WAMMP Mangrove Community Monitoring Program:
Direct impact monitoring through the establishment of fixed-point sentinel sites in Shark Bay Marine Park

Marine Science Program Metadata Report
MDR_Mangrove_SBMP_201304

KP Bancroft

April 2013

Marine Science Program
Science Division
Department of Environment and Conservation

Department of
Environment and Conservation
Our environment, our future

Suggested citation

Bancroft KP (2013) *WAMMP Mangrove Community Monitoring Program: Direct impact monitoring through the establishment of fixed-point sentinel sites in Shark Bay Marine Park.* Marine Science Program, Department of Environment and Conservation, Perth, Western Australia Meta Data Report **MDR_Mangrove_SBMP_201304**. 17p.

.

Report

Who is submitting this report?	Kevin Bancroft
Date report submitted?	26 April 2013
Who has reviewed this report?	Kim Friedman

What

What is the title of the study/project?	WAMMP Mangrove Community Monitoring
SPP number if relevant (refers to internal MSP projects)	SPP 2012-008
What kind of data was collected (e.g. species richness, species inventory, abundance or density, % coral cover, etc)	Fixed-Point photogrammetric data: tree height, tree width, relative canopy density, pneumatophore density, panoramic photographic record. Remote-sensed mangrove condition model verification data: Canopy density and species identification.
What would be some key words for searching for these data?	Mangroves, monitoring, remote sensing, extent, condition, fixed point photogrammetry, Shark Bay Marine Park

Who

Who did the research/monitoring? Please list names, duties and their affiliations.	Kevin Bancroft	MSP	Trip Leader, Researcher
	Dave Holley	Shark Bay District	Marine Park Coordinator, Field Assistance
	Ross Mack	Shark Bay District	Marine Reserves Officer, Field Assistance
	Shane Heriot	Shark Bay District	District Operations Officer, Skipper
MSP	Kevin Bancroft Marine Science Program Science Division DEC 17 Dick Perry Ave Kensington WA 6151		
Who else should be acknowledged and what contribution did they make (field, technical, GIS support, post-processing)?			

Why

Why was the research done? Provide an abstract that summarises the aim and objectives of the research and where it might be used. This may be taken directly from SPP for internal MSP projects.	<u>WAMMP Mangrove Community Monitoring</u> The monitoring of mangrove communities within WA's marine park network falls within WAMMP's overall objectives of monitoring the states marine assets. Within Shark Bay Marine Protected Areas, mangrove communities are listed as a KPI, increasing their priority as a primary focus for management and the need for CPR information from WAMMP. In a recent review conducted by DEC staff of the potential indicators and techniques and applicability of various approaches to mangrove monitoring in WA, the use of remote sensing to obtain accurate estimates of community extent and density was highlighted as a cost-effective and relevant tool. In conjunction with this, especially in interim years when remote sensing imagery is not available or to monitor dynamic areas of mangrove under risk, fixed point photo assessment of condition will be utilized. This technique allows close-up long term assessments to be made, and involves the selection of sites that are representative of the mangal to be recorded. Mangroves are spatially monitored using 10 sites in the MPA. Sentinel sites have been selected where possible within these sites. It is anticipated that this work can be completed over a four day period. <u>Aims: WAMMP Mangrove Community Monitoring</u> 1. Establish fixed point sentinel sites for monitoring mangrove condition using digital still photography linked to locations identified as dynamic and stable through remote sensing. <u>General Aims</u> 1. Continue to communicate MSP aims, process, and preliminary results to DEC regional staff and local residents 2. Continue to build effective working arrangements with Shark bay regional staff.

How

How was the research done? (e.g. instrumentation, brief description of procedure)?	Baseline fixed-point monitoring of a possible six locations will be established for annual assessments and collection of ground-truth data for remote sensing analysis. The key pressures on the SBMPA mangals are cyclones, air/sea temperature, salinity, hydrocarbon spills, and physical disturbances. Fixed-point photogrammetric method provides photographic evidence for long term monitoring of potential impact sites in mangrove communities that are not available from remotely sensed datasets. These data include tree height and trunk width, tree mortality and damage, pneumatophore density; other impact information (area of impact, litter etc). Qualitative data collected will be the historical photograph.

Please give a brief overview of the sampling design (spatial and temporal), including the spatial array of sample collection, how often measurements were taken and the specific unit of time or space that was used to aggregate samples (e.g. 20 sites, 10 inside sanctuary zones and 10 outside. 5 fixed transects at each site, each transect, surveyed twice a year, once in the summer and once in the winter, etc)?	<u>Sentinel Monitoring</u>
	
	Thirty-seven fixed point sentinel photogrammetric sites were established in the mangroves of Shark Bay Marine Park, three sites at Fowlers Camp, seven sites at Little Lagoon, eight sites at Guischenault, eight sites at Big Lagoon, five sites at Blind Inlet and six sites at southern Faure Island. Only one tree was recorded at each site.
	
