SOUTH COAST TERRESTRIAL AND MARINE RESERVE INTEGRATION STUDY

A collaborative project between CALM Marine Conservation Branch and South Coast Region

Project No: N713 - National Reserves System Cooperative Program
Environment Australia

BIOLOGICAL SURVEY OF THE MAJOR BENTHIC HABITATS OF THE SOUTH COAST (STARVATION BOAT HARBOUR - GROPER BLUFF): 7-21 MARCH 1997

Field Programme Report: MRIP/SC/F - 02/1997

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ACKNOWLEDGEMENTS

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- Dr John Watson - Manager, South Coast Region.

CALM Collaboration

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- Jennie Cary, Marine Ecologist, MCB.
- George Watson - Dive Master, Mornington District.
- Emma Parkes - CALM Volunteer, MCB.
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- Gilles Monty - CALM Volunteer, MCB.
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External Collaboration

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- Neville Barrett, Zoology Department, University of Tasmania.
- Matz Berggren, Marine Biology Laboratory, University of Western Australia.
- Julia Phillips, Environmental Management Department, Edith Cowan University.
- Kevin Bancroft, Estuarine Health Indicators Project, Murdoch University.
- Eva Boogard, professional underwater photographer.
- Skipper and crew of the MV Sealion.

- Gary Kendrick, Botany Department, University of Western Australia.
- Paul Lavery, Environmental Management Department, Edith Cowan University.
- Hugh Kirkman, CSIRO Division of Fisheries and Oceanography, Marmion.
- Mike Steber, DOLA Remote Sensing Applications Centre, Perth.

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SUMMARY

This report presents details of a field survey to be undertaken aboard the vessel MV Sealion, from 7-21 March 1997, along the south coast of Western Australia. The survey, a systematic and quantitative investigation of the major benthic habitats from Starvation Boat Harbour to Groper Bluff, is being being carried out to examine marine biota in nearshore waters adjacent to the Fitzgerald Biosphere Reserve.

This field survey is part of the South Coast Terrestrial and Marine Reserve Integration Study, funded by Environment Australia under the National Reserves System Cooperative Programme (Project No: N713). This project is being conducted by the Marine Conservation Branch as part of the Marine Reserve Implementation Programme (MRIP), in collaboration with CALM's South Coast Region, and will contribute to a regional classification of the proposed marine reserve areas along the south coast, identified in the Wilson Report, according to ecological, economic and cultural criteria. The project will also provide recommendations that will facilitate the integrated management of adjacent terrestrial and marine reserves and will ensure that the potential impacts of terrestrial and estuarine ecosystems upon their marine counterparts are understood prior to the creation of any marine reserves.

The objectives of this survey are to provide a quantitative description of marine biota at representative sites within the major benthic habitats and to investigate of the influence of physical parameters, such as substrate type and wave exposure, on community diversity. The survey will also involve the collection of fauna and flora density and biomass data, as baseline information for long-term monitoring of communities before and after marine reserve implementation.

1. INTRODUCTION

1.1 General background

This report presents details of a field survey to be undertaken aboard the vessel MV Sealion, from 7-21 March 1997, along the south coast of Western Australia. The survey, a systematic and quantitative investigation of the major benthic habitats from Starvation Boat Harbour to Groper Bluff, is being being carried out to examine marine biota in nearshore waters adjacent to the Fitzgerald Biosphere Reserve.

The terrestrial environment of the south coast region of Western Australia is known to have exceptionally high conservation values and, in recognition of these natural attributes, the Western Australian Department of Conservation and Land Management (CALM) has established a system of terrestrial reserves along this coastline. By contrast little is known about the conservation values of the marine environment, although high levels of marine biodiversity and endemism has been reported from other parts of Australia's temperate marine environment (Edyvane, 1996).

A recently published statewide review of the marine environment of Western Australia, entitled "*A Representative Marine Reserve System for Western Australia* - Report of the Marine Parks and Reserves Selection Working Group, 1994" (CALM, 1994: known as the Wilson Report) identified a number of marine areas, offshore from existing terrestrial reserves, along the south coast that were considered as suitable candidates for possible incorporation into the state system of representative marine reserves. This included the area adjacent to the Fitzgerald River National Park (Figure 1).

Under the *New Horizons in Marine Management* strategy released in November 1994, the State Government requires biological, economic, usage and cultural assessments to be made of areas to be considered for marine reserve status under the CALM Act before the Notice of Intent (NOI) is issued. This revised process has been designed to reduce the level of user concern normally resulting from the release of the NOI for public comment. The data layers provide the basic information for a consultative process resulting in the determination of preliminary boundaries and zonings so that current users have a clear appreciation of how the proposed marine reserve will affect their current and future activities from the outset.

The CALM Act (1984) allows for the establishment of multiple-use marine reserves for the purposes of conservation of marine flora and fauna and public recreation. Commercial activities, such as fishing, aquaculture and petroleum exploration and production, are also acceptable within specific zones of multiple-use marine reserves. Commercial and recreational fisheries in marine reserves are managed by the Fisheries Department. The CALM Act specifies the statutory process for the reservation of marine reserves, including a public planning process for the development of management zoning schemes that allow for the spatial separation of incompatible activities in a marine park. In anticipation of this process the major marine resources and current uses of areas recommended for reservation in the Wilson Report, are being identified and mapped in a Geographical Information System (GIS) by CALM's Marine Conservation Branch (MCB).

This field survey is being carried out as part of the South Coast Terrestrial and Marine Reserve Integration Study, funded by Environment Australia under the National Reserves System Cooperative Programme (Project No: N713). This project is being conducted by the Marine Conservation Branch as part of the Marine Reserve Implementation Programme (MRIP), in collaboration with CALM's South Coast Region, and will contribute to a regional classification of the proposed marine reserve areas along the south coast, identified in the Wilson Report, according to ecological, economic and cultural criteria. The project will also provide recommendations that will facilitate the integrated management of adjacent terrestrial and marine reserves and will ensure that the potential impacts of terrestrial and estuarine ecosystems upon their marine counterparts are understood prior to the creation of any marine reserves.

1.2 Survey area

The coastline adjacent to the Fitzgerald Biosphere Reserve is a high energy environment with heavy swells. The open ocean shores, south-facing headlands and beaches are exposed to strong wave action, and most of the bays are wide and open to prevailing winds and swells. On the basis of geomorphological features and wave exposure, the coast can be divided up into 3 major distinctive coastal types:

- Limestone shores, with narrow reefs and platforms parallel to the shore, (Starvation Boat Harbour to Hopetoun);

