MARINE MANAGEMENT SUPPORT
SHARK BAY

MOVEMENTS AND COMMUNITY BASED CONSERVATION OF SHARK BAY DUGONGS: RETRIEVAL OF GPS LOCATIONAL TAGS AND SEAGRASS HABITAT ASSESSMENT IN THE SHARK BAY WORLD HERITAGE PROPERTY

9 AUGUST– 28 AUGUST 2002

Field Program Report: MMS/SBY/SBA – 55/2002

A collaborative project between CALM Marine Conservation Branch, CALM Shark Bay District, Yadgalah Aboriginal Corporation, Edith Cowan University and James Cook University.

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Prepared by
D.K. Holley
Marine Conservation Branch

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

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Copies of this report may be obtained from:

Marine Conservation Branch
Department of Conservation and Land Management
47 Henry St.
Fremantle, Western Australia, 6160

Ph: (08) 9336 0100
Fx: (08) 9430 5408

SUMMARY

This report outlines the methods and program for the retrieval of four GPS location recording tags and seagrass habitat assessment of high use locations determined from the tags within the Shark Bay World Heritage Property (SBWHP) during the period 9th – 29th August 2002. This information will then be used in a management framework for more effective management of this population and its habitat requirements within the SBWHP.

The project is a collaboration between the Marine Conservation Branch of the Department of Conservation and Land Management, Shark Bay District of Conservation and Land Management, Shark Bay Yadgalah Aboriginal Corporation Inc, Edith Cowan University and James Cook University.

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1 INTRODUCTION

1.1 GENERAL

This field program report outlines the methods and program for the retrieval of location recording tags deployed on dugongs *(Dugong dugon)* within the Shark Bay World Heritage Property (SBWHP) during the period 14th – 22nd June 2002. Location data from these tags will be used to identify areas of high use by dugongs. These areas will then be assessed for preferred dugong habitat structure during winter, by determining seagrass composition, percentage cover and biomass. The information gained from this survey will be used by CALM in a management framework for more effective management of this dugong population and its habitat requirements within the Shark Bay marine reserves and World Heritage Property.

The project is a collaboration between the Marine Conservation Branch (MCB) and Shark Bay District of the Department of Conservation and Land Management (CALM), and a local indigenous group, the Shark Bay Yadgalah Aboriginal Corporation (YAC). Edith Cowan and James Cook universities are also in involved in this collaboration.

The August field trip will be coordinated by the Marine Conservation Branch (MCB) of CALM (Project supervisor: Nick D'Adamo) (Field Team Leader: Dave Holley) in collaboration with CALM Shark Bay District (Marine Officers: Kevin Crane and Richard Hall), members from the Shark Bay Yadgalah Aboriginal Corporation (contact: Darren Capewell) and researchers from Edith Cowan University (under the supervision of Dr. Paul Lavery). Dave Holley will coordinate field trip preparation. Field staff will include Dave Holley from MCB, Kevin Crane and Richard Hall from Shark Bay District, up to three members from the YAC and Dr Paul Lavery, Nick Wood and Mark Westera from ECU.

1.2 BACKGROUND

Dugong populations are under extreme human pressure throughout their global range and now survive in substantial numbers only in Australia (Marsh and Lefebvre, 1994). Dugongs within Shark Bay, due to the low level of human predation and incidental mortality and presumed low level of habitat disturbance, represent a valuable reference point to compare through time with other important populations that are subjected to greater levels of disturbance (Preen *et al.* 1997).

The Shark Bay Marine Reserves Management Plan (1996 – 2006)(CALM, 1996) identifies a number of research priorities for the management of dugongs within the Shark Bay World Heritage Property. These priorities include research into dugong distribution, behaviour and habitat usage. In order for CALM to effectively manage and protect this key population of dugongs, information on seasonal movement patterns and habitat preference is required. This information will facilitate targeted and appropriate management of a species highlighted as being of World Heritage value.

