Coral Bay reef recovery study: 2008 survey

Field Operations Plan

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Department of Environment and Conservation

MARINE SCIENCE PROGRAM
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Contents

Background

Coral reefs are highly dynamic systems in which the frequency and intensity of disturbance is an important determinant of community structure (Connell 1978; Pickett & White 1986; Connell *et al.* 1997). Some reefs are resilient to some disturbances, while others are not. Understanding of the conditions that promote recovery and resilience is essential for future effective management of the world's coral reefs, and this understanding requires comparison of long-term studies of reef responses to disturbance. Despite considerable current interest and obvious management applications, surprisingly few studies documenting the long-term responses of coral reefs to disturbance have been published in the scientific literature (Connell *et al.* 1997; Brown *et al.* 2002; Halford *et al.* 2003; Berumen & Pratchett).

In 1989, Simpson et al. (1993) documented a novel form of disturbance in coral reef habitats: unusually calm wind and sea conditions coincident with mass coral spawning caused a dystrophic crisis (*sensu* (Adjeroud *et al.* 2001)) in Bill's Bay, Ningaloo Reef WA, as the respiratory demand of the spawn slick followed by its *in situ* decomposition apparently depleted available oxygen in the water column and sediments. Studies in other coral reef environments have demonstrated extreme rates of sedimentary oxygen consumption (2.5x pre-spawning values) even during normal coral mass spawning events with fairly low levels of spawn sedimentation (Wild *et al.* 2004). Up to 100% of corals, fishes and reef invertebrates died at some sites during this event in Bill's Bay, including colonies up to 50 years old, indicating that a mass mortality of this magnitude had not occurred for at least four to five decades (Simpson *et al.* 1993). Anecdotal reports of less severe anoxic events at Bill's Bay coincident with coral spawning on several occasions since 1989 indicate that such events may not be uncommon in this location. In March/April 2008 another dystrophic crisis occurred in Bill's Bay that appears to have been the most severe in terms of area of coral mortality to occur since 1989. DEC will re-survey the existing Bills Bay long-term monitoring sites in September 2008 to quantify the extent of coral mortality and recovery associated with the event. The aim of this report is to provide information to familiarise field team staff with the project and to give logistical information that will aid the operation of the September 2008 survey.

Objective

To monitor the recovery of corals at Bills Bay from the 1989 and subsequent dystrophic crisis events.

Methods

In September 2008, we will survey all 17 established long-term monitoring sites. At each site we will survey three 50 m transects that are positioned parallel in an east-west orientation, 20 m apart. At each of the northern, central and southern (eastern end) GPS coordinate at each site, a marker buoy will be deployed. One diver will lay out the three 50 m transect parallel in an east-west orientation, 20 m apart (starting at the deployed marker buoys). The second diver will film the benthic community using a video camera in an underwater housing. Each transect will be filmed in normal definition rather than high definition format on the progressive scan setting, to avoid potential problems during the analysis stage. With the zoom set at maximum wide-angle, the camera must be held approximately 50 cm above the substrate and

positioned such that the transect tape is not in the frame. Analysis of the tapes will be performed according to Page et al. (2001), using the benthic category codes described therein. The results will be comparable with data collected in Bill's Bay in previous years by both DEC and AIMS.

Table 1. GPS coordinates (decimal degrees, datum WGS 84) of the start (east) and finish (west) of each of the three transects (north, mid and south) surveyed at the 17 sites in Bill's Bay in 2006 – these are the coordinates that will be used in 2008. These coordinates are mapped in Fig. 1. In 2006, transects at site 16b ran east from the central site 16 GPS coordinate, over a deeper more lagoonal environment relative to 16a, for which the transects ran west from the central site 16 GPS coordinate, and which was shallower.