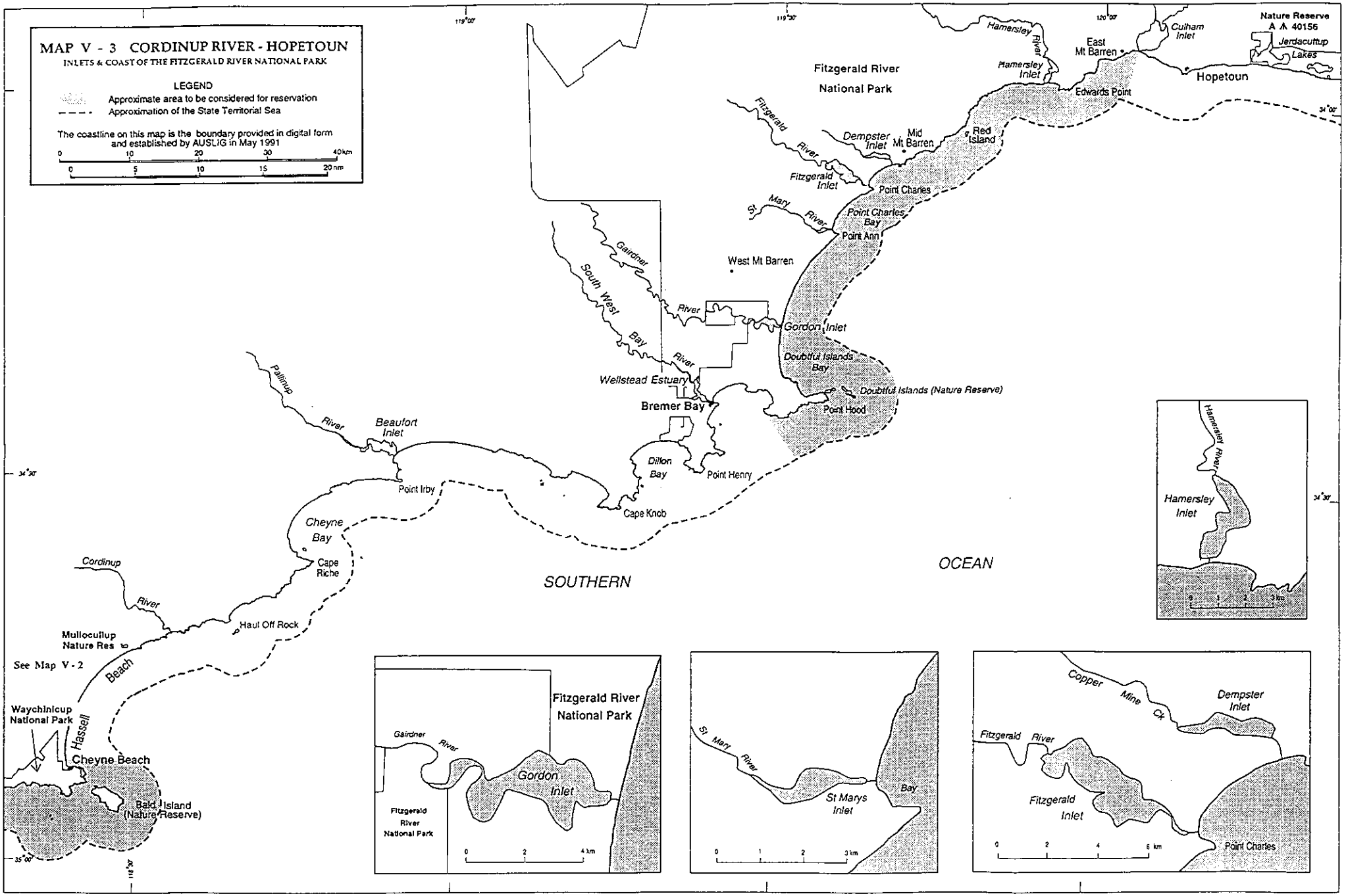


Figure 1: Proposed marine reserves along the south coast between Hopetoun and Bald Island.

- Wide bays with sandy beaches and shallow shelving seabed. These areas are generally protected from the prevailing south-westerly swell (Hopetoun to the Doubtful Islands);
- Granitic or gneissic headlands, exposed to open ocean swells, with steep wave-swept slopes and small lunate bays, boulder fields on the less-exposed eastern sides of headlands, and offshore reefs with steep or vertical walls (Doubtful Islands to Groper Bluff).

These distinctive coastal types are repeated all along the south coast and provide a variety of habitats for marine fauna and flora. The limestone reefs at the eastern end of the survey area are characterized by low profile reef that is easily covered in sand and does not have a heavy growth of seaweeds, and higher profile reef with a cover of kelp or other macro-algal species. The more sheltered central region of the survey area is characterized by extensive seagrass meadows beyond the surf zone, and areas of coarse-grained bare sand. The western end of the survey area is characterized by steep rock walls dropping off to as much as 40 m before reaching a sandy sea floor. The upper sections of these walls (to 20 m or so) are usually dominated by macro-algae, but in deeper water dense communities of sponges, ascidians and coelenterates occur. The more sheltered sides of headlands often have granitic boulder fields with different benthic communities. Each of these three coastal types covers approximately 80 kms, a total of 250 kms from Starvation Boat Harbour west to Groper Bluff.

Benthic habitat classification, compiled by Dr Hugh Kirkman, CSIRO Division of Fisheries, has been obtained for the south coast from Albany to the Recherche Archipelago. The relevant digital data sets has been sourced through the Coastal Resource Atlas at the Western Australian Department of Transport (DOT), and transferred to the marine GIS currently being established at the MCB office in Fremantle. A benthic habitat map for the area being covered during this survey is included as Appendix I.

1.3 Objectives

Primary objectives:

- quantitative description of marine biota at representative sites within the major benthic habitats;
- quantitative analysis of species richness within the major benthic community types;
- investigation of the influence of physical parameters, such as substrate type and wave exposure, on community diversity; and
- collection of fauna and flora density and biomass data as baseline information for long-term monitoring of communities before and after marine reserve implementation.

Secondary objectives:

- opportunistic collection of qualitative information on visually dominant fauna and flora; and
- opportunistic collection of salinity and temperature profile data.

2. METHODS

A quantitative survey will be undertaken, with sampling at 40-50 sites (approximately 15 within each distinctive coastal type) between Starvation Boat Harbour and Groper Bluff. At each site the following will be surveyed:

- the abundance of large fishes and smaller cryptic fishes;
- the abundance of macro-epibenthic invertebrates (specimens >10mm in size);
- the percentage cover of macro-algae and seagrasses;
- the biomass of seagrasses.

A combination of visual censuses, quadrat sampling and benthic video transects will be employed to maximize the amount of data gathered within the short duration of the survey.

2.1 Site selection

The sampling locations will be located about 10-15 kms apart and it is planned that 2 locations (4 sampling sites) per day will be surveyed, weather conditions permitting. The 2 sites, approximately 1-2 kms apart, will be sampled concurrently at each location and the sampling sites will be chosen at locations where the spatial extent of the habitat is large enough to ensure that the transects do not extend outside the habitat boundaries (i.e. on to bare sand). At each site a team of 4 divers will be used. The divers will descend to the seabed, from

line, in opposite directions. The position of the start of the transects will be recorded using a hand-held GPS. It is estimated that approximately 90 mins in the water will be required at each site.

2.2 Quantitative sampling methodology

2.2.1 Limestone reefs and granite slopes

In the limestone reef and granite slope areas the transects will be laid across the slope to reduce some of the spatial variability between sites, along either the 5 m or 10 m depth contour. A depth of 5 m is probably optimal considering the spatial extent of the limestone reef systems, and diving limitations due to decompression schedules and air consumption rates. In areas where sites at 5 m depth may be affected by wave turbulence and surge the transects will be laid at 10 m depth. Firstly, the density of large fishes will be determined by a diver swimming along the centre of a 5 m wide swathe up one side and down the other side of each 100 m transect line, recording on waterproof paper the number of each species observed. The data will being recorded separately for each 50 m section, representing 4 x 50 m sub-samples. A total area of 4 x 500 m^2 will thus be censused for large fish species. The abundance of smaller fishes and macro-epibenthic invertebrates will be determined by a diver swimming along the entire 200 m transect length, recording the number of each species within 1 m of the line.