1.3 OBJECTIVES

The overall objectives of the project, 'Movements and Community Based Conservation of Dugongs' are to facilitate the establishment and implementation model for genuine joint management of dugong populations between indigenous communities and CALM in Shark Bay through:

1. a determination of the movements of Shark Bay dugongs at appropriate spatial and temporal scales by tracking:
    a. seasonal surface movements of dugongs over an annual scale relative to water temperature and depth.
    b. fine scale surface movements at a diurnal/tidal scale in relation to water depth.
    c. fine scale sub-surface movements of dugongs in the water column.

2. a determination of the most important dugong habitats through measurements of:
    a. the amount of time spent in particular areas/depths/water temperatures and
    b. details of the type of sea grass and probable forage. This information will assist in designing planning and management frameworks that aim to resolve, through management, existing and/or potential conflicts between human activities and the needs of dugongs.

Within this framework, the aims of the August field program are to:

- Retrieve four GPS data loggers deployed on dugongs during June 2002.
- Undertake seagrass surveys to assess habitat structure at a number of locations known to be of importance to dugongs, as recorded from the GPS units deployed in June 2002 as well as from previous deployments.

2. SITE SELECTION, METHODS AND EQUIPMENT.

2.1 SITE SELECTION

2.1.1 Retrieval

The locations of tagged dugongs will be determined via radio telemetry from an aircraft. Once the units have been located from the air, a boat will then navigate to that location, from which retrieval of GPS units will be undertaken.During the June deployment program tags were deployed at the edge of seagrass banks, adjacent to the eastern shoreline of Dirk Hartog Island, and it is anticipated that tagged animals will still be in this general vicinity.

2.1.2 Habitat assessment

Dugong habitat assessment will occur at a total of six locations representing the habitat usage of three selected dugongs. These locations will be selected on the basis of our newly acquired understanding that dugongs have been actively foraging and/or resting there. A further three locations will be selected on the basis that we now consider them to be travel paths linking high use foraging and resting locations.

Selection of these sites and determination of habitat classification will be undertaken using data obtained from location recording tags deployed on dugongs during June 2002 (Holley,2002) and from previous deployments during winter 2000 and 2001 using dedicated spatial analysis software. Determination of these sites will occur once tags have been retrieved and positions downloaded.

2.2 METHODS

2.2.1 Tag retrieval

For the retrieval of tags deployed on dugongs, tags must first be located via intensive radio telemetry that is undertaken initially from an aircraft and then by boat. A tag is located using a directional aerial connected to a telemetry receiver. The signal strength, as heard from the receiver, indicates the direction and distance of the unit. Once a unit is located visually, a remote release mechanism is triggered with the unit breaking away from the animal in free-floating mode. The tag is then retrieved and the information stored within it is downloaded using dedicated software.

Radio tracking from a boat requires at least two personnel; a boat skipper to operate the boat and one other to operate the aerial and radio receiver. Frequent diving behaviour by dugongs results in the tag disappearing underwater and subsequent loss of signal. Extended periods are often required on the water in order to locate each animal.

2.2.3 Habitat assessment

The habitat assessment program will be undertaken from the charter vessel '*James Scheerer II*'. The aim of the habitat assessment program is to identify the type and amount of forage available to dugongs at each of the identified six locations. To achieve this aim, ten replicate sites will be sampled at each location. At each replicate a $1m^2$ quadrat will be randomly distributed with seagrass composition determined and percentage cover estimated. Biomass samples will then be collected within a $0.2m^2$ section of each quadrat, epiphytes removed and each sample dried and weighed. In addition a series of 50m video transects will be run perpendicular to bathymetry at each location to further classify habitat structure, with species composition, and percentage cover determined at regular intervals.

If due to weather and time constraints the total number of sites sampled are unachievable then the number of replicates will be reduced by the same number at each site, in order to ensure that an even sample size is achieved throughout all six locations.

GENERAL PROCEDURES

Two tenders may be used throughout the field program, including the CALM marine mammal research vessel C644 (a 5.4m Zodiac with 50hp o/board) and James Scheerer tender (a 3.5m Zodiac with 25hp o/board). Once at each selected location, the following procedures will be undertaken.