Site	*Transect*	*Transect start (east)*		*Transect finish (west)*	
		LATITUDE	LONGITUDE	LATITUDE	LONGITUDE
1	(N)orth	S23.14090	E113.76967	S23.14099	E113.76919
	(M)id	S23.14106	E113.76970	S23.14111	E113.76924
	(S)outh	S23.14125	E113.76967	S23.14133	E113.76920
2	(N)orth	S23.14132	E113.76648	S23.14120	E113.76602
	(M)id	S23.14147	E113.76663	S23.14137	E113.76613
	(S)outh	S23.14162	E113.76668	S23.14148	E113.76627
3	(N)orth	S23.14177	E113.76264	S23.14163	E113.76222
	(M)id	S23.14205	E113.76259	S23.14192	E113.76216
	(S)outh	S23.14228	E113.76251	S23.14217	E113.76213
4	(N)orth	S23.14231	E113.75875	S23.14228	E113.75837
	(M)id	S23.14248	E113.75875	S23.14243	E113.75830
	(S)outh	S23.14279	E113.75864	S23.14274	E113.75824
5	(N)orth	S23.13635	E113.76959	S23.13627	E113.76914
	(M)id	S23.13651	E113.76956	S23.13661	E113.76911
	(S)outh	S23.13658	E113.76951	S23.13675	E113.76916
6	(N)orth	S23.13672	E113.76595	S23.13666	E113.76550
	(M)id	S23.13695	E113.76594	S23.13699	E113.76548
	(S)outh	S23.13718	E113.76599	S23.13719	E113.76559
7	(N)orth	S23.13685	E113.76189	S23.13681	E113.76138
	(M)id	S23.13713	E113.76188	S23.13700	E113.76140
	(S)outh	S23.13731	E113.76182	S23.13726	E113.76138
8	(N)orth	S23.13773	E113.75749	S23.13769	E113.75702
	(M)id	S23.13790	E113.75740	S23.13789	E113.75695
	(S)outh	S23.13810	E113.75739	S23.13812	E113.75697
9	(N)orth	S23.13032	E113.76800	S23.13040	E113.76755
	(M)id	S23.13051	E113.76802	S23.13054	E113.76761
	(S)outh	S23.13066	E113.76810	S23.13068	E113.76762
10	(N)orth	S23.13030	E113.76478	S23.13030	E113.76432
	(M)id	S23.13046	E113.76485	S23.13048	E113.76438
	(S)outh	S23.13060	E113.76492	S23.13063	E113.76443
11	(N)orth	S23.13048	E113.76017	S23.13048	E113.75968
	(M)id	S23.13072	E113.76019	S23.13076	E113.75970
	(S)outh	S23.13096	E113.76027	S23.13095	E113.75977
12	(N)orth	S23.13086	E113.75438	S23.13077	E113.75392
	(M)id	S23.13090	E113.75432	S23.13083	E113.75386
	(S)outh	S23.13115	E113.75430	S23.13117	E113.75384
13	(N)orth	S23.12461	E113.76568	S23.12465	E113.76519
	(M)id	S23.12489	E113.76566	S23.12483	E113.76520
	(S)outh	S23.12514	E113.76564	S23.12515	E113.76516
14	(N)orth	S23.12540	E113.76063	S23.12526	E113.76017
	(M)id	S23.12564	E113.76060	S23.12554	E113.76011
	(S)outh	S23.12589	E113.76054	S23.12577	E113.76014
15	(N)orth	S23.12538	E113.75751	S23.12531	E113.75705
	(M)id	S23.12560	E113.75742	S23.12559	E113.75696
	(S)outh	S23.12576	E113.75740	S23.12567	E113.75696
16a (shallow)	(N)orth	S23.12441	E113.75494	S23.12447	E113.75447
	(M)id	S23.12462	E113.75476	S23.12470	E113.75424
	(S)outh	S23.12482	E113.75467	S23.12486	E113.75425
16b (deep)	(N)orth	S23.12441	E113.75537	S23.12441	E113.75494
	(M)id	S23.12467	E113.75523	S23.12462	E113.75476
	(S)outh	S23.12477	E113.75515	S23.12482	E113.75467
17	(N)orth	S23.14665	E113.76349	S23.14648	E113.76310
	(M)id	S23.14685	E113.76349	S23.14683	E113.76302
	(S)outh	S23.14715	E113.76353	S23.14703	E113.76303

