MARINE MANAGEMENT SUPPORT
SHARK BAY

MOVEMENTS AND COMMUNITY BASED CONSERVATION OF SHARK BAY DUGONGS:
DEPLOYMENT OF GPS LOCATIONAL TAGS ON DUGONGS IN THE SHARK BAY WORLD HERITAGE PROPERTY
15 MARCH– 26 MARCH 2002

Field Program Report: MMS/SBY/SBA – 57/2002

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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Coasts & Clean Seas

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Helping Communities Helping Australia

Project Number: 28624

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Copies of this report may be obtained from:

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SUMMARY

This report outlines the methods and program for the deployment of nine GPS location recording tags on dugongs *(Dugong dugon)* within the Shark Bay World Heritage Property (SBWHP) during the period 15th March- 26th March 2002. Location data from these tags will be used to identify areas of high use by dugongs, which will then be assessed to assist in determining the dugong's preferred habitat for foraging. This information will then be used in a management framework for more effective management of this population and its habitat requirements within Shark Bay.

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, James Cook University and Edith Cowan University.

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ACKNOWLEDGEMENTS

CALM Collaboration

- Gordon Wyre A/Director of Nature Conservation.
- Dave Rose District Manager, Shark Bay District.
- Dr Chris Simpson Manager, Marine Conservation Branch.
- Nick D'Adamo Section Coordinator, Marine Management Support, Marine Conservation Branch.
- Kevin Crane Marine Operations Officer, Shark Bay District.
- Richard Hall Marine Reserves Officer, Shark Bay District.

External Collaboration

- Darren Capewell and Dianne Bellottie Yadgalah Aboriginal Corporation
- Dr Nick Gales Australian Antarctic Division.
- Craig & Jessie Shankland James Scheerer Research Charters.
- Dr Ivan Lawler James Cook University.
- James Sheppard James Cook University.
- Dr Paul Lavery Edith Cowan University.
- Nick Wood Edith Cowan University.

Funding and Resources.

- Funding for this project was obtained through the NHT Coast and Clean Seas Marine Species Protection Program.
- The Department of Conservation and Land Management's Marine Conservation Branch, Wildlife Branch and Shark Bay District have provided additional funding and resources.

1 INTRODUCTION

1.1 GENERAL

This field program report outlines the methods and program for the deployment of location recording tags on dugongs *(Dugong dugon)* within the Shark Bay World Heritage Property (SBWHP) during the period 15th March- 26th March 2002. Location data from these tags will be used to identify areas of high use by dugongs, which will be assessed to assist in determining the dugong's preferred habitats for foraging. This information will then be used 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, 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 March 2002 field program will deploy nine GPS tracking tags on dugongs throughout the Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve using established safe capture and restraint techniques (Lawler and Marsh 1999). These units will be attached to the dugongs for periods of up to five months, and will measure their spatial distribution in relation to seasonal variables.

The March 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 members from the Shark Bay Yadgalah Aboriginal Corporation (contact: Darren Capewell). Dave Holley will coordinate field trip preparation with assistance from Nick Wood at ECU.

Field staff will include Dave Holley, three members from the YAC, Richard Hall and Kevin Crane from CALM Shark Bay District, James Sheppard from JCU, Nick Wood from ECU and CALM volunteer Sietske Hunn.

1.2 BACKGROUND

Dugong populations are under extreme human pressure throughout their range and now survive in substantial numbers only in Australia (Marsh and Lefebvre, 1994). Marsh *et al.*(1999) suggest that an optimum management strategy for dugong conservation is to identify key areas that consistently support large numbers of dugongs and to set these aside as dugong sanctuaries in which dugong mortality is minimized and their habitat protected. Dugongs within Shark Bay, due to the low level of human predation, 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) identifies a number of research priorities have been identified 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 the Department of Conservation and Land Management to effectively manage and protect this key population of dugongs, information on seasonal movement patterns is required. Such data are most productively acquired via telemetry and GPS data logger technology. The application of this technology represents a breakthrough in identifying the seasonal movement patterns, cryptic home ranges and habitat use by this species. This information will be made directly available to the local community for broad public presentation and 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 government management agencies in Shark Bay through:

1. a determination of the movements of Shark Bay dugongs on the following spatial and temporal scales by tracking:
    a. seasonal surface movements of dugongs over an annual scale in relation 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 at all depths.

2. a determination of the most important dugong habitats through measurements of:
    a. the amount of time spent in particular areas/depths/water temperatures (as per Objective 2)
    b. the type of sea grass and probable forage for areas identified in Objective 2, part a. 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 March field program are to:

- Locate and retrieve two GPS tracking tags deployed during August and November 2001, respectively.
- Catch nine dugongs and deploy one GPS/satellite unit on each of these dugongs for a period of five months at one location in the eastern gulf, and one location in the western gulf.

2 SITE SELECTION, METHODS AND EQUIPMENT.

2.1 SITE SELECTION

Dugong capture sites will be selected as areas where seasonal dugong aggregation's are known to be relatively dense, as determined by past aerial surveys (Preen et al 1997, Marsh et al 1994, Gales unpublished data from 1999, Holley 2002). The dugong capture technique requires candidate dugongs to be in water depths of less than about 1.8m at the point of restraint.

During this deployment period, dugongs will be caught and tags deployed at two locations within the Shark Bay World Heritage Property (Figure 1). The seagrass banks surrounding Pelican and Three Bays Islands fit the above mentioned criteria and also represent locations within both gulfs of Shark Bay that are important for dugongs throughout the summer period (Marsh 1994). In the week prior to the capture attempts, the crew of the James Scheerer II research vessel will undertake a survey of the area surrounding Three Bays Island (Figure 1) to ascertain whether there are sufficiently large numbers of dugong in the area to make a capture program feasible. For the same purpose, dugong observations will be undertaken from an aircraft over the proposed capture area of the eastern gulf.

