MARINE MANAGEMENT SUPPORT:
SHARK BAY

MARINE WILDLIFE DISTRIBUTION IN SHARK BAY MARINE PARK AND HAMELIN POOL MARINE NATURE RESERVE

Report: MMS/SBY/SBA,HPO-59/2002

Prepared by
K P Bancroft, J A Davidson and M Sheridan
Marine Conservation Branch

June 2002

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Department of Conservation and Land Management
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Western Australia, 6160

ACKNOWLEDGEMENTS

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- Curt Jenner, Institute of Whale Research.
- Dr Chris Burton, Fisheries Consultant.
- Craig and Jessie Shankland, Shankland Nominees Pty Ltd., Denham.
- Gary Jackson, Department of Fisheries.
- Dr Bob Prince, Science Division, Department of Conservation and Land Management.
- Phil Fuller, Science Division, Department of Conservation and Land Management.
- Dr Andrew Burbidge, Science Division, Department of Conservation and Land Management.
- David Holley, MCB, Department of Conservation and Land Management.
- Kevin Crane, Shark Bay District, Department of Conservation and Land Management.
- Richard Hall, Shark Bay District, Department of Conservation and Land Management.

Other MCB contribution:

- Ray Lawrie – Geographical Information System (GIS).
- Ben Lamb – GIS
- Nick D'Adamo – Review.

Cover illustration courtesy of Leeuwin Bancroft

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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: 61-8-9336 0100; Fax: 61-8-9430 5408

SUMMARY

Management strategies, outlined in the Shark Bay Marine Reserves Management Plan 1996 – 2006, highlight the need to develop an understanding of the distributions of marine wildlife in Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve. This project was coordinated by the Marine Conservation Branch (MCB) of the Department of Conservation and Land Management and aims to address the basic requirements of these management strategies through the development of a marine wildlife distribution map for the Shark Bay marine reserves.

Anecdotal and scientific information on the distribution and important sites of various species of marine wildlife, including whales, dugongs, turtles, seabirds, whale sharks, manta rays, black snapper and pink snapper, has been compiled and incorporated into a map, which delineates areas of high conservation value, in relation to marine wildlife. This map will be used for the conservation of large marine fauna and for the ongoing management of the Shark Bay marine reserves.

Data for this project has been sourced from existing documentation and from direct communication with people (internal and external to the Department of Conservation and Land Management) whom have expert knowledge on the distribution of marine wildlife in the Shark Bay region.

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1 INTRODUCTION

1.1 BACKGROUND

Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve are part of the Shark Bay World Heritage Area, which was inscribed on the World Heritage List in 1991 in recognition of the area's outstanding universal natural values (Department of Conservation and Land Management, 1996). A large number of the area's natural values occur within the marine park or the marine nature reserve, including stromatolites, the Faure Sill, the Wooramel Bank seagrass meadows, the occurrence of significant populations of dugongs, humpback whales and turtles, and many more biological and geological phenomena. In response to these internationally significant values, the Shark Bay Marine Reserves Management Plan 1996-2006 was developed (Department of Conservation and Land Management, 1996).

The Shark Bay Marine Reserves Management Plan 1996 – 2006 outlines management strategies that highlight the need to develop a growing knowledge of the distributions of marine wildlife in Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve. To address the basic requirements of these management strategies the Marine Conservation Branch (MCB) of the Department of Conservation and Land Management has undertaken a project involving the development of a marine wildlife distribution map for the Shark Bay marine reserves.

Anecdotal and scientific information on the distribution and important sites of various species of marine wildlife, including whales, dugongs, turtles, seabirds, whale sharks, manta rays, black snapper and pink snapper, has been compiled and incorporated into a map, which delineates areas of high conservation value, in relation to marine wildlife. This map will be used for the conservation of large marine fauna and for the ongoing management of the Shark Bay marine reserves.

Data for this project has been sourced from existing documentation and from direct communication with people (internal and external to the Department of Conservation and Land Management) whom have expert knowledge on the distribution of marine wildlife in the Shark Bay region.