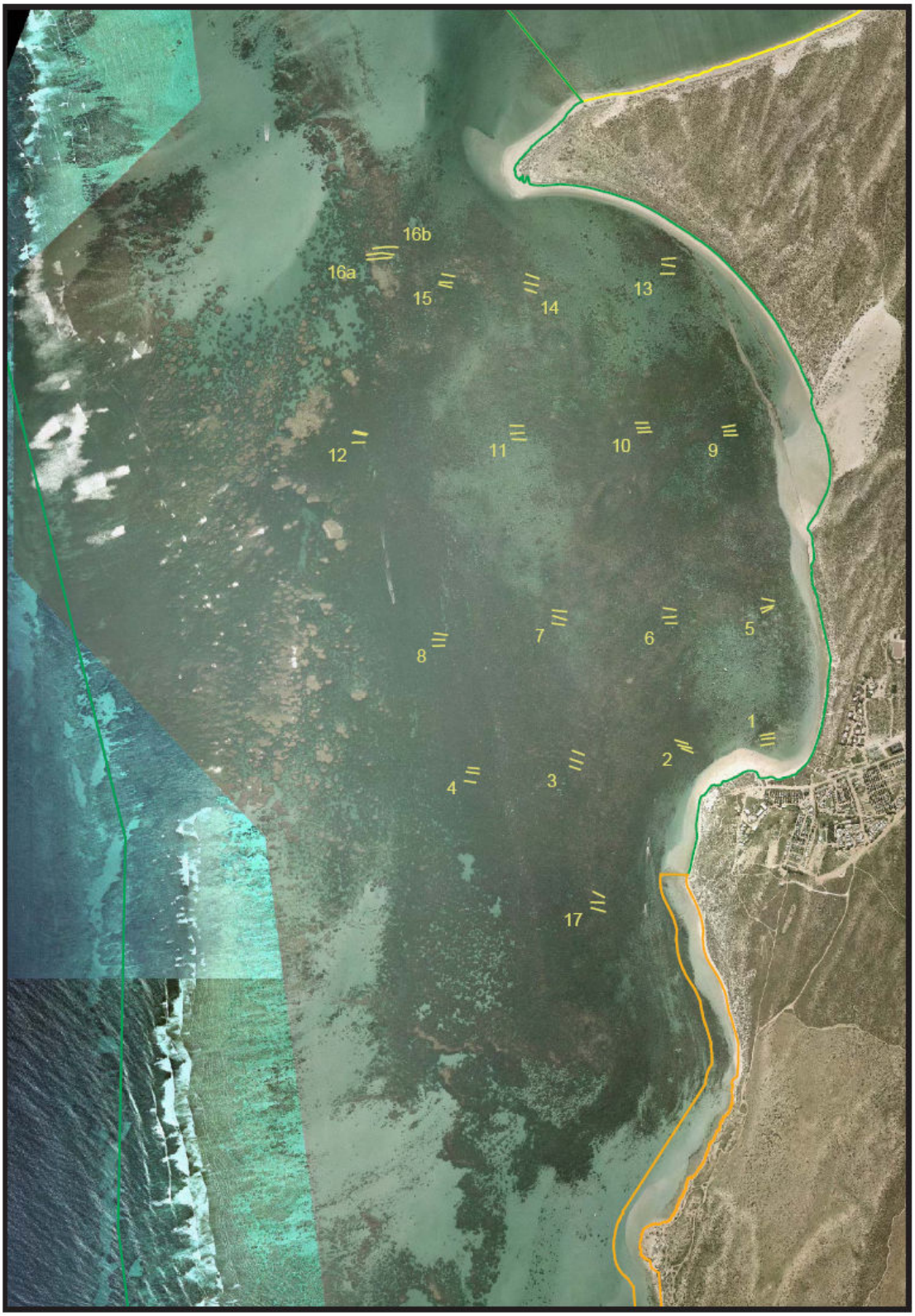


Figure 1. Position of transects (north, middle, south) at each of the 17 sites in Bill's Bay.