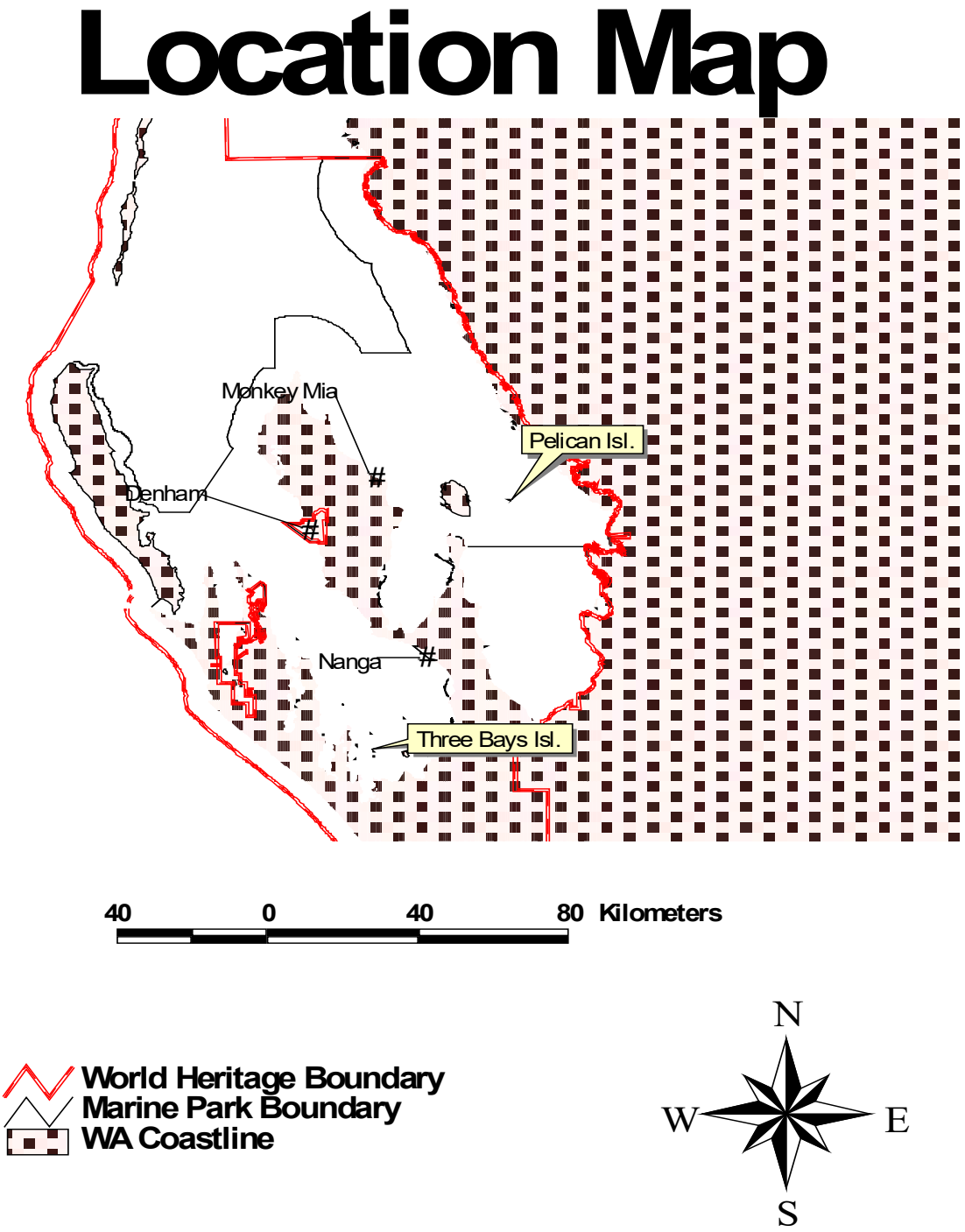

Figure 1. Location map showing dugong capture locations (Pelican and Three Bay islands) within the Shark Bay World Heritage Property.

MARINE PARKS AND RESERVES AUTHORITY

SUMMARY SHEET

TITLE: 5.3.2 (a) Review of the Ningaloo Marine Park (State Waters) Management Plan and consideration of adjacent marine conservation reserves

FORWARDED BY: Dr C Simpson

ISSUES TO BE DISCUSSED: Ningaloo Marine Park Framework Paper

WHERE DOES THIS FIT IN WITH THE MPRA'S STATUTORY RESPONSIBILITY (indicate section(s) of the CALM Act): Section 54

BACKGROUND SUMMARY:

The Minister for Environment and Heritage has directed the Department to commence the planning process to review the Ningaloo Marine Park Management Plan, and to consider proposed marine conservation reserves adjacent to the Park.

Before commencing this process the Department has requested guidance from the Authority to inform the Department and key stakeholders on the MPRA's view on key issues that are likely to be raised in the review. The Authority considered the first draft of the Ningaloo 'Framework Paper' at its January meeting and subsequently held an extraordinary meeting (23 January 2003) to specifically discuss this matter. The framework paper is essential a broad policy statement that will be provided to stakeholders to show the direction the Authority believe the management of the Ningaloo Marine Park should take.

