point	General Use	Withnell	Figure 4
SA1	Sandy Point	Sanctuary	Withnell	Figure 5
SA2	Sandy Point south	General Use	Withnell	Figure 5
LO1	Louisa Bay	General Use	Withnell	Figure 6
HB1	Herald Bay	General Use	Withnell/Steep Point	Figure 7
HB2	Herald Bay (north)	General Use	Withnell/Steep Point	Figure 6
HB3	Herald Bay (north)	General Use	Withnell/Steep Point	Figure 6
HB4	Herald bay (north)	General Use	Withnell/Steep Point	Figure 6
QU1	Quoin Bluff	General Use	Steep Point	Figure 7
HS1	DHI Homestead	General Use	Steep Point	Figure 8
SP1	Surf Point	Sanctuary	Steep Point	Figure 9
SP2	Surf Point	General Use	Steep Point	Figure 9
BD1	Bernier & Dorre Islands	Outside MPA	Charter vessel	Figures 10-12

2.2 BENTHIC HABITAT OBSERVATIONS

Benthic habitat observations will be made using either a drop-down video camera typically at depths >10m or in poor water visibility or a bathyscope or by diver at depths <10m or in good water visibility (see next section). At each site, the following information will be recorded on a proforma habitat data sheet: location, latitude/longitude, depth, date, method of observation, substrate type, and a description of the dominant biological assemblage with cover estimates (see attached form (Appendix IV). The habitat classification at each site will be determined according to the following classification: live hard coral (Acroporidae, Pocilloporidae, Faviidae, Poritidae, Fungiidae, mixed, etc.); recently dead hard coral; live soft coral; macroalgae, rubble/turf algae, rubble/coralline algae; reef/turf algae, reef/coralline algae; sponge/filter feeders, silt/mud and sand.

2.3 IN-WATER OBSERVATION

Using a manta board, snorkellers will be towed behind the vessel to locate coral reef communities and to ascertain the extent of these communities. GPS waypoints will be recorded at the boundaries of the habitat.

2.4 ADDITIONAL RESEARCH

The field survey will also collect coral samples for a project entitled "The Comparative biogeography of Australian *Symbiodinium*" which is being undertaken by the Centre for Marine Studies, University of Queensland (contact Professor Ove Hoegh-Guldberg). Refer to APPENDIX V for project objectives, methods, and required licences.

3 PROJECT MANAGEMENT

3.1 FIELD TEAM

The field team comprises staff from the Shark Bay District and the marine Science Program. A minimum of three personnel will be required for this field survey (see Table 2).

Table 2 Field team

Num	Name	Role	Office
1	Tim Grubba	Leader/ Dive Supervisor/data recorder/ camera operator/ snorkeller	DEC Denham
2	Kevin Bancroft	Leader/ data recorder/camera operator/ snorkeller	DEC MSP
3	Wayne Moroney	Boat operator	DEC Denham
4	Volunteer (TBC)		

3.2 ITINERARY

Refer to Table 3 for the field survey itinerary.

The survey will be conducted from three base camps, Denham, Steep Point and Withnell Point. The survey vessel will access survey sites from these camps on a daily basis. In Denham visiting personnel will be accommodated in hotel style accommodation. In Steep Point personnel will camp in the vicinity of the ranger's residence. In Withnell Point personnel will camp at the Withnell Pt shack. Basic cooking and camping equipment will be required for camping.

Table 3 Itinerary

	Day		1	2	3	4	5	6	7	8	9	10		
	February	17	18	19	20	21	22	23	24	25	26	27	28	29
		Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri
Task														
Preparation														
Pack up														
Base camp	**Survey areas**													
Denham	Gregory's													
	Broadhurst													
Steep Pt Rangers house	Surf Pt													
	Homestead													
	Quoin Bluff													
Withnell Pt shack	Turtle Bay													
	Withnell													
	Sandy Point													
Charter vessel	Bernier & Dorre Islands													

Survey Personnel														
Wayne Moroney	Vessel skipper													
Kevin Bancroft	Project leader													
Tim Grubba	Field survey leader													
Volunteer														

3.3 VESSELS

The SBMR program vessel "*Sirenia II*" will be used during the survey. The vessel has the capacity to carry six crew and a skipper. The vessel will be used for day trips only operating from each of three base locations (Denham, Steep Point and Withnell Point). "*Sirenia II*" will need to return to Denham as required to refuel.

3.4 VEHICLES

The DEC Dirk Hartog Island vehicle (Toyota Hilux dual cab) is available to transport field survey members on Dirk Hartog Island if required. The DEC marine parks vehicle (Toyota Troop Carrier) is available if required to transport field survey members on the Peron Peninsula.

3.5 SAFETY

3.5.1 Safety briefing

A comprehensive safety briefing will be provided by the team leader to all personnel prior to commencement of the survey. The following section provides an overview of key safety issues and procedures.

3.5.2 Crisis Management Plan

In the event that a medical emergency occurs the Crisis Management Plan (**Error! Reference source not found.**) should be followed.

Team leaders should contact the Brett Fitzgerald, Shark Bay District Manager as soon as possible following any serious event.

3.5.3 Swimming and snorkeling

Snorkeling by DEC staff will be conducted in compliance with the DEC Diving Code of Practice. DEC staff undertaking snorkeling activities must as minimum be registered as Category 'D' divers in the DEC Dive Program. Tim Grubba as Dive Supervisor and Department Dive Officer will develop/approve a Snorkel Plan for the trip.

3.5.4 Boating

All vessels are to be skippered by suitably qualified DEC staff. Daily programs will be dependent on sea and weather conditions. All boating activities will comply with the DEC boating policy "*Safe Marine Operations in CALM*" (Department of Conservation and Land Management 2002).

3.6 COMMUNICATIONS AND EMERGENCY CONTACTS

3.6.1 Daily check

The survey team leader will make contact with the DEC Denham office (Ph 9948 1208) on a daily basis between the hours of 8am and 12pm. Contact will be made via satellite phone or via the vessel DEC (VHF) radio.

There will be satellite (bgan inmarsat) based internet and email access on the vessel which the team leader can use to communicate with the DEC Denham Office and check weather forecasts.

3.6.2 Contacts

Contact details of the field team, charter operators, emergency services are listed below in Table 4,

Table 4 List of contact details

General		**Phone (Wk)**
Brett Fitzgerald, District Manager	Brett.Fitzgerald@dec.wa.gov.au	9948 1208 0427 41 3754
Chris Simpson	Chris.simpson@dec.wa.gov.au	9948 1208 9219 8761 0419 96 4766
Tim Grubba, Marine Park Coordinator	Tim.Grubba@dec.wa.gov.au	9948 1208 0428 66 0370
Kevin Bancroft (Marine Science Program)	Kevin.bancroft@dec.wa.gov.au	9219 9792 0429 36 0102
Dirk Hartog Island DEC satellite phone		0420 10 6332
Shark Bay Air Charters (Margaret)		0417 91 9059
Dirk Hartog Island Homestead		9948 1211
Barry Edwards (Oceanic Group)		9948 1333 0417 93 0959
Paul & Pam Dickenson (Steep Point Ranger)		9948 3993
Emergency		
DEC Fisheries Department	Denham office Denham office Carnarvon office	9949 1208 9948 1210 9941 1185
Carnarvon Hospital Geraldton Hospital Denham Silver Chain		9941 0555 9956 2222 9948 1400
Ambulance Police	 Denham Carnarvon	000 9948 1201 9941 1444
Royal Flying Doctor Service Denham Sea Rescue Group DEC VHF Radio	 Call Sign: VMR679, Channel 90 Monitored at Denham & Monkey Mia office, Channel 70	9414 1200

3.7 BUDGET

The total budget for the program is $40K with Shark Bay Marine Reserves budget contributing ~$15K and Marine Science Program budget contributing ~$25K (see Table 5)

Table 5 Indicative budget details

	Days	SB District (Salary)	SB District (Ops)	MSP (Salary)	MSP (Ops)	Total
PERSONNEL						
Tim Grubba	12	$4,703				$4,703
Kevin Bancroft	12			$4,703		$4,703
Wayne Moroney	12	$2,931				$2,931
Volunteer						
OPERATIONS						
Airfare					$816	$816
Vehicle			$500			$500
Accommodation (x 5nights)					$750	$750
Food			$2,000			$2,000
Camping allowance			$500		$250	$750
Vessel fuel			$2,000		$2,000	$4,000
Misc			$1,500			
Contingency					$1,000	$1,000
Freight					$400	$400
Vessel Hire (not confirmed)					$6,000	
TOTAL COST		**$7,634**	**$6,500**	**$4,703**	**$10,966**	**$29,803**

3.8 EQUIPMENT

Camping equipment will be provided by the Shark Bay District. Survey equipment will be provided by the Shark Bay District and the Marine Science Program (Table 6).

Table 6 Equipment list

Camping		**Survey**	
x 4 camp stretchers	SB	Manta tow board	MSP
x 4 camp chairs	SB	Laptop (tough book)	SB
x 1 Camp Shower	SB	Satellite dish	SB
x1 flywire enclosed gazebo	SB	Underwater video	SB
x 4 Mosquito domes	SB	Underwater camera	SB
x 4 sets of cutlery	SB	X2 underwater camera	MSP
x 4 sets of plates/bowls/cups	SB	X2 Drop down camera & VDU/battery pack	MSP
Pots, pans, wok, misc bowls etc.	SB	Bathyscope	MSP
x 1 portable barbeque	SB		
x ? tarps	SB	**Emergency**	
x 1 large trestle table	SB	Comprehensive first aid kit	SB
x 1 (60L) Waeco fridge	SB	Oxy-viva unit	SB
x 1 (100L) eskies	SB	Satellite Phone	SB
x 4 (20L) water containers for drinking water	SB		
X1 Genset	SB		

4 DATA MANAGEMENT AND REPORTING

4.1 RAW DATA

Hard copies of data sheets will be archived as per DEC protocols. Raw data will be entered into the Western Australia Habitat database maintained by the Marine Science Program (Kevin Bancroft). The WA Habitat database is held on the Marine Science Program server at the following URL: T:\529-CALMscience\Shared Data\Marine Science Program\MSP_DATABASES\Habitat database.

A copy of this data base will be stored on the Shark Bay District server (T drive) at Denham along with the electronic copy of the data report.

4.1.1 Still images

Still images will be stored as high resolution jpegs in the Denham District server image library (T drive) and the MSP image library (T:\529-CALMscience\Shared Data\Marine Science Program\MSP_COMMUNICATION\image library).

4.2 PUBLICATIONS

4.2.1 Data report

A data report will be produced containing hard copies of the data. Copies will be stored at the DEC library at Kensington, at the Shark Bay District library and at the Batty Library. It will also be available in electronic form on the Shark Bay District server (T drive).

4.3 REPORT DISTRIBUTION

Hard copies of this field program report will be distributed to:

Tim Grubba, Marine Park Coordinator, Shark Bay District and Department Dive Officer, DEC;
Kevin Bancroft, Marine Researcher, Marine Science Program, Science Division, DEC;
Wayne Moroney, Marine Ranger, Shark Bay District, DEC;
DEC library at Kensington;
MSP Library; and
Serials Section, State Library of WA, Alexander Library Building.

Electronic copies of this field program report will be distributed to:

Kelly Gillen, Manager, Midwest Region, DEC;
Brett Fitzgerald, A/Manager Shark Bay District, DEC;
Chris Simpson, Manager, Marine Science Program, DEC;
DEC library at Kensington; and
MSP Library.

An electronic copy will be stored on the Shark Bay District server (T drive) at Denham.