1. James Scheerer to navigate to each location and to anchor.
2. Depending on the James Scheerer's ability to anchor as close as possible to each location, all activities will be undertaken from the mother vessel or from the two tenders.
3. Once at each location, four marker buoys will be used to define the boundaries of the location as determined from the dugong tags.
4. Gear to be set up and personnel organised into two teams, each team to undertake either video transect or biomass sampling and percentage cover/shoot density estimates. At the completion of sampling of all replicates at each location, samples to be returned to Denham, where they will be oven dried for a period of 12 hours and weighed to gain a dry weight.
5. Once each location has been sampled the marker buoys retrieved and the James Scheerer to move on to the next location.

VIDEO TRANSECTS

A series of non-permanent 50m video transects will be undertaken at each site. Each transect will be run perpendicular to bathymetry, from a random starting point, with the video held at a constant height and travelling at a constant speed. Footage will be viewed each night aboard the *James Scheerer II,* to determine seagrass composition and percentage cover at regular intervals. The procedure for the transect survey at each site will be as follows:

1. Record time and date on data sheet then video data sheet.
2. One team member to roll out 50m weighted marker rope along substrate perpendicular to bathymetry and wait at end of transect.
3. Second team member to swim above tape measure at constant speed, maintaining camera at constant height, filming until end of transect.
4. Both team members to swim back along transect retrieving rope, move to second point chosen at random and repeat procedure.

In addition to the non-permanent transects, a permanent transect will be established within each of a representative foraging or travelling location. Permanent transects will supplement the Shark Bay Marine Park Monitoring Program (SBMPMP) and identified as sites as important to dugongs. Each transect will be 50m and replicated end on end. Procedure as follows.

1. Record time, date and start coordinates on data sheet and location type, video data sheet.
2. Mark start point of transect with a star picket, record number on PVC cap on picket.
3. Film transect as for non-permanent transects.
4. At end of transect, mark with star picket. This picket represents the beginning of next transect and to be labelled as such and coordinates recorded.
5. Repeat procedure until three end on end 50m transects are filmed and permanently marked.

SHOOT DENSITY, PERCENTAGE COVER ESTIMATION AND BIOMASS.

At each site one team will determine composition and percentage cover from a $1m^2$ quadrat. Shoot density counts and biomass will be sampled from within a $0.2m^2$ segment of the quadrat. The following is the outline of procedures.

1. Within each location distribute quadrat randomly and record species composition within quadrat.
2. Both team members to estimate % cover and record results.
3. One team member to conduct shoot density counts within a $0.2m^2$ segment of the quadrat
4. Both team members to take a core of the above and belowground seagrass from within the $0.2m^2$ corner of the quadrat. Where seagrass is the species *Amphibolous antarctica*, only above ground biomass is required.
5. Upon to return to vessel, epiphyte material removed from seagrass, samples are then placed in labelled bags and put in drying oven for 12 hours. Once samples are dry they are then weighed to within 0.1g.

3 PROJECT MANAGEMENT

3.1 FIELD TEAM

3.1.1 CALM personnel

Personnel involved in tag retrieval, and habitat assessment will be comprised of up to three CALM personnel depending on availability of CALM's Shark Bay District staff. These are; Dave Holley (MCB), Kevin Crane (Shark Bay District) and Richard Hall (Shark Bay District).

Dave Holley (DH)	Field Team Leader Marine Fauna Zoologist	Ph (w) (08) 9336 0121 Fax (w) (08) 9430 5408 Mb. 0417 952 118 Ph (h) (08) 9335 6645
Kevin Crane (KC)	Dive Supervisor / Research Assistant Marine Operations Officer	Ph (w) (08) 9948 1208
Richard Hall (RH)	Research Assistant / Vessel Master Marine Reserves Officer	Ph (w) (08) 9948 1208

3.1.2 Yadgalah Aboriginal Corporation personnel

Up to three members of YAC will be involved in the tag retrieval component of the program. These members are selected on a rotational basis by the YAC coordinators.