	Materials:
	
	• GPS (Garmin GSX);
	• Digital camera (Canon G10);
	• Tripod;
	• Surveyors staff (5M);
	• Tape measure (8m);
	• One metre rule; and
	• Field note journal.
	
	Method:
	
	• A tree was selected for its relative ease in identifying its extent (side to side, top to bottom), in an impact area (easy access, firewood, clearing, trampling, 4wd track) or a suitable reference area (hard access, away from tracks, no visible anthropogenic impact;
	• The surveyors staff was placed against the tree in the camera's field of view for height reference;
	• The staff was extended to above the tree canopy to enable an accurate height measurement (in laboratory);
	• The camera tripod was placed approx eight metres from the tree trunk;
	• A compass bearing from the centre of the tripod to the tree trunk was recorded;
	• Using the digital camera on the tripod, zoomed in to capture the whole tree, a sentry photo was collected;
	• With the camera still on the tripod and zoomed to wide angle, several panoramic photos capturing the peripheral views were taken (typically capturing shoreline to shoreline);
	• After removing the camera from the tripod, a photo of the tripod position relative to the tree was taken approximately a further 5 metres away from the tree (where possible);
	• With the camera still on wide angle, 4-6 photos a metre above the substrate (using a metre rule) under the canopy and around the trunk of the tree were collected;
	• A plastic cattle tag was attached using a 4.6 mm x 300 mm cable tie, to the tree for identification in the future;
	• GPS waypoints were fixed for the tree trunk and tripod position, and
	• The data was recorded in the field notes:
	  ○ Site number;
	  ○ Latitude and longitude of the sentinel tree trunk;
	  ○ Latitude and longitude of the tripod; and
	  ○ Observations of anthropogenic pressure including sawn or broken branches and litter.
	
	<u>Canopy verification</u>
	
	Six canopy density verification sites were recorded in the mangroves of Shark Bay Marine Park. These sites are located in the mangals at Blind Inlet.
	
	Materials<u>:</u>
	
	• GPS (Garmin GSX);
	• Digital camera (Canon G10); and
	• Field note journal.
	
	Method:
	
	• At tree was selected central to the width if the mangal where accessible;
	• A GPS way point was collected and recorded;
	• With the digital camera set on wide angle, four upward facing photos, perpendicular to the water and approximately one metre were taken, capturing the canopy cover;
	• Mean canopy cover was also estimated for the site and recorded; and
	• The data was recorded in the field notes.

How are the data currently stored, that is what format is the data? (e.g. GIS shapefiles, Access database or geodatabase, compressed AVI etc.) Please provide as much information as possible.	WAMMP Mangrove Community Monitoring GIS Shapefiles MS Excel spreadsheets JPEG Images (site photographs and canopy photographs)

When

When was the research carried out? When were the start and end dates?	09 – 13 April 2013

Where

Where was the research done? As a minimum Please indicate the 'bounding box' in latitude/longitude (decimal degrees) (e.g. North bound latitude -22.00; West bound longitude 113.00; East bound longitude 114.00; South bound latitude -23.00)	Shark Bay Marine Park North: -25.66^{o} South: -26.22^{o} East: 113.88^{o} West: 113.25^{o}

Site names and GPS co-ordinates (in latitude/longitude (decimal degrees)

WAMMP Mangrove Community Monitoring

Table 1. location coordinates for the fixed-point monitoring sites established in Shark Bay Marine Park on 09-13 April, 2013.

Site	Object	Lat	Long
Fowlers Camp 01	Tree	-26.10644	113.61796
Fowlers Camp 02	Tree	-26.10672	113.61662
Fowlers Camp 03	Tree	-26.10674	113.61604
Little Lagoon 01	Tree	-25.90338	113.52382
Little Lagoon 02	Tree	-25.90441	113.52407
Little Lagoon 03	Tree	-25.90518	113.52463
Little Lagoon 04	Tree	-25.90584	113.52565
Little Lagoon 05	Tree	-25.90284	113.52392
Little Lagoon 06	Tree	-25.90512	113.52867
Little Lagoon 07	Tree	-25.89914	113.53153
Guischenault 01	Tree	-25.63132	113.58025
Guischenault 02	Tree	-25.63881	113.58391
Guischenault 03	Tree	-25.63525	113.58116
Guischenault 04	Tree	-25.63522	113.57920
Guischenault 05	Tree	-25.63688	113.57565
Guischenault 06	Tree	-25.63741	113.56945
Guischenault 07	Tree	-25.63550	113.56084
Guischenault 08	Tree	-25.63085	113.54878
Big Lagoon 01	Tree	-25.78718	113.47734
Big Lagoon 02	Tree	-25.78798	113.47717
Big Lagoon 03	Tree	-25.78967	113.47689
Big Lagoon 04	Tree	-25.78452	113.47781
Big Lagoon 05	Tree	-25.78494	113.47836
Big Lagoon 06	Tree	-25.78116	113.47801
Big Lagoon 07	Tree	-25.77370	113.47542
Big Lagoon 08	Tree	-25.77221	113.47510
Blind Inlet 01	Tree	-26.20597	113.26377
Blind Inlet 02	Tree	-26.19928	113.26281
Blind Inlet 03	Tree	-26.18848	113.25346
Blind Inlet 04	Tree	-26.18744	113.25047
Blind Inlet 05	Tree	-26.18514	113.24603
Faure Island 01	Tree	-25.87392	113.87192
Faure Island 02	Tree	-25.87351	113.86832
Faure Island 03	Tree	-25.86829	113.86378
Faure Island 04	Tree	-25.86698	113.85791
Faure Island 05	Tree	-25.86686	113.85860
Faure Island 06	Tree	-25.86433	113.85388