APPENDICES

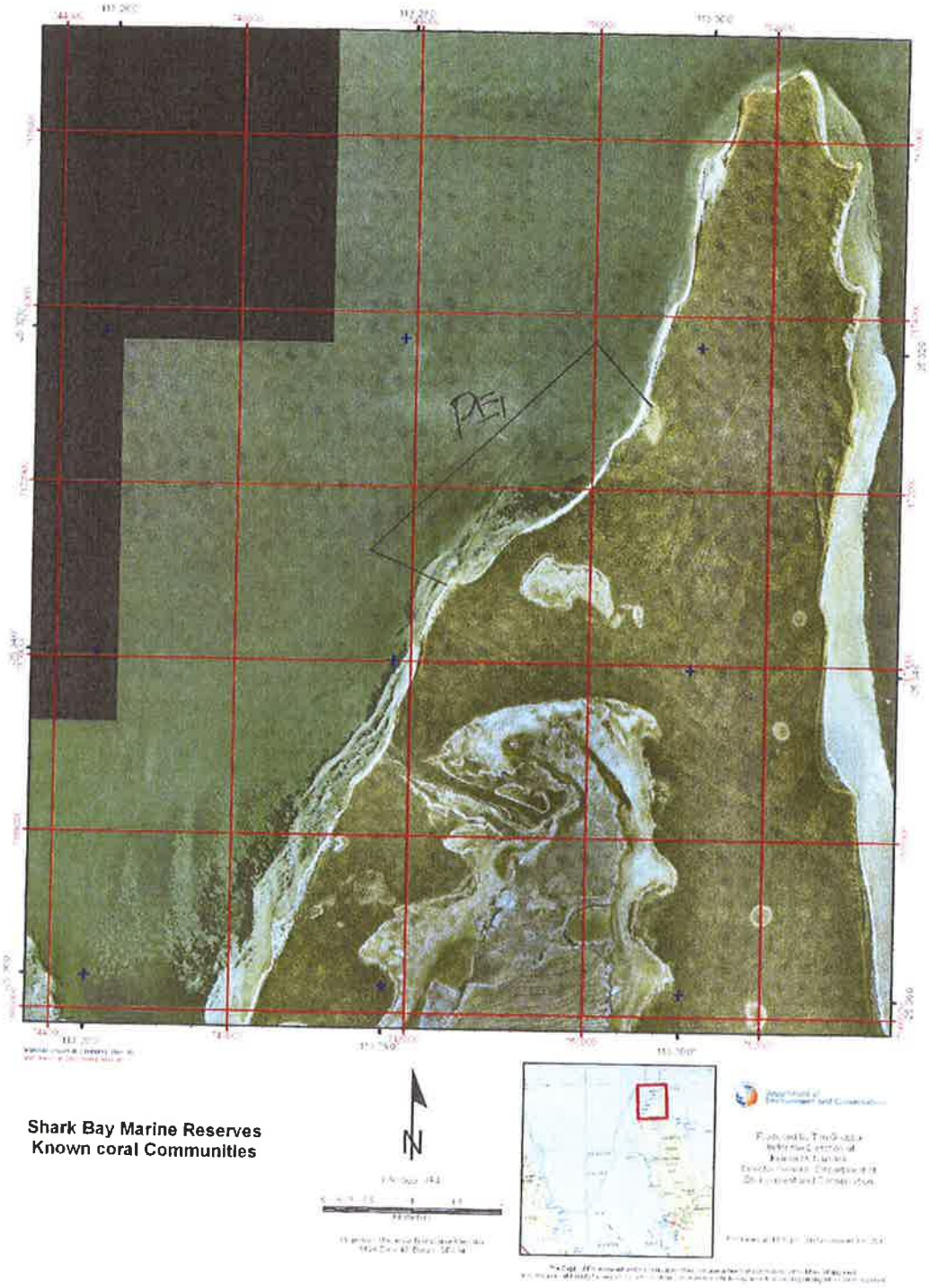
Appendix I. Overview of proposed survey locations

Site Code	Site Name	Zone	Figure	Usage	Pressure	Physical Environment	Habitat
PE1	Peron	General Use	1	Level of usage is high. There are a number of camping & day use sites along the coast of the FPNP e.g. Gregory's. Recreational beach & boat fishing occurs at these sites. Small dinghies launched across the beach. Snorkeling activities including spear fishing occurs in the area	Anecdotal reports of anchor damage & fishing pressure. Potential impacts due to snorkeling activities.	Waters subject to moderate - high turbidity and strong currents.	Subtidal limestone reef platform with a low abundance/ diversity of hard corals adjacent to sand/silt/ seagrass
PE2	Peron	General Use	2	Unknown. Probably recreational boat-based fishing. Dinghies launched from FPNP.	Potential impacts due to vessel anchoring & fishing pressure	Waters subject to moderate - high turbidity and strong currents.	Unknown
PE3	Peron	General Use	2	Unknown. Probably recreational boat-based fishing. Dinghies launched from FPNP.	Potential impacts due to vessel anchoring & fishing pressure	Waters subject to moderate - high turbidity and strong currents.	Unknown
TB1	Cape Inscription to Cape Levillian	General Use	3	Level of usage is low. Commercial fishing vessels anchor overnight at Turtle Bay. Recreational boat based fishing does occur in the area.	Potential impacts due to vessel anchoring & fishing pressure	Exposed site with low water turbidity.	Wide spread patchy reef with high diversity of hard corals.
LE1	Cape Levillian south	General Use	3	Level of usage is low.	Potential impacts due to vessel anchoring & fishing pressure	Semi protected site with low water turbidity	Patchy reef with isolated coral bommies.
WI1	Withnell Point	General Use	4	Level of usage low?. Fishing camp and vessel anchorage at Withnell Pt. Recreational boat based fishing occurs in	Potential impacts due to vessel anchoring & fishing pressure	Semi protected site with low water turbidity	Unknown

Site Code	Site Name	Zone	Figure	Usage	Pressure	Physical Environment	Habitat
				the area.			
SA1	Sandy Point	Sanctuary	5	Level of usage is low-moderate. Recreational vessels do access the adjoining areas for boat based fishing. Trawlers do anchor in the area.	Potential impacts due to vessel anchoring & illegal fishing pressure. One report of a number of trawlers operating within the SZ (No apparent damage to corals)	Semi protected site with low water turbidity and some sand movement	Limestone reef colonized with a high diversity & abundance of hard coral. High diversity & abundance of fish including many targeted species. Reef surround by sand.
SA2	Sandy Point south	General Use	5	Level of usage is low.	Potential impacts due to vessel anchoring & fishing pressure.	Semi protected site with low water turbidity and some sand movement	Unknown
LO1	Louisa Bay	General Use	6	Level of usage is low.	Potential impacts due to vessel anchoring & fishing pressure.	Semi protected site with moderate water turbidity and some sand movement	Limestone reef dominated by turbinaria (foliose)
HB1	Herald Bay	General Use	7	Level of usage is low.	Potential impacts due to vessel anchoring & fishing pressure.	Semi protected site with moderate water turbidity and some sand movement	Unknown
HB2	Herald Bay (north)	General Use	6	Level of usage is low.	Potential impacts due to vessel anchoring & fishing pressure.	Semi protected site with moderate water turbidity and some sand movement	Unknown
HB3	Herald Bay (north)	General Use	6	Level of usage is low.	Potential impacts due to vessel anchoring & fishing pressure.	Semi protected site with moderate water turbidity and some sand movement	Unknown
HB4	Herald bay (north)	General Use	6	Level of usage is low.	Potential impacts due to vessel anchoring & fishing pressure.	Semi protected site with moderate water turbidity and some sand movement	Unknown
QU1	Quoin Bluff	General Use	7	Level of usage is moderate.	Anecdotal reports of	Protected site with	Limestone reef dominated by

Site Code	Site Name	Zone	Figure	Usage	Pressure	Physical Environment	Habitat
				Recreational fishing vessels anchor in the protection of the bluff.	anchor damage to corals.	moderate to high water turbidity/sedimentation	turbinaria (foliose)
HS1	DHI Homestead	General Use	8	Level of usage is moderate. DHI homestead operates as a low volume accommodation facility. Guests can participate in snorkeling, fishing and boating activities. The reef north of the homestead is a popular snorkel site.	Anecdotal reports of anchor/mooring /snorkel damage to corals.	Protected site with moderate to high water turbidity/sedimentation	Limestone reef dominated by turbinaria (foliose) & widespread patchy reef
SP1	Surf Point	Sanctuary	9	Level of usage is high Managed camping sites at Steep Pt used by recreational fishers engaged in shore & boat based fishing.	Anecdotal reports of anchor damage to corals.	Exposed site with low turbidity. Exposure to warm/clear oceanic waters and a high level of flushing of water through Blind Strait.	High diversity and abundance of soft and hard corals.
SP2	Surf Point	General Use	9	Level of usage is high Managed camping sites at Steep Pt used by recreational fishers engaged in shore & boat based fishing.	Anecdotal reports of anchor damage to corals.		High diversity and abundance of soft and hard corals.
DI 1	Bernier & Dorre Islands	Waters east of Dorre Is: candidate for inclusion in the SBMPA	10-12	Level of usage is moderate. Recreational boat based fishing	Anecdotal reports of anchor damage to corals.	Exposed site with low turbidity. Exposure to warm/clear oceanic waters.	Unknown

Appendix II. Survey location maps



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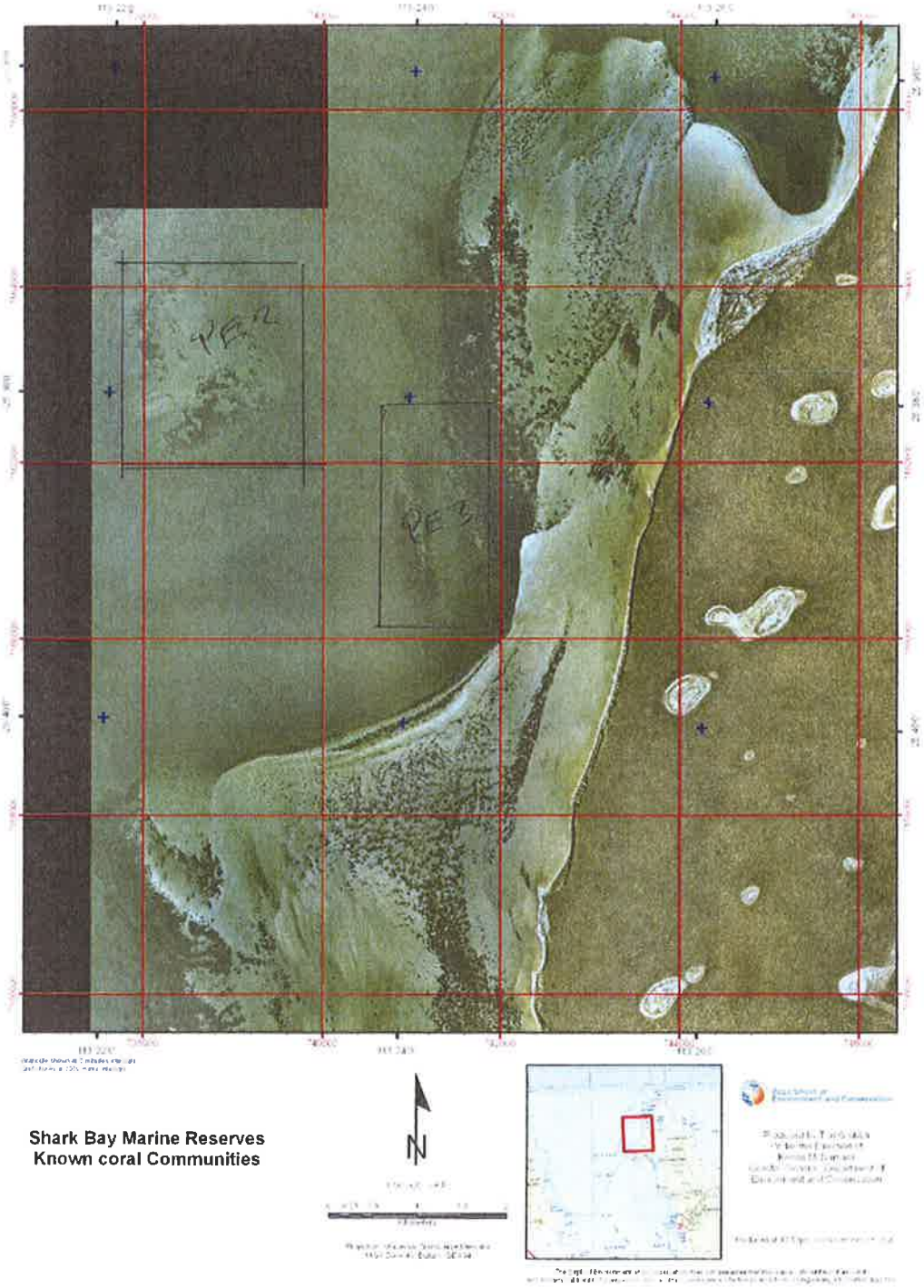