1.2 PURPOSE

The purpose of this report is to:

- provide information, in the form of maps, on the marine wildlife distribution in the Shark Bay marine reserves;
- document the sources of the marine wildlife information used;
- document the methods used to produce the information layers;
- document the metadata for the GIS information layers, and;
- document the storage location of the GIS information layers.

2 METHODS

2.1 STUDY AREA

The study area for this project is the Shark Bay marine reserves, which comprise Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve. The Shark Bay marine reserves encompass the eastern and western gulfs of Shark Bay and extends north along the coast to Carnarvon (Figure 1).

2.2 INFORMATION SOURCES

Data layers, such as distributions, breeding/nesting areas, aggregations and migratory pathways of the various marine wildlife (including whales, dugongs, turtles, seabirds, whale sharks, manta rays, black snapper and pink snapper) that occur in the study area, were gathered from a range of sources both internal and external to the Department of Conservation and Land Management. Department of Conservation and Land Management regional staff, Kevin Crane and Richard Hall, and local commercial tour operators, Craig and Jessie Shankland (Shankland Nominees Pty Ltd., Denham) reviewed the data.

2.2.1 Cetaceans

Many species of whales have been seen in Shark Bay Marine Park. However, humpback whales utilise the area on their migration north to calving areas and south on their way back to feeding grounds. Curt Jenner (Institute of Whale Research, WA) and Dr Chris Burton (Fisheries Consultant) provided data on migratory pathways and important resting areas of humpback whales (*Megaptera novaeangliae*). These data were derived from both anecdotal information provided by Kevin Crane, Richard Hall, Dr Bob Prince (Department of Conservation and Land Management), Craig and Jessie Shankland and published research (Bannister, 1994; Burton, 2001; Jenner *et al.*, 2000; Preen *et al.*, 1997).

2.2.2 Dugongs

Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve are important areas for dugongs. The seagrass meadows at Wooramel Bank for example provide an important feeding ground for dugongs. David Holley (MCB, Department of Conservation and Land Management) and Dr Bob Prince (Science Division, Department of Conservation and Land Management) provided data on dugong (*Dugong dugon*) migration and occurrence. These data were derived from anecdotal information, recent unpublished survey data (1999 and 2002 dugong aerial surveys and ongoing satellite tracking project) and from published research of earlier surveys (Bejder, 2000; Marsh *et al.*, 1994; Preen *et al.*, 1997; Prince *et al.*, 1981).

2.2.3 Marine turtles

Four species of marine turtles have been seen in Shark Bay Marine Park. The area is important for loggerhead turtles in particular, however green turtles and hawksbill turtles also utilise the region for nesting. Dr Bob Prince provided data on turtle nesting and aggregation areas as part of the Western Australian Turtle Project. Further data were derived from anecdotal information provided by Kevin Crane and Richard Hall, recorded sightings and from published research (Bejder, 2000; Preen *et al.*, 1997).