The Department has finalised a draft paper for consideration by the Authority taking into account the discussions of the Authority to date. The only part of this paper uncompleted is the front page relating to the MPRA's vision/mission etc for Ningaloo, as the Authority has indicated a desire to develop this component of the paper. As such, at the February meeting it is hoped that this section can be finalised, and that the Authority can approve the framework paper. As the planning and consultation process cannot be commenced until the framework paper is approved, it is hoped that the Authority can finalise the consideration of this matter to enable the planning process to commence and the project moved forward.

RECOMMENDATIONS:

That the Authority;

1. **finalise consideration of the vision/mission statements (as discussed at the extraordinary meeting on the 23 January 2003); and**
2. **endorse the Ningaloo Framework Paper (with any required amendments) to enable the Department to commence public consultation on the project.**

DECISION(S)

2.2 Catch and Restraint Methods

The catch and restraint of dugongs within Shark Bay has and will continue to be undertaken following procedures as outlined in a 'Protocol For Capture Of Dugongs and Fitting Of Satellite Tracking Apparatus' (Marsh and Lawler, 1999) (Appendix 1). An abbreviation of this protocol is outlined below.

2.2.1 Chase and capture.

The following criteria are used for the selection of candidate animals.

- Dugongs in, or close to, water of 1-1.8m depth are selected.
- Only dugongs estimated to be >2.2m long are selected. Where possible, dugongs >100m from other dugongs are selected.
- When capturing dugongs from a herd, animals on the edge are selected, and the pursuit and herding procedure arranged so as to direct the dugong away from the group. A maximum of two capture attempts from any one herd is made.
- Captures are not made from groups containing cow-calf pairs.

Once a suitable dugong is located, the GPS co-ordinates are recorded on the catch data sheets (Appendix 2) and the catch boat (5.4m, centre-console, fibreglass hulled, inflatable Zodiac powered by a 50HP four-stroke Yamaha outboard) approaches the dugong at less than wake speed (approximately 5km/hr) from between it and the nearest deep water. The approach is maintained until the dugong is startled and swims rapidly away from the capture boat; the time is recorded and the chase commences. All capture attempts from this point on are logged (Appendix 2).

During a chase, the pursued dugong slows down and comes to the surface to breath. The breath cycle takes at least 2 seconds, during which the animal first presents its head at the surface, inhales, and then raises its back and tail peduncle to the surface prior to diving. If the catch boat is in position during a surfacing, the dugong is allowed to take a full breath, and, when the back and tail peduncle are presented, the nominated catcher leaps from the boat onto the dugong and wraps his/her arms rapidly and firmly around the peduncle. It is essential to establish this firm grip prior to the animal being able to establish a powerful tail beat, as this is likely to dislodge and potentially injure the catcher.

Once the grip is established, the catcher then stands up with the dugong's fluke held down against his body. Two other catchers immediately follow the primary catcher into the water and attempt to grip one each of the dugong's pectoral fins. During the establishment of the restraint, the capture boat manoeuvres alongside the dugong and an additional person enters the water from the second boat, equipped with a 120 x 12cm foam flotation device with 1.2m of rope attached to each end. This is placed under the dugong, immediately behind the pectoral fins with the ropes being secured to an inflatable pontoon of the capture boat. The noodle acts as a cradle preventing the animal from rolling and ensures that the animal is able to lift its head out of the water to breathe. The primary catcher continues to hold the dugong by the tail fluke.

If during any stage of the restraint and stabilisation procedure the dugong is not able to acquire a breath for a period in excess of 30secs, the animal is released immediately.

2.2.2 Sampling

Once secured alongside the boat, the following procedures are undertaken:

- Measurements of standard length (straight lie from tip of face to mid-fluke) and of axillary girth
- Dorsal skin biopsy taken with a 5mm biopsy punch
- Application of temporary paint mark using a livestock marker
- Determination of sex from inspection of anal-genital openings
- Collection of a facial vibrissae for stable isotope analysis
- Application of the location tag by securing the harness around the dugong's tailstock.

Upon completion of these tasks, the dugong is released with the tag held out of the way of any obstacles until the animal is clear of all people and boats. If possible, the animal is followed at a distance and observed to ensure there is no adverse reaction from the procedure.

2.3 Tag Description

Tags used during this field program will be on loan from James Cook University. The tags, Telonics TMT – 240 GPS/PTT location loggers, are new generation tags that, when at the surface, will log the dugongs' positions using the Geographical Positioning System (GPS) array of satellites. Positions, in a latitude / longitude format, obtained from this system have an accuracy of <5m and can be generated at intervals of between 5 minutes and 6 hours. Aside from the GPS capability, the tags can also transmit locational data via the Argos system of satellites. Positions obtained from the Argos system are to within 150 to 4000m. The Argos system will therefore mainly be used to uplink acquired GPS data from the units, monitor the tags approximate position and determine if any tags have released prematurely. All tags are equipped with a unique VHF radio beacon enabling the tags to be located via radio telemetry from either boat or plane.

3 PROJECT MANAGEMENT

3.1 DEPLOYMENT TEAM

3.1.1 CALM personnel

The deployment team may be comprised of up to four CALM personnel depending on availability of CALM's Shark Bay District staff. These are; Dave Holley (MCB), assisted by Richard Hall and Kevin Crane (Shark Bay District) and Sietske Hunn, CALM Volunteer

Dave Holley (DH)	Field Team Leader Marine Fauna Zoologist	Ph (w) (08) 9432 5100 Fax (w) (08) 9430 5408 Mb. 0417 952 118 Ph (h) (08) 9335 6645
Richard Hall (RH)	Boat Operator Marine Reserves Officer	Ph (w) (08) 9948 1208
Kevin Crane (KC)	Data recorder Marine Operations Officer	Ph (w) (08) 9948 1208
Sietske Hunn (SH)	Data recorder, equipment assistant CALM Volunteer	

3.1.2 Yadgalah Aboriginal Corporation personnel

Up to three members of YAC will be involved in the deployment program. These members are selected on a rotational basis by the YAC coordinator.