Figure 2

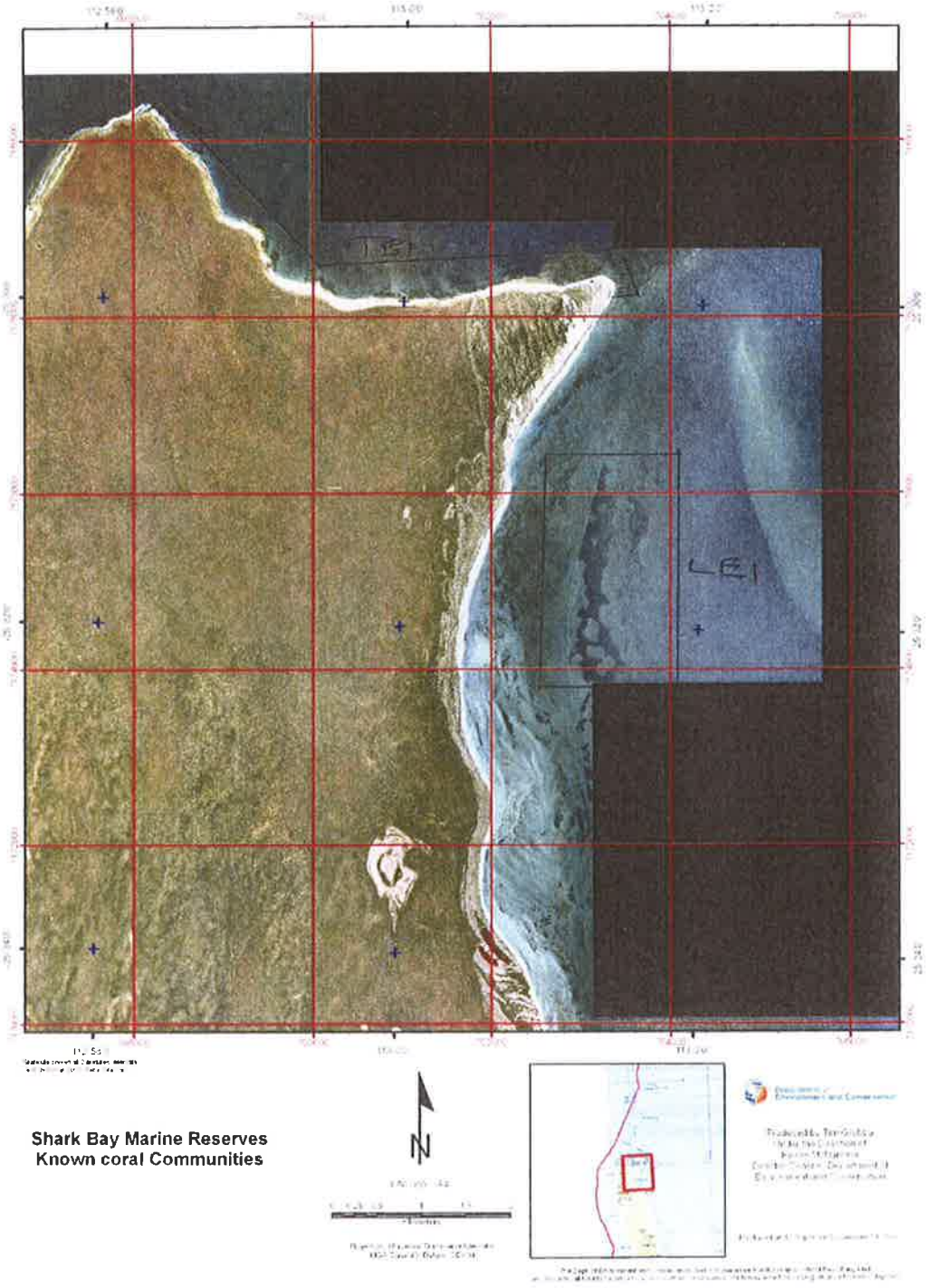
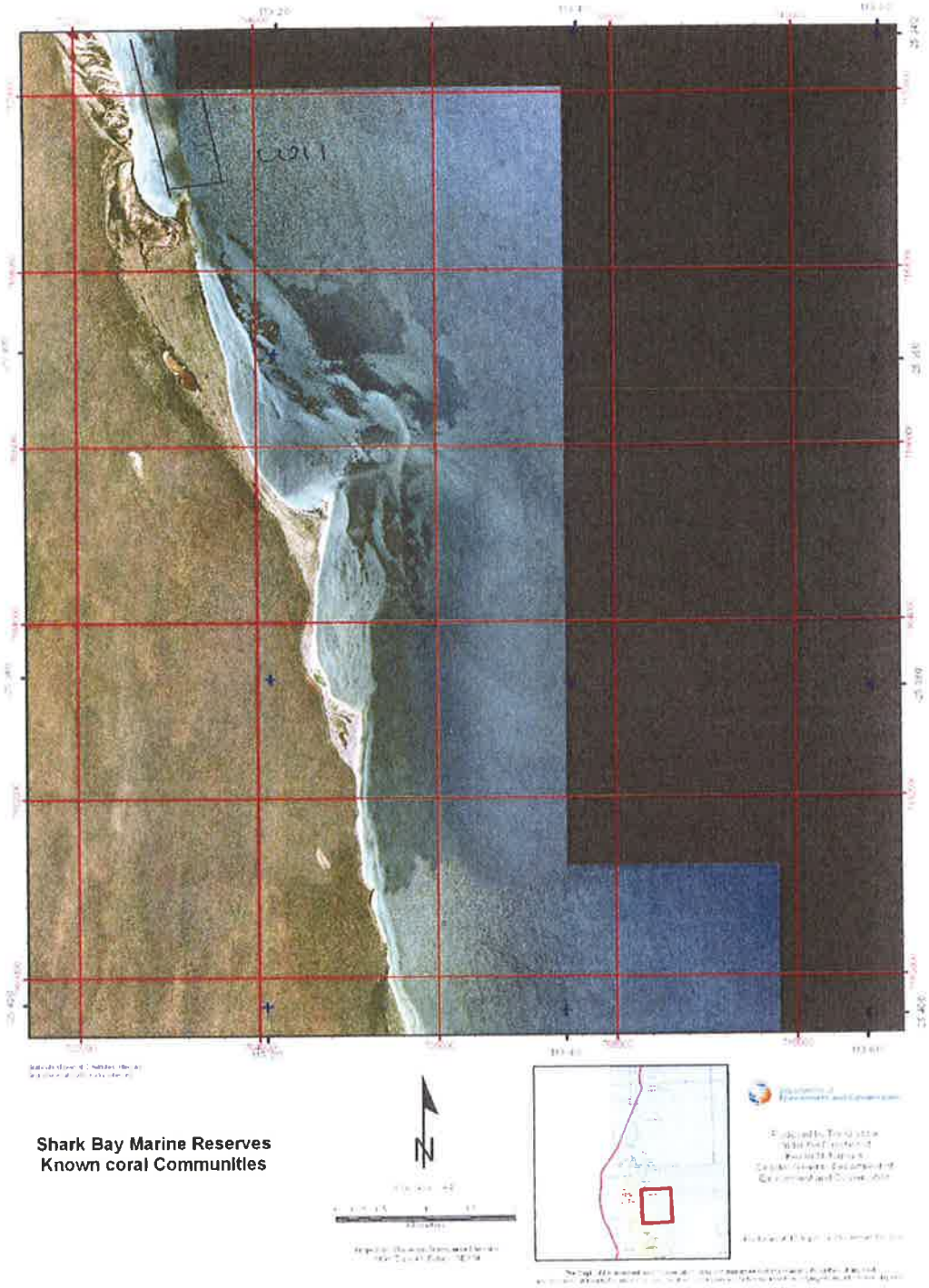

LE1
LE1
Shark Bay Marine Reserves
Known coral Communities
N

Figure 3



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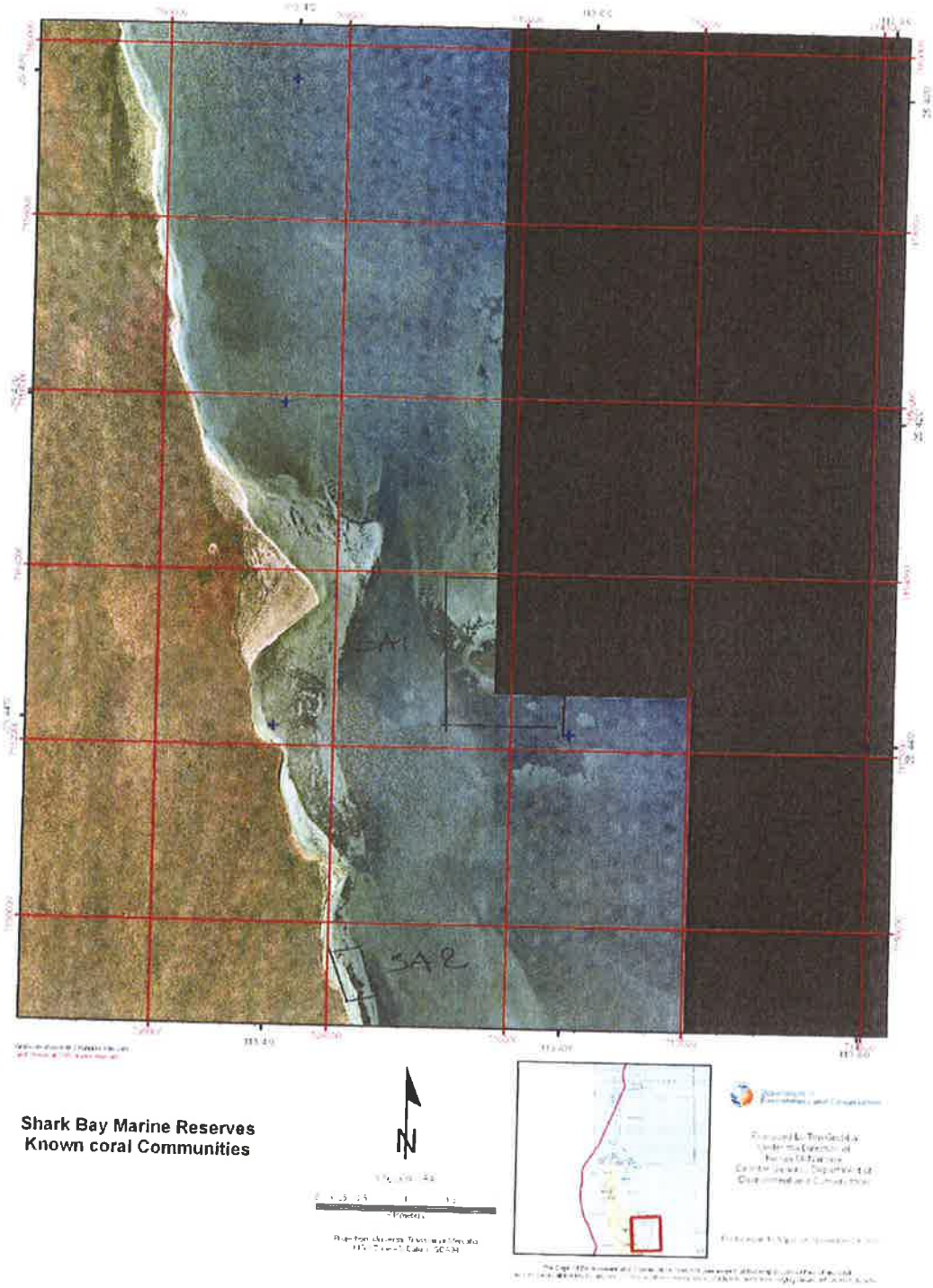