Table 2. location coordinates for the verification sites investigated in Shark Bay Marine Park on 09-13 April 2013.

Location	Site	Lat	Long
Blind Inlet	Verify 1	-26.18779	113.25200
Blind Inlet	Verify 2	-26.18792	113.25299
Blind Inlet	Verify 3	-26.18693	113.24966
Blind Inlet	Verify 4	-26.18522	113.24643
Blind Inlet	Verify 5	-26.18497	113.24600
Blind Inlet	Verify 6	-26.18563	113.24741

Where in the vertical column of the ocean was the research undertaken? (e.g. minimum and maximum depth)

Between high water mark and one metre

GIS/ Remote Sensing (to be filled in by the GIS officer responsible for the work)

Supporting Imagery

What satellite sensor/s or raster data type (ie Landsat , WV2 or bathymetry data)	Digital Multi-Spectral Imagery DMSI aerial photogrammetry	
What was the date of imagery capture?	2012	
Imagery location: What regional mosaic or path/row was used?	K:\rs_imagery\Aerial_photography\Shark_Bay\	
What is the imagery file name?	Denham_Townsite_Aug_2012_Mosaic.ecw Edel_1545_Mar_2012_Mosaic.ecw Edel_1545_Mar_2012_Mosaic_Blind_Strait.ecw Hamelin_1745_Jun_2012_Mosiac.ecw Peron_1645_Mar_2012_Mosaic.ecw Sand_Island_Long_Reef_Rothery_Reef_Aug_2012_Mosaic.ecw Shark_Bay_1646_Northen_Extension_1647_Mar_2012_Mosaic.ecw Shark_Bay_Useless_Loop_Jetties_Jun_2012_Mosaic.ecw Wooramel_1746_Jun_2012_Mosaic.ecw Denham_Haven_and_Beaches_Jun_2012_Mosaic.ecw Denham_1546_Northern_Extension_1547_Mar_2012_Mosaic.ecw	
What are the names of any derived raster products?		

Site Selection

Which datasets were used for site selection?			
Provide a brief description of the site selection method used	Mangrove trees were selected at areas of known impact (easily accessible) and reference site were collected away from and perceived anthropogenic pressure.	Trees need to be quite discrete, ie. identifiable	
GPS format created for use in the field	Decimal degrees Datum GDA 94		
What are the names of any derived vector products?			

Data Creation date

Who is the custodian of the GIS products? Please list names, duties and their affiliations.	Kevin Bancroft, Marine Research Scientist, Marine Science Program
Where is the original source data stored? (database, computer directory and computer name)	• NAS drive: K:\KBA_GIS\Shark Bay\sbmp_GIS • Backup Drive: G:\MSP_000_directory\GIS\Shark Bay • C Drive: C:\000_directory\GIS\Shark Bay\sbmp_GIS
Where are the derived data stored? (computer directory and computer name)	• NAS drive: K:\KBA_GIS\Shark Bay\sbmp_GIS • Backup Drive: G:\MSP_000_directory\GIS\Shark Bay • C Drive: C:\000_directory\GIS\Shark Bay\sbmp_GIS

How to Access

Where are the raw data stored (include full file name and location, corporate file number etc)?	• Kevin Bancroft, Kensington Offices, computer: C:\000_directory\XXX_Working\2012_2013\Mangroves\SBMP\20130409 • Kevin Bancroft, Kensington Offices, Back up drive G:\MSP_000_directory\XXX_Working\2012_2013\Mangroves\SBMP\20130409 • NAS drive: K:\project_data\Mangroves\SBMP\Sentinel_data\SBMPA\20130409 • Corporate Files Archive Box 2011/005086-1: DVD
Where are derived data products and processed data stored (include full file name and location)?	• Kevin Bancroft, Kensington Offices, computer: C:\000_directory\XXX_Working\2012_2013\Mangroves\SBMP\20130409 • Kevin Bancroft, Kensington Offices, Back up drive G:\MSP_000_directory\XXX_Working\2012_2013\Mangroves\SBMP\20130409 • NAS drive: K:\project_data\Mangroves\SBMP\Sentinel_data\SBMPA\20130409 • Corporate Files Archive Box 2011/005086-1: DVD
Where are any other related publications/information about the research published - if any? (e.g. url)	- Field Operations Plan T:\529-CALMscience\Shared Data\Marine Science Program\REPORTS\POST 2009 REPORTS\FIELD OPERATIONS PLANS\FOP_Mangroves\FOP_Mangroves_Shark_Bay_20130403.pdf - Science Concept Plans T:\529-CALMscience\Shared Data\Marine Science Program\ADMINISTRATION\MSP SCPs and SSPs\Draft SCPs\SCP_WAMMP_Mangrove communities_THO_Draft.doc -
What constraints/restrictions would you place on the data and access to it (e.g. legal, usage - purposes that shouldn't use the data)	None