A diver will then swim along the 200 m transect, placing a 0.25 m^2 quadrat at 20 m intervals along one side of the transect line and recording the estimated percentage cover of each macro-algal species. A total 10 quadrats (2.5 m^2) will be sampled. Another diver will lay a smaller 0.1 m^2 quadrat at the same intervals along the transect line and collect specimens of all macro-algae within the quadrat (a total of 10 quadrats). This diver will also record the density of selected sessile invertebrate species within these quadrats. The quadrat collections will assist in the taxonomic identification of plants and animals recorded on the visual censuses. Macro-algae will be preserved in 2-4 % seawater formalin and all invertebrate specimens will be preserved in 4 % formalin buffered with sodium bicarbonate. Sponge specimens will be preserved in 70% alcohol. Only approximately horizontal upper surfaces will be sampled using the quadrats, and if a quadrat falls on a vertical surface the nearest horizontal surface will be sampled. The substrate type and exact depth (±0.2 m) at each quadrat location will also be recorded.

2.2.2 Seagrass meadows

In seagrass meadows the transects will be laid up and down the slope to examine variability within a meadow resulting from different levels of wave exposure and light attentuation. A minimum depth of 5 m is probably optimal considering the depth ranges of seagrass species, and difficulties with surge at shallower depths. A visual census for large fish will be carried out across the top of the meadow, using the same methodology applied to the hard substrate sites. Benthic video transects will then be carried out by a diver obtaining video footage of a 1 m wide strip down one side of the entire transect line (a total of 4 x 50 m^2), holding the underwater video camera parallel to the substrate at a set height (1 m) and swimming at a set speed (0.2m s^{-1}). This footage will be analysed after the field survey to determine the percentage cover of different seagrasses. Operating instructions for the underwater video systems are included as Appendix II. Details of each video transect will be recorded on a standard video data sheet (Appendix III).

A total of 10 x 0.1 m^2 quadrats will be laid at 20 m intervals along each 200 m transect and all above ground biomass will be removed using a pair of clippers. If these quadrats fall on blow-outs or edges of the meadow they will be moved to ensure the full quadrat area is comprised of seagrass. The bulk of this leaf and stem material will be analysed on board the vessel. The seagrass samples will be sorted into different species, the shoot density will be recorded, and the material from 8 of the 10 quadrats per transect will be wet-weighed and then discarded. The material from the remaining 2 quadrats will be wet-weighed and then stored in a refrigerator, for later drying and ashing to obtain dry weights and organic content. At each seagrass site Secchi disc readings will be taken at 0, 100 and 200 m along the transect line to determine turbidity levels.

2.3 Qualitative sampling

Qualitative information will also be collected at each site. This will entail divers collecting specimens, taking video footage of visually dominant flora and fauna and close-up photographs of sessile invertebrates. Reference specimens will be preserved to form the basis of a reference collection. General information about each sampling site will be recorded on a standard habitat data sheet (Appendix IV).

2.4 Physical data

Vertical profiles of salinity and temperature will be collected through the water column at each location to

surface temperature (SST) and water colour signals, which can be used as a proxy for broad-scale surface water circulation patterns. This data will be recorded on a standard salinity-temperature data sheet (Appendix V).

Sea-surface temperature measurements will also be taken during the periods of NOAA-AVHRR satellite overpasses as an aid to interpretations of satellite imagery of sea-surface temperature and water colour signals which can be used as a proxy for broad-scale surface water circulation patterns. The times (Western Standard Time) at which NOAA-AVHRR satellites begin their passes over the south coast of Western Australia have been obtained from the Department of Land Administration (Remote Sensing Applications Centre, contact Mr Mike Steber) and this information has been reproduced in Appendix VI (see column 6). The last column (i.e., column 11) of the data sheets in Appendix VI shows the time that will be taken by the satellite to cover the entire area of Western Australia and this time should be added to the equator time in column 6 to give the approximate time that the satellite overpasses the survey area. The physical data set will be forwarded to Mr Alan Pearce (CSIRO, Division of Oceanography) for use in the calibration of selected NOAA-AVHRR SST images.

At each of the sampling locations a surface seawater sample will be taken in clean glass sample bottles. The water samples will be taken by quickly filling a sample bottle from the bucket of seawater, and the bottle number will be recorded in the appropriate section of the standard salinity-temperature data sheet (Appendix V). The sample bottles and caps used to collect these salinity samples must be thoroughly pre-washed in sea-water from the site just prior to sampling. The salinity of these water samples will subsequently be analysed back in Perth.

3. FIELD PROGRAMME

3.1 Survey vessel

A 23 m live-aboard charter vessel, the MV Sealion, has been chartered from Mackenzie's Marine in Esperance. The vessel will be crewed by a skipper and two deck-hands, and is equipped with a 5 m semi-rigid zodiac and a 4 m inflatable zodiac. The vessel has a top speed of 20 knts and accommodation for 14 people. All meals will be supplied onboard. The vessel will be fitted with 2 dive compressors and a total of 22 scuba cylinders are being supplied.

3.2 Survey team

The survey team will be comprised of 10 people, 9 of whom are divers.

CALM

Jeremy Colman	Project Leader, MCB
George Watson	Dive Master, Mornington District
Jennie Cary	Marine Ecologist, MCB
Peter Collins	Wildlife Officer, South Coast Region
Emma Parkes	CALM Volunteer, MCB

External

Graham Edgar	University of Tasmania, Hobart
Neville Barrett	University of Tasmania, Hobart
Kevin Bancroft	Murdoch University
Julia Phillips	Edith Cowan University
Matz Berggren	University of Western Australia
Eva Boogard	Professional underwater photographer

3.3 Field itinerary

The team will embark on the vessel on the morning of 7 March in Hopetoun, and the first 7 days will be spent sampling sites east along the coast to Starvation Boat Harbour and west to Point Ann. Weather permitting the vessel will anchor out overnight, but considering the exposed nature of this stretch of coastline it is more likely that the vessel will have to return to Hopetoun each evening. During the second 7 days the coastline from Point Ann to Groper Bluff will be worked, with the vessel returning to sheltered anchorages in Bremer Bay if

necessary. The vessel will then proceed to Albany, where the survey team will disembark on morning of the 22 March.

Wind patterns along this stretch of coastline at this time of year may mean that the sampling work will be restricted to the first half of the day. A 5-10 knt offshore (N-NE) breeze usually gives way to a 10-20 knt S-SE seabreeze during the afternoon. Work will be commenced as early as possible in the morning and if wind/wave conditions prevent diving work in the afternoon the time will be spent sorting/preserving samples and collating field data. If weather conditions prevent diving altogether, sampling will be carried out at deeper sites using a small dredge.

Table 1: Field itinerary for the Fitzgerald marine habitat survey, March 1997.

Date	Activity
5/3/97	Emma Parkes arrives in Fremantle with vehicle from Albany. Graham Edgar and Neville Barrett arrive from Tasmania. Overnight in Norfolk Hotel, Fremantle.
6/3/97	Survey team departs Fremantle (am) in 2 vehicles with trailers. Arrives Hopetoun (pm) and loads equipment on the MV Sealion. Team stays at the Hopetoun Motel overnight.
7/3/97	**Field survey commences (am).**
7-14/3/97	Sites between Starvation Boat Harbour and Point Ann are surveyed.
14/3/97	Vessel returns to Hoptoun (pm). Jennie Cary disembarks and Peter Collins embarks.
15/3/97	Vessel departs Hopetoun (am). Jennie Cary departs in vehicle for Bremer Bay and Albany. Arrives Albany 16/3/97. Flys back to Perth.
15-21/3/97	Sites between Point Ann and Groper Bluff are surveyed.
21/3/97	**Field survey completed.** Vessel arrives Albany (pm). Survey team overnights onboard.
22/3/97	Survey team departs from Albany (am) in 2 vehicles and returns to Fremantle (pm). Graham Edgar and Neville Barrett fly back to Hobart (pm).
24/3/97	Emma Parkes returns to Albany with vehicle.