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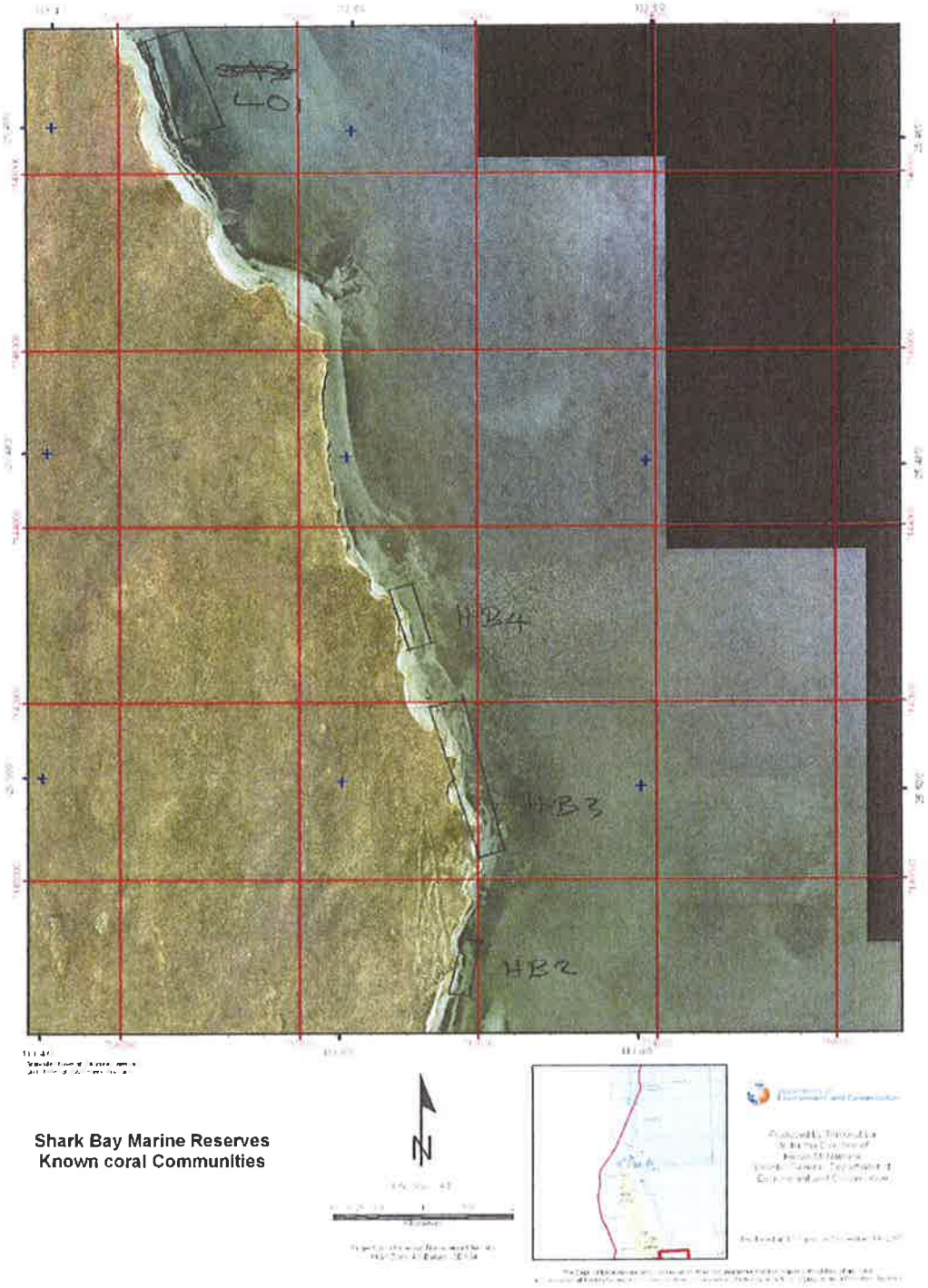
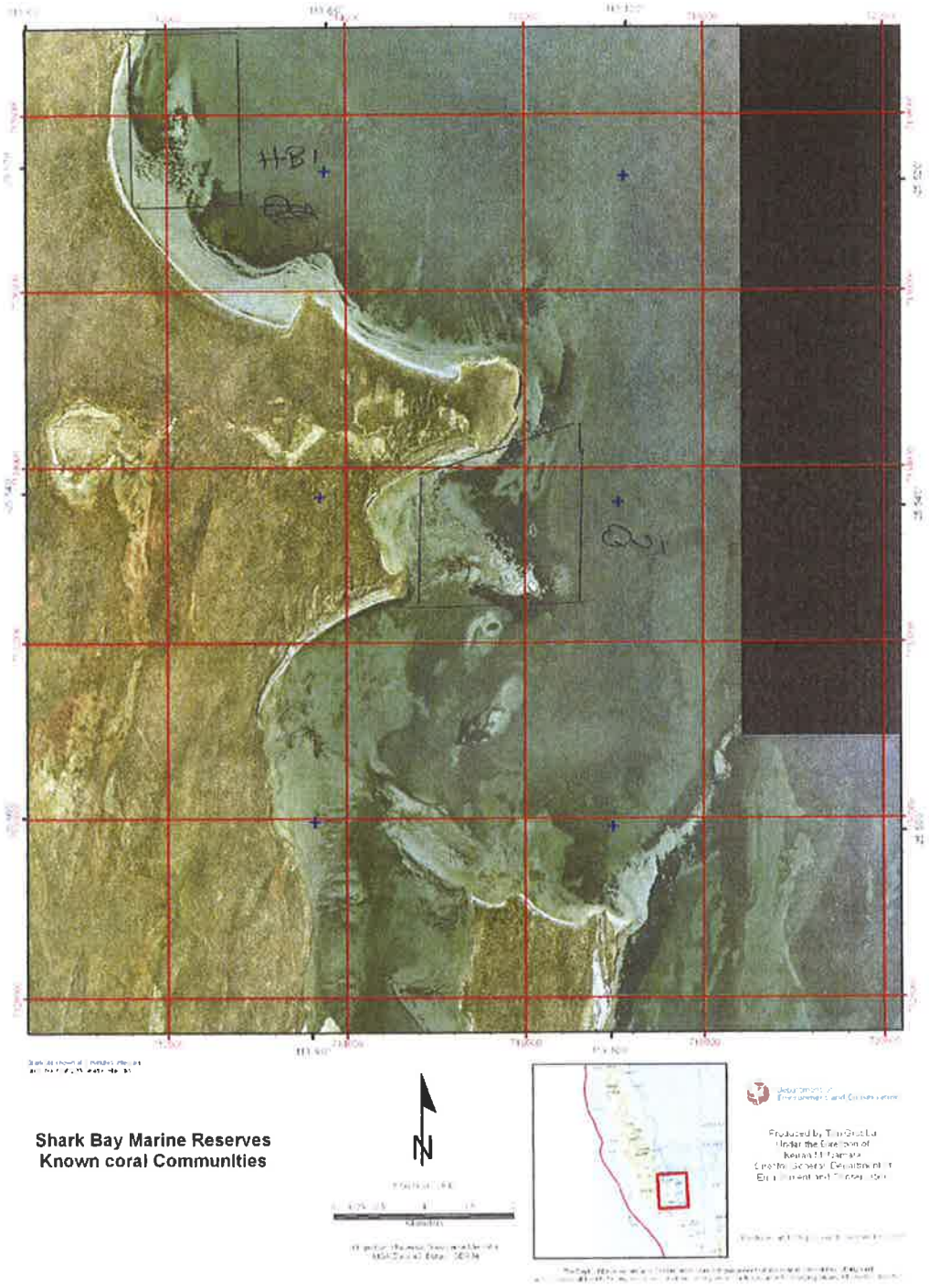

HB4
HB3
HB2
Shark Bay Marine Reserves
Known coral Communities
N

Figure 6



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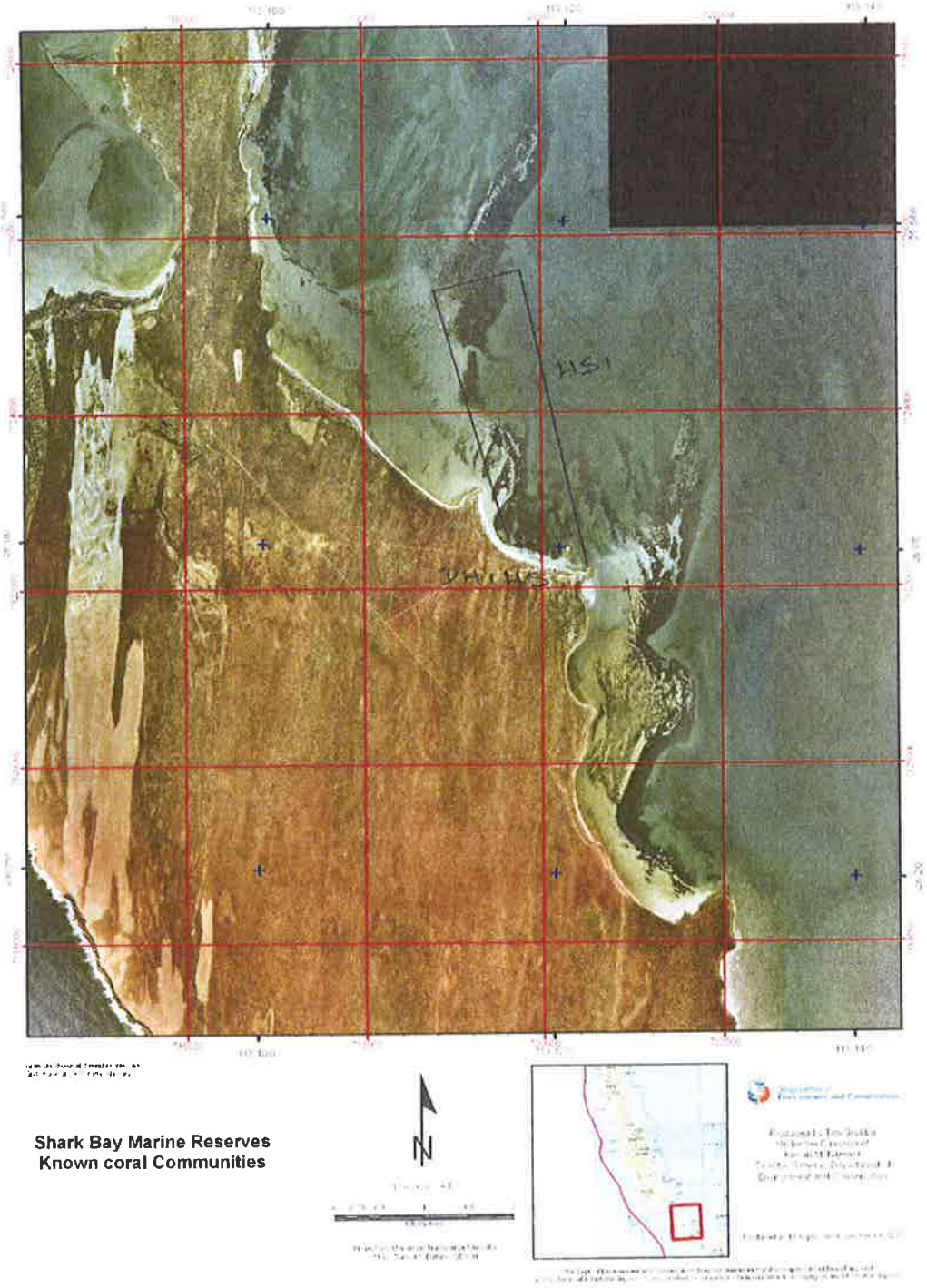