Darren Capewell (DC) & Diane Belottie (DB)	YAC Coordinators	Ph (w) (08) 99458 1318

3.1.3 James Cook University personnel

James Sheppard (JS)	Field Assistant (PhD candidate)	Ph (w) (07) 4781 4325 Fax (w)(07) 4781 4020

3.1.4 Edith Cowan University personnel

Nick Wood (NW)	Field Assistant (PhD candidate)	Ph (h) (08) 9444 550 mb. 0407 800 732

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 and a boat depending on availability. Other assistance is provided in the form of inexpensive 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 outline the proposed activities and to seek confirmation of their involvement.
- Upon arrival at Shark Bay, DH will meet with KC and David Rose (DR) to issue the Field Program Report, and to discuss the field program.
- KC and DR will be invited to accompany DH to address the YAC committee before the commencement of the program.
- During conduct of the field program, KC and or RH may assist in dugong captures, depending on their availability.
- Upon completion of the program, the District will be briefed on the results of the 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 three YAC personnel will be employed on a rotational basis to catch and restrain dugongs. YAC personnel also provide important local knowledge and may also assist by providing extra logistical support by means of extra boats, if required.

- Prior to commencement of field program, contact will be made with the YAC coordinators Darren Capewell (DC) and Diane Belottie (DB) seeking YAC assistance for the conduct of the program. If assistance assured DH will outline requirements to DC. A letter formally inviting YAC to participate and the requirements for the survey will follow.

- Upon arrival at Shark Bay, DH, KC and DR, will address YAC committee outlining proposed activities and formally invite members to accompany the catch team aboard the James Scheerer II to view the dugong catching process on Sat 24th March. A copy of the field program report to be issued.

- During program, YAC to provide DH with catching personnel and extra boat and skipper.

- Upon completion of program, DH to outline to YAC results of the program and to invite all members of YAC to a BBQ to be held at Peron Homestead.

3.2.3 James Cook University.

The tags to be deployed during this field program will be on loan from James Cook University (JCU) as part of a national dugong monitoring program. In return, MCB will provide an opportunity through this survey for a PhD student from JCU to further his skills in the capture and restraint of dugongs. The student will be assisting with all aspects of dugong captures, tag attachment and sampling activities.

- Prior to commencement of program, contact to be made with JCU to formally invite JS to participate.
- During program, JS to provide technical assistance and to assist with all captures.

3.2.4 Edith Cowan University.

The role of Edith Cowan University within the program is to provide expertise in the sampling and data analysis associated with habitat usage determined from tag locations. A PhD student will accompany the deployment team and assist the team during deployment as well as collecting seagrass samples from the capture locations.

- Prior to field program, DH to contact NW and invite him to participate in program.
- During program, NW to assist with data collection/recording aspects of the survey and the collection of seagrass samples at catch location.
- Upon completion of the program, NW to provide DH with list of seagrass species sampled.

3.3 FIELD ITINERARY

Table 1. Itinerary for March field program for the deployment of location tags on dugongs within the Shark Bay World Heritage Property.

Date	Day	Location	Personnel	Activity
15/03/02	Fri	Perth	DH, NW, JS, SH	Depart Perth driving to Shark Bay.
16-17/03/02	Sat-Sun	Peron Homestead	DH, NW, JS, SH	Equipment preparation
18/03/02	Mon	YAC office Denham	DH, KC, DR	Meeting with YAC Committee and coordinators to outline program.
19-21/03/02	Tue- Thu	Three Bays Island	DH, NW, JS, SH 3YAC, *SBD	Tag deployment – western gulf. Departing Nanga daily.
22-24/03/02	Fri - Sun	Pelican Island	DH, NW, JS, SH 3YAC, *SBD	Tag deployment – eastern gulf. Departing Monkey Mia daily.
24/03/02	Sun	CALM Offices, Denham	All personnel, CALM staff and YAC members	Social BBQ.
25/03/02	Mon	Denham	DH, NW, JS, SH	Clean boat and pack equipment.
26/03/02	Tues	YAC office Denham	DH, KC, DR	Debriefing with YAC committee.
27/03/02	Wed	Denham	DH, NW, JS, SH	Depart Shark Bay driving to Perth.

CALM Personnel- DH- Dave Holley, DR- Dave Rose, SBD (either of Kevin Crane or Richard Hall).

*Denotes participation due to availability.

Other Personnel – YAC –Yadgalah Aboriginal Corporation Catchers, JS –James Sheppard, NW – Nick Woods, SH – Sietske Hunn.

3.4 SAFETY

3.4.1 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 – Dave Holley. The capture and restraint of dugong is an inherently dangerous activity, for this reason only those experienced in the capture methods are involved in subduing and restraint of the dugong.

3.4.3 Boating

For conduct of this field program, two vessels will be used. These are, respectively, the CALM marine mammal research vessel C644 and a YAC owned jet boat. Boating and navigation are the responsibility of the boat skippers and activities conducted from the CALM vessel shall be conducted in accordance with "Safe Marine Operations in CALM" Boating Policy. Safety issues on each vessel are the responsibility of each skipper. For operations conducted from CALM vessel C644, the skipper is DH (FTL). The skipper responsible for the YAC vessel is Benny Bellottie (BB). DH will coordinate boating activities each day in consultation with BB.