3.4 Safety

All safety procedures relating to navigation and associated vessel activities, and the personal safety of crew and passengers of the MV Sealion during this field survey are the primary responsibility of the skipper of the vessel. Alterations to survey procedures based on safety aspects related to weather conditions and sea-state are the responsibility of the skipper of the vessel. Decisions to modify the methods of the field survey will be made by the project leader and dive master, in consultation with the vessel's skipper and the rest of the survey team.

The Project Leader has primary responsibility for ensuring that all field work undertaken by members of the survey team is conducted according to CALM's departmental safety procedures and protocols.

The Dive Master has primary responsibility for all personnel participating in diving operations and for ensuring that all diving operations are conducted according to the CALM dive code and to an approved dive plan.

The dive plan for this survey has been approved by the departmental diving officer. No decompression dives will be undertaken. External participants in this field survey will dive according to their own diving codes of practice where appropriate and are required to sign an indemnity form (CLM 154). They have a responsibility for their own personal safety and for the safety of other members of the diving team. Any diving undertaken by the vessel skipper and crew is done so at their own risk.

3.5 Communications and emergency contacts

General

CALM, Marine Conservation Branch: Ph. 09 432 5100, fax 09 4305408
Mobile: 041 904 5285

CALM, Esperance: Ph. 090 71 3733, fax 090 71 3657

Fitzgerald River National Park
Ranger-in-charge, (Lindsay Brown): Ph. 098 35 5043, fax 098 35 5045
Ranger - Hopetoun (Mark True): Ph. 098 38 3060, fax 098 38 3060
Stokes National Park
Ranger-in-charge, (Rick France): Ph. 090 76 8541, fax 090 76 8541

Fisheries Department, Albany: Ph. 098 41 7766

Department of Transport, Albany: Ph. 098 41 4944

Ravensthorpe Police: 098 38 1004
Albany Police: Ph. 098 41 0555

Mackenzie's Marine, Esperance: Ph. 090 71 5757, fax 090 71 4993
Mobile (onboard MV Sealion) 018 935120

Royal Flying Doctor Service: Ph. 09 414 1200
Radiophone booking line: 09 414 1300
Medical & emergency calls: 1800 625 800

Albany Hospital: Ph. 098 92 2222

Esperance Hospital: Ph. 090 71 9222

Hopetoun Medical Centre: Ph. 098 38 3244

Nurses Post, Bremer Bay: Ph. 098 374 026

Fremantle Hyperbaric/Diving Services: Ph. 09 431 2233 or 09 431 3333

Hopetoun Motel: Ph. 098 38 3219, fax 098 38 3220.

Radio

Marine HF - channels 2182, 4620, these channels will establish contact with:
VIP Perth radio (ph. 09 30 20104)

channels 4125, 6215.5, these channels will establish contact with:
VIE Esperance radio

Seaphone - Telstra Seaphone operator (ph. 0108)
MV Sealion call sign VLW4148

Marine VHF - channel 16 (any station).

CALM VHF - channel 16 (Stavation Boat Harbour to Point Ann)
channel 19 (Point Ann to Groper Bluff)

3.6 Equipment

A detailed equipment list is included as Appendix VII.

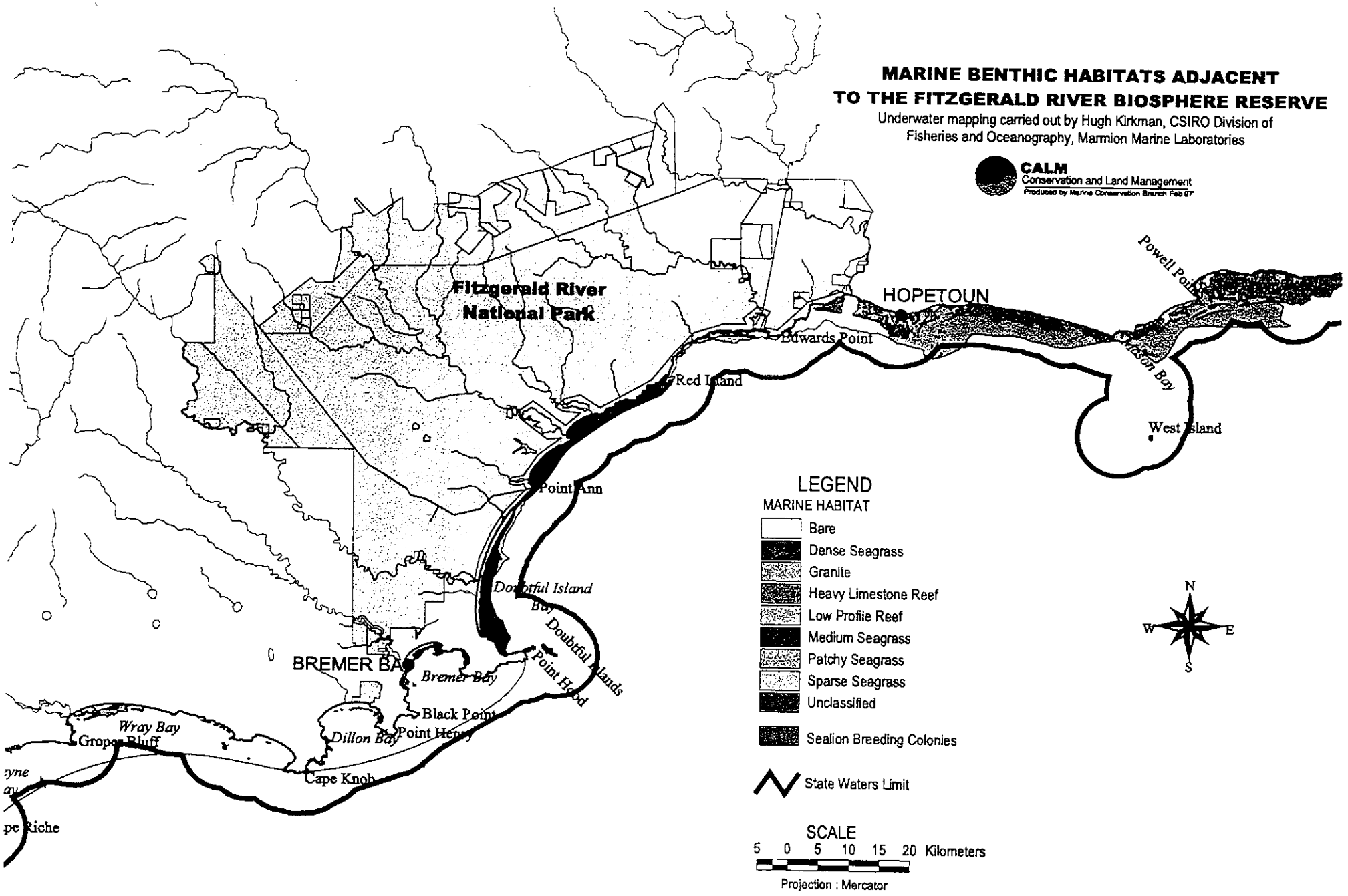
4. REFERENCES

Christie C A, Bass D K, Neale S J, Osborne K and Oxley W G (1996). Surveys of sessile benthic communities using the video technique. Long-term monitoring of the Great Barrier Reef. Standard Operational Procedure Number 2. Australian Institute of Marine Science, Townsville, Queensland.