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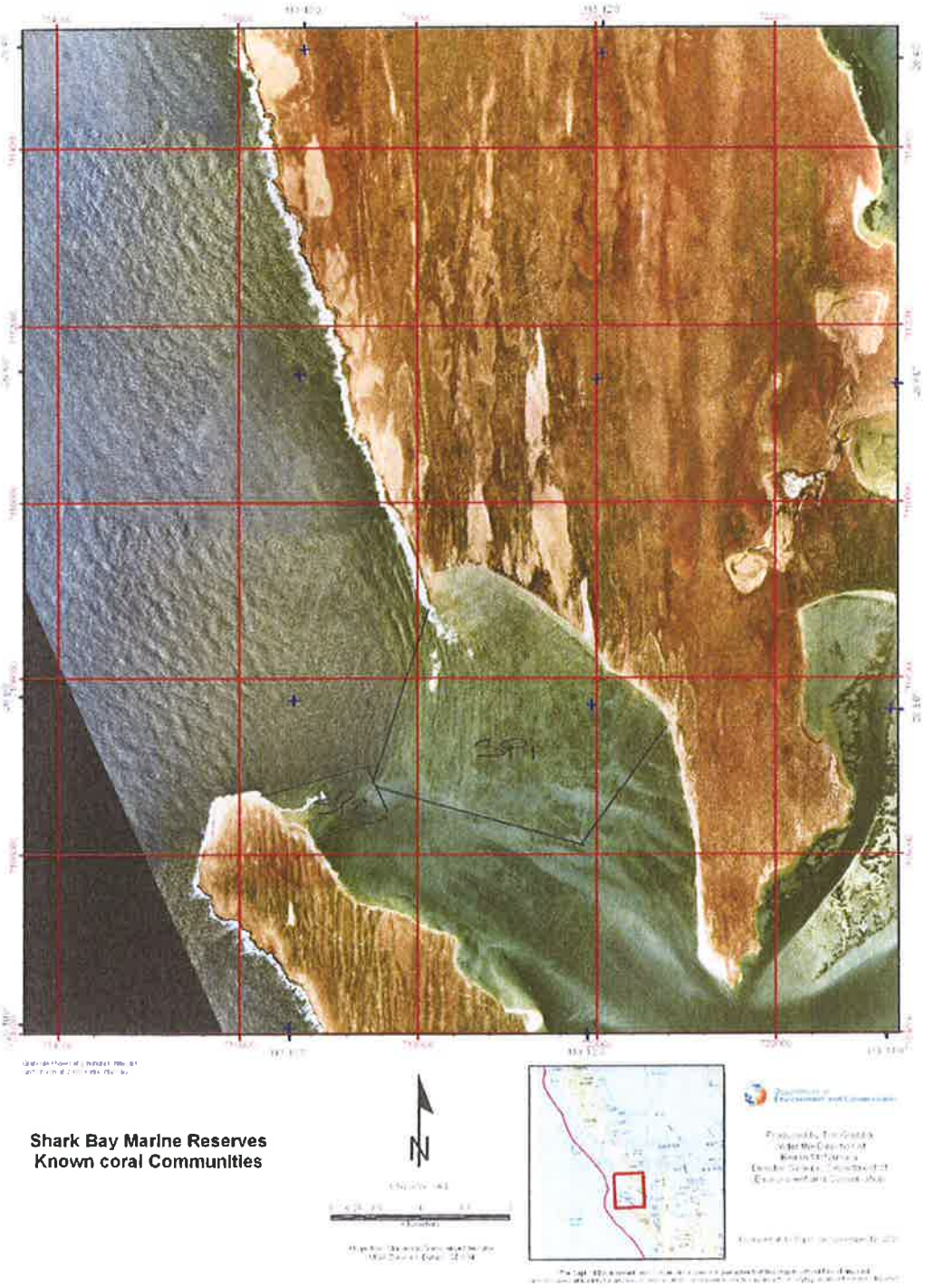

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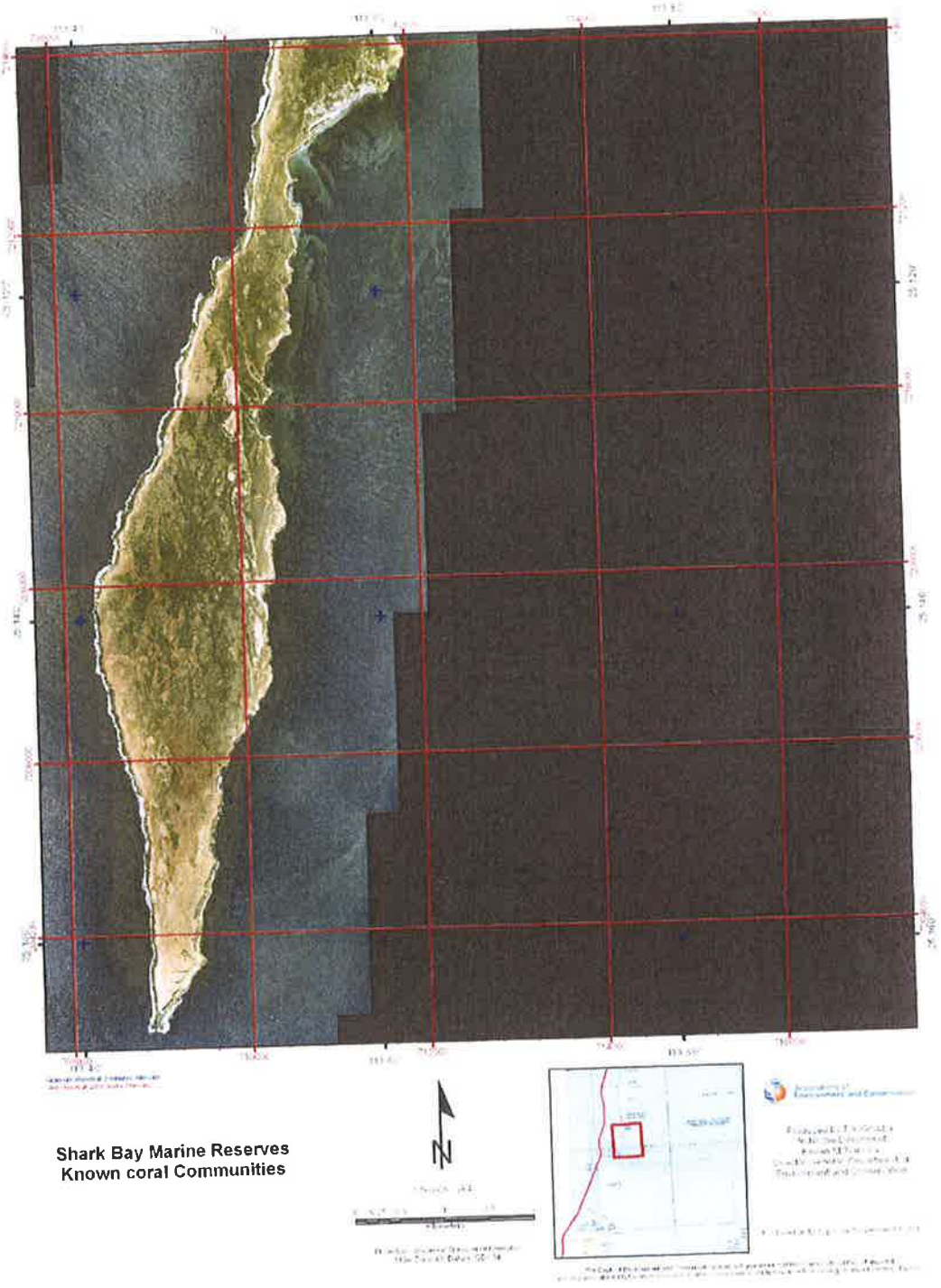