Before departure each day DH will log in with relevant radio operators, see 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 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 COMMUNICATIONS AND EMERGENCY CONTACTS

3.5.1 General

- The deployment team can be contacted on DH mobile phone during all hours subject to coverage.
  – 0417 952 118.
- The offices of the Yadgalah Aboriginal Corporation during business hours is-
  (08) 9948 1318

3.5.2 CALM Offices – Business hours only.

- Shark Bay District, Denham – (08) 9948 1208
- Monkey Mia Visitors Centre – (08) 9948 1366
- Marine Conservation Branch, Fremantle – (08) 9432 5100

3.5.3 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

3.5.4 Boating Radio Contacts

- 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.

3.6 ACCOMMODATION

During the course of the field program, DH, JS, NW and SH will be accommodated at the Peron Peninsula Homestead in the Francois Peron National Park. DH will purchase food, with all personnel to prepare meals on a rotational basis.

3.7 BUDGET

Table 2. Budget proposal for March field program for the deployment of location tags on dugongs within the Shark Bay World Heritage Property.

Budget Item			EA Costs ($)	CALM District costs ($)	MCB costs ($)	Total costs ($)
Travel						
Vehicle	MCB 4WD – 2000 km @ $0.45/km		0		900	900
Accommodation	Denham – 11 days		700	0	0	700
Provisions	10 days @ $120		1200	0	0	1200
		Sub-total	1900	0	900	2800
Staff						
DH	12 days @ $ 229		0	0	2748	2748
KC	3 days @ $ 251		0	753	0	753
RH	3 days @ $ 188		0	564	0	564
Yadgalah	6 days @ $ 500		3000	0	0	3000
		Sub-total	3000	1317	2748	7065
Vessel & other equipment						
RIB C644	6 days @ $100		600	0	0	600
Charter boat	6 days @ $340		2040	0	0	2040
James Scheerer Research vessel	1 day @ $1500		1500			700
Charter flight	2 hr @ $540hr		1080	0	0	1080
		Sub-total	5220	0	1000	4420
Consumables						
Batteries			100	0	0	100
Sundries			500			500
		Sub-total	600	0	0	600
TOTAL			**$ 10,720**	**$ 1,317**	**$3,648**	**$15,685**

3.8 EQUIPMENT

3.8.1. Tags and attachment equipment.

- 9 Telonics PTT/GPS location tags.
- 9 Harness and tethers
- Tool kit containing attachment tools.
- Non-toxic livestock marker.

3.8.2. Sampling equipment

- Tape measure.
- Biopsy punches.
- Sample vials.
- 3 Waterproof notebooks.
- Pencils and waterproof markers.
- Watch.
- Garmin3 hand held DGPS.

3.8.2. Vessels and Vehicles

- Marine Mammal Research RIB – C644.
- MCB 4wd vehicle - 1QAG 734.

3.8.3 Safety

- 6 personal floatation devices
- Stocked field first aid kit
- AB Fire extinguisher
- EPIRB and flares.

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) 9432 5100 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. On CD-ROM [mms_5702] held onsite at the Marine Conservation Branch
2. On the MCB homepage located within the framework of the Department of Conservation and Land Management Intranet (i.e. CALM web):
3. http://calmweb.calm.wa.gov.au/drb/ncd/mcb/rep_mms.htm#2002.

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.

5 PUBLICITY

A film crew from the company 'Wild Visuals' will be accompanying the deployment team for the capture and tagging of dugongs during this March deployment. The filming of the dugong captures will form part of an overall documentary on research being carried out in the marine environment of Western Australia. The company has already obtained permits for this filming activity. A written agreement with the company has been reached ensuring that a copy of all raw and edited footage will be made available to CALM Shark Bay District for education and interpretation purposes.

On the last days of deployments in the eastern gulf, the weekend of 23-24 March, the vessel James Scheerer II will accompany the catch boats to the deployment location on the banks surrounding Pelican Isl. The purpose will be to bring out the elder members of the Yadgalah Aboriginal Corporation to view the catchers as they are in the process of catching dugongs. This represents an opportunity for the local community members to view first hand how the project operates and for the FTL to explain the details of how their involvement in the project contributes towards the conservation management of dugongs within the SBWHP.

6 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) Summer distribution and abundance of Shark Bay dugongs. Field Program Report. Unpublished Report.

Lawler, I., Marsh, H. (2000). A protocol for capture of dugongs and fitting of satellite tracking apparatus. Unpublished Report.

Marsh, H., and Lefebvre, L. W. (1994). Sirenian status and conservation efforts. *Aquatic Mammals* **20**, 155-70.

Marsh, H., Prince, R.I.T., Saalfeld, W.K., and Shepherd, R. (1994). The distribution and abundance of the dugong in Shark Bay, Western Australia. *Wildlife Research* **21**, 149-61.

Marsh, H., Eros, C., Corkeron., and Breen, B. (1999). A conservation strategy for dugongs: implications of Australian research. *Marine and Freshwater Research* **50**, 979 – 90.

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

7 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.
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Yadgalah Aboriginal Corporation Inc.

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APPENDIX 1. Capture data record sheet.

