MARINE RESERVE IMPLEMENTATION:
MIDWEST

BIOLOGICAL VERIFICATION OF THE MAJOR BENTHIC HABITATS OF THE PROPOSED SOUTHERN EXTENSION TO THE NINGALOO MARINE PARK (AMHERST POINT TO RED BLUFF): 18-24 OCTOBER 1999

Field Programme Report: MRI/MW/NSE – 24/1999

A collaborative project between
CALM's Marine Conservation Branch and Midwest Regional Office

A project partially funded through
the Natural Heritage Trust's Coast and Clean Seas Marine Protected Areas Programme
Grant No G024/97

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ACKNOWLEDGEMENTS

Direction

- Dr Chris Simpson - Manager, Marine Conservation Branch (MCB)

CALM Collaboration

- Kelly Gillen – Regional Manager, Midwest Region
- Kevin Bancroft - Marine Conservation Officer, MCB
- Ray Lawrie - Marine Information Officer, MCB
- Mike Lapwood - Marine Operations Officer, MCB
- Liesl Jonker - Marine Planning Officer, MCB

Funding and Resources

- Partial funding of $22,000 has been provided by the National Heritage Trust, via the Coast and Clean Seas Marine Protected Areas Programme (Grant No G024/97).
- Support in the form of technical, logistical and human resources, has been provided by the Department of Conservation and Land Management ($50,000).

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Copies of this report may be obtained from:

Marine Conservation Branch
Department of Conservation and Land Management
47 Henry Street, Fremantle, Western Australia, 6160
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SUMMARY

This field program report presents planning details for a field survey of the major benthic habitats of the southern section of the Ningaloo Reef, from Amherst Point to Red Bluff. This section of coastline includes the proposed southern extension to Ningaloo Marine Park. The survey is to be conducted during 18-24 October 1999 and coordinated by CALM's Marine Conservation Branch in collaboration with CALM's Midwest Regional Office.

Partial funding of $22,000 for the project has been obtained through Environment Australia's Natural Heritage Trust, via the Coast and Clean Seas Marine Protected Areas Program. The MCB will contribute resources to the value of approximately $50,000 to the project.

The primary objectives of this survey are: (a) to ground-truth the major marine habitats of the area, and; (b) to document the diversity of coral and fish species at representative sites within selected habitats. The secondary objectives of the survey are: (a) to establish the location of prominent terrestrial and marine landmarks in order to spatially rectify Landsat satellite images of the area, which will be used as a basis for the habitat map, and; (b) to opportunistically collect photographic stills and digital video footage, which characterise key flora, fauna, habitat type and human usage, for use in the public participation and marine reserve planning processes. These data will also be of use for ongoing management purposes.

The locations of the field survey sites have been pre-selected, based on preliminary interpretations of habitat distributions from aerial photographs and satellite imagery. Approximately 85 sites will be surveyed during this period.

The data to be acquired during this survey will be important in the determination of the relative conservation values of the respective major habitats of the proposed Ningaloo Reef southern extension. It will also contribute to the information base required for the marine reserve planning process, during which marine reserve boundaries and zones for multiple-use will be considered for the area.

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1. INTRODUCTION

1.1. GENERAL BACKGROUND

This report presents details of a shore-based field survey to be undertaken from the 18th to 24th October 1999, to ground-truth the biological and spatial accuracy of CALM's benthic habitat map for the waters of the proposed extension to the Ningaloo Marine Park, between Amherst Point and Red Bluff.

In recognition of the importance of conserving the State's marine biodiversity, the Minister for the Environment established the Marine Parks and Reserves Selection Working Group (MPRSWG) in 1986. The main aim of the MPRSWG was to identify representative and unique areas of Western Australia's marine waters for consideration as part of a statewide system of marine conservation reserves under the *Conservation and Land Management (CALM) Act* 1984. The MPRSWG's report was released in June 1994 and identified over seventy such candidate areas throughout the coastal waters of Western Australia (CALM 1994).

The State's vesting body for marine conservation reserves is the Marine Parks and Reserves Authority (MPRA) which was established in 1997. The MPRA has prioritised the candidate areas for implementation as marine conservation reserves and the proposed southern extension of the Ningaloo Marine Park is one of the MPRA's high priority candidate areas.

Under the State Government's marine and conservation strategy detailed in *New Horizons - The way ahead in marine conservation and management* released by the Western Australian Government in 1998 (WA Government, undated), there is a requirement for:

> *"Extensive assessment, community consultation and management planning before a new marine conservation reserve is established."*

An essential component of this is that:

> *"A comprehensive assessment of the area's biological and economic resources, and social values is carried out."*

In view of the high standing that the southern extension to Ningaloo Marine Park has in the MPRA's priority list for new marine conservation reserves, CALM applied to Environment Australia for funding to develop an accurate habitat map of the area. Partial funding of $22,000 for the project has been obtained through Environment Australia's Natural Heritage Trust, via the Coast and Clean Seas Marine Protected Area Programme. CALM will contribute further resources to the project, valued at approximately $50,000.

The data to be acquired during this survey will be important in the determination of the relative conservation values of the respective major habitats of the proposed Ningaloo Reef southern extension. It will also contribute to the information base required for the marine reserve planning process, during which marine reserve boundaries and zones for multiple-use will be considered for the area.

CALM's preliminary habitat map for the Ningaloo Reef southern extension was derived by auto classification from Landsat Thematic Mapper satellite imagery (30 m pixel) and 1:20,000 aerial photography. This preliminary habitat map needs to be ground-truthed and spatially rectified to obtain a high level of accuracy for the final habitat map. The data to be acquired during this survey will provide the information to achieve this objective.

This survey is part of the Biological Inventory portfolio of the Marine Reserve Implementation function of CALM's Marine Conservation Branch (MCB). The survey will be coordinated by the MCB and conducted in collaboration with CALM's Midwest Regional Office.

The information gathered during this survey will complement that from other recent studies that have been performed in the Ningaloo Marine Park (D'Adamo, 1997; Cary & Grubba, 1998; Cary, *et al*., 1998; Cary, *et al*., 1999; Cary & Daly, 1999; D'Adamo, 1999).

1.2. OBJECTIVES

The objectives of this field survey are as follows.

Primary objectives are:

- To ground-truth the major marine habitats of the area, and;
- To document the diversity of coral and fish species at representative sites within selected habitats.