Edyvane,K. 1996. The role of marine protected areas in temperate ecosystem management. In: *Developing Australia's representative system of marine protected areas: Criteria and guidelines for identification and selection* (ed. R. Thackway). Proceedings of a technical meeting held at the South Australian Aquatic Sciences Centre, West Beach, Adelaide, 22-23 April 1996. Department of the Environment, Sport and Territories: Canberra.

APPENDIX I

Benthic Habitat Map


MARINE BENTHIC HABITATS ADJACENT
TO THE FITZGERALD RIVER BIOSPHERE RESERVE
Underwater mapping carried out by Hugh Kirkman, CSIRO Division of
Fisheries and Oceanography, Marmion Marine Laboratories
CALM
Conservation and Land Management
Produced by Marine Conservation Branch Feb 97
Fitzgerald River
National Park
HOPETOUN
Powell Point
Edwards Point
Red Island
Wilson Bay
West Island
Point Ann
Doubtful Island
Bay
Doubtful Islands
Point Hood
BREMER BAY
Bremer Bay
Black Point
Point Henry
Dillon Bay
Wray Bay
Gropers Bluff
Cape Knob
pe Riche
LEGEND
MARINE HABITAT
Bare
Dense Seagrass
Granite
Heavy Limestone Reef
Low Profile Reef
Medium Seagrass
Patchy Seagrass
Sparse Seagrass
Unclassified
Sealion Breeding Colonies
State Waters Limit
N
W
E
S
SCALE
5 0 5 10 15 20 Kilometers
Projection : Mercator

APPENDIX II

Underwater Video System

Operating Instructions

Preparation of underwater housing and video camcorder

Step-by-step instructions on preparing the StingRay SR-700 housing and Blaupunkt CC894 camcorder are given below. This procedure is adapted from the AIMS Standard Operational Procedure Number 2: "Surveys of sessile benthic communities using the video technique" (Christie *et al.,* 1996).

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. For more details refer to the relevant instruction manual.

Housing

1) Open the housing by simultaneously releasing and rotating the two black plastic catches at the rear of the housing. Carefully remove the monitor back and place to one side. Remove the camera tray by depressing the small black plastic catch on the left hand side and simultaneously sliding out the tray. 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 the red filter and clean using blower brush, lens tissues and lens cleaning fluid if necessary. Check which lens is attached to the housing - super wide-angle (the shorter of the two available optics) or zoom-macro. **For transect work the super wide-angle lens is required.**

2) If using the SunRay lighting system, install a fully charged battery in each of the battery pods mounted on both sides of the housing (see StingRay instruction manual).

3) Remove the two O-rings from the monitor back, clean them with lens tissues and check for any cracks or scratches. If there is any damage to the O-rings, discard and replace with new ones. 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. Repeat with the second O-ring. **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-rings supple and not to actually form a seal.

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

Camcorder

5) Place the camcorder on a clean, dry, flat surface and attach the StingRay battery adapter to the rear. Attach a fully charged Sony NP-78 battery pack to the battery adapter. Remove the lens cap, check the lens and clean if necessary. Attach a yellow or orange filter if required (see point No. 24).

6) If the housing zoom-macro lens system is being used, attach the zoom-macro adaptor to the front of the camcorder. This accessory lens pushes on in front of the camcorder lens, so that it lies flush with the manual focusing ring.

7) Press the eject switch (small switch with blue button on top of camcorder) and insert a blank Hi 8 video tape into the cassette holder, ensuring that the red copy protection switch is switched off. Close the cassette holder by gently pressing the 'PUSH' mark on the right side - the top section of the cassette holder will then close down automatically. **Do not push it down manually.**

8) Switch the camcorder on by sliding the OPERATE switch (front left side with green button) to CAMERA. Turn the REC switch (rear left side with red button) to STANDBY.

9) Select the camcorder settings. Turn the IMAGE STABILIZER switch (below the AUTO MODE cover on left side) to ON. Open the AUTO MODE cover and set the functions as follows:

FOCUS- the focus mode can be selected when the camcorder is inside the housing.

EXPOSURE - leave the exposure mode in automatic setting (no exposure indicator on the left side of the LCD display).

PROGRAM - select the desired shutter speed by pressing the PROGRAM button. The SPORTS setting (indicated by a running figure on the LCD display) gives a shutter speed of 1/50 to 1/500 of a second. **This will be suitable for most video transect work**. On occasions when camcorder shake may be excessive, or when trying to video fast-

moving subjects such as marine mammals or fish it would probably be better to select the HIGH SPEED setting (indicated by a golfing figure on the LCD display), giving a shutter speed of 1/4000 sec.

WHITE- the white balance setting can be selected when the camcorder is inside the housing (see point No. 18).

10) Ensure the viewfinder lens is removed, and the viewfinder is locked in the down position (see camcorder instruction manual for details).

11) Ensure that the timecode function is switched on (TC displayed on the top right side of the LCD display). If it is off, press the COUNTER/TIMECODE button below the LCD display so that TC is displayed.

12) Mount the camcorder on the StingRay camera tray, ensuring that the camcorder is correctly aligned and that the screw on the bottom of the tray is tightened firmly. Attach the cables from the tray to the camcorder, in the following order:

    i) attach the video cable (yellow label) to the VIDEO OUT plug (front right side), ensuring that it is routed snugly under the base of the battery and inside the camcorder grip strap (otherwise it will not reach the plug);

    ii) attach the power-out cable (green label) from the battery adapter to the DC power jack on the camera tray;

    iii) attach the remote cable (blue label) to the blue REMOTE plug (back right side);

    iv) attach the microphone cable (red label) to the red MIC plug (front right side),ensuring that it is routed under the lens and clear of the camera tray.

13) Slide the camera tray assembly into the grooves in the housing and push forward gently until it will not go in any further. Check that the assembly is locked in place and cannot be withdrawn without depressing the small black plastic locking button at the rear left hand side of the camera tray.

14) Ensure that the two black plastic catches on the outside of the housing are in the vertical position with the slots facing towards you. Place the monitor back onto the rear of the housing, ensuring that the two black plastic guide pins go into the guide holes on the camera tray. Simultaneously rotate the locking catches towards you, ensuring that the stainless steel guide pins on the monitor back enter the slots on the catches. Continue to rotate the catches until they lock in the horizontal position. Inspect around the circumference of the monitor back to ensure that it is properly seated.

15) Assemble the monitor back screen shade and place it in the tracks of the monitor back. Slide it down until it locks in place.

Pre-filming checks

16) Power up the camcorder by sliding the PWR switch (right side rear) towards you and holding it in place for 2 seconds. A green LED comes on at the bottom centre of the monitor back, and the screen display will come on. Check the screen display to ensure that all the camcorder functions are set correctly. At the top right side of the display there should be Hi8 and SP (indicating that the tape is Hi8 format and record mode is set for short play), and STBY (indicating that the camcorder is in standby mode). Underneath these symbols the time code indicator and the remaining tape indicator, will be displayed. At the bottom right side the battery indicator will be displayed. At the top left side there will be a hand symbol (indicating that the image stabilization system is on), and a running figure symbol (indicating that the shutter speed is set to SPORTS mode), and a hand symbol with the letter F inside (indicating that the manual focus mode is on). Check the manual focus by holding the focus switch (left side front) to both N (near) and F (far) positions.

17) To switch to autofocus mode, toggle (push and immediately release) the PWR switch towards you. Do not hold the switch in place or the camcorder will turn off. To return to manual focus mode, toggle the AF switch away from you. Use automatic focus for panoramic shots and manual focus for filming the transects.