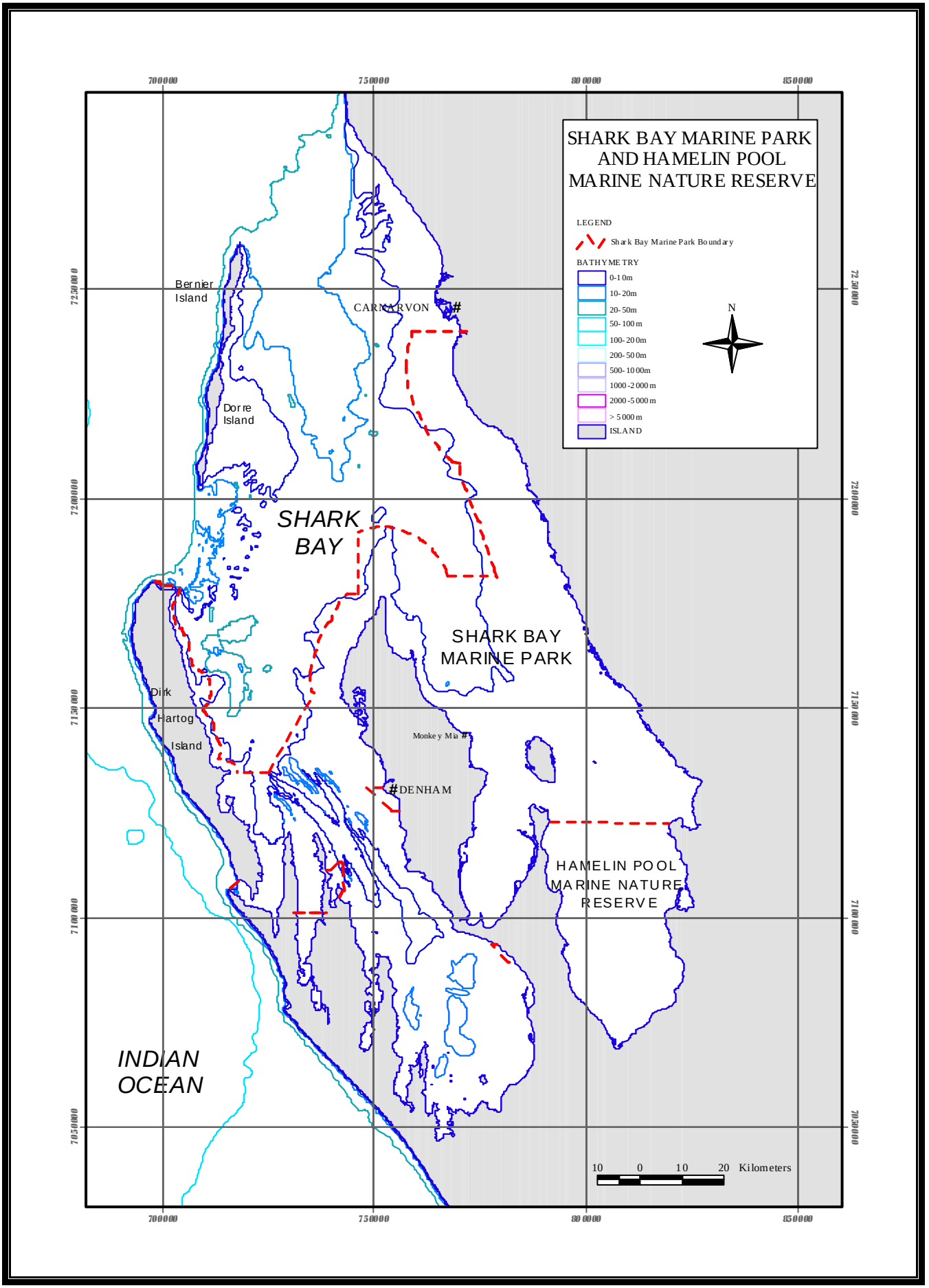

Figure 1: The study area: Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve

2.2.4 Seabirds

Many species of seabirds have been seen utilising areas of Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve as feeding grounds and roosting, breeding and nesting areas. Dr Andrew Burbidge and Phil Fuller (both from the Science Division, Department of Conservation and Land Management) provided the information on locations of seabird nesting areas from the Department's Seabird Breeding Island Database. These data were derived from anecdotal information and published research (Burbidge and Fuller, 2000). Kevin Crane, Richard Hall, and Craig and Jessie Shankland provided anecdotal cormorant breeding/nesting area data.

2.2.5 Fish

Many species of fish inhabit Shark Bay Marine Park, of these whale sharks, manta rays, pink snapper and black snapper have been highlighted.

Whale sharks (Rhincodon typus)

Dr Bob Prince, Kevin Crane, Richard Hall and Craig and Jessie Shankland provided anecdotal data on whale shark sightings.