Secondary objectives are:

- To establish the location of prominent terrestrial and marine landmarks in order to spatially rectify Landsat satellite images of the area, which will be used as a basis for the habitat map, and;
- To opportunistically collect photographic stills and digital video footage, which characterise key flora, fauna, habitat type, and human usage, for use in the public participation and marine reserve planning processes. These data will also be of use for ongoing management purposes.

2. METHODS

2.1. SURVEY AREA

The area targeted for this survey is from Amherst Point (23º S) to Red Bluff (24º S), and extends seaward to the Limit of State Territorial Waters, described as 3 nm from the Territorial Sea Baseline (Figure 1).

2.2. SITE SELECTION

A preliminary benthic habitat map was created through auto-classification (using ER Mapper software) of Landsat data based on existing habitat ground-truthing information from Ningaloo Marine Park. Sampling sites were preselected to lie within distinct habitats as identified in the preliminary habitat map (Figures 2 & 3), and that they can be accurately located on higher resolution aerial photographs (1:20,000). The latitudes and longitudes for the preselected sites can be found in Appendix I.

Other sites can be included opportunistically, but will have a secondary priority and only be surveyed if weather and time permit. In the event of disruptions to the field work (eg. poor weather or equipment failure), priority will be given to obtaining a broad coverage of the high priority sites, in preference to a high density of sites within a specific locality.

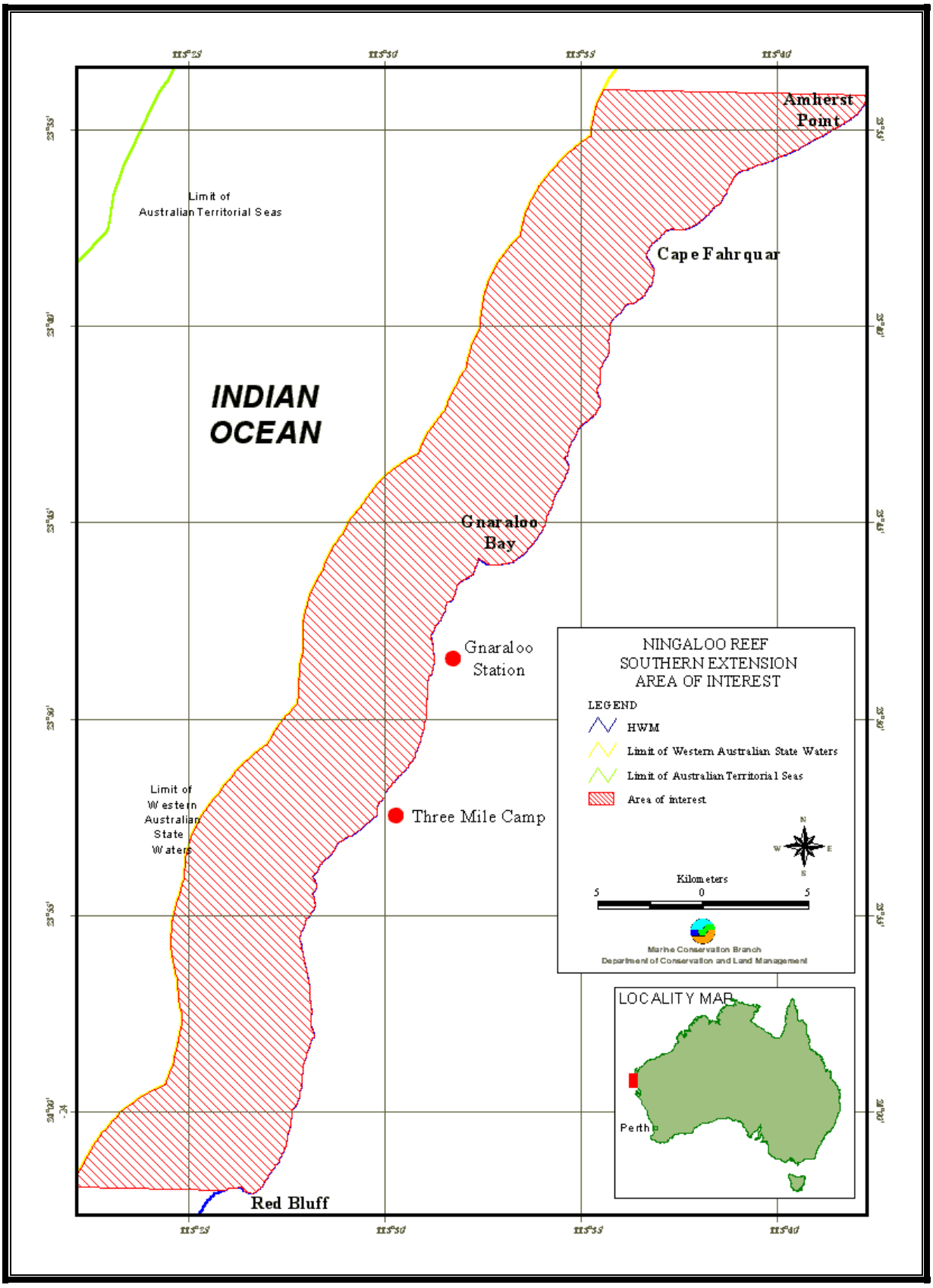

Figure 1: Location map of the proposed Ningaloo Reef southern extension.