18) Toggle the WB switch (left side) towards you repeatedly to change the white balance mode (as indicated by symbols in the top left side of display). The settings available are:

AUTO MODE- (no symbol): automatic white balance setting.

OUTDOOR MODE - (sun symbol).

INDOOR MODE - (light bulb symbol).

For video transect work the most suitable settings are AUTO or OUTDOOR. Use the OUTDOOR mode in shallow (<3 m) water, on bright sunny days when the water visibility exceeds 8 m. Otherwise, leave the white balance in AUTO mode.

19) If there are any other symbols displayed on the screen check the camcorder instruction manual to determine what they represent.

20) Ensure that the zoom function is set to full wide-angle. Move the zoom switch (right side front) to the W position and hold it there. Check the zoom indicator on the left side of the screen display. (*Note: When using the super wide-angle lens and the auto focus mode, the camcorder will only zoom in and stay in focus for about 50 % of the full range before going out of focus. To zoom in closer than 50 % the zoom-macro lens system should be fitted).*

21) Turn the power off by moving the power/record switch to PWR and holding it there for 5 seconds. the screen display and the green LED will turn off.

22) Check that there is no condensation on the camcorder lens or housing lens. If condensation is present, delay filming until it disappears (approximately 10 minutes). The housing should be kept out of the sun during transport.

23) Once in the water, if visibility is good (>8 m) and transects are in water >3 m deep, slide the red filter down over the lens by turning the knob on the front plate of the housing. If transect is in water <3 m deep, or if the visibility is poor it will probably be necessary to use a yellow or orange filter that screws on to the camcorder, directly in front of the lens.

24) Check the housing for leaks. This may be indicated by a moisture condensation symbol on the screen display (refer to camcorder instruction manual), bubbles coming from the housing, or water droplets visible inside the housing when you look through the housing lens.

25) Before starting to film, check the front of the housing lens for small air bubbles. Gently wipe away any that are present with your hand. Check for air bubbles regularly.

26) If lighting conditions are poor, switch on both SunRay lamps.

27) Turn the power on (move the power/record switch to PWR position and hold it there for 2 seconds) and commence recording (toggle the switch to the REC/STBY position. A red LED will come on at the bottom centre of the monitor back, and the REC symbol will appear at the top left side of the screen display.

Post-dive procedure

28) After every dive immerse the housing in fresh water. Leave it there for 10-15 minutes and wash the controls and monitor back with running water. Remove the monitor back screen shade.

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

30) Wipe carefully around the rear seal of the housing before opening so that no water gets onto the camcorder. Open the housing by simultaneously rotating the black plastic catches at the rear of the housing. Remove the camera tray assembly by depressing the small black plastic locking button at the rear left side and sliding the tray out. Detach the cables and remove the camcorder from the tray. Attach caps to both housing and camcorder lens. **Do not open the housing where salt spray is present.**

31) Switch the camcorder to video by sliding the OPERATE button to VTR. Rewind the tape using the either the controls on the top 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.

The video tapes should be consecutively numbered according to the following coding system:

Project acronym (MRIP/SC/)/Site numbers - Date/Tape number (#1 onwards).

Thus, the first tape would be labelled as: **MRIP/SC/F1-5 - 07-10/03/97/TAPE#1**

If the tape contains footage spanning more than one day the tape number should indicate this.

32) A total of three sites should be recorded on each 90 minute Hi8 tape. Before commencing filming at another site, ensure that the tape is wound forward to the end of the footage recorded at the previous site. This will ensure that no data is recorded over accidentally. Once a tape is complete the red copy protect switch on the tape should be switched on to prevent any loss of site data. The tapes should be stored in a waterproof container and duplicated at the end of the field trip.

33) Clean the video heads with the head cleaning cassette after approximately 10 hours of use. Follow the instructions carefully to avoid damage to the video heads. Refer to the camcorder instruction manual for more details.

Recharging the battery packs

34) New batteries should be fully charged and discharged several times before use to prolong their life. The Sony NP-78 batteries should last between 75 and 90 mins, when using the monitor back. Before recharging a used battery, make sure it is fully discharged first (use the REFRESH function on the battery charger or a battery discharger). Once the battery is totally discharged, slide the indicator switch on the top of the battery so that a red dot is visible. This serves as a reminder that the battery is totally discharged. Connect it to a battery charger and charge it completely. This will take approximately 2 hours and 20 minutes for a Sony NP-78 battery. Once it is charged, slide the indicator switch to hide the red dot, indicating that the battery is fully charged and ready to be used. At the end of the field trip, leave all batteries discharged.

APPENDIX III

Video Data Sheet

VIDEO DATA SHEET

Project	FITZGERALD MARINE BIOLOGICAL SURVEY				**Field Survey**	MARCH 1997	
Site No.		**Site Name**		**Date**		**Recorder**	
Start time		**Finish time**		**Depth (m)**		**Visibility (m)**	

Video System	Blaupunkt CC894 camcorder in StingRay SR-700 housing											
Focus mode				**Exposure mode**				**Program mode**				**White balance mode**			
Auto	☐	Manual	☐	Auto	☐	Manual	☐	Sports	☐	High-speed	☐	Auto	☐	Outdoor	☐
Lens system				**Filters**								**Lights**			
Wide-angle	☐	Zoom-macro	☐	None	☐	Red	☐	Yellow	☐	Orange	☐	On	☐	Off	☐

Video operator		**Tape no.**	MRIP/SC/ /#	**Height above substrate (cm)**	
Time coding for all video footage at site:		**From:**	: : :	**To:**	: : :

Transect time coding	**Start**	**Finish**	**Total time (mins/secs)**
T1	: : :	: : :	.
T2	: : :	: : :	.
T3	: : :	: : :	.

Notes:

APPENDIX IV

Habitat Data Sheet

HABITAT DATA SHEET

Project	FITZGERALD MARINE BIOLOGICAL SURVEY				**Field Survey**		MARCH 1997
Site No.		**Site Name**		**Date**		**Recorder**	
Vessel	MV Sealion		**Time**		**Weather**		
Sea			**Water depth (m)**		**Water visibility (m)**		
GPS Latitude			**GPS Longitude**		**Differential**		
° ' S			° ' E		**Yes**	☐	**No** ☐
Site location							

Habitat Description

Dominant Species

Sea-grass	
Macro-algae	
Coral	
Fish	
Invertebrates	

Other Features

Impact or Activity

Video reference	MRIP/SC/ /#	**Aerial reference**	/WA /RUN /
Slide reference		**Print reference**	

Habitat Data Sheet Guidelines

To assist with the standardisation of data recording and survey methodologies used in field surveys by CALM's Marine Conservation Branch the following is a brief explanation of the terms and methodologies to be used in the attached habitat data sheet.

Site No: All sites visited were designated a site number. Each site number should begin with F (denoting Fitzgerald) and ends in a number or number/letter combination. It is anticipated that these site numbers will remain with these locations in all future CALM studies and are therefore key designators for any other information or records kept relating to each site.

Site Name: Most sites have been given a name, chosen either as one that is formally recognised (such as a chart location) or a name introduced by the study team to enable quick identification.

Date and Time: This is the date and time at which the data at the site were collected.

Recorder: This is the name of the person who was primarily responsible for the recording of original notes.

Vessel Name: Name of survey vessel.

Weather: The percent cloud cover and wind speed (km/hr) and direction (degrees) were estimated.

Sea: The sea state was described as calm (no wind, calm sea), slight (breeze was influencing surface water), moderate (wind was generating wind waves up to 1 metre) or rough (windy with wind waves greater than 1 metre).