DATE	UNIT No.	Remote Release Code	Beacon Frequency	Time Depth Recorder No.
Time Sighted	Commence Chase	Capture Time	Release Time	Abort
Length (m)	Girth (m)	Peduncle (m)	Biopsy	Sex
Latitude	Longitude	Water Depth	Tide State	Scarring Level
Mark	Comments			

APPENDIX 2. PROTOCOL FOR CAPTURE OF DUGONGS AND FITTING OF SATELLITE TRACKING APPARATUS

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Introduction

This protocol describes the method used by the dugong ecology group at School of Tropical Environment Studies and Geography, James Cook University. The protocol has not been developed in isolation, but rather has been distilled from the experience of ourselves and other researchers who have captured dugongs since 1986. In particular, the chase and "rodeo" capture method draws heavily on guidelines developed by Dr Janet Lanyon of the Department of Zoology, University of Queensland. The procedures for capture by hoop net have been developed in consultation with Dr Tony Preen, previously of TESAG, who has successfully caught some 60 animals using this technique. The method for restraining dugongs beside the boat after rodeo capture was an innovation of Dr Nick Gales of the Department of Conservation and Land Management, Western Australia. This protocol has been reviewed by Dr Gales (who is both a marine mammal researcher and a veterinarian). It has also been commented on by Mr Peter Buosi who assisted in the capture of numerous dugongs with Dr Preen using the hoop net method, as well as assisting Dr Lawler in the capture of four animals using the rodeo method.

We describe the protocol in three phases: 1. Chase; 2. Capture, and; 3. Handling.

The chase phase is essentially the same regardless of the capture method used. However, the capture method used will vary depending on the conditions (particularly depth), and subsequent handling will be determined by the capture method.

We believe that the capture phase is the one in which there is the most danger of harm to the animal. Two mortalities have occurred in the past during capture of dugongs and we believe there are significant similarities between the captures that indicate that minor adjustments to the protocol can substantially reduce the likelihood of further deaths. Both deaths occurred in Moreton Bay, one in an operation conducted by Dr Tony Preen in 1990 and the other in an exercise conducted by Dr Janet Lanyon in 1998.

The common factor that we believe is the most significant in the two deaths is that in both cases the initial capture attempt was made as the dugong surfaced, *but before it was allowed to draw breath*. Thus, while the animal was significantly aerobically challenged it was prevented from breathing, leaving little in reserve for that period between capture and its first opportunity to breathe. In response to this concern the protocol described below incorporates steps to: 1. assign a monitor during the chase, whose role is to assess the breathing and condition of the animal and keep track of the duration of the chase, and; 2. set limits in the time and number of breaths taken by the dugong during the chase to ensure the animal is not too exhausted; 3. ensure that the animal is allowed to draw a full breath before capture, and; 4. give the dugong the maximum opportunity to breath during processing and to monitor its ability to do so.

The other similarity between the deaths is that both occurred in Moreton Bay in Spring. Dugongs in Moreton Bay are thought to be significantly nutritionally challenged during winter because water temperatures over the feeding areas are considered lower than necessary for the dugongs to thermoregulate. Thus, the opportunities to feed are limited and many dugongs are in poor condition in the late Winter and early Spring. The two dugongs that died may both have been in weaker than normal condition. We do not believe this to be a problem in more northerly areas where there is no seasonal reduction in feeding opportunity.

Equipment and Personnel

Two boats should be used, one to act as a support and the other as a primary catch boat. This provides the benefit of reducing crowding in the main boat, increasing the search coverage while locating animals and is a safety precaution should any mishaps occur with the single boat. A spotter aircraft in radio contact with the boats can greatly facilitate the locating of animals.

The primary catch boat should be light and manoeuvrable and approximately 5m long. The motor should be sufficiently powerful to allow rapid change of direction and acceleration (up to 20 knots). Forward steering allows the animal to be followed directly by the driver with less reliance on instruction from other observers. The boat hull and engine let should be as shallow draft as possible. A depth sounder may prove valuable in assessing the suitability of conditions for capture.

The support boat has fewer requirements, needing only to be able to carry support crew and equipment. It also needs to be a suitable platform for restraining the dugong against. Thus it should have low sides to allow access from those within the boat and preferably be inflatable so the side of the boat against which the animal is restrained is cushioned.

Where two boats are used, some form of radio communication between them is essential.

Rodeo technique

The minimum personnel for the rodeo technique comprises approximately eight people:

Catch Boat

1. driver
2. primary catcher
3. two dugong handlers (one of whom will attach the tether)
4. monitor - makes the call of when to terminate a chase and/or when to release an animal if a capture is effected

Support Boat

1. driver
2. data recorder/equipment handler
3. extra dugong handler(s)

Hoop net technique

The hoop net technique requires fewer personnel (minimum four) due to the use of a tail rope to restrain the dugong. A support boat is not essential, but where this technique has been used in the past by Dr Preen a spotter plane has usually been employed.

1. driver
2. catcher
3. data recorder/equipment handler
4. dugong handler

Dugong Capture

Note that the risks to the dugong, and the steps taken to reduce these risks are summarised for each phase and capture technique in Table 1.

Phase 1. Chase

Location of animals by observers in both boats searching the catch area. Once dugongs are located, a candidate animal must be chosen according to the following criteria:

- the suitability of its location (especially proximity to shallow water)
- being either alone or on the edge of a herd
- adult and in apparent good health (animals with obvious dorsal processes should be avoided)

The candidate dugong is approached at low speed, with the aim of getting as close to the animal as possible before initiating the chase.

- Some time may be spent in herding the animal into a more catchable position. In this circumstance the dugong is aware of, and avoids, the boat but is not swimming rapidly to escape. The driver attempts to keep the boat on the seaward side of the dugong and be sufficiently close to cause it to move into shallower water to avoid the boat, but not approach so closely that it makes a rapid escape swim until it is in an area where an attempt at capture may be made.