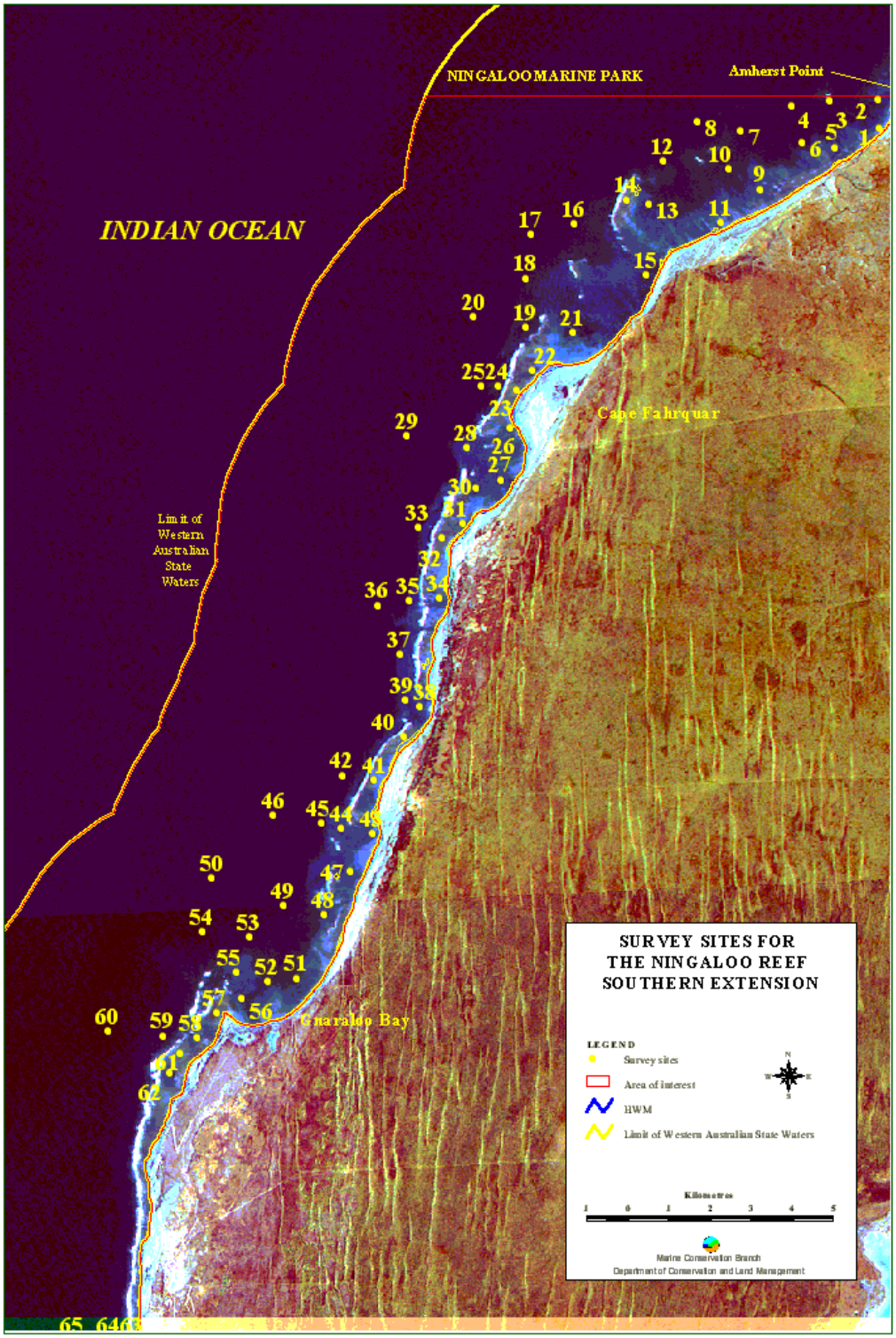

Figure 2. Northern survey sites for the proposed Ningaloo Reef southern extension

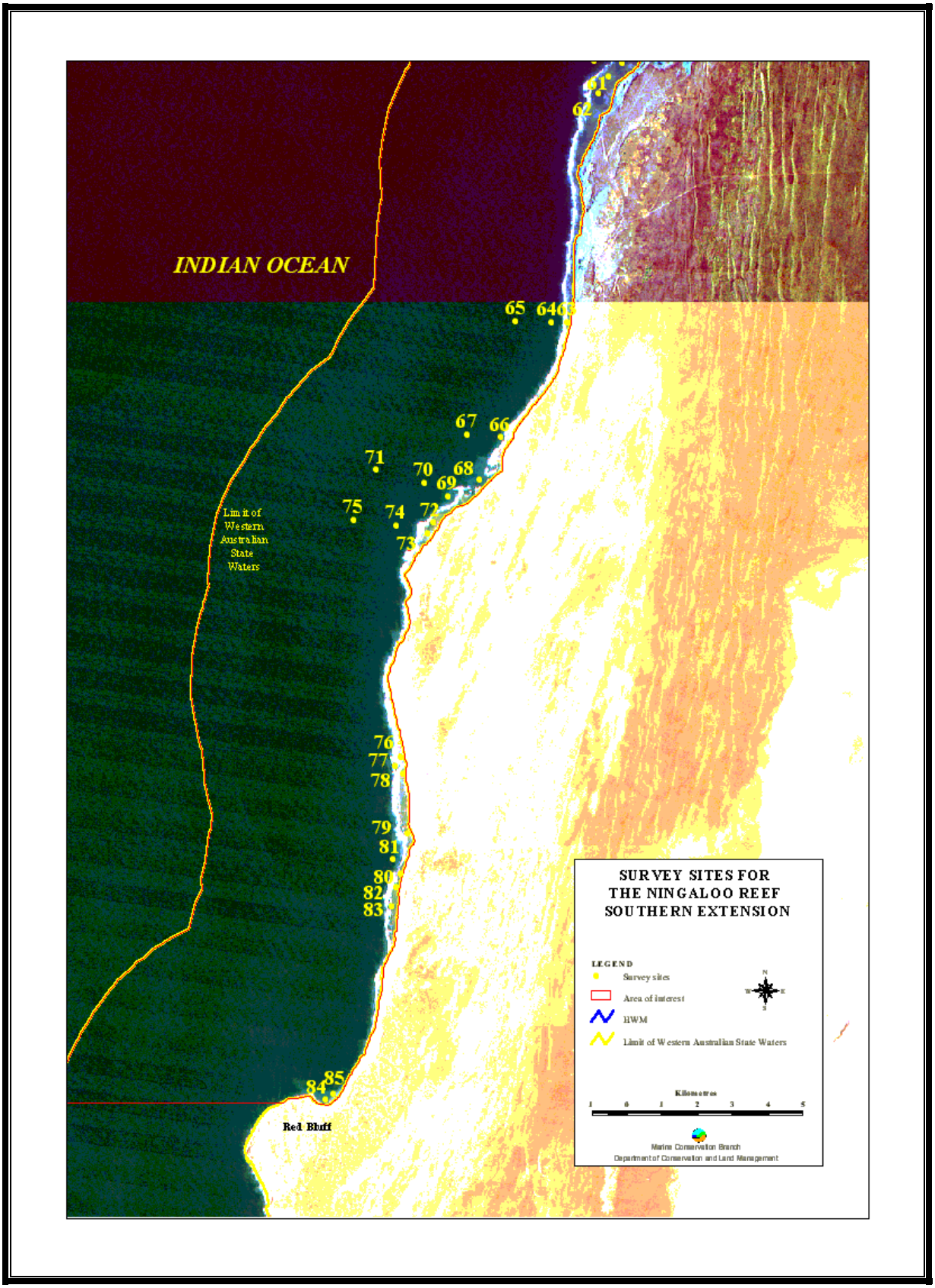

Figure 3. Southern survey sites for the proposed Ningaloo Reef southern extension

2.3. FIELD METHODS

To facilitate biological verification of the preliminary benthic habitat map, video footage of the major benthic community types (eg. coral communities, limestone platform etc.) will be filmed. Visually dominant flora and fauna will be recorded: (a) at deep sites (>5 m) using a manually deployed, underwater digital drop-down video camera system, and; (b) at shallow lagoonal sites (<5 m) using the hand held digital video camera. This will provide broadscale representation of the visually dominant flora and fauna of the proposed southern extension of the Ningaloo Marine Park.