Field team

- Project Leader/ Diver: Shannon Armstrong (Research Scientist, DEC, Marine Science Program).
- Dive Supervisor/ Diver/ Skipper: Huw Dilley (Marine Ranger, DEC, Exmouth District)
- Diver/ Skipper: Dave Bond (Ranger, Coral Coast, DEC, Exmouth District)

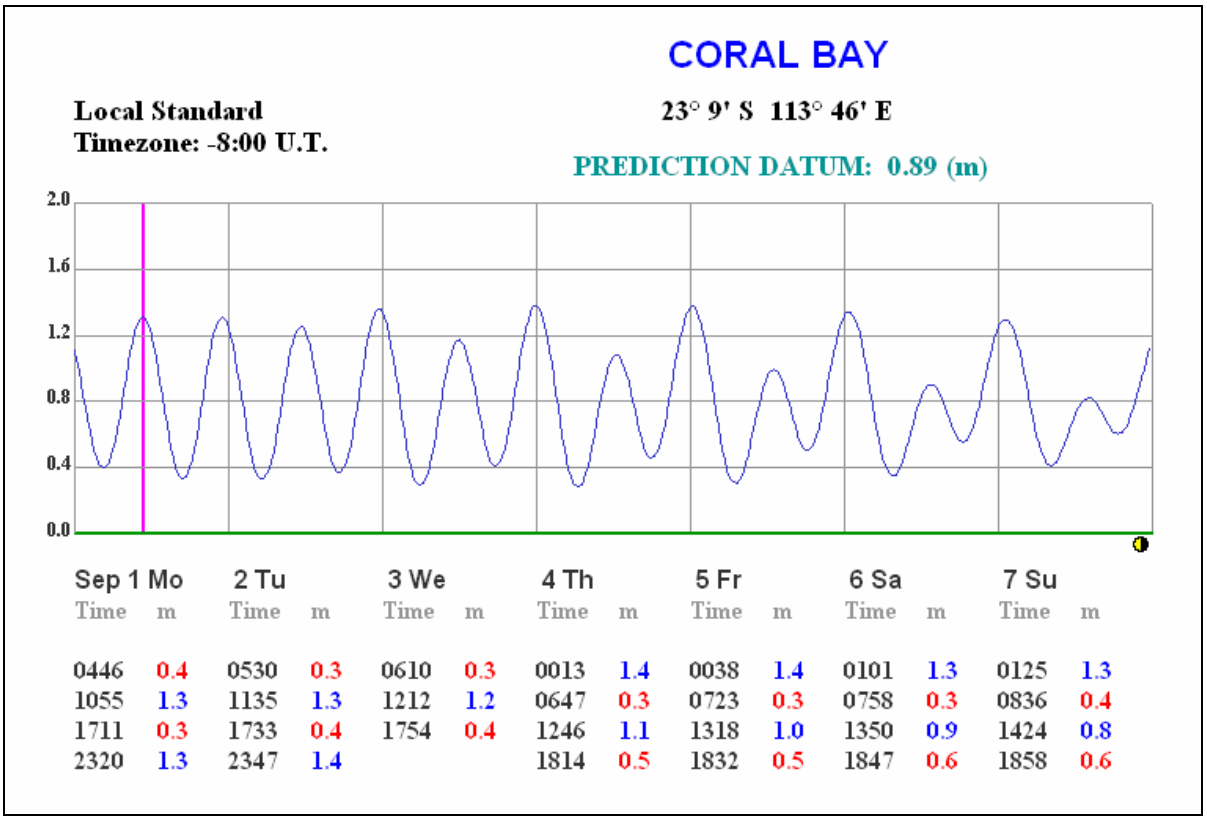
Contact details

Shannon Armstrong	0427519622
Huw Dilley	0419098305
Dave Bond	0418920331
Matt Smith	0429685110
Exmouth Office	08 9947 8000
Frazer McGregor	0427848655
CBA Coral Bay	08 99425955
Pot Shot Hotel	08 9949 1200