Figure 10

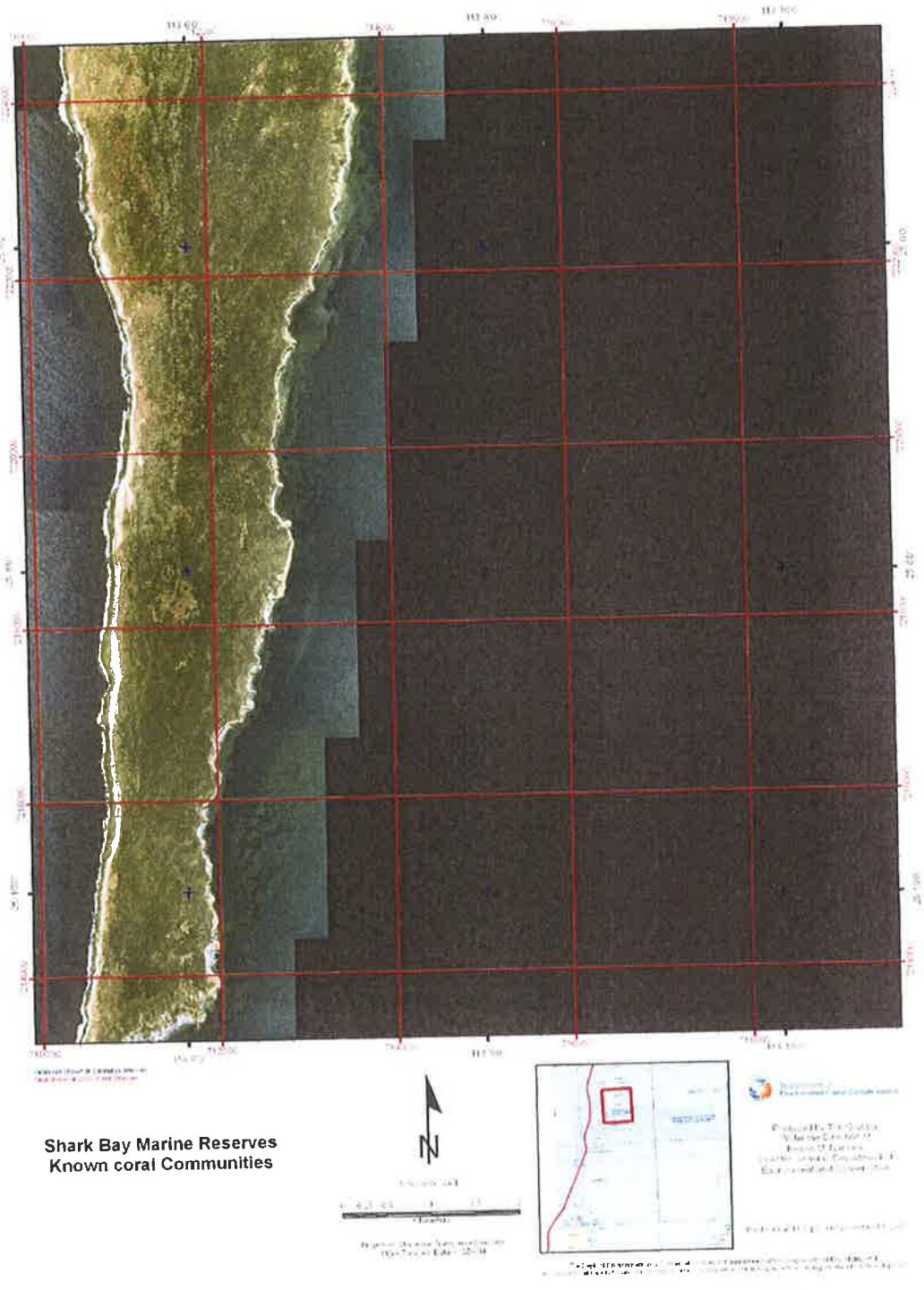

Figure 11

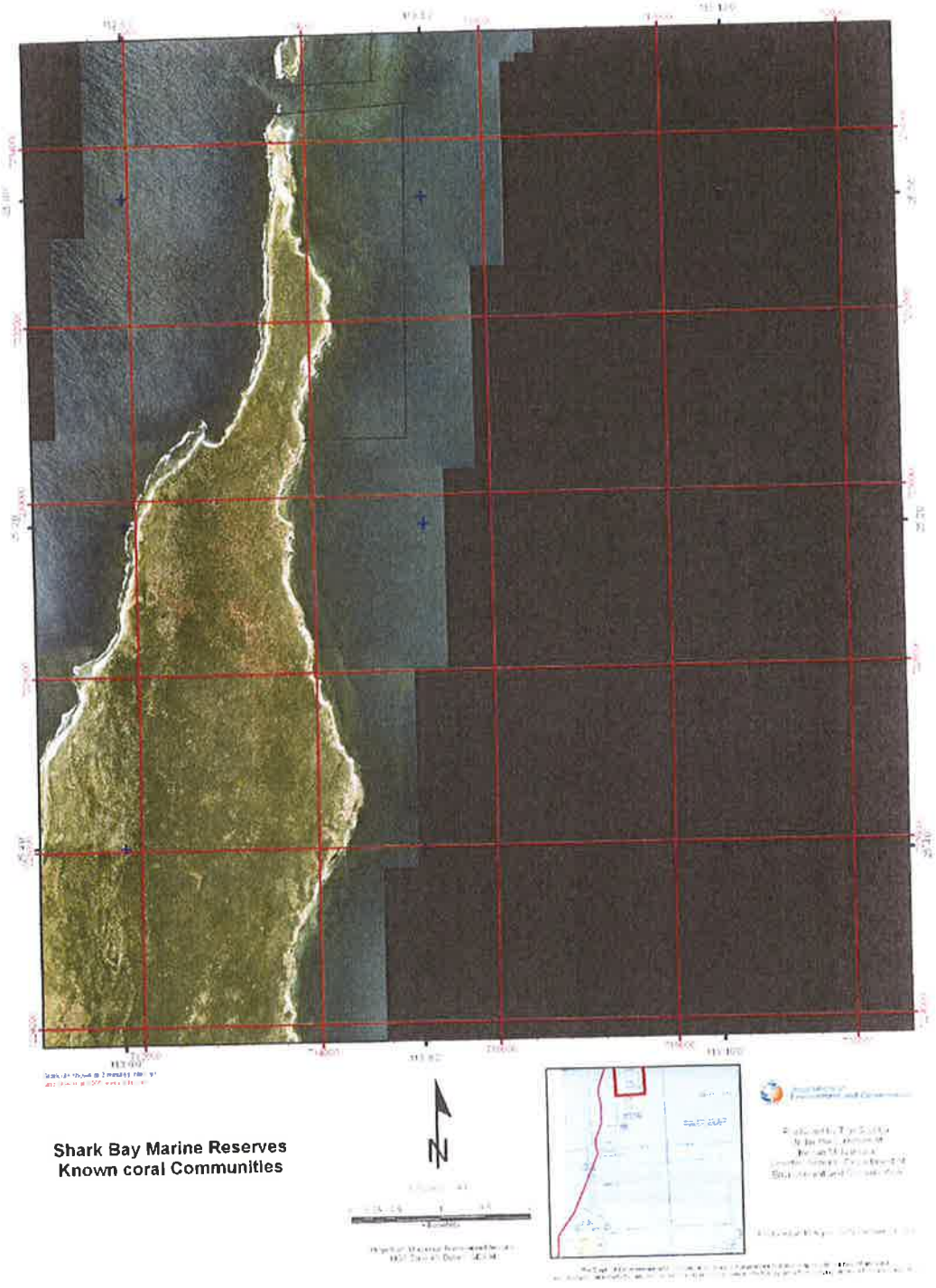

Figure 12

Appendix III. Existing habitat data

NO	LOCATION	SUBSTRATE	DEPTH	HABITAT TYPE	BIOLOGICAL ASSEMBLAGE	LAT DEG	LONG DEG	SOURCE	DATE
SBMR_0015		Limestone	-12	Coral reef communities (subtidal)	Large variation in reef height, about 2-3m, some high coral cover (50%), others coral/limestone rubble. GT19	-25.98033	113.23033	CALM Long-term monitoring survey 1997	21/04/97
SBMR_0017		Limestone	-10.5	Coral reef communities (subtidal)	Broken limestone/sand substrate with occasional coral colonies and sea anemones. Also coral rubble. Dominant coral sp.; Favids (massives) and *Pocillopora* sp.. GT23	-25.57583	113.28667	CALM Long-term monitoring survey 1997	21/04/97
SBMR_0552	Cape Inscription	Sand	-4	Coral reef communities (subtidal)	Sand, coral, dissected reefs. Mobile sand rising abruptly to limestone reefs (~2m higher). Lots of coral (*Acropora* sp. and *Pocillopora*), soft corals, some algae (*Asparagopsis* and a little *Caulerpa*). Gorgonians under ledges and some hydrazoans. (WAM_SB#6)	-25.48333	112.97833	WA Museum biodiversity survey 1981	4/05/81
SBMR_0576	Louisa Bay, Dirk Hartog Island	Sand	-3.5	Coral reef communities (subtidal)	Sand and weed (*Amphibolis*, *Zonaria*, *Sargassum*) and coral (*Acropora*, *Turbinaria*, *Favites*, and soft coral). (WAM_SB#30)	-25.76666	113.08333	WA Museum biodiversity survey 1981	8/05/81
SBMR_0809	South Freycinet	Limestone	-2.8	Coral reef communities (subtidal)	Filter feeders (sponges, coral, Pocillopora, Turbinaria), some macroalgae, some *Halodule*.	-26.30258	113.62603	CALM Benthic habitat verification 2002	25/03/02
SBMR_0867	Sunto's Coral	Limestone	-3	Coral reef communities (subtidal)	Coral reef community, *Turbinaria* sp., lots of coral.	-25.98250	113.19083	CALM Benthic habitat verification 2002	27/03/02
SBMR_0759	Redcliff Bay	Sand	-10	Filter feeder community	Filter feeders, sparse *Amphibolis*, sponges, some macroalgae, some soft coral (*Sinularia*) ? Pavement?	-25.77725	113.76583	CALM Benthic habitat verification 2002	24/03/02
SBMR_0769	Redcliff Bay	Limestone	-9.8	Filter feeder community	Filter feeders (sponges, soft coral), sparse *Amphibolis*, macroalgal tufts, rubble?	-25.77875	113.76772	CALM Benthic habitat verification 2002	24/03/02
SBMR_0770	Redcliff Bay	Limestone	-10.1	Filter feeder community	Filter feeders (sponges and soft corals), sparse *Amphibolis*, macroalgae and rubble.	-25.77982	113.76643	CALM Benthic habitat verification 2002	24/03/02

No	Location	Substrate	Depth	Habitat type	Biological assemblage	Lat deg	Long deg	Source	Date
SBMR_0780	South Freycinet	Limestone	-10.7	Filter feeder community	Filter feeders (corals, sponges) on limestone pavement covered with coarse sand.	-26.13535	113.56118	CALM Benthic habitat verification 2002	25/03/02
SBMR_0781	South Freycinet	Limestone	-11.8	Filter feeder community	Filter feeders (corals, sponges), some macroalgae on limestone platform covered with sand, some rubble.	-26.14008	113.54660	CALM Benthic habitat verification 2002	25/03/02
SBMR_0854	South Passage	Limestone	-9.2	Filter feeder community	Macroalgae on limestone (300 mm), sponges, sand, patches of dense pearl shell, rubble, corals, sponges.	-26.15455	113.19192	CALM Benthic habitat verification 2002	26/03/02
SBMR_0594	Cape Herisson	Sand	-16.5	Subtidal reef platform	Shell grit, rock, silty sand, soft corals, sponges and gorgonian fans. (WAM_SB#49)	-25.94667	113.33333	WA Museum biodiversity survey 1981	11/05/81
SBMR_0603	Cape Peron	Sand	-2	Subtidal reef platform	Rock gives way to sandy bottom with scattered stones. Fauna very sparse, few very small corals, *Turbinaria* sp., and small faviids. (WAM_SB#69)	-25.50833	113.50833	WA Museum biodiversity survey 1981	14/05/81
SBMR_0605	Herald Bight	Sand	-5.5	Subtidal reef platform	Very silty sand with scattered rocks and some coral, mostly *Turbinaria* spp., many colonies partially dead, few healthy. (WAM_SB#71)	-25.56250	113.52500	WA Museum biodiversity survey 1981	14/05/81
SBMR_0075	NE of Levillian Shoal	Limestone	-19.5	Subtidal reef platform (low relief)	Patchy limestone/sand pavement, covered in sparse coral, sponge and ascidian assemblage. Tuft algae covering limestone pavement, patchy Turbinaria sp., starfish, ascidians, sponges. GT85.	-25.45917	113.07667	CALM Long-term monitoring survey 1997	19/04/97
SBMR_0151	Eastern Gulf	Limestone	-7.4	Subtidal reef platform (low relief)	Sand on limestone, sponges EG10	-25.36670	113.76670	Dept of Fisheries, Pink Snapper research Gary Jackson 1996	18/03/96
SBMR_0214	Eastern Gulf	Limestone	-10.1	Subtidal reef platform (low relief)	Sand, sponges and coral EG113	-25.80000	113.78330	Dept of Fisheries, Pink Snapper research Gary Jackson 1997	7/04/96
SBMR_0275	North-Western Gulf	Limestone	-20.5	Subtidal reef platform (low relief)	Coarse sand over limestone, some sponges observed NW35	-25.56667	113.18333	Dept of Fisheries, Pink Snapper research Gary Jackson 1998	24/03/96

NO	LOCATION	SUBSTRATE	DEPTH	HABITAT TYPE	BIOLOGICAL ASSEMBLAGE	LAT DEG	LONG DEG	SOURCE	DATE
SBMR_0276	North-Western Gulf	Limestone	-19.2	Subtidal reef platform (low relief)	Sand over limestone, unidentified seagrass present, sponges dominate (20% combined seagrass/ sponge cover) NW36	-25.56667	113.15000	Dept of Fisheries, Pink Snapper research Gary Jackson 1999	23/03/96
SBMR_0277	North-Western Gulf	Limestone	-19.9	Subtidal reef platform (low relief)	Sand over limestone, sponges observed NW37	-25.56667	113.11667	Dept of Fisheries, Pink Snapper research Gary Jackson 2000	23/03/96
SBMR_0278	North-Western Gulf	Limestone	-17.3	Subtidal reef platform (low relief)	Sand over limestone, patchy sponge cover, some leaf matter observed NW38	-25.56667	113.08333	Dept of Fisheries, Pink Snapper research Gary Jackson 2001	23/03/96
SBMR_0286	North-Western Gulf	Limestone	-20	Subtidal reef platform (low relief)	Sand over limestone, unidentified seagrass sp. and sponges observed (20% cover) NW46	-25.60000	113.18333	Dept of Fisheries, Pink Snapper research Gary Jackson 2002	24/03/96
SBMR_0287	North-Western Gulf	Limestone	-20.9	Subtidal reef platform (low relief)	Sand over limestone, sponges observed NW47	-25.60000	113.15000	Dept of Fisheries, Pink Snapper research Gary Jackson 2003	23/03/96
SBMR_0289	North-Western Gulf	Limestone	-17.8	Subtidal reef platform (low relief)	Sand over limestone, some sponges observed NW49	-25.60000	113.08333	Dept of Fisheries, Pink Snapper research Gary Jackson 2004	23/03/96
SBMR_0296	North-Western Gulf	Limestone	-18.8	Subtidal reef platform (low relief)	Sand over limestone, some sponges observed NW57	-25.63333	113.18333	Dept of Fisheries, Pink Snapper research Gary Jackson 2005	24/03/96
SBMR_0297	North-Western Gulf	Limestone	-19.2	Subtidal reef platform (low relief)	Sand over limestone, sponges observed NW58	-25.63333	113.15000	Dept of Fisheries, Pink Snapper research Gary Jackson 2006	23/03/96
SBMR_0298	North-Western Gulf	Limestone	-19.8	Subtidal reef platform (low relief)	Sand and silt (green in colour) over limestone, some sponges observed NW59	-25.63333	113.11667	Dept of Fisheries, Pink Snapper research Gary Jackson 2007	23/03/96

No	Location	Substrate	Depth	Habitat type	Biological assemblage	Lat deg	Long deg	Source	Date
SBMR_0300	North-Western Gulf	Limestone	-11	Subtidal reef platform (low relief)	Rubble bottom, some sponges observed NW61	-25.63333	113.05000	Dept of Fisheries, Pink Snapper research Gary Jackson 2008	23/03/96
SBMR_0385	North-Western Gulf	Limestone	-15.5	Subtidal reef platform (low relief)	Sand over limestone, rocky with sponges NW147	-25.96667	113.35000	Dept of Fisheries, Pink Snapper research Gary Jackson 2009	27/04/96
SBMR_0390	North-Western Gulf	Limestone	-15	Subtidal reef platform (low relief)	Sand over limestone, rubble and sponges? NW154	-26.00000	113.38333	Dept of Fisheries, Pink Snapper research Gary Jackson 2010	29/04/96
SBMR_0393	North-Western Gulf	Limestone	-11.9	Subtidal reef platform (low relief)	Coarse sand over limestone, rubble and sponges NW158	-26.03333	113.48333	Dept of Fisheries, Pink Snapper research Gary Jackson 2011	29/04/96
SBMR_0394	North-Western Gulf	Limestone	-12	Subtidal reef platform (low relief)	Coarse sand over limestone, rubble and sponges NW159	-26.03333	113.45000	Dept of Fisheries, Pink Snapper research Gary Jackson 2012	29/04/96
SBMR_0395	North-Western Gulf	Limestone	-15.3	Subtidal reef platform (low relief)	Coarse sand over limestone, rubble and sponges NW160	-26.03333	113.41667	Dept of Fisheries, Pink Snapper research Gary Jackson 2013	29/04/96
SBMR_0431	North-Western Gulf	Limestone	-6	Subtidal reef platform (low relief)	Sand over limestone, sponges observed NWUI155	-26.00000	113.31667	Dept of Fisheries, Pink Snapper research Gary Jackson 2014	13/05/96
SBMR_0432	North-Western Gulf	Limestone	-5.8	Subtidal reef platform (low relief)	Sand over limestone, rocks and sponges observed NWUI161	-26.03333	113.31667	Dept of Fisheries, Pink Snapper research Gary Jackson 2015	13/05/96
SBMR_0453	South-Western Gulf	Limestone	-12.9	Subtidal reef platform (low relief)	Coarse sand over limestone, sponges observed?? SW21	-26.20000	113.58330	Dept of Fisheries, Pink Snapper research Gary Jackson 2016	2/05/96