The video camera will be lowered over the side of the field survey vessel and 30 seconds of video footage of the seabed will be recorded at each of these sites. Site number, date, time, water depth, DGPS coordinates and habitat description will be recorded on the standardised habitat data sheets (Appendix II) for each section of video footage. In addition, the DGPS coordinates of the point at which the 30 seconds of video footage ends, will be recorded. Operating instructions for the digital drop-down camera and video system are included as Appendix III.

Operating instructions for the Canon MV1 hand held video camera are included as Appendix IV.

Operating instructions for the differential GPS are included in Appendix V.

2.4. HABITAT CLASSIFICATION

Habitats will be classified as per the draft classification scheme presented in Appendix VI.

3. PROJECT MANAGEMENT

3.1. SURVEY TEAM

3.1.1. CALM Marine Conservation Branch personnel

Kevin Bancroft	Project Leader Marine Conservation Officer	Ph: 95432 5102 Mob: 0417 401 200 Fax: 9430 5408 Email: kevinb@calm.wa.gov.au
Dr Chris Simpson	MCB Manager	Ph: 9432 5100 Mob: 0419 964 766 Fax: 9430 5408 Email: chris@calm.wa.gov.au
Mike Lapwood	Skipper Marine Operations Officer	Ph: 9432 5108 Mob: 0419 045 285 Fax: 9430 5408 Email: michaella@calm.wa.gov.au
Liesl Jonker	Marine Planning Officer	Ph: 9432 5119 Fax: 9430 5408 Email: lieslj@calm.wa.gov.au

3.2. ACCOMMODATION

Accommodation is booked at the Gnaraloo Homestead over the period of the survey.

Accommodation contact:
Gnaraloo Booking Agency
Mrs Barbara Gadomski
Shop 12a, Subiaco Village,
531 Hay Street,
Subiaco 6008
Ph. 9388 2881
Fax. 9388 2887.

3.3. FIELD ITINERARY

Adverse weather and sea conditions may cause changes to the field programme. Decisions on any changes will be the responsibility of the Project Leader.

Table 1: Itinerary details for the Ningaloo Reef southern extension habitat mapping survey.

Date	Activity
18/10/99	Depart Perth for Gnaraloo Station 0300
19/10/99	Launch at south of Amherst Point Field work in area (*see* Figure 2)
20/10/99	Launch at Cape Fahrquar Field work in area (*see* Figure 2)
21/10/99	Launch at Gnaraloo Bay Field work in area (*see* Figure 2)
22/10/99	Launch at Three-Mile Camp Field work in area (*see* Figure 3)
23/10/99	Travel to Red Bluff Field work in area (*see* Figure 3)
24/10/99	Depart Gnaraloo Station for Perth 0600
25/10/99	Unpack vehicle Return hire equipment

3.4. SAFETY

3.4.1. Diving

All diving activities shall be in accordance with the 'Safe Diving in CALM: Scientific diving, September 1998' document. The Dive Supervisor, Mike Lapwood, is responsible for diving safety at all times. No SCUBA diving will be carried out. However extensive snorkelling will be conducted to record benthic assemblages.

3.4.2. Boating

Boating and navigation is the responsibility of the vessel Skipper and shall be conducted in accordance with the 'Safe Boating in CALM: Policy and procedures manual for marine operations' (Draft). The vessel Skipper will be Mike Lapwood.

3.4.3. Other safety issues

All other safety issues shall be in accordance with the CALM Occupational Health and Safety Procedures Manual and be the responsibility of the Field Team Leader, Kevin Bancroft.

In the event of adverse weather conditions, the Skipper and Field Team may alter the proposed itinerary.

3.5. COMMUNICATIONS AND EMERGENCY CONTACTS

3.5.1. General

- The vehicle is equipped with a CALM VHF radio and VHF marine radio.
- The boating party will carry a hand held VHF and will be in contact with the vehicle on channel 72.
- The survey team can be contacted by sat-phone 24 hours a day on 0011 8816 5611 2771.

If communication with the survey team is required the sat-phone number should be tried first. In the case of emergencies or if the team cannot be contacted by sat-phone, messages can be left at Gnaraloo Station (Russell and Jill Gray) on ph: 99425927 or fax 9948 5050.

Gnaraloo Station is equipped with a VHF radio and the team will log on and off with the station on a daily basis.

3.5.2. CALM Offices

Marine Conservation Branch, Fremantle:	Ph: 9432 5100 Fax: 9430 5408. CALM VHF channel 17.
CALM Geraldton	Ph: 9921 5955 Fax: 9921 5713 CALM VHF channel 17.
CALM Exmouth	Ph: 9949 1676 Fax: 9949 1580 CALM VHF channel 17.

3.5.3. Volunteer Sea Rescue Group

Coral Bay Sea Rescue Group can be contacted on 27 Mhz channels 90 & 88 (dual channel). Group phone contacts are:

Brodie Hunt
Coral Bay Adventures
Ph: 9942 5810 between 0730 and 1830 hrs

Mr. Kas Muntz
Coral Bay Supermarket
Ph: 9942 5988

3.6. BUDGET

This project is partially funded by the National Heritage Trust, Coast and Clean Seas Marine Protected Areas Programme Grant No G024/97 ($22,000).

The Department of Conservation and Land Management supports the Biological Survey of the Ningaloo Reef Southern Extension with the provision of technical, logistical and human resources ($50,000).

The budget breakdown for this field survey is described in Table 2.