Supplementary information -

Please attach any further information you think would be useful for future researchers

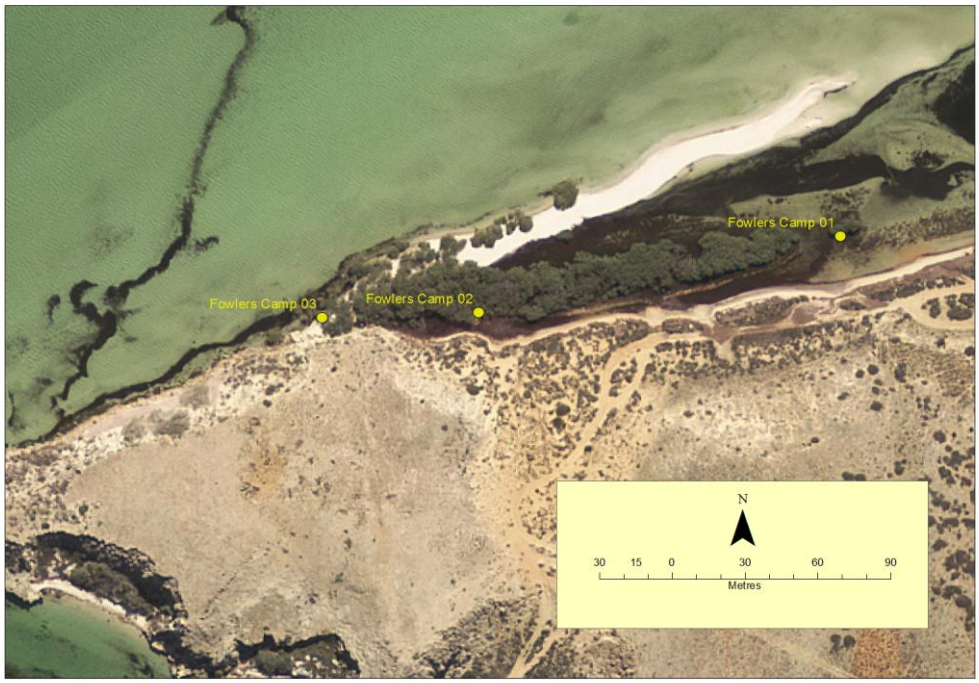


Figure 1. Fixed point monitoring sites at Fowlers Camp, Shark Bay Marine Park.

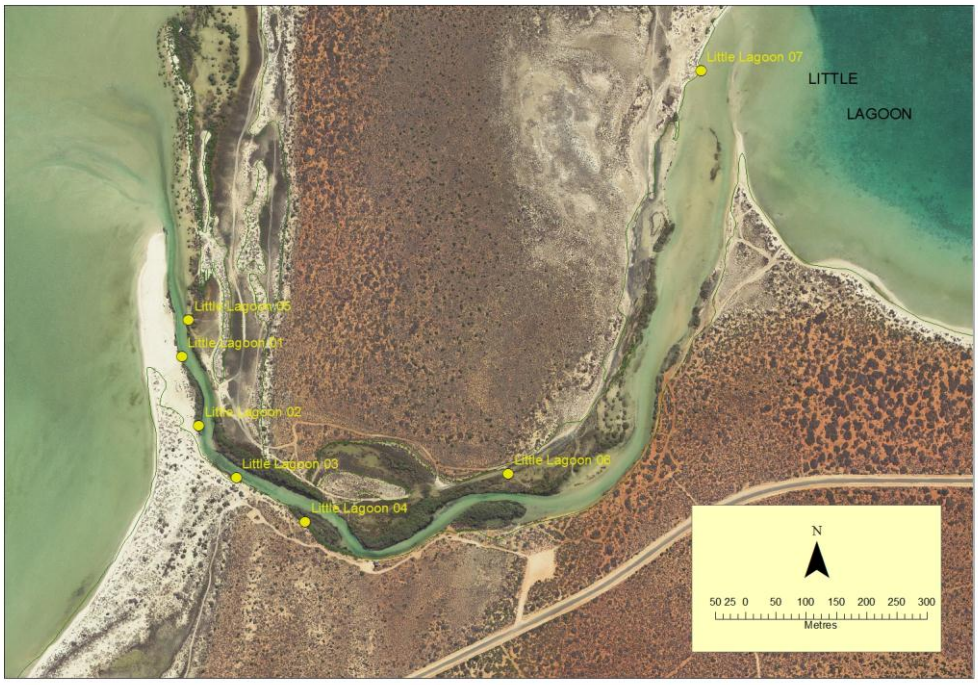


Figure 2. Fixed point monitoring sites at Little Lagoon, Shark Bay Marine Park.