Water Depth: Depths are approximate and were read off an echo sounder.

Water Visibility: This is an estimation of horizontal in-water visibility at the time of observation.

GPS Lat and GPS Long: The GPS coordinates of a site are recorded as degrees, minutes, seconds and decimals of a second. The GPS **must be** setup to use the AGD 66 or AGD 84 datum.

Differential: If a differential GPS was used then 'yes' is noted. GPS readings utilising a differential system allowed for position fixing described by latitude and longitude to within about 3 m or less.

Location of site with ref. to lat/long: On occasions observations were made after swimming some distance from the position of the anchored vessel. Hence, a note of the actual location of the observations and/or visual recordings that were made is given with respect to the latitude and longitude of the anchored vessel.

Habitat description: This is a general note of the habitat type and its percentage cover. As cover can vary within the general vicinity of a site the described percentage cover can have an error of approximately 20%.

Dominant Species: This is a list of the most common or readily observed species of marine life at the site. It reflects what an observer might expect to see when visiting the site in the future. Taxa are usually described to genus .

Other Habitat Notes: Features of interest at or nearby the site are noted.

Activity or Impact Noted: Signs of activity or impacts that were observed at the site are noted.

Video reference: Video image taken of the site is referred to as:

MRIP/SC/F45 - 070397/TAPE#2

MRIP is the program descriptor (Marine Reserve Implementation Study)
SC is the regional descriptor (South Coast)
F45 is the area descriptor (Fitzgerald) and site number

Photo reference and Slide reference: A photograph or slide image taken of the site is referred to as:

MRIP/SC/F10-150397/01p where:

01 is the photo or slide number
p refers to 'photo' (alternatively *s* refers to 'slide')

Aerial reference: Aerial photographs of the site are referred to as:

5193/WA 2957/RUN39/20.2.91 where:

5193 is the photograph number
WA 2957 is the series number
RUN 39 is the flight run number
20.2.91 is the date that the photograph was taken

APPENDIX V

Salinity-Temperature Data Sheet

SALINITY-TEMPERATURE DATA SHEET

Project	FITZGERALD MARINE BIOLOGICAL SURVEY				**Field Survey**	MARCH 1997	
Site No.		**Site Name**		**Date**		**Recorder**	
Time	**GPS Latitude**		**GPS Longitude**		**Differential**		
	° ' S		° ' E		**Yes** ☐	**No** ☐	

ST meter details		**Salinity calibration sample bottle no.**		**Meter salinity reading of calibration sample**	
Thermometer details		**Thermometer reading of calibration sample**		**Meter temperature reading of calibration sample**	

Depth (m)	Salinity (pss)	Temperature (℃)
0		
0.5		
1.0		
2.0		
3.0		
4.0		
5.0		
6.0		
7.0		
8.0		
9.0		
10.0		
11.0		
12.0		
13.0		
14.0		
15.0		

Depth (m)	Salinity (pss)	Temperature (℃)
16.0		
17.0		
18.0		
19.0		
20.0		
21.0		
22.0		
23.0		
24.0		
25.0		

Notes:

Marine Conservation Branch, Department of Conservation and Land Management

APPENDIX VI

NOAA-AVHRR Satellite Overpass Times
Western Australia, 1-31 March 1997

DOLA Remote Sensing Applications Centre

Sat	Orbit	Date (WST)	Equator Cross Time	Equator Cross Long	Start Time	Azim	Lat	Long	Max Elev	Min
12	30104	1/ 3/1997	1747	131.880	1913	170.13	-55.62	123.07	74	15
12	30111	2/ 3/1997	536	314.610	629	10.55	-6.65	120.45	79	15
12	30118	2/ 3/1997	1725	137.400	1851	162.97	-55.08	128.30	64	15
12	30125	3/ 3/1997	514	320.140	607	22.78	-7.22	125.85	63	15
12	30132	3/ 3/1997	1703	142.930	1829	156.27	-54.53	133.54	38	15
12	30139	4/ 3/1997	452	325.670	546	36.45	-11.32	130.46	37	14
12	30175	6/ 3/1997	1738	134.190	1903	167.28	-57.22	126.31	80	15
12	30182	7/ 3/1997	526	316.930	620	15.82	-8.54	122.35	78	15
12	30189	7/ 3/1997	1715	139.720	1841	161.04	-56.65	131.50	51	15
12	30196	8/ 3/1997	504	322.450	558	28.39	-9.12	127.74	51	15
12	30203	8/ 3/1997	1653	145.250	1820	152.03	-52.61	134.89	31	14
12	30210	9/ 3/1997	442	327.980	536	39.59	-9.70	133.14	31	15
12	30232	10/ 3/1997	1750	130.980	1916	171.28	-55.87	122.32	70	15
12	30239	11/ 3/1997	539	313.710	632	8.56	-6.35	119.62	72	15
12	30246	11/ 3/1997	1728	136.510	1854	164.14	-55.29	127.52	70	15
12	30253	12/ 3/1997	517	319.240	610	20.80	-6.93	125.02	68	15
12	30260	12/ 3/1997	1706	142.030	1832	157.37	-54.71	132.74	42	15
12	30267	13/ 3/1997	455	324.770	549	34.41	-11.06	129.63	40	14
12	30303	15/ 3/1997	1741	133.290	1906	168.31	-57.37	125.51	80	15
12	30310	16/ 3/1997	530	316.030	623	13.70	-8.30	121.51	79	15
12	30317	16/ 3/1997	1718	138.820	1844	162.04	-56.80	130.70	55	16
12	30324	17/ 3/1997	507	321.560	601	26.38	-8.89	126.90	55	15
12	30331	17/ 3/1997	1656	144.350	1823	153.19	-52.79	134.08	33	14
12	30338	18/ 3/1997	445	327.080	539	37.79	-9.47	132.30	33	15
12	30374	20/ 3/1997	1731	135.610	1857	165.30	-55.49	126.74	76	15
12	30381	21/ 3/1997	520	318.340	613	18.85	-6.72	124.18	73	15
12	30388	21/ 3/1997	1709	141.130	1835	158.51	-54.93	131.96	45	15
12	30395	22/ 3/1997	458	323.870	552	32.40	-10.85	128.78	44	14
12	30431	24/ 3/1997	1744	132.390	1909	169.33	-57.61	124.76	75	16
12	30438	25/ 3/1997	533	315.130	626	11.60	-8.10	120.66	78	15
12	30445	25/ 3/1997	1722	137.920	1847	163.10	-57.06	129.96	59	16
12	30452	26/ 3/1997	510	320.660	604	24.37	-8.68	126.06	60	15
12	30459	26/ 3/1997	1659	143.450	1826	154.48	-53.09	133.33	36	14
12	30466	27/ 3/1997	448	326.180	542	35.98	-9.27	131.45	36	15
12	30502	29/ 3/1997	1734	134.710	1900	166.48	-55.79	126.01	83	15
12	30509	30/ 3/1997	523	317.440	616	16.90	-6.51	123.33	78	16
12	30516	30/ 3/1997	1712	140.240	1838	159.71	-55.24	131.24	49	15
12	30523	31/ 3/1997	501	322.970	554	28.53	-7.10	128.73	47	16
12	30530	31/ 3/1997	1650	145.760	1816	153.53	-54.69	136.47	30	15