Darren Capewell (DC)	YAC Coordinators	Ph (w) (08) 99458 1318

3.1.3 Edith Cowan University

Three researchers from ECU will be involved during the dugong habitat surveys and will provide assistance and expertise in seagrass sampling techniques.

Paul Lavery (PL)	Research Supervisor	Ph (w) (08) 9400 5687
Mark Westera (MW)	Research Assistant	
Nick Wood (NW)	Research Assistant	

3.2 PROJECT COLLABORATORS

The assistance and logistical support provided to CALM MCB by other collaborators is outlined below.

3.2.1 CALM Shark Bay District.

The District supports this project by the provisioning of assistance in the form of up to two marine reserve personnel. Other assistance is provided in the form of accommodation at the Peron Homestead and administrative support with access to phones and office equipment.

- Prior to the commencement of the field program, contact will be made with the district through KC to seek confirmation of their involvement, outline the proposed activities and to develop dive plan.
- Upon arrival at Shark Bay, DH will meet with KC and Carl Beck (CB), A/Manager, Shark Bay District, to issue the Field Program Report, and to discuss the field program.

3.2.2 Yadgalah Aboriginal Corporation.

The Yadgalah Aboriginal Corporation (YAC) are an integral part of the project and provide assistance and support in the form of dugong catchers. Up to two YAC personnel will be employed on a rotational basis to catch and restrain dugongs. YAC personnel also provide important local knowledge.

- Prior to commencement of field program, contact will be made with the YAC coordinators Darren Capewell (DC) seeking YAC assistance for the conduct of the program. If YAC assistance is assured, DH will outline requirements to DC. A letter from DR accompanied by a copy of this field program report, formally inviting YAC to participate will follow.
- During program, YAC to provide DH with personnel to assist with tracking and possible recaptures.
- Upon completion of program, DH to outline to YAC results of the program.

3.2.3 Edith Cowan University

Researchers from Edith Cowan University, School of Natural Sciences, will be assisting in the conduct of habitat assessment and seagrass sampling activities. Prior to commencement of field program, contact will be made with researchers to ensure availability and to discuss field program and methodology.

3.3 BUDGET

Budget Item			EA Costs ($)	CALM District costs ($)	MCB costs ($)	Total costs ($)
Travel / Accomodation						
Wildlife Admin vehicle	Perth – Shark Bay return 3000km@60c/km*				1800	1800
Accommodation	Denham – Peron Homestead – 7 days		300			300
Provisions	7 days @ $150pd		1050			1050
		Sub-total	1350		1800	3150
Staff						
DH	15 days @ $ 229		0	0	3435	3435
KC	7 days @ $ 251		0	1757	0	1757
RH	7 days @ $ 188		0	1316	0	1316
Yadgalah	5 days @ $ 500		2500	0	0	2500
NDA	1 day @ $313		0	0	313	313
		Sub-total	2500	3073	3748	9321
Vessels & other equipment						
C644	15 days @ $50		750	0	0	750
Sirenia II	5 days @ $200		1400			1400
James Scheerer II	8days @ $1200		9600			9600
Charter flight	2 hr @ $540hr		1080	0	0	1080
		Sub-total	12830	0	0	12830
Consumables						
Batteries			200			200
Video tapes			300			300
Sundries			500			500
Contingency funds			1000			1000
		Sub-total	2000	0	0	2000
TOTAL			**$18680**	**$ 3073**	**$5548**	**$26988**

*Use of Wildlife Admin vehicle is preferred to flying, due to the amount and nature of equipment that will be required for the conduct of the program.

3.4 FIELD ITINERARY

Table 1. Itinerary for August field program for the retrieval of location tags and habitat assessment within the Shark Bay World Heritage Property.