Figure 3. Fixed point monitoring sites at Guischenault, Shark Bay Marine Park.

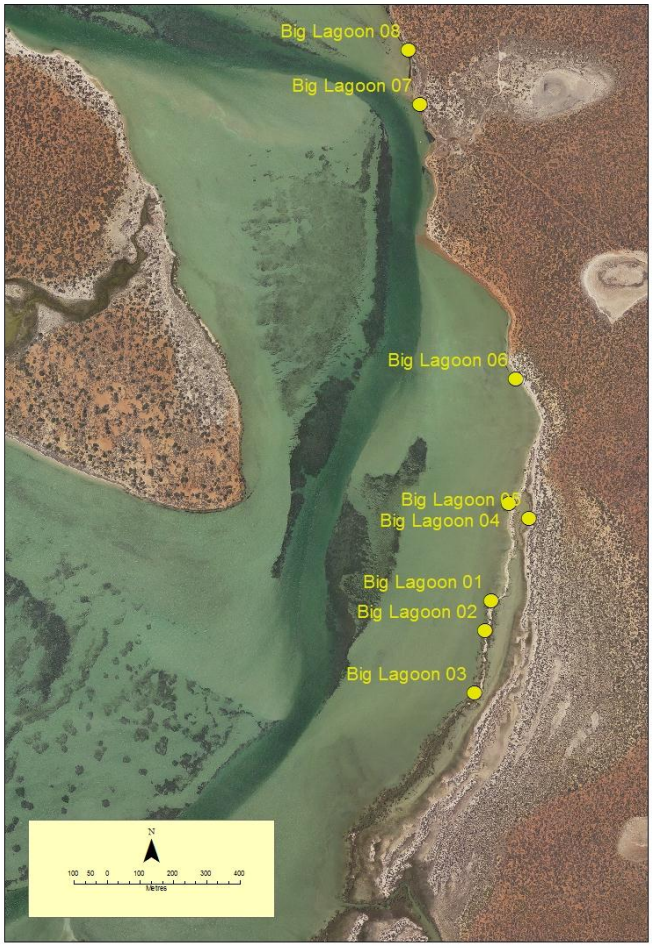


Figure 4. Fixed point monitoring sites at Big Lagoon, Shark Bay Marine Park.

Figure 5. Fixed point monitoring sites at Blind Inlet, Shark Bay Marine Park.

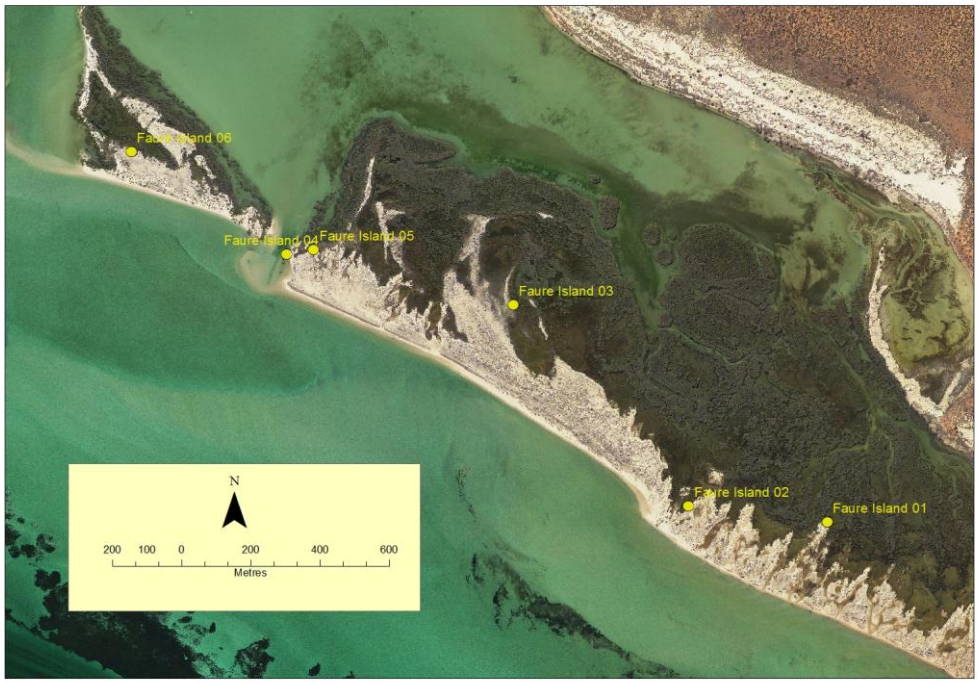


Figure 6. Fixed point monitoring sites at South Faure Island, Shark Bay Marine Park.