- When the dugong is considered to be in an appropriate position, the chase is initiated by accelerating rapidly towards the animal. The monitor should record the time of the initiation of the chase along with the respiration rate of the dugong. Initiation of the chase is defined as being when the dugong makes its first fast burst swim in an attempt to escape.

- Once a chase has started the support boat remains approximately 100m to the deep water side of the catch boat, participating in the chase only by observation and attempting to head the animal off if it evades the catch boat and heads for deeper water.

- In cases where the animal does not make effective attempts to escape (i.e. appears lethargic or slow-moving) this will be taken to be a sign of ill health or age and the pursuit will be called off.

- The driver of the catch boat pursues the dugong, aiming to keep the animal just slightly in front and to the side of their own position in the boat. This enables the catcher to dive forward onto the tail of the animal when the time is right. It is important that the dugong always be kept to the side of the boat, never directly in front. This is because when they take a breath they often slow down and the catch boat risks riding up over the back of the animal.

- The dugong is pursued until it is considered that it is in an appropriate situation to be caught and has surfaced to take a breath.

- For rodeo-style capture, this is usually in water no greater than approximately shoulder depth for the capture team and optimally slightly greater than waist deep.

- For hoop net captures the water must be no greater than three metres deep.

- Pursuits are called off if the animal has not been captured within 10 minutes of initiation of the chase (Most chases last for less than five minutes). As an additional caution, if the animal makes sustained dives while pursued, or surfaces many times in quick succession, the chase is abandoned if the animal cannot be caught after the third time it surfaces.

Additional points to note

There are two sources of significant risk to dugongs during the chase. The first of these is the risk of hitting the dugong with the boat. This can be minimised by using only experienced boat drivers/skippers and appropriate boats. It is also important that observers on both the catch and support boats (and aircraft, if used) assist in making the driver aware of the position of the animal being pursued and any other animals in the vicinity. The second potential source of danger from the chase is capture myopathy. This is minimised by the restrictions described above for limiting pursuit times. The levels of capture myopathy have not been quantified to date. However, there have been no known dugong deaths from capture myopathy during capture operations.

Phases 2 and 3. Capture and handling - rodeo

(Capture based on the technique developed by Dr Janet Lanyon, handling based on technique developed by Dr Lanyon with innovations from Dr Nick Gales)

Capture is effected as the animal surfaces to breathe *but must not take place until it has drawn a full breath!* We believe this to be the most significant time of potential danger to the dugong. The dugong is initially restrained by the primary catcher jumping from the boat to grab the tail stock of the animal. This is done in such a way that the tail flukes are held, with the tail bent downwards rather than upwards, pressed against the chest and belly of the catcher, preventing the dugong from making a propulsive down stroke of the tail. To effect this the catcher must have his/her feet on the substrate and arch his/her body backwards.

- The catcher remains holding the tail throughout the processing of the animal.

- Immediately the catcher leaves the boat, two handlers follow (but enter the water beside or in front of the dugong due to the movement of the boat).

- When the catcher and handlers have left the boat the driver manoeuvres the boat close to the restrained dugong to allow the monitor to keep track of the breathing rate and condition of the animal (it is their responsibility to call for the release of the animal in case of a mishap).

- Note that during the initial restraint, if the dugong does not take a breath for 30 seconds it should be released immediately.

- The role of the supporters is to assist in restraining the dugong, but also to prevent it from rolling and ensure that it remains close to the surface and is able to breathe freely at all times. To do so, the supporters must be able to touch the substrate to enable them to provide support for the animal. It is for this reason that the rodeo technique should only be used where water is chest deep or less.

- As soon as the driver of the support boat sees the catcher leave the primary boat the support boat approaches, cutting the motor to drift in close to where the dugong is being held.

- At this stage another person from the support boat may enter the water to assist in supporting or restraining the dugong.

- An additional method of restraint is used, in the form of a polystyrene tube approximately 1.5m long (a swimming pool "noodle") to which are attached two short lengths of rope. This is passed under the dugong immediately behind the flippers. The ends of the rope are then held (not tied off) by someone in the support boat, further ensuring the animal is kept close to the water surface and able to breathe freely (i.e. the nostrils are held at the surface at all times). This also keeps the animal alongside the boat where equipment is readily available. Note that this boat should have an inflatable hull if possible to cushion the restrained dugong.

- This form of restraint ensures that the animal can be held securely but be released immediately at any time on the advice of the monitor.

- When the dugong is suitably restrained the data recorder hands the tether to one of the dugong handlers who attaches it as quickly as possible to the tail, making such adjustments as are necessary.

- Further data are recorded *only if the tether has been attached within five minutes.* If the monitor decides that the struggle has been more prolonged than optimal, the dugong is released immediately the tether is attached (*in some cases earlier*), with no other measurements or data recorded.

- Other data that are recorded are the sex, length, girth and tusk eruption status. A skin scraping and/or faecal sample may be taken for genetics.

- The dorsal surface of the dugong should be marked with a paint stick soon after capture, to make it easy to identify animals that have previously been caught (especially those that have been released before tether attachment).

- The dugong is held for no more than 6 minutes before release. Optimum handling times are <4 minutes.

- Indications of excessive stress are: squealing, intense struggling and frequent rolling such that breathing may be inhibited.

- The animal is released by first removing the polystyrene tube from around its middle (one end of the rope is let go and the tube is simply pulled free).

- Once this has been done the other supporters release the animal after ensuring that the satellite tether is not tangled with, or obstructed by, the boat or supporters.