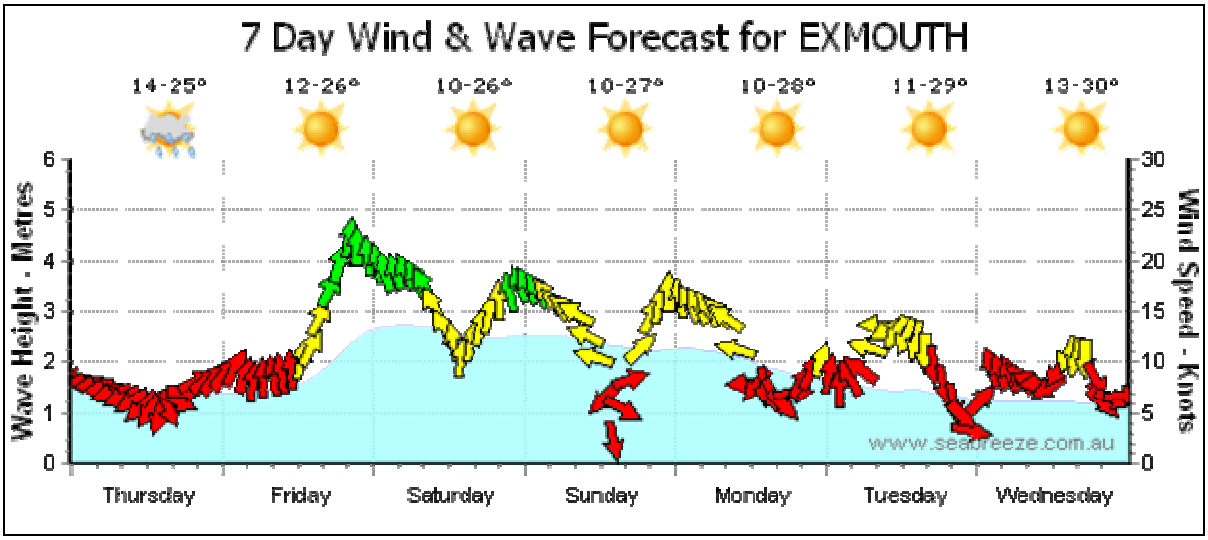
Field itinerary

Date	Activity	Logistics	Staff required
Sun 31 Aug	•Staff to arrive in Coral Bay (if not already there) •Pre-survey briefing over dinner pm	•Shannon may require lift from Learmonth to Coral Bay if possible - TBD •Yardiyarra to be put in the water and on mooring if possible	Shannon Armstrong Huw Dilley Dave Bond
Mon 1 Sept	•In field training of methods •Survey 2 sites (SCUBA)	Yardi on mooring over night	Shannon Armstrong Huw Dilley Dave Bond
Tue 2 Sept	Survey 3 sites (SCUBA)	Yardi on mooring over night	Shannon Armstrong Huw Dilley Dave Bond
Wed 3 Sept	Survey 3 sites (SNORKEL)	Yardi on mooring over night	Shannon Armstrong Huw Dilley Dave Bond
Thur 4 Sept	Survey 3 sites (SCUBA)	Yardi on mooring over night	Shannon Armstrong Huw Dilley Dave Bond
Fri 5 Sept	Survey 3 sites (SCUBA)	Yardi on mooring over night	Shannon Armstrong Huw Dilley Dave Bond
Sat 6 Sept	Survey 3 sites (SNORKEL)	Yardi on mooring over night if applicable	Shannon Armstrong Huw Dilley Dave Bond
Sun 7 Sept	Survey Contingency Day	Staff return to Exmouth PM	Shannon Armstrong Huw Dilley Dave Bond
Mon 8 Sept	Staff return to normal duties	Shannon flys back to Perth TBD	Shannon Armstrong