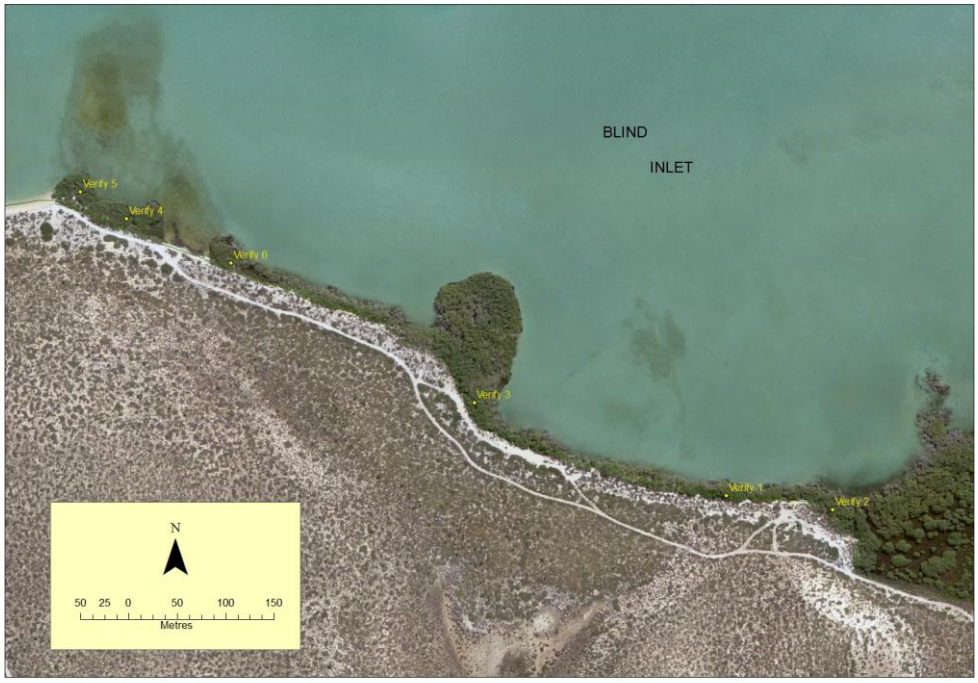


Figure 7. Verification sites at Blind Inlet, Shark Bay Marine Park.

Table 3 Field notes for all fixed-point monitoring sites established in Shark Bay Marine Park, 09-13 April 2013.