Manta rays (Manta birostris)

Dr Bob Prince, Kevin Crane, Richard Hall and Craig and Jessie Shankland provided anecdotal data on manta ray sightings. Information was also derived from published research (Preen *et al.*, 1997).

Pink snapper (Pagrus auratus)

Information on pink snapper spawning and aggregation areas was provided by Gary Jackson (Department of Fisheries) from Shark Bay inner gulf pink snapper larval surveys of 1997-2001.

Black snapper (Lethrinus laticaudis)

Information on black snapper spawning and aggregation areas was derived from an FRDC Project by Dr Suzie Ayvazian and Ian Kay titled: *The age, growth, reproductive biology and stock assessment of grass snapper, Lethrinus laticaudis in Shark Bay, Western Australia*.

2.3 MAPPING

Information layers were constructed using ArcView GIS 3.2 (ESRI) software.

Detailed descriptions of methods used in mapping are provided in the metadata pertaining to each individual data layer (see Appendices I - X).

3 RESULTS

The full set of marine wildlife distribution data acquired in this study has been presented as a series of three maps (Figures 2, 3 and 4). This series of maps highlight areas of high conservation value associated with: i) cetacean migration and activity, ii) dugong activity, iii) turtle aggregation and nesting, seabird breeding/nesting, whale shark and manta ray activity, and spawning and aggregation areas of pink and black snapper.

4 METADATA

The simplest definition of metadata is 'data about data'. It describes the content, quality, currency and availability of data. A 'metadata' description of a particular data set will typically include detailed

information on data collection methods, processing history, content, quality, accuracy, geographic extent and contact (source) information pertaining to the data. This information is important so potential users of existing data can assess its suitability for other purposes.

The metadata associated with the marine wildlife distribution data presented in the map series are included as Appendix I (whale migration pathways), Appendix II (whale activity), Appendix III (dugong activity), Appendix IV (turtle nesting beaches), Appendix V (seabird breeding islands), Appendix VI (cormorant breeding/nesting areas), Appendix VII (whale shark activity), Appendix VIII (manta ray activity), Appendix IX (pink snapper spawning and aggregation areas), Appendix X (black snapper spawning and aggregation areas).

5 DATA MANAGEMENT

5.1 REPORT

Hard copies of this report will be held at the following locations:

1. Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry Street, Fremantle Western Australia, 6160. Ph: (08) 9336 0100 Fax: (08) 9430 5408.

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

3. Archives, Woodvale Library, Science and Information Division, Ocean Reef Road, 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, Western Australia, 6537. Ph: (08) 9948 1208 Fax: (08) 9948 1024.

5. Midwest Region, Department of Conservation and Land Management, 193 Marine Terrace, Geraldton, Western Australia, 6530. Ph: (08) 9921 5955 Fax: (08) 9921 5713.

Digital copies of this report will be held at the following:

1. The Marine Conservation Branch server:
   Shareddata on 'Calm-frem-1'
   [T:\144-Marine Conservation Branch\Shared Data\Current_MCB_reports\MMS\mms_5902]

2. The Marine Conservation Branch server full backup DAT tape:
   Shareddata on 'Calm-frem-1'
   [T:\144-Marine Conservation Branch\Shared Data\Current_MCB_reports\MMS\mms_5902]

3. CD ROM held at Marine Conservation Branch and Archives (Woodvale Library, Science and Information Division):
   CD-ROM [mms_5902]