Date	Day	Location	Personnel	Activity
9/08/02	Fri - am Sat- pm	Perth Denham	DH	Depart Perth - Driving Arrive Shark Bay
12/08/02	Mon- am	Denham - YAC offices - Western gulf	DH DH	Briefing meeting with SB district staff, and YAC coordinator. Undertake charter flight and equip.prep.
13/8- 17/8	Tues - Sat	Western Gulf – Eastern shore, Dirk Hartog Isl.	DH, NW, 2 Yac	Tag retreival
19/8-27/8	Mon-Tues	SBMP Western gulf- Eastern shore, Dirk Hartog Isl.	CALM- DH, KC, RH. ECU- PL, NW, MW. CS, JS	Seagrass habitat assessment from James Scheerer II.
28/8	Wed- am Wed – pm	Denham CALM office YAC office.	DH, PL, NW,MW DH, PL DH,PL DR,KC	Clean, sort and pack equipment. Debrief with DR, KC Debrief with YAC.
29/8	Thu- am	Denham	DH, PL, NW,MW	Depart SB- Driving Arrive Perth PM.

CALM Personnel- DH- Dave Holley, DR- Dave Rose, KC – Kevin Crane, RH- Richard Hall
Other Personnel – YAC –Yadgalah Aboriginal Corporation catchers.
ECU- PL- Paul Lavery, NW- Nick Wood, MW – Mark Westera
James Scheerer – CS-Craig Shankland, JS – Jessie Shankland

3.5 SAFETY

3.5.1 General

Field operations shall be carried out in accordance with departmental procedures and protocols. Overall responsibility for field procedures during this field trip and the personal safety of all team members rests with the Field Team Leader (FTL) – Dave Holley.

3.5.2 Boating

For conduct of the retrieval component of this field program the CALM marine mammal research vessel C644 will be used. For the habitat assessment the majority of activities will be conducted from the James Scheerer. If required the Shark Bay District vessel Sirenia II may be used. Boating, navigation and safety are the responsibility of each of the boat skippers. For operations conducted from CALM vessel C644, the skipper is DH (FTL). The skipper responsible for Sirenia II will be Richard Hall or Kevin Crane. The skipper of the James Scheerer II is Craig Shankland (CS).

DH will coordinate boating activities each day in consultation with CS, RH and KC. All boating activities from CALM vessels will be conducted in accordance with CALM's draft Procedure Guideline Statement '*Safe Marine Operations in CALM*'.

Before departure each day for the retrieval operation, DH will log in with relevant radio operators, see section 3.5.4, detailing each day's proposed activities. Upon completion of each day's activities, DH will log out with the relevant operator. Weather forecasts will be obtained on a daily basis and will assist in determining the suitability of carrying out boating operations the following day. For operations aboard the James Scheerer, CS will conduct all log in log out procedures.

For any emergency at sea during the conduct of this field program, the 'Emergency Management Plan' (Appendix 3), relabelled from that developed for turtle research on Dirk Hartog Island by CALM Shark Bay District and adapted to suit this program's working locations, will be followed.

3.5.3 Diving

All diving activities, both SCUBA and snorkelling shall be in accordance with the CALM dive code document and the Procedure Guideline Statement '*Safe Marine Operations in CALM'*. The Dive Supervisor is responsible for diving safety at all times. The Dive Supervisor will be Kevin Crane. A dive plan has been lodged to the Departmental Dive Officer (DDO) and approved. Researchers from Edith Cowan University will dive under the universities dive code.

3.6 COMMUNICATIONS AND EMERGENCY CONTACTS

3.6.1 General

- The deployment team can be contacted on DH's mobile phone during all hours subject to coverage.
  – 0417 952 118.

- The James Scheerer II has mobile phone coverage throughout much of Shark Bay, during the seagrass sampling activities it can be contacted on
- 0429369440

- The office of the Yadgalah Aboriginal Corporation during business hours is-
  (08) 9948 1318

3.6.2 CALM Offices – Business hours only.

- Shark Bay District, Denham – (08) 9948 1208
- Monkey Mia Visitors Centre – (08) 9948 1366
- Marine Conservation Branch, Fremantle – (08) 9336 0100
- Project Supervisor, Nick D'Adamo, mobile- 0409 680 247

3.6.3 Emergency Contacts

- Silver Chain Bush Nursing Post, Denham – (08) 9948 1213
- Department of Fisheries, Denham- (08) 9948 1154
- Police, Denham- (08) 9948 1201
- Volunteer Marine Rescue, Denham- 0409 117 093

3.6.4 Boating Radio Contacts

- Radio contact with CALM's district office at Denham will be maintained each day from James Scheerer II. During field procedures involving the CALM vessels C644 and Sirenia II, radio comms from both vessels will serve to keep both vessels in communication with James Scheerer II and with Shark Bay base

- For all boating activities within the eastern gulf radio contact will be maintained with Monkey Mia CALM office on VHF Channel 72 between the hours 0730 – 1630.