Forecasted tide and weather conditions



Sep 1 Mo		2 Tu		3 We		4 Th		5 Fr		6 Sa		7 Su	
Time	m	Time	m	Time	m	Time	m	Time	m	Time	m	Time	m
0446	0.4	0530	0.3	0610	0.3	0013	1.4	0038	1.4	0101	1.3	0125	1.3
1055	1.3	1135	1.3	1212	1.2	0647	0.3	0723	0.3	0758	0.3	0836	0.4
1711	0.3	1733	0.4	1754	0.4	1246	1.1	1318	1.0	1350	0.9	1424	0.8
2320	1.3	2347	1.4			1814	0.5	1832	0.5	1847	0.6	1858	0.6



Accommodation

Accommodation will be land based. DEC staff accommodation in Coral Bay will be utilized.

Safety

To ensure the safety of all survey personnel a dive plan will be lodged to and approved by the Departmental Dive Officer prior to commencement of the survey. A

field trip advice form containing preferred methods and details of communication contact will be lodged with the Exmouth DEC and Science Division offices.

The skipper of the vessel will be responsible for boating and navigation in accordance with the 'Safe Marine Operations in Calm Procedure Guidelines (2002)'.

Diving will be in accordance with the 'CALM Diving Code of Practice (2005)'. Huw Dilley (Exmouth District) will be the Dive Supervisor and will be responsible for all diving activity. Snorkelling will be undertaking in accordance with the 'CALM Diving Code of Practice (2005)'.

All other safety issues shall be in accordance with the CALM Occupational Health and Safety Procedures Manual (1995).

Budget

	Item	MSP Cost $	Exmouth Cost $
Staff Salary	Shannon Armstrong - 33 days (office and field) Huw Dilley Dave Bond	11'066	 x x
Equipment	Mini DV cassettes x 20	100	
Data analysis	54 transects @ ~ $35 per transect	1'890	
Vehicle/Vessel	Fuel, maintenance, other		x
Travel	Airfare Bus shuttle Excess baggage	700 100 50	
Other	Food	500	
TOTAL		14'406	x

Equipment

Video photography
MSP Sony digital video camera with battery packs (4) and chargers (2)
Amphibico underwater video housing
Housing O-ring kit and silicone grease
Instruction manuals
Digital video tapes (20)
Leads, spares

Still photography
Sony cybershot with underwater housing
2x 512 Mb flash memory cards
Battery charger
Silicone grease

Photographic backup gear
Backup of all of the above

Other survey gear
Magnadoodle (=underwater clapperboard) x2
HB Pencils and sharpener
4x 50 m transect tapes
3 x marker buoy on 10 m line, with dive weight
Waterproof handheld GPS spare batteries, waterproof bag
2 x wrist compasses
2 catch bags

Data sheets
Video transect data sheets
Habitat data sheets

Dive gear
Personal dive gear (fins, mask, weight belt, wetsuits)
3 x BCD's, regs, occys and computers
2 spare masks and snorkels
2 spare pairs of fins
2 filled tanks per diver per diving day (to be hired in Coral Bay or brought from Exmouth District) Note: 1 cylinder can probably be used for two dives).
Save a dive kit (basic dive repair kit)

Safety
Diving first aid kit containing emergency response flow chart and contacts, patient information log, accident log sheets
Oxy-viva units (available on board Yardiyarra)
Sunscreen
Sunglasses
Water
Dive flag
Communication