- The respiratory rate and behaviour of the dugong is recorded for at least 10 minutes after capture, the observers being careful to remain at such a distance so as to not pursue the animal.

Phases 2 and 3. Capture and handling - hoop net

As with the rodeo method, capture is effected as the animal surfaces to breath *but does not take place until is has drawn a breath!*

- The dugong is caught by placing a net over the front of the animal while it is (briefly) at the surface. The net is a hooped bag that covers the front half of the animal. It breaks away from the frame and is secured to the boat by a rope that also forms a drawstring around the mouth of the hoop.

- In 2001 we have developed a modification of the hoop net. It is of the same principle, but uses a smaller, moulded mesh (there are no knots) and has a small diameter hoop at the front, which passes over the dugong's head but cannot move further down it's body. This enables the animal to be caught in the same way, but it does not have any material covering its face and potentially impairing its ability to breathe.

- As soon as the dugong is caught the motor of the boat is cut. One person enters the water to attach a padded rope to the tail stock and to remove the net from the front of the dugong. Note that the tail rope should be shorter than the net rope, such that if the dugong pulls on the ropes there is sufficient slack in the net rope to allow its removal. The tail rope may be up to 30m long, *sufficient that it not inhibit the dugong from making an effective downstroke with the tail,* thus allowing it to surface to breathe while measurements are taken and the satellite tether attached. When the animal has calmed, the rope may be shortened to approximately 10m, to allow shorter transits from the boat to the animal for the person taking measurements and attaching the tether.

- *The rope should be held, rather than tied off, to provide the capacity for immediate release.*

- Again note that in 2001 we intend to use an amalgamation of the two techniques. That is, the net will be used simply to stop the dugong, but it will then be handled as per the rodeo style post-capture, with the net removed immediately after we have someone restraining it by the tail (see above).

- As with the rodeo method, the dugong must have free access to the water surface to breathe. For this reason the rope is kept long and capture should not be made in water greater than 3m deep. At greater depths, the angle of the rope from the tail to the boat is becomes too steep, inhibiting the downstroke of the tail and the ability of the dugong to raise its head.

- All handling of the animal is done while it is restrained by the tail rope. Only one person is in the water with the animal. As the dugong is free to move while equipment is attached and data taken, handling may take up to 15 minutes.
- The animal is released after data recording by removing the tail rope (which has a quick-release mechanism).

- The main concerns during handling with this method are the ability to free both the handler and the dugong from the rope quickly. To this end, the tail rope has a large, quick release mechanism (a rock-climbing carabiner) and the person in the water carries a diver's knife strapped to their leg. The situation is also watched closely by those in the boat who also have a knife to cut the dugong or handler free in the event of a mishap.

Table 1. Summary of risks associated with each phase of capture for both methods and the steps take to reduce or avoid those risks

Capture Phase	Risk	Steps taken to avoid risk
Chase - both methods	boat strike	• use of experienced drivers • driver advised of position of dugong by observers in both boats • propeller guard on catch boat and/or removal of hydraulics to allow motor to give way if animal hit.
	Capture myopathy	• limitations on length of chase (no mortalities from capture myopathy have yet been recorded) •
Capture and Handling - rodeo	drowning	• ensure breath taken before capture attempt made • assist dugong in keeping head at surface while handled • depth limit on capture area • immediate release if sustained struggling or unable to bring to surface • limit on length of handling time •
Capture and Handling - hoop net	drowning	• ensure breath taken before capture attempt made • use of tail rope of sufficient length to allow animal to surface freely • minimal crew in water to reduce animal stress • handler and boat crew to have knives to allow rapid release of dugong in emergency

APPENDIX 3 . Emergency Management Plan – Dugong research

BACKGROUND

Dugong catch locations are in a remote part of Shark Bay. While conducting operations in this area the extra level of difficulty in dealing with an emergency must be recognised. This plan outlines the general concepts on dealing with emergencies that may develop when operating in the area. It does not remove the discretion of the operational leader nor does it devolve from them the ultimate responsibility for safe working practices.

DEFINITIONS

Minor Injury- An injury that does not require specialized medical care. Things such as sprained ankles, minor cuts and abrasions, sunburn are minor injuries.

Major Injury- An injury that requires specialized medical care but is not immediately life threatening or is time critical. Broken arms

Life threatening Injury- An injury that requires immediate specialized medical care. Things such as snakebite, cardiac arrest are classed as life threatening injuries.

RESPONSES

Minor Injuries

Initial response will be to treat the injury on site. The patient will be further treated on board the vessel if necessary. Unless the patient is in excessive pain, there will be no need to evacuate them back to Denham. An injury/accident report is required.

Major injuries

Initial response will be on site with transfer as soon as possible and practicable to the main vessel. Contact to be made with Silver Chain in Denham. Evacuation is to be undertaken as soon as practicable through to Denham. Patient transfer to Ambulance at Jetty.

LIFE THREATENING

Initial response will be on site with transfer as soon as possible and practicable to the main vessel. Contact to be made with Silver Chain in Denham and advice sought as to course of action. Evacuation is to be undertaken as soon as practicable through to Denham or elsewhere as directed. It is unlikely with sea conditions and possible airstrips that this would be any other location than Denham. Patient transfer will be as directed.

EVACUATION

In the event of evacuation, the injured person will be transported to the nearest jetty by boat, i.e. Monkey Mia, Nanga or Denham. Arrangements to be made through radio contact to have ambulance and necessary expertise waiting at the jetty upon arrival.

REPORTING

Any injuries, accidents or near misses should be documented by normal CALM procedures.