Table 2: Budget breakdown for the Ningaloo Reef southern extension habitat mapping survey

Budget Item			CALM ($ in kind)	MPA funds ($)	Total costs ($)
Travel					
Vehicle	MCB Triton - 45 c per km for 3000 km (fuel included)			1350	1350
		Sub-Total		1350	1350
Accommodation					
Gnaraloo Homestead	4 persons for 6 nights @ $25 p/p night			600	600
				600	600
Staff					
C. Simpson	7 days @ $918		8262		8262
L. Jonker	7 days @ $421		1631	1316	2947
K. Bancroft	14 days @ $421		3262	2632	5894
M. Lapwood	12 days @ $361		2400	1932	4332
Camping allowance	7 days @ 5 staff @ $23.25			811	811
			15555	6691	22246
Vessel & other equipment					
Inflatable dinghy & 25 hp o/b	7 days @ $100		700		700
Fuel & oil	400 L @ $1			400	400
Hand held marine VHF radio	7 days @ $15		105		105
Drop-down camera	7 days @ $50		350		350
Backup drop-down camera	7 days @ $50		350		350
D-GPS unit	7 days @ $40		280		280
Digital video cameras (2)	7 days @ $60		420		420
Hire digital video recorder	8 days @ $40			320	320
Nikonos V & 28 mm lens	7 days @ $30		210		210
Canon EOS	7 days @ $30		210		210
		Sub-Total	2625	720	3345
Maps/Charts/Aerials					
Landsat images				1300	1300
Charts/habitat maps				250	250
		Sub-Total		1550	1550
Consumables					
Provisions	4 persons for 7 days @ $30			840	840
Digital tapes	10 @ $25			250	250
Slide film	10 rolls & processing @ $40ea			400	400
Other				400	400
		Sub-Total		1890	1890
Contingency					
Administration overruns	10% of funding			1280	1280
		Sub-Total		1280	1280
		TOTAL	**18180**	**14081**	**32261**

3.7. EQUIPMENT HIRE

Digital Video record/playback unit

Bard Productions
Mr Rob Bygott
23 Chadwick Street
Hilton
WA 6163
Ph: 9331 5881
Fax: 9331 5882

3.8. EQUIPMENT

3.8.1. Boating

CALM DGPS unit
Backup GPS unit
Charts
Site map/coordinates
First aid kit
Sunscreen
Hats
Wet weather gear
Snorkelling gear
3x20 L fuel drums
Drum pump
20 L outboard oil

3.8.2. Drop down camera and digital underwater cameras

Canon MV1 digital & housing (Unit 1)
Canon MV1 digital & housing (Unit 2)
TV/video unit
Backup 6" monitor and video recorder
Drop down camera and cable
Backup drop down camera and cable
12 v truck battery x 2
12 v motorbike batteries x 6
Battery charger x 2
Cigarette lighter adaptor x 2
Spare splitter
Digital video tapes (10 x 60min)
5xVHS 180 tapes to back up.

3.8.3. Miscellaneous

Habitat data sheets
Clip boards
Waterproof paper
Clapper boards (2)
Chalk
Pens, pencils, erasers, etc.
Electrical tool box
Mechanical tool box
Desktop Computer case
Jumper leads
Gas lantern and bottle (with spare mantles)
Torch
Esky
Water coolers (2)
Glass bottom bucket
Land camera

3.8.4. Still camera equipment

Nikonos V camera
Canon EOS land camera
8 rolls slide film

4. DATA MANAGEMENT

4.1. FIELD PROGRAMME REPORT

Hard copies of the Field Programme Report will be held at three locations:

1. Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry St., Fremantle Western Australia, 6160. Ph. (08) 9432 5100 Fax. (08) 9430 5408.

2. Woodvale Library, Science and Information Division, Ocean Reef Rd., Woodvale, Western Australia, 6026. Ph. (08) 9405 5100 Fax. (08) 9306 1641.

3. Archives, Woodvale Library, Science and Information Division, Ocean Reef Rd., Woodvale, Western Australia, 6026. Ph. (08) 9405 5100 Fax. (08) 9306 1641.

The Marine Conservation Branch will hold digital copies of the Field Programme Report at three locations:

1. The Marine Conservation Branch Server:
   mcb on StreetTalk\User Data@CALM.FREM@CALM [T:/Reports/MRI/MRI_2499

2. MCB Server full backup DAT tape [T:/Reports/MRI/MRI_2499]

3. CD-ROM [MRI_2499]

4.2. DATA REPORT

The raw data to be collected during this survey will be documented in a Marine Reserve Implementation Data Report and copies will be held at the same locations as for the Field Programme Report. Data presented in the form of GIS layers will be stored digitally at three locations:

1. The Marine Conservation Branch Server:
   GIS Data@FREM.SHARED@CALM on StreetTalk [L:/GIS/MCB/MW/NSE/]

2. MCB Server full backup DAT tape [L:/GIS/MCB/MW/NSE/]

3. On GIS Information Coordinator's Computer. [H:/MCB/MW/NSE/]

4.3. VIDEO RECORDS

Video footage will be held at two locations:

1. Digital masters to be archived at the CALM Information Management Branch, Como.

2. VHS copies to be stored at CALM Marine Conservation Branch, Fremantle.

4.4. STILL PHOTOGRAPHY

All slide photographs will be held at CALM Marine Conservation Branch, Fremantle.
Digital images of selected slides will be available on the MCB slide library.

5. REPORT DISTRIBUTION

Copies of this report will be distributed to:

- Dr Chris Simpson - Manger, Marine Conservation Branch
- Kelly Gillen - Regional Manager, Midwest Region
- Chris Muller - Regional Manager, Pilbara Region
- Doug Myers - Manager, Exmouth District
- All survey team members.

6. PUBLICITY/EDUCATION

6.1. PUBLIC RELATION OPPORTUNITIES

A media statement will be released by CALM prior the start of the field survey.

6.2. EDUCATION OPPORTUNITIES

No education opportunities have been identified.

7. REFERENCES

CALM (1994). A Representative Marine Reserve System for Western Australia. Report of the Marine Parks and Reserves Selection Working Group. Department of Conservation and Land Management, Perth.

Cary J. & Grubba T. (1998). Initialisation of long-term benthic monitoring sites (Ningaloo) May 1998. Marine Management Support Field Programme Report: MMSP/MW/NMP-10/1998. Marine Conservation Branch, Department of Conservation and Land Management (Unpublished report).

Cary J., Grubba T. & Myers J. (1998). Initialisation of long-term benthic monitoring sites (Ningaloo) May 1998. Marine Management Support Data Report: MMS/PI/NMP-14/1998. Marine Conservation Branch, Department of Conservation and Land Management (Unpublished report).