Site	Object	Lat	Long	distance	Object	Tripod_Lat	Tripod_Long	Bearing	tree_photos	Panorama	Tripod	benthos_photos	other_photos	Date	height_m	width_m
Fowlers Camp 01	Tree	-26.10667	113.61798	~8m	Tripod	-26.10651	113.61799	5	2723	2724-2726	2727-2728	2729-2733		9/04/2013	2.650	3.200
Fowlers Camp 02	Tree	-26.10672	113.61662	~8m	Tripod	-26.10683	113.61663	350	2734	2735-2739		2740-2743	2744-45	9/04/2013	3.100	4.000
Fowlers Camp 03	Tree	-26.10674	113.61604	~8m	Tripod	-26.10678	113.61602	15	2746	2747-2751	2752-2753	2754-2757	2758-2760	9/04/2013	3.400	2.100
Little Lagoon 01	Tree	-25.90338	113.52382	~8m	Tripod	-25.90345	113.52381	350	2762	2763-2766	2767	2768-2773		9/04/2013	1.995	5.300
Little Lagoon 02	Tree	-25.90441	113.52407	~8m	Tripod	-25.90442	113.52399	80	2775	2776-2778		2779-2783	2784	9/04/2013	2.100	2.500
Little Lagoon 03	Tree	-25.90518	113.52463	~8m	Tripod	-25.90525	113.52465	355	2786	2785-2788	2789	2790-2793		9/04/2013	2.450	5.300
Little Lagoon 04	Tree	-25.90584	113.52565	~8m	Tripod	-25.90590	113.52565	10	2794-2795	2796-2799	2800	2801-2804		9/04/2013	2.850	5.050
Little Lagoon 05	Tree	-25.90284	113.52392	~8m	Tripod	-25.90280	113.52400	240	2806	2805-2807	2808; 2813	2809-2812	2813	9/04/2013	2.600	3.450
Little Lagoon 06	Tree	-25.90512	113.52867	~8m	Tripod	-25.90506	113.52867	180	2814	2815-2819	2820-2821	2822-2826	2827	9/04/2013	1.800	3.300
Little Lagoon 07	Tree	-25.89914	113.53153	~8m	Tripod	-25.89918	113.53147	40	2828	2829-2831	2835-2833	2834-2837	2838-2839	9/04/2013	2.150	4.950
Guischenault 01	Tree	-25.63132	113.58025	~8m	Tripod	-25.63128	113.58019	120	2840; 2847	2841-2846	2848	2849-2852	2853-2861	10/04/2013	2.450	2.500
Guischenault 02	Tree	-25.63881	113.58391	~8m	Tripod	-25.63888	113.58394	320	2862	2863-2867	2868-2869	2871-2874	2870	10/04/2013	2.600	3.000
Guischenault 03	Tree	-25.63525	113.58116	~8m	Tripod	-25.63526	113.58107	75	2875	2876-2880	2881; 2892	2882-2886	2887-2891; 2893-2894	10/04/2013	2.250	3.300
Guischenault 04	Tree	-25.63522	113.57920	~8m	Tripod	-25.63524	113.57929	270	2895	2896-2899	2900-2901; 2909	2902-2908		10/04/2013	3.250	7.400
Guischenault 05	Tree	-25.63688	113.57565	~8m	Tripod	-25.63692	113.57571	300	2910	2911-2913	2914-2915; 2923	2916-2919	2920-2921	10/04/2013	3.900	6.600
Guischenault 06	Tree	-25.63741	113.56945	~8m	Tripod	-25.63749	113.56942	0	2924	2928-2930	2931	2932-2937	2938-40	10/04/2013	2.050	2.750
Guischenault 07	Tree	-25.63550	113.56084	~8m	Tripod	-25.63554	113.56081	20	2941	2942-2946	2947	2948-2955	2956	10/04/2013	2.400	5.100
Guischenault 08	Tree	-25.63085	113.54878	~8m	Tripod	-25.63091	113.54875	20	2958	2959-2963	2964	2965-2971	2957	10/04/2013	2.650	4.400
Big Lagoon 01	Tree	-25.78718	113.47734	~8m	Tripod	-25.78717	113.47742	270	2972	2973-2980	2981	2982-2986		10/04/2013	3.250	6.850
Big Lagoon 02	Tree	-25.78798	113.47717	~8m	Tripod	-25.78802	113.47722	305	2987	2990-2994	2995	2996-3002		10/04/2013	2.550	5.200
Big Lagoon 03	Tree	-25.78967	113.47689	~8m	Tripod	-25.78967	113.47697	260	3003	3004-3008	3009	3010-3014		10/04/2013	2.850	4.700
Big Lagoon 04	Tree	-25.78452	113.47781	~8m	Tripod	-25.78454	113.47789	290	3015	3016-3020	3021	3022-3027		10/04/2013	2.225	5.400
Big Lagoon 05	Tree	-25.78494	113.47836	~8m	Tripod	-25.78499	113.47843	315	3028	3029-3033	3034	3035-3040		10/04/2013	2.475	4.300
Big Lagoon 06	Tree	-25.78116	113.47801	~8m	Tripod	-25.78114	113.47808	250	3041	3043-3046	3047	3048-3052	3053-3054	10/04/2013	2.450	5.400
Big Lagoon 07	Tree	-25.77370	113.47542	~8m	Tripod	-25.77364	113.47545	180	3055	3056-3060	3061	3062-3064		10/04/2013	3.150	7.900

Site	Object	Lat	Long	distance	Object	Tripod_Lat	Tripod_Long	Bearing	tree_photos	Panorama	Tripod	benthos_photos	other_photos	Date	height_m	width_m
Big Lagoon 08	Tree	-25.77221	113.47510	~8m	Tripod	-25.77220	113.47519	260	3065	3066-3069	3070	3071-3074	3084	10/04/2013	1.850	3.850
Blind Inlet 01	Tree	-26.20597	113.26377	~8m	Tripod	-26.20597	113.26373	95	3085-88	3090-3093	3094	3095-3102	3103	11/04/2013	2.900	4.950
Blind Inlet 02	Tree	-26.19928	113.26281	~8m	Tripod	-26.19932	113.26278	20	3104-3105	3110-3114	3115	3116-3121		11/04/2013	2.150	4.350
Blind Inlet 03	Tree	-26.18848	113.25346	~8m	Tripod	-26.18855	113.25342	20	3122-3123	3124-3127	3128	3130-3135	3129	11/04/2013	5.300	5.900
Blind Inlet 04	Tree	-26.18744	113.25047	~8m	Tripod	-26.18750	113.25043	20	3149	3150-3154	3155	3156-3159		11/04/2013	3.200	3.400
Blind Inlet 05	Tree	-26.18514	113.24603	~8m	Tripod	-26.18519	113.24600	20	3164	3165-6169	3170	3171-3174	3175; 3180-3181	11/04/2013	2.350	3.500
Faure Island 01	Tree	-25.87070	113.87429	~8m	Tripod	-25.87428	113.87099	350	3187	3188-3191	3192	3193-3199		12/04/2013	1.450	3.900
Faure Island 02	Tree	-25.87351	113.86832	~8m	Tripod	-25.87354	113.86838	300	3200	3201-3204	3205	3206-3210		12/04/2013	1.250	2.500
Faure Island 03	Tree	-25.86829	113.86378	~8m	Tripod	-25.86828	113.86371	70	3211	3212-3215	3216	2.000	4.200			
Faure Island 04	Tree	-25.86698	113.85791	~8m	Tripod	-25.86699	113.85798	255	3224	3225-3228	3229	3230-3234		12/04/2013	5.525	5.800
Faure Island 05	Tree	-25.86686	113.85860	~8m	Tripod	-25.86690	113.85855	50	3235	3236-3240	3241	3242-3245		12/04/2013	1.950	5.600
Faure Island 06	Tree	-25.86433	113.85388	~8m	Tripod	-25.86437	113.85384	40	3246	3251-3255	3256	3257-3261		12/04/2013	1.375	2.700