- For after hours, contact will be made through Carnarvon Sea Rescue on VHF Channel 16.

- For all boating activities within the western gulf radio contact is maintained with Shark Bay Sea Rescue on VHF Channel 16. This includes an after hours service.

3.7 ACCOMMODATION

During the period of tag retrieval DH and NW will be accommodated at the Peron Peninsula Homestead in the Francois Peron National Park. During the habitat program, all personnel will live aboard the James Scheerer II.

4 DATA MANAGEMENT

4.1 FIELD PROGRAM REPORT

Hard copies of this report to be held at three locations:

1. Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry st., Fremantle, WA, 6160. Ph (08) 9336 0100 Fax (08) 9430 5408.
2. Woodvale Library, Science and Information Division, Ocean Reef Rd., Department of Conservation and Land Management, Woodvale, WA, 6026. Ph (08) 9405 5100 Fax (08) 9306 1641.
3. Archived with CD ROM, Woodvale Library, Science and Information Division, Ocean Reef Rd., Department of Conservation and Land Management, Woodvale, Western Australia, 6026. Ph (08) 9405 5100 Fax (08) 9306 1641.
4. Shark Bay District, Department of Conservation and Land Management, 67 Knight Terrace, Denham 6537, WA.

The Marine Conservation Branch will hold digital copies of the Field Program Report:

1. The Marine Conservation Branch Server:
   Shareddata on 'CALM-frem-1' [T:144-Marine Conservation Branch\Shared Data\Current_MCB_reports\MMS\mms_5502]

2. MCB Server full backup DAT tape:
   [T:144-Marine Conservation Branch\Shared Data\Current_MCB_reports\MMS\mms_5502]

4.2 DATA

Collected raw data will be:

1. Produced as a Marine Management Support Data Report and copies will be held at the same locations as for the Field Program Report.
2. Entered into electronic copies of the data sheets (Microsoft Excel) database 'Streettalk\userdata@FREM.MCB@CALM'T:\144-Marine Conservation Branch\Shared Data\Databases\Biological inventory\dugongs.

4.3 VIDEO RECORDS

Collected mini digital video (MDV) footage will be held at two locations.

1. Video masters and copies to be stored at the Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry Street, Fremantle, Western Australia.
2. MDV copies to be stored at the Shark Bay District Offices, Department of Conservation and Land Management, 67 Knight Terrace, Denham. 6537.

5 REFERENCES

Department of Conservation and Land Management. 1996. Shark Bay Marine Reserves Management Plan 1996 – 2006.
Department of Conservation and Land Management, Perth, Western Australia, 6000.

Holley, D.K. (2002):Deployment of GPS locational tags on dugongs in the Shark Bay World Heritage Property. Field Program Report: Unpublished Report.

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Preen, A.R., Marsh, H., Lawler, I.R., Prince, R.I.T., and Shepard, R. (1997). Distribution and abundance of dugongs, turtles, dolphins and other megafauna in Shark Bay, Ningaloo Reef and Exmouth Gulf, Western Australia. *Aquatic Botany* **52**, 3-17

6 DISTRIBUTION LIST

Department of Conservation and Land management

Dr. Chris Simpson, Manager, Marine Conservation Branch.
Nick D'Adamo, Senior Oceanographer, Marine Conservation Branch.
David Rose, District Manager, Shark Bay District.
Kelly Gillen, Regional Manager, Mid West Region.

Yadgalah Aboriginal Corporation Inc.

Darren Capewell - Coordinator.

Edith Cowan University

Dr Paul Lavery – Head of School, School of Natural Sciences.