Cary J., Lawrie R., Baxter K. & Fuller M. (1999). Establishment of baseline benthic monitoring sites in the Ningaloo Marine Park: Spatial rectification of aerial photography and benthic habitat ground truthing. 19 July - 2 August 1999. Marine Management Support Field Program Report: MMS/PI/NMP- 16/1999. Marine Conservation Branch, Department of Conservation and Land Management (Unpublished report).

D'Adamo N. (1997). Cross-shelf salinity-temperature surveys between Ningaloo Marine Park and adjacent waters: 20-23 January 1997. Marine Reserve Management Programme Field Programme Report: MRMP/NMP-1/97. Marine Conservation Branch, Department of Conservation and Land Management (Unpublished report).

D'Adamo N. (1999). Salinity-temperature data and contour plots from surveys conducted in Bills Bay on April 8 1994 and 29 May 1996. Marine Management Support Field Programme Report: MMS/PI/NMP-19/1999. Marine Conservation Branch, Department of Conservation and Land Management (Unpublished report).

Daly T. & Cary J. (1999). Establishment of baseline benthic monitoring sites in the Ningaloo Marine Park. August 1999. Marine Management Support Field Program Report: MMS/PI/NMP- 17/1999. Marine Conservation Branch, Department of Conservation and Land Management (Unpublished report).

WA Government (undated). New Horizons, the way ahead in marine conservation and management. Prepared for the Western Australian Government by the Department of Conservation and Land Management, Perth, Western Australia.

8. APPENDICES

APPENDIX I: LATITUDE/LONGITUDE FOR PRESELECTED SAMPLING SITES

Site No	AMG 50 Northing	Easting	Latitude ADG84 Deg Min	Longitude ADG84 Deg Min
GBC_001	163090.29	7388860.67	-23º 34.5390’	113º 41.9748’
GBC_002	163041.37	7389539.32	-23º 34.1712’	113º 41.9550’
GBC_003	161871.73	7389509.65	-23º 34.1724’	113º 41.2680’
GBC_004	160943.98	7389381.76	-23º 34.2300’	113º 40.7220’
GBC_005	161999.51	7388384.04	-23º 34.7832’	113º 41.3280’
GBC_006	161227.50	7388512.86	-23º 34.7040’	113º 40.8768’
GBC_007	159722.09	7388793.36	-23º 34.5330’	113º 39.9966’
GBC_008	158685.94	7389022.44	-23º 34.3962’	113º 39.3918’
GBC_009	160207.29	7387368.79	-23º 35.3100’	113º 40.2618’
GBC_010	159426.77	7387858.27	-23º 35.0352’	113º 39.8106’
GBC_011	159228.33	7386561.81	-23º 35.7342’	113º 39.6762’
GBC_012	157839.27	7388056.71	-23º 34.9080’	113º 38.8812’
GBC_013	157482.08	7387011.61	-23º 35.4690’	113º 38.6574’
GBC_014	156952.91	7387117.44	-23º 35.4048’	113º 38.3484’
GBC_015	157415.93	7385278.58	-23º 36.4056’	113º 38.5944’
GBC_016	155682.91	7386535.35	-23º 35.7036’	113º 37.5948’
GBC_017	154624.57	7386284.00	-23º 35.8260’	113º 36.9696’
GBC_018	154518.74	7385212.43	-23º 36.4044’	113º 36.8928’
GBC_019	154518.74	7384021.81	-23º 37.0488’	113º 36.8760’
GBC_020	153248.74	7384273.16	-23º 36.8964’	113º 36.1338’
GBC_021	155643.22	7383889.52	-23º 37.1346’	113º 37.5348’
GBC_022	154651.03	7382976.70	-23º 37.6158’	113º 36.9390’
GBC_023	154280.61	7382487.22	-23º 37.8756’	113º 36.7152’
GBC_024	153844.05	7382593.05	-23º 37.8126’	113º 36.4602’
GBC_025	153420.72	7382593.05	-23º 37.8072’	113º 36.2112’
GBC_026	154135.09	7381561.18	-23º 38.3748’	113º 36.6168’
GBC_027	153910.20	7380317.63	-23º 39.0450’	113º 36.4674’
GBC_028	153076.76	7381084.93	-23º 38.6190’	113º 35.9886’
GBC_029	151661.23	7381375.97	-23º 38.4432’	113º 35.1612’
GBC_030	153301.65	7380119.20	-23º 39.1440’	113º 36.1068’
GBC_031	152970.92	7379259.30	-23º 39.6054’	113º 35.9010’
GBC_032	152494.67	7378888.88	-23º 39.7992’	113º 35.6160’
GBC_033	151939.05	7379153.46	-23º 39.6492’	113º 35.2932’
GBC_034	152441.76	7377446.90	-23º 40.5786’	113º 35.5644’
GBC_035	151714.15	7377367.52	-23º 40.6122’	113º 35.1360’
GBC_036	150946.86	7377261.69	-23º 40.6596’	113º 34.6836’
GBC_037	151489.25	7376071.06	-23º 41.3106’	113º 34.9854’
GBC_038	151978.73	7374827.52	-23º 41.9898’	113º 35.2554’
GBC_039	151608.32	7374999.50	-23º 41.8920’	113º 35.0406’
GBC_040	151595.09	7374099.91	-23º 42.3786’	113º 35.0202’
GBC_041	150867.48	7373041.58	-23º 42.9414’	113º 34.5774’
GBC_042	150100.19	7373160.64	-23º 42.8670’	113º 34.1286’
GBC_043	150827.79	7371758.35	-23º 43.6356’	113º 34.5360’
GBC_044	150060.50	7371864.18	-23º 43.5684’	113º 34.0866’
GBC_045	149584.25	7371996.47	-23º 43.4904’	113º 33.8088’
GBC_046	148420.08	7372194.91	-23º 43.3680’	113º 33.1272’
GBC_047	150272.17	7370819.07	-23º 44.1360’	113º 34.1964’
GBC_048	149637.17	7369787.20	-23º 44.6862’	113º 33.8082’
GBC_049	148644.98	7369998.86	-23º 44.5584’	113º 33.2286’
GBC_050	146925.18	7370660.32	-23º 44.1780’	113º 32.2272’
GBC_051	148988.94	7368239.38	-23º 45.5148’	113º 33.4056’