NO	LOCATION	SUBSTRATE	DEPTH	HABITAT TYPE	BIOLOGICAL ASSEMBLAGE	LAT DEG	LONG DEG	SOURCE	DATE
SBMR_0458	South-Western Gulf	Limestone	-7.3	Subtidal reef platform (low relief)	Sand over limestone, sponges observed SW26	-26.23330	113.71670	Dept of Fisheries, Pink Snapper research Gary Jackson 2017	5/06/96
SBMR_0509	South-Western Gulf	Limestone	-11.4	Subtidal reef platform (low relief)	Sand over limestone, silt and sponges SW77	-26.40000	113.78330	Dept of Fisheries, Pink Snapper research Gary Jackson 2018	30/04/96

Appendix IV. Habitat ground-truth data proforma

HABITAT MAPPING DATA SHEET

SITE N°.		LOCATION NAME	
LAT	.....° .....'S	LONG	.....° .....'E
DGPS/GPS		DATUM	
DEPTH (M)		TIDAL RANGE	
DATE		TIME	
RECORDER		OBSERVAT^{n} METHOD	
MPRSWG		IMCRA BIOREGION	
SUBSTRATE TYPE		RELIEF	
VIDEO TAPE N°	MSP / SBY / SBMPA / ___#___-___/____ (IMCRA region) (MPRSWG) (DD or HH camera) (number) (MM/YYYY)		
VISUALLY DOMINANT ORGANISM			
DESCRIPTION.....			
HABITAT TYPE			

SITE N°.		LOCATION NAME	
LAT	.....° .....'S	LONG	.....° .....'E
DGPS/GPS		DATUM	
DEPTH (M)		TIDAL RANGE	
DATE		TIME	
RECORDER		OBSERVAT^{n} METHOD	
MPRSWG		IMCRA BIOREGION	
SUBSTRATE TYPE		RELIEF	
VIDEO TAPE N°	MSP / SBY / SBMPA / ____#____-____/____ (IMCRA region) (MPRSWG) (DD or HH camera) (number) (MM/YYYY)		
VISUALLY DOMINANT ORGANISM			
DESCRIPTION.....			
HABITAT TYPE			

Appendix V. Details of research program entitled "The comparative biogeography of Australian *Symbiodinium*" – Chief Investigator: Professor Ove Hoegh-Guldberg, Centre for Marine Studies, University of Queensland.

The comparative biogeography of Australian *Symbiodinium*

Investigators

Professor Ove Hoegh-Guldberg (CI), Dr Sophie Dove (PI), Dr Maoz Fine (PI), Dr Effrat Meroz-Fine: Dr Eugenia Sampayo: Dr Tyrone Ridgway

Project overview

Reef building corals and invertebrates from at least four other phyla for endosymbioses with *Symbiodinium* (a dinoflagellate). Historically, the symbiosis of reef-building corals were thought to contain a single ubiquitous species of dinoflagellate (*Symbiodinium microadriaticum*). However, with the advent of molecular techniques, it has become apparent that the genus Symbiodinium is highly diverse and contains 8 broad genetic groupings (clades) from which many subcladal types have originated. Evidence now points out that much of the behaviour of reef-building corals, with respect to environmental parameters such as light and temperature, are largely driven by differences in these "subcladal types" of *Symbiodinium*. This study explores the role that these symbiotic dinoflagellates play in driving host distributions and has so far built up a detailed picture of the diversity of *Symbiodinium* from the East Coast of Australia. To date, the diversity of symbiotic dinoflagellates found within their hosts along the Western Australian coast is largely unknown. As some studies have shown that the Indian Ocean may represent a distinct biogeographical province gaining information on symbiont diversity aling the Western Australian coastline will enable us to answer a number of important questions.

First, this study will be the first to assess the diversity of *Symbiodinium* within the tissues of Western Australian host invertebrates and as such will provide an important baseline study for future studies. By incorporating a wide range of host taxa and sites covering a wide range of environmental parameters (light and temperature), and include both temperate and tropical regions, we will be able to expand our understanding of the tolerance ranges of these symbiotic reefs invertebrates. Further, by sampling a few target species (Pocilloporidae) more intensely we will be able to assess whether symbiont diversity from these species differs dramatically from their Pacific and Western Indian Ocean counterparts. With this information we will be able to assess connectivity between the oceans and the nature (ecological, evolutionary, physical) of existing species boundaries. Particularly assessing the level of connectivity along the WA coast as well as ocean-wide will be of great use to determine suitable locations for Marine Protected Areas.

This project is part of a large multi-institutional and disciplinary initiative and is funded by the ARC Centre for Excellence for Coral Reef Studies. More information on the general purpose and scope of the ARC-CoE can be found on the website, www.coralcoe.org.au.

Methodology

Small fragments or tissue of no larger than 2 cm^2 will be collected from each colony - using care not to cause the death of the original colony and no collection will include the removal of complete individuals. From anemones, soft corals zoanthids, corrallimorphs, hydroids and clams only small portions of the tentacles or mantle are to be removed. From reef-building corals only a single fragment will be removed per colony. Most collected species are colonial organisms that will re-grow removed tissue within 2-3 months.

Samples will be collected from no more than 3-4 individuals at each location except from the following common coral species: *Pocillopora damicornis, Pocillopora verrucosa, Stylophora pistillata* and *Seriatopora hystrix*. In order to study the connectivity and population structuring at least 20 individuals will need to be sampled at each location from each species. At each site no more that 200 individual samples will be collected.

Samples will be stored using DMSO and taken back to the University Queensland where the ITS2 region of the DNA amplified and identified using the methods of LaJeunesse et al. (2003, 2005).

Department of
Environment and Conservation

SEND TO
Wildlife Clerk
Department of Environment and Conservation
Locked Bag 30, Bentley Delivery Centre,
Western Australia 6983 Fax 08 9334 0278

WILDLIFE CONSERVATION ACT 1950 (AS AMENDED)

REGULATION 17

APPLICATION FOR A LICENCE TO TAKE (I.E. CAPTURE, COLLECT, DISTURB, STUDY) FAUNA FOR SCIENTIFIC PURPOSES

(Allow 20 working days to process application)

1. **Name of Applicant:**

Surname: Hoegh-Guldberg
Given Names: Ian Ove

2. **Address:** Centre for Marine Studies
The University of Queensland
St. Lucia

Postcode	**Phone No**	**Mobile No.**
4072	07 3365 1156	0401 106 604
Fax No.		**email.**
0733654755		oveh@uq.edu.au

3. **Qualifications:** Professor

4. **Name of Project:**

The comparative biogeography of Australian *Symbiodinium*

5. **Objective:** The project aims to address a number of important questions. Thus far diversity of symbiotic dinoflagellates that are found within the tissues of a wide range of marine invertebrates on the Western Australian is largely unknown. These dinoflagellates can influence the capacity of their hosts to respond to (changed) environmental conditions.

Therefore our selected sampling locations range from temperate to tropical environments as well as an inshore area (Shark Bay). Further by sampling a few target species (Pocilloporidae) more intensely we will be able to assess whether symbiont diversity from these target species differs dramatically from their Pacific and Western Indian Ocean counterparts. With this information we will be able to assess connectivity between the oceans and the nature of present boundaries (ecological, evolutionary, physical). Particularly assessing the level of connectivity along the WA coast as well as ocean-wide will be of great use to determine suitable locations for Marine Protected Areas.

6. Procedure: Small fragments or tissue of no larger than 2 cm^2 will be collected from each host - using care not to cause any additional damage - and no collection will include the removal of complete individuals. From anemones, soft corals zoanthids, corrallimorphs, hydroids and clams only small portions of the tentacles or mantle are to be removed. From reef-building corals only a single fragment will be removed per colony. The target species are mostly colonial organisms and will successfully re-grow removed tissue within 2-3 months. Tissue removal will be done using clippers or a small chisel (for hard corals) and scissors for soft-bodied organisms (such as anemones, clams, zoanthids).

Impact on the population is further reduced by collecting no more than 3-4 individuals at each location with the exception of the following common coral species: *Pocillopora damicornis, Pocillopora verrucosa, Stylophora pistillata* and *Seriatopora hystrix*. In order to study the connectivity and population structuring at least 20 individuals are needed at each location from each species. Species in the genus Pocilloporidae are fast-growing branching species and from previous studies that followed colonies over time we have found no harmful effects of removing a small branch fragment.

7. Duration of Project: From 15/09/2007 To 15/10/2007

8. Location of Project:

Note: Permits are not normally issued to collect in Nature Reserves or National Parks. Applications to collect in Nature Reserves or National Parks shall be supported by full reasons.

Suggested sampling locations are:

1. Broome
2. Dampier Archipelago Marine Park
3. Ningaloo Marine Park
4. Shark Bay Marine Park
5. Jurien Bay Marine Park
6. Shoalwater Islands Marine Park

All collections are low-impact and have no foresee-able long term effects on organisms (see also question 6).

9. Specimens to be Collected/Captured:

Common Name	Scientific Name	Number
1. Anthozoa		
1.1 Scleractinia (Reef-building corals) (branch clipping), any available genus but particularly Acroporidae, Pocilloporidae, Faviidae, Poritidae, Fungidae and Mussidae		
1.2 Actinaria, mainly Heteractis sp.		

1.3 Corralimorpharia, mainly Discosoma sp.
1.4 Zooanthidea (Zoanthids), mainly Zoamus sp. and Palythoa sp.
1.5 Alcyonacea (soft corals), any available genus
2. Hydrozoa. (hydroids) mainly Millipora sp.
3. Mollusca. only Tridacnea sp (Giant clam)

At each site no more that 200 individual samples will be collected and this number include sthe more intensively sampled species (see question 6). Also, no more than 3-4 individuals will be sampled from a single species except from the four target (more intensively) species (see question 6).

10. Will collecting be done by yourself? ☒ **Yes** ☐ **No**

11. If NO, list names and addresses of collectors on a separate sheet.

12. Ultimate fate of fauna taken: Preservation and DNA analysis

13. (a) Relevant Institution Animal Ethics Approval No. n/a
(Please attach copy)

(b) For PhD or Masters level projects, attach copy of proposal ☐ **Yes** ☒ **No**

14. Means, Facilities and Place of Holding: Centre for Marine Studies, The University of Queensland, St. Lucia QLD4072

15. What Reporting or Publications if any, will follow:
Data from this study will lead to at least two publications in Scientific Peer reviewed international journals.

16. Are associated with a

(i) Scientific Institution, University or other tertiary institution etc? ☒

(ii) Private consulting group ☐

(iii) Private individual

If (i), above name of Institution and Head of Department

17. If YES, name of Institution and Head of Department:

Centre for Marine Studies, The University of Queensland, St. Lucia, QLD 4072.
Head of Department: Professor Ove Hoegh-Guldberg

18. **The following declaration must be completed by Head of Department:**

I hereby certify that this is a bona fide scientific fauna project and that fauna will not be used for exhibition or sale.

Signature of officer in Charge: _____

Name: Ove Hoegh-Guldberg Date 07-08-2007

Name and Address of any Organisations sponsoring project

19. **Name of Project/Student Supervisor:** Ove Hoegh-Guldberg

Supervisor Contact telephone No. : 07 3365 1156

Supervisor Contact e-mail address: ovehg@uq.edu.au

20. **What is the financial basis for this research?**

- ☐ direct financial gain (e.g. consulting fees)
- ☐ indirect financial gain (e.g. grants or funding tied to information resulting from research)
- ☐ commercial gain from sale of information derived from the research
- ☒ no financial gain of any form

21. **Names and Addresses of two Scientists who may be consulted about the qualifications of the Applicant.**

(a) Name: Dr Todd LaJeunesse

Address: (Florida International University - lajeunes@ fiu.edu

(b) Name: Dr Mike Lesser

Address: University of New Hampshire (mpl@ceisunix.unh.edu)

22. **I hereby certify that the information provided in this application is true and correct.**

Signature of Applicant: _____ **Date:** 7/8/07

I:\calm forms\forms-Reg 17 Application

Enquiries: Wildlife Clerk
Phone: (08) 9334 0439
Fax: (08) 9334 0278
E-mail: Danny.Stefoni@dec.wa.gov.au

To the Applicant

Dear Sir/Madam,

When completing the Regulation 17 Application for a Licence to take Fauna for Scientific purposes please note the following:-

(1) EXPORTS

Within Australia

In the case of an applicant who wishes to send material collected under a Reg.17 licence out of Western Australia (WA) to other parts of Australia then application for a State Government Department of Environment and Conservation (DEC) Reg.18 export licence must be made prior to transport.