Sat	Orbit	Date (WST)	Equator Cross Time	Equator Cross Long	Start Time	Azim	Lat	Long	Max Elev	Min
14	11171	1/ 3/1997	1322	131.680	1448	169.47	-57.69	124.68	72	16
14	11185	2/ 3/1997	1311	134.470	1437	166.30	-57.32	127.24	75	16
14	11192	3/ 3/1997	106	315.840	159	13.01	-7.33	121.41	85	15
14	11199	3/ 3/1997	1300	137.260	1426	163.13	-56.90	129.78	63	16
14	11206	4/ 3/1997	054	318.630	148	19.37	-7.79	124.10	76	15
14	11213	4/ 3/1997	1249	140.050	1415	159.88	-56.29	132.22	49	16
14	11220	5/ 3/1997	043	321.420	137	25.59	-8.25	126.79	59	15
14	11227	5/ 3/1997	1238	142.840	1404	156.84	-55.94	134.80	38	16
14	11234	6/ 3/1997	032	324.210	126	31.56	-8.71	129.49	46	15
14	11241	6/ 3/1997	1227	145.630	1353	153.96	-55.60	137.40	30	15
14	11248	7/ 3/1997	021	326.990	115	37.22	-9.18	132.18	36	15
14	11312	11/ 3/1997	1313	134.060	1439	166.60	-56.85	126.63	80	16
14	11319	12/ 3/1997	108	315.430	201	12.23	-7.80	120.98	81	15
14	11326	12/ 3/1997	1302	136.850	1428	163.29	-56.37	129.15	66	16
14	11333	13/ 3/1997	057	318.220	150	18.73	-8.27	123.68	77	15
14	11340	13/ 3/1997	1251	139.640	1417	160.01	-55.90	131.67	51	16
14	11347	14/ 3/1997	046	321.000	139	25.09	-8.74	126.37	60	15
14	11354	14/ 3/1997	1240	142.430	1406	156.79	-55.44	134.20	40	15

14	11361	15/ 3/1997	035	323.790	128	31.21	-9.21	129.06	47	15
14	11368	15/ 3/1997	1229	145.220	1355	153.69	-54.99	136.75	31	15
14	11375	16/ 3/1997	023	326.580	117	37.00	-9.68	131.75	37	15
14	11439	20/ 3/1997	1316	133.650	1441	166.92	-56.35	126.02	85	16
14	11446	21/ 3/1997	110	315.010	202	11.86	-4.80	121.36	77	16
14	11453	21/ 3/1997	1304	136.440	1430	163.51	-55.91	128.56	69	16
14	11460	22/ 3/1997	059	317.800	151	17.74	-5.27	124.06	76	16
14	11467	22/ 3/1997	1253	139.230	1419	160.13	-55.47	131.10	53	15
14	11474	23/ 3/1997	048	320.590	140	23.52	-5.74	126.75	62	16
14	11481	23/ 3/1997	1242	142.020	1408	156.82	-55.04	133.65	42	15
14	11488	24/ 3/1997	037	323.380	130	30.84	-9.71	128.63	48	15
14	11495	24/ 3/1997	1231	144.810	1357	153.64	-54.60	136.21	32	15
14	11502	25/ 3/1997	026	326.170	119	36.77	-10.18	131.32	38	15
14	11509	25/ 3/1997	1220	147.600	1346	150.61	-54.16	138.77	25	15
14	11566	29/ 3/1997	1318	133.240	1443	167.29	-56.00	125.49	89	15
14	11580	30/ 3/1997	1307	136.030	1432	163.78	-55.56	128.03	71	15
14	11587	31/ 3/1997	101	317.390	153	17.12	-5.76	123.63	74	16
14	11594	31/ 3/1997	1256	138.820	1421	160.31	-55.12	130.58	55	15

APPENDIX VII

Equipment List

EQUIPMENT LIST

DIVING

- 12 SCUBA cylinders
- 8 BCDs
- 8 regulator sets
- 5 weight belts, each with 24 lb of weights
- Spare weights
- 2 dive computers
- 4 u/w torches
- 4 compasses
- 2 masks and snorkels
- 2 pairs of fins
- Spare straps
- 1 underwater viewfinder

Accessories

- 2 dive flags
- Diving spares/repair kit
- Dive compressor with spares/repair kit

SAMPLING

- 5 x 100m weighted and scaled transect lines, with reels
- 4 x 1m measuring rods
- 3 x 0.25m^2 quadrats
- 3 x 0.25 m^2 quadrats with cross wires
- 3 x 0.1m^2 quadrats
- 2 x 1 m^2 quadrats
- 4 pairs of clippers
- 40 calico bags
- 3 gear crates
- Pimple floats and lines
- Railway line weights
- 10 catch bags
- Dredge
- 230 m rope

Data recording

- 6 underwater slates, grips and pencils
- 300 sheets waterproof paper
- 1 box of rubber bands
- 1 box of pencils

Sample Preservation

- 6 sorting trays
- 6 plastic screw-top containers (20 litre)
- Naly crates with lids (35l, 55l)
- Plastic sample containers (100, 250, 500 ml)
- Sealable plastic bags (various sizes)
- Plastic tie wraps
- Permanent marker pens
- Labels
- Field notebooks
- Stationary
- 70% alcohol (20 litres)
- Formaldehyde (6 litres)
- Sodium bicarbonate

- Disposable gloves
- Engel portable refrigerator
- Sartorius balance
- Plant pressing materials

Salinity-temperature sampling
- Yeokal Salinity-Temperature Bridge (Hamon Model 602). Serial No. ST384
- Scientific thermometer (model TOT 1MM E-MIL GOLD LINE)
- Digital thermometer
- 40 water sample bottles

CAMERAS

Video
- 2 Blaupunkt CC894 Hi 8 video camcorders, with battery packs (6), battery chargers (4), battery discharger (2), yellow and orange filters
- 2 StingRay SR-700 underwater video housings with colour monitor backs, super wide-angle and zoom-macro lenses, and built-in red filters
- 1 SunRay underwater lighting system with battery pack (3), battery charger (1), and spare lamps (2)
- Instruction manuals
- 30 Sony professional 90 min Hi 8 video tapes
- Housing O-ring kits and silicone grease
- Cleaning kit
- Sony 8mm camera system (backup)
- Colour monitor

Still photography
- Nikonos V camera, 35 mm lens, SB102 strobe unit, close up kit
- Nikonos IV camera, 35 mm lens, SB102 strobe unit, close up kit
- 28 mm lens
- Canon EOS camera and lens
- 40 rolls of 36 exposure slide film
- 20 rolls of 36 exposure print film
- Log books for all 3 cameras
- Kit of camera spares

SAFETY

- Comprehensive diving first aid kit
- Emergency response flow-sheet
- Emergency contact flow chart
- Patient information log
- Log sheets for accidents
- Oxygen therapy equipment
- Spare oxygen D cylinder
- Sunscreen

INFORMATION

- Marine Charts: AUS 337, AUS 116, DMH 575
- Field identification guides for temperate water fishes, macro-algae, seagrasses,benthic invertebrates
- Reference books on southern Australian seabirds and marine mammals
- CALM GIS habitat maps
- Aerial photographs of coastline
- Habitat data log sheets
- Salinity/temperature data sheets
- Laptop computer and accessories
- 20 high density discs
- Small white-board and marker pens

POSITION FIXING

- 1 Scoutmaster hand held GPS units and accessories

MECHANICAL/ELECTRICAL REPAIRS

- Comprehensive mechanical tool kit
- Comprehensive electrical repair kit
- Equipment log book

ACCESSORIES

- AA batteries
- D batteries
- C batteries

CONTACTS

Equipment suppliers:

- Scoutmaster GPS: Benchmark, Rob Ferguson, Ph. 08 232 5405
- Underwater video system: David Hill, Sea Optics, Ph. 08 361 6161