Table 4. Location data for groundtruth verification sites at Blind Inlet, Shark Bay 09-13 April 2013

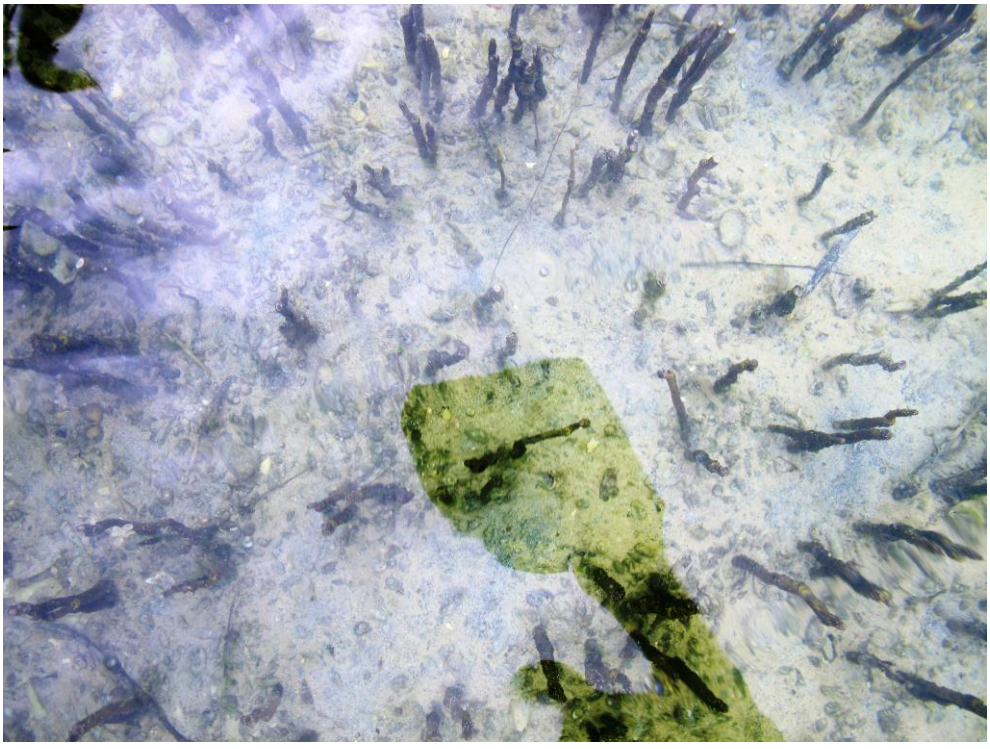
Location	Site	Lat	Long	Photos	Date	Cover_estimate
Blind Inlet	Verify 1	-26.18779	113.25200	3136-3139	11/04/2013	35%
Blind Inlet	Verify 2	-26.18792	113.25299	3141-3144	11/04/2013	40%
Blind Inlet	Verify 3	-26.18693	113.24966	3143-3148	11/04/2013	20%
Blind Inlet	Verify 4	-26.18522	113.24643	3160-3163	11/04/2013	60%
Blind Inlet	Verify 5	-26.18497	113.24600	3176-3179	11/04/2013	20%
Blind Inlet	Verify 6	-26.18563	113.24740	3183-3186	11/04/2013	50%

Image

If you have one handy please also attach a picture (JPEG preferable) that best describes your research. This will be used as the thumbnail image next to the metadata records in the MEST

Fixed Point Monitoring Site

Fixed point monitoring sentry tree



Benthic sample under fixed point monitoring sentry tree

	 Upward photo of canopy cover at ground truth verification sites

WAMMP Mangrove Community Monitoring
Sentinel Monitoring Site Data

MPA:..... Location:.....

Site #:.....

Date:..... Time:.....

Sentinel Tree	Tripod
Way Point	Way Point
Latitude	Latitude
Longitude	Longitude
Photo #	Photo #
	Compass Bearing (tripod to tree)

Panorama Photos #: .....

Benthic Photo #:.....

Site Observations (e.g. sawn; broken branches, litter)