After collecting activities have been completed, the licensee or authorised agent must apply for this export licence and supply in writing: the number and types of specimens (keyed out and identified as accurately as possible) and the dates & locations from where they were collected, date of shipment, name & address of receiver. Note that Import licenses may need to be obtained from the relevant State Government 'receiving' state or territory.

DEC export licenses can be applied for by letter, fax 08 9334 0278 or by e-mail Danny.Stefoni@dec.wa.gov.au or Peter.Mawson@dec.wa.gov.au

There is nil fee for bone fide scientific exports and at least three working days should be allowed for processing.

Outside Australia

In the case of an applicant who wishes to send material collected under a Reg.17 licence overseas, then application for a State Government DEC Reg.18 export licence must be made prior to transport.

After collecting activities have been completed, the licensee or authorised agent must apply for this export licence and supply in writing; the number and types of specimens (keyed-out and identified as accurately as possible) and the dates & locations from where they were collected, date of shipment, name & address of receiver. DEC export licenses can be applied for by letter, fax 08 9334 0278 or by e-mail Darryl.Stefonia@dec.wa.gov.au or Peter.Mawson@dec.wa.gov.au

There is nil fee for bone fide scientific exports and at least two working days should be allowed for processing.

Additionally, Federal Government export licenses need to be applied for prior to shipment of collected material out of Australia. Application is to be made to International Wildlife Trade, Department of the Environment and Heritage, www.gen.gov.au / GPO BOX 787, CANBERRA, A.C.T. 2601. Phone +61 02 6274 1900, fax +61 02 6274 1921 or e-mail wildlifetrade@deh.gov.au

At least 10 working days need to be allowed for processing and any costs can be determined by enquiry

(2) SPECIMEN LODGEMENT

Reg.17 licence applicants are to note and fulfill the following conditions associated with this licence.

All holotypes and syntypes and a half share of paratypes of species or subspecies permitted to be permanently taken under this licence shall be donated to the Western Australian Museum. Duplicates (one pair in each case) of any species collected which represents a significant extension of geographic range shall be donated on request to the Western Australian Museum

To prevent any unnecessary collecting in this state, all specimens and material collected under the authority of this license shall, on request, be loaned to the Western Australian Museum. Also, the unused portion or portions of any specimen collected under the authority of this license shall be offered for donation to the Western Australian Museum or made available to other scientific workers if so required.

To liaise with the relevant curator (or delegate) of Western Australian Museum, Francis Street, Perth, Western Australia, 6000, phone 08 9427 2700, fax 09 9427 2882 or e-mail reception@museum.wa.gov.au

In order to facilitate these requirements, both overseas residents and non West Australian-based Australian resident licensees should donate all collected specimens, samples etc. to the WA Museum prior to their departure. The museum will then take their share entitlement as above and then forward the balance to the collector at his or her nominated address. As the WA Museum has export clearance then this negates the need for export licence application as previously discussed above.

(3) REPORTS

Reg.17 licence applicants are to note and fulfil the following condition associated with this licence.

Within one month of the expiration of this licence (or at such other time or times as the Director General may determine) the holder shall furnish to the Director General a return setting out in full detail the number of each species of fauna taken during the currency of the licence, the localities where the species was/were taken and the method of handling of such fauna and disposal of specimens. A copy of any paper or report resulting from this research should be lodged in due course with the Director General. In the case of consultants, a list of the fauna handled, the localities involved and a copy of the interpretive data prepared should be lodged.

Please mark all reports & correspondence to the attention of the Wildlife Clerk.

(4) GENERAL

If any applicant for a Reg.17 licence will not or cannot adhere to the above requirements which form part of this licence, then NO licence will be issued.

Yours sincerely,

D Stefoni

....

for Keiran McNamara
DIRECTOR GENERAL

9 August 2007

[illegible] \Shared Data\Calm forms\"Reg 17 Supplement"

Department of
Environment and Conservation

RETURN APPLICATION TO:
Department of Environment and Conservation
Wildlife Licensing Section
Locked Bag 30 Bentley Delivery Centre, Western Australia, 6983
Fax (08) 9334 0278

REGULATION 4 AUTHORITY

APPLICATION TO ENTER DEPARTMENT OF ENVIRONMENT AND CONSERVATION LANDS AND/OR WATERS FOR THE PURPOSE OF UNDERTAKING RESEARCH

APPLICABLE TO REGULATIONS 8, 10, 12, 18 AND 31 OF THE CONSERVATION AND LAND MANAGEMENT REGULATIONS 2002

- Please complete ALL sections of this application
- Please allow 20 working days to process application

1. **Name of Applicant:**

Surname: Hoegh-Guldberg **Given Names** Ian Ove

Address: Centre for Marine Studies
The University of Queensland **Phone Contact – Work: 07 3365 1156**
Home: 0401 106 604

Postcode: 4072 **Fax No.** 0733654755

Email: oveh@uq.edu.au

2. **Department/Institution/Company/School/Club etc.**

See attached letter
(A letter of support from the Head of your organisation should be attached to this application)

3. **Names of other participants:** Dr. Maoz Fine, Dr. Sophia Dove, Dr. Effrat Fine will be assisting with sample collections

4. **Which DEC LAND / WATER (e.g. National Park, Nature Reserve, Marine Park, State Forest) will research be undertaken in?**
(Details of name/s, number/s and actual location/s)

1. Broome
2. Dampier Archipelago Marine Park
3. Ningaloo Marine Park
4. Shark Bay Marine Park
5. Jurien Bay Marine Park
6. Shoalwater Islands Marine Park

5. **Purpose of project:** The project aims to address a number of important questions. Thus far diversity of symbiotic dinoflagellates that are found within the tissues of a wide range of marine invertebrates on the Western Australian is largely unknown. These dinoflagellates can influence the capacity of their hosts to respond to (changed) environmental conditions. Therefore our selected sampling locations range from temperate to tropical environments as well as an inshore area (Shark Bay). Further by sampling a few target species (Pocilloporidae) more intensely we will be able to assess whether symbiont diversity from these target species differs dramatically

from their Pacific and Western Indian Ocean counterparts. With this information we will be able to asses connectivity between the oceans and the nature of presem bounderies (ecological, evolutionary, physical). Particularly assessing the level of connectivity along the WA coast as well as ocean-wide will be of great use to determine suitable locations for Marine Protected Areas.

6. **Applicants are required to submit a copy of their research proposal (including any maps of the proposed study sites) with this application.**

See 1 page outline attached. This is a project being pursued as part of Program 4, within the ARC Centre for Excellence (http: www.coralcoe.org.au). This centre for excellence is being funded until 2010.

7. **If you propose to collect specimens, state common and scientific name/s:**

(a) **Species to be taken:**

1. Anthozoa

1.1 Scleractinia (Reef-building corals) (branch clipping), any available genus but particularly Acroporidae, Pocilloporidae, Faviidae, Poritidae, Fungidae and Mussidae

1.2 Actinaria, mainly Heteractis sp.

1.3 Corralimorpharia, mainly Discosoma sp.

1.4 Zooanthidea, mainly Zoantus sp. and Palythoa sp.

1.5 Alcyonacea (soft corals), any available genus

2. Hydrozoa, (hydroids) mainly Millipora sp.

3. Mollusca, only Giant clams (Tridacnea)

(b) **Parts to be taken:** Small fragments or tissue of no larger than 2 cm^2. No collection will include the removal of complete individuals. From anemones, soft corals zoanthids, corrallimorphs, hydroids and clams only small portions of the tentacles or mantle are to be removed. From reef-building corals only a single fragment will be removed per colony. Most collected species are colonial organisms that will re-grow removed tissue within 2-3 months.

(c) **Purpose of samples:** DNA analysis to assess the diversity of the symbiotic dinoflagellates living inside the tissues of collected host species as well as the population structure and connectivity of four common coral species (see below).

(d) **Quantity to be collected:** From each collected species no more than 3-4 individuals will be sampled at each location except from the following coral species: Pocillopora damicornis, Pocillopora verrucosa, Stylophora pistillata and Seriatopora hystrix. In order to study the connectivity and population structuring at least 20 individuals will need to be sampled at each location from each species. At each site no more that 200 individual samples will be collected.

(e) **Where will the specimens be lodged?** The Centre for Marine Studies, University of Queensland, St. Lucia, QLD4072, Australia.

(f) **Method of collection:** Clippers (for corals) and scissors (for soft bodied animals such as anemones, zoanthids, soft corals, clams, hydroids)

8. **Who will supervise the work?** Ian Ove Hoegh-Guldberg

9. **Starting and finishing date:** 15 September 2007 to 15 October 2007

10. **Are vehicles / vessels to be used on the National Parks/Nature Reserves/Marine Parks? If so, give details including make, type, registration number, vessel call sign and marine radio type (27 mHz or Mar VHF).** NO

11. **Nature and location of proposed accommodation:** Yet to be booked, nearby towns, private accommodation (hotel, apartment, camping)

12. **Will the study sites be reference marked? If so, how?** NO

13. **How long will the reference marks remain:** n/a

13.1 **When will the reference markers be removed:** n/a

Please read and sign the following declaration:

I AGREE THAT:

I will comply with the provisions of the Wildlife Conservation Act and Regulations and the Conservation and Land Management Act and Regulations and all conditions applicable to the issue of this Authority.

Signature of Applicant

7 / 8 /2007

Dear Tim,

Thank you for offering to collect samples for us. Below are some instructions for sampling the pocilloporids of Shark Bay. Basically, we need 20 samples from each of Pocillopora damicornis, Pocillopora verrucosa and Stylophora pistillata. We have prepared a box of tubes and some sampling equipment.

Regards, Ove (address - see card; email = OVEH@UQ.EDU.AU)

Instructions =

① Collect a small fragment (branch tip 2-3 cm) - use plastic bags that match up with the tubes. Samples will be fine if left in the bags in a cool spot for several hours.

② Break up collected fragments so that they will fit into the tubes. Try to get as much into the bags as possible.

③ Fill the tubes up with the preservative and put lid on (seal tube with parafilm to prevent leakage. Preservative is not dangerous but it is a good idea to use the gloves provided.

④ Record species, Latitude and longitude, and depth on the sheet.

⑤ Add any notes that might help (ie colour of coral, anything about the community etc.)

⑥ Send us an email when you have collected the samples. We will arrange for them to be couriered over to the University of Queensland.

Thanks once again,

Ove.

ID	Species	Lat. + long + depth	Notes
MM 1			
MM 2			
MM 3			
MM 4			
MM 5			
MM 6			
MM 7			
MM 8			
MM 9			
MM 10			
MM 11			
MM 12			
MM 13			
MM 14			
MM 15			
MM 16			
MM 17			
MM 18			
MM 19			
MM 20			
MM 21			
MM 22			
MM 23			
MM 24			
MM 25			
MM 26			
MM 27			
MM 28			
MM 29			
MM 30			
MM 31			
MM 32			
MM 33			

ID	Species	lat, long, depth	Notes.
MM34			
MM 35			
MM 36			
MM37			
MM 38			
MM39			
MM 40			
MM 41			
MM 42			
MM 43			
MM44			
MM 45			
MM 46			
MM 47			
MM 48			
MM 49			
MM 50			
MM 51			
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MM 62			
MM 63			
MM 64			
MM 65			
MM 66			
MM 67			

Appendix VI. Crisis Management Plan (CMP) January 2008

CRISIS MANAGEMENT PLAN (CMP) FEBRUARY 2008

CORAL HABITAT MAPPING PROGRAM: SHARK BAY

IN CASE OF A MEDICAL EMERGENCY:

- Provide immediate first aid. There is a comprehensive first aid kit on the vessel/base camp. The vessel/base camp also has medical oxygen and delivery equipment for up to 1 hour.
- Seek immediate medical emergency advice by calling the RFDS telephone number 1800 625 800. If this number does not connect use (08) 9417 6364. Follow the advice given by the RFDS concerning medical assistance to the patient and emergency evacuation procedures.
- The survey SAT phone number is 0420 106 332 and will be checked daily
- The airstrips at Denham and Useless Loop are registered with the RFDS and can be used for a medical evacuation if the RFDS assess the situation as critical. They will advise which airstrip is the most appropriate.
- There is a nursing post in Denham situated at 33 Hughes Street, phone (08) 9948 1213. There is an ambulance based in Denham (call 000 for ambulance). There is a nursing post at Useless Loop situated in the main street (Salina Street), phone (08) 9948 0217.
- Each leader has a copy of the Crisis Management Plan which should be carried on their person at all times.