Site No	AMG 50 Northing	Easting	Latitude ADG84 Deg Min	Longitude ADG84 Deg Min
GBC_052	148287.79	7368146.78	-23º 45.5556’	113º 32.9922’
GBC_053	147838.00	7369244.80	-23º 44.9562’	113º 32.7432’
GBC_054	146700.29	7369377.09	-23º 44.8692’	113º 32.0766’
GBC_055	147507.27	7368384.90	-23º 45.4170’	113º 32.5368’
GBC_056	147652.79	7367736.67	-23º 45.7692’	113º 32.6130’
GBC_057	147044.25	7367392.71	-23º 45.9474’	113º 32.2506’
GBC_058	146554.77	7366784.17	-23º 46.2702’	113º 31.9542’
GBC_059	145747.78	7366837.09	-23º 46.2306’	113º 31.4802’
GBC_060	144411.64	7366942.92	-23º 46.1562’	113º 30.6966’
GBC_061	146157.89	7366400.52	-23º 46.4724’	113º 31.7154’
GBC_062	145893.31	7365924.27	-23º 46.7268’	113º 31.5528’
GBC_063	144993.72	7359441.97	-23º 50.2212’	113º 30.9306’
GBC_064	144557.16	7359441.97	-23º 50.2152’	113º 30.6738’
GBC_065	143538.51	7359455.20	-23º 50.1948’	113º 30.0750’
GBC_066	143101.95	7356174.36	-23º 51.9636’	113º 29.7702’
GBC_067	142189.13	7356253.73	-23º 51.9084’	113º 29.2344’
GBC_068	142519.86	7354983.73	-23º 52.5996’	113º 29.4102’
GBC_069	141646.73	7354507.48	-23º 52.8456’	113º 28.8900’
GBC_070	140972.05	7354877.89	-23º 52.6362’	113º 28.4982’
GBC_071	139609.44	7355248.31	-23º 52.4172’	113º 27.7026’
GBC_072	141249.86	7353753.41	-23º 53.2482’	113º 28.6452’
GBC_073	141091.11	7353462.37	-23º 53.4036’	113º 28.5480’
GBC_074	140178.29	7353687.27	-23º 53.2692’	113º 28.0140’
GBC_075	138974.44	7353832.79	-23º 53.1744’	113º 27.3078’
GBC_076	140310.59	7347152.05	-23º 56.8062’	113º 27.9954’
GBC_077	140165.07	7346887.46	-23º 56.9472’	113º 27.9060’
GBC_078	140389.96	7346662.57	-23º 57.0720’	113º 28.0350’
GBC_079	140509.02	7344995.69	-23º 57.9750’	113º 28.0806’
GBC_080	140323.82	7343857.98	-23º 58.5882’	113º 27.9546’
GBC_081	140098.92	7344254.85	-23º 58.3704’	113º 27.8280’
GBC_082	140178.29	7343447.87	-23º 58.8078’	113º 27.8628’
GBC_083	140046.00	7342918.70	-23º 59.0922’	113º 27.7776’
GBC_084	138167.46	7337455.05	-24º 02.0220’	113º 26.5902’
GBC_085	138418.81	7337613.80	-24º 01.9398’	113º 26.7408’

APPENDIX II: STANDARDISED HABITAT DATA SHEETS

Department of Conservation and Land Management

MARINE CONSERVATION BRANCH

HABITAT MAPPING DATA SHEET

SITE ID			
HABITAT TYPE			
SUBSTRATE TYPE			
LAT	° ’ …….. …….. **S**	**LONG**	° ’ …….. …….. **E**
DEPTH (m)		**TIME**	
BIOLOGICAL ASSEMBLAGE	…… …… …… …… …… ……		
RECORDER		**OBSERVATION METHOD**	
VIDEO TAPE No.		**DATE**	
SITE		**REGION**	
DGPS/GPS		**DATUM**	

SITE ID			
HABITAT TYPE			
SUBSTRATE TYPE			
LAT	° ’ …….. …….. **S**	**LONG**	° ’ …….. …….. **E**
DEPTH (m)		**TIME**	
BIOLOGICAL ASSEMBLAGE	…… …… …… …… …… ……		
RECORDER		**OBSERVATION METHOD**	
VIDEO TAPE No.		**DATE**	
SITE		**REGION**	
DGPS/GPS		**DATUM**	

APPENDIX III: DROPDOWN CAMERA AND VIDEO INSTRUCTIONS

Setup

1. Connect sheathed coax cable to splitter box and camera
2. Ensure the sheath is tied to the camera in a way that prevents any load on the coax itself
3. Connect splitter box to TV/video unit via short lead (aerial in socket)
4. Connect TV/video unit to 12 volt power supply
5. Tune TV to channel 0
6. Connect camera power leads to 12 volt battery
7. Ensure that the polarity of the battery leads are correct or the 1 amp splitter box fuse will rupture

Operation

1. Write site number, date and location on the clapper board
2. Place clapper board in front of the camera and record for about 30 seconds then press pause
3. Lower camera to the bottom and press pause to recommence recording.
4. Record about 30 seconds of benthic habitat footage
5. Fill out habitat data sheet
6. Switch video and camera power off
7. Retrieve camera
8. Check footage regularly to ensure correct operation

Equipment Care

1. Don't allow twists or knots in the cable. Figure eight the cable on the deck or in a nally bin
2. Don't step on the cable
3. Clean and silicon grease camera connection plug daily
4. Do not use CRC, WD40 or similar on electrical connections
5. Don't attach weights or other objects to camera or cable
6. Beware of propeller
7. Don't allow camera to hit the side of the boat when deploying or retrieving
8. Don't allow camera to hit or drag along bottom
9. Always keep remote control in sealed plastic bag (one drop from a wet hand will destroy it)
10. 240 volt power is not to be used on boats. Use only 12 volt power supply
11. Keep splitter box and batteries in a dry place
12. Disconnect power to camera when not in use

APPENDIX IV: CANON MV1 VIDEO CAMERA AND UNDERWATER HOUSING INSTRUCTIONS

PREPARATION OF UNDERWATER HOUSING AND VIDEO CAMCORDER

Where possible, store and prepare the equipment at room temperature to prevent condensation on the lenses of the camcorder and housing. Carry out these preparations in a dry, dust and spray-free environment.

The following is to be used as a general guide only. Users should refer to the relevant instruction manual for full details on settings, care and use.

Housing

Check the inside of the housing for any dust or other particulate matter, and clean out using a lens cloth and blower brush if necessary. Check the inside of the lens and clean using blower brush, lens tissues and lens cleaning fluid if necessary.

Remove the O-ring from the housing, clean it with lens tissues and check for any cracks or scratches. If there is any damage to the O-ring, discard and replace with a new one. Apply a small amount of silicone grease (2-3 mm) between thumb and index finger and run the O-ring through several times to spread this evenly. **Ensure that you do not use too much grease as this could cause the seal to leak!** Remember that the grease is there to keep the O-ring supple and not to actually form a seal.

Clean out the O-ring groove with a cotton bud, and carefully replace the clean and greased O-ring back into the groove without twisting it. Ensure that there is no particulate matter sticking to the O-ring. The housing is now ready for the camcorder to be inserted.

Camera setup

Set the OPERATE switch to CAMERA
Set the STANDBY LEVER (front right) to MOVIE
Press MENU button
Use the small joy stick controller, on the left hand side of the camera, to move around the menu
Set movie mode to PRO SCAN
Set the PROGRAM SELECT switch to AUTO ("A" inside a square)

POST-DIVE PROCEDURE

After every dive immerse the housing in fresh water for about 10-15 minutes. Occasionally operate the external controls to ensure they are well rinsed.

Wipe the housing with a clean, dry towel and leave in a clean, dry, airy and salt-free environment to dry completely.

Wipe carefully around the rear seal of the housing before opening so that no water gets onto the camcorder. Open the housing and remove the camera. **Do not open the housing where salt spray is present.**

Rewind the tape using the either the controls on the back of the camcorder or the remote commander. Connect the camcorder to the TV monitor (refer to camcorder instruction manual) and view the footage. Transcribe the system settings and time code information onto the main Video Transect Data Sheet (Appendix II). Label the tape clearly (using a permanent marker pen) with the designated tape number, the site number and the date of recording as described below.

APPENDIX V: DIFFERENTIAL GPS OPERATING INSTRUCTIONS

Note: These instructions should be used in conjunction with those supplied by Scoutmaster and Fugro (kept with unit).

Warning! Don't mess with the settings on the Omnistar demodulator (black box) if you don't know what you are doing! Technical settings instructions provided with the unit are to be used only in conjunction with verbal advice from Fugro (ph: 9321 0284) or Tim Daly (CALM MCB ph: 9432 5106).

1. Plug in mushroom aerial and check that button aerial is still plugged in. Note: Scoutmaster aerial (button type) should have as clear a view of the sky as possible. The DGPS aerial (mushroom type) must have a clear view to the north east sky.

2. Press scoutmaster on button. Wait a few seconds and check that display is indicating LOC.

3. Press return and then wait for at least three satellites. This could take from 30 seconds to 10 minutes depending on satellite availability and location of the DGPS unit.

4. When you have at least 3 satellites you will be given a GPS coordinate. When you have this press the big red button and wait for the GPS coordinate to become a DGPS coordinate. **Note: When the red button is on it is costing about $20 per hour**.

5. If the scoutmaster is disconnected from it's power source for more than about 30 minutes it may cause some settings to default back to the factory pre-set. The main problem is that the mapping datum reverts back to a North American setting. The danger is that the unit will give coordinates as usual but there will be some error. **Check datum prior to use (WGS 84)**. If the main battery is to be disconnected for charging then connect the backup battery to maintain power to the unit or remove the power adaptor from the Scoutmaster and install the AA battery pack.

APPENDIX VI: DRAFT MARINE HABITAT CLASSIFICATION SCHEME

HABITAT CLASSIFICATIONS

HABITAT CLASSIFICATION	TIDAL RANGE	SUBSTRATE TYPE	TROPICAL	TEMPERATE	RELIEF	MACROBIOLOGY	COMMENTS
1. Rocky Shore	Intertidal	igneous metamorphic sedimentary	✓	✓	high & low	bare	• continuous rocky shore • cliff, boulders, pavement • around HWM
2. Beach	Intertidal	sand	✓	✓	low	bare	• continuous intertidal sand
3. Shoreline reef platform	Intertidal	igneous metamorphic sedimentary	✓	✓	low	bare algal turf	• continuous reef platform along the shoreline
4. Intertidal reef	Intertidal	igneous metamorphic sedimentary	✓	✓	low	coralline algae, macroalgae	• offshore
5. Mangal	Intertidal	n/a	✓	✓	n/a	mangroves	• continuous mangrove cover (<1 ha)
6. Mudflat	Intertidal	mud silts	✓	✓	n/a	bare algal mats	• continuous intertidal mudflat • includes flats behind mangals
7. Salt marsh	Intertidal	mud silt	✓	✓	n/a	samphire	• continuous salt marsh cover (>1 ha) • on protected or low energy coastline

HABITAT CLASSIFICATION	TIDAL RANGE	SUBSTRATE TYPE	TROPICAL	TEMPERATE	RELIEF	MACROBIOLOGY	COMMENTS
8. Coral reef	Intertidal & Subtidal	n/a	✓		high & low	hard & soft corals	• typical coral reef community • seaward reef slope, reef crest, back reef, reef flat and individual bommies
9. Rubble	Subtidal	dead coral	✓		low	sparse live coral sparse vegetation	• lagoonal areas • mainly unconsolidated coral rubble
10. Reef platform	Subtidal	igneous metamorphic sedimentary	✓	✓	low	diverse algae sessile invertebrates (including sponges, sea-whips, sea-pens)	• includes limestone pavement or low relief reef
11. Limestone reef	Subtidal	sedimentary		✓	high	macroalgae	• typically covered in macroalgae with diverse invertebrate life in overhangs & caves
12. Granite reef	Subtidal	igneous metamorphic	✓	✓	high	macroalgae (browns)	• typically covered in macroalgae with diverse invertebrate life in overhangs & caves
13. Macroalgal beds	Subtidal	sand pavement	✓	✓	n/a	macroalgae	• continuous macroalgal cover (>1 ha) • seasonal % coverage allowance
14. Seagrass meadows	Subtidal	sand pavement	✓	✓	n/a	seagrasses	• continuous seagrass coverage (>1 ha) • perennials/ephemerals
15. Sand	Subtidal	Sand (generally white)	✓	✓	n/a	bare	• little or no vegetation
16. Silt	Subtidal	muds silts	✓	✓	n/a	Bare	• marine and/or terrigenous muds & silts • little or no vegetation