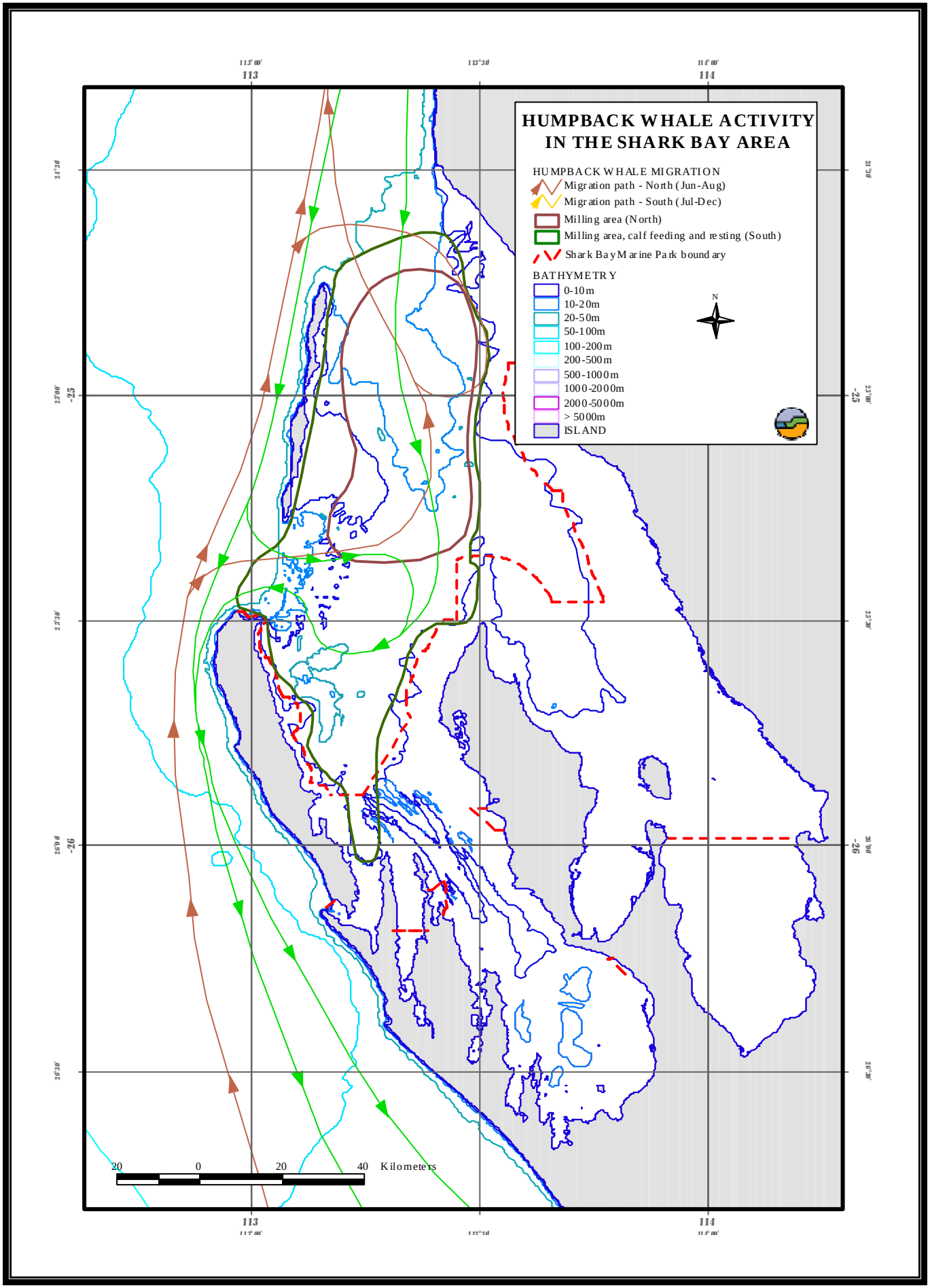

Figure 2: Cetacean migration and activity in the Shark Bay marine reserves

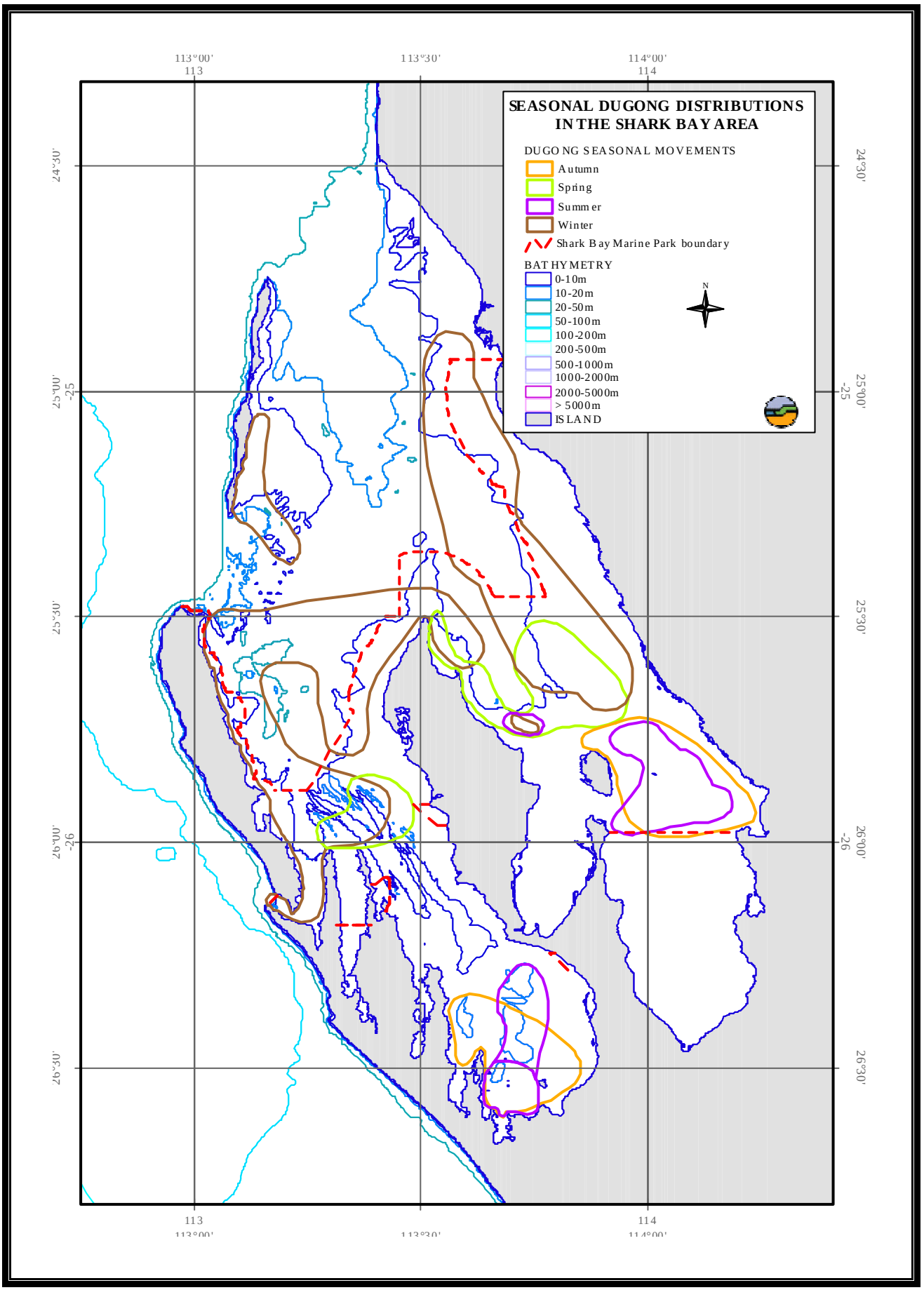

Figure 3: Dugong activity in the Shark Bay marine reserves

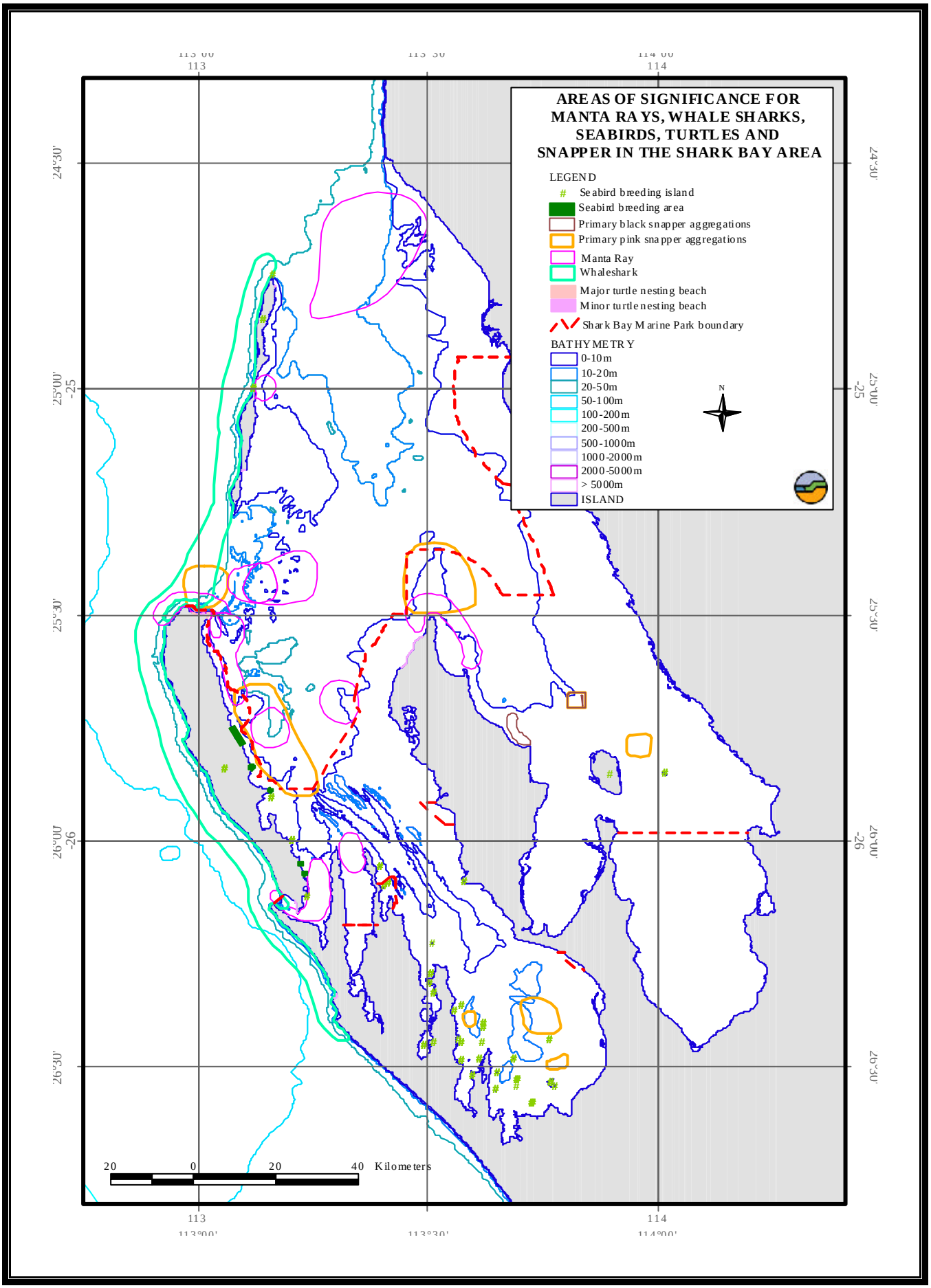

Figure 4: Turtle aggregation and nesting, seabird breeding/nesting, whale shark and manta ray activity, and

spawning and aggregation areas of pink and black snapper in the Shark Bay marine reserves

4. The MCB homepage on the Department of Conservation and Land Management Intranet CALMweb http://calmweb.calm.wa.gov.au/drb/ncd/mcb/rep_pdf/mms_reps/mms_2002/mmsrep02.htm#mms_5902

5.2 GIS LAYERS

The data presented in the form of GIS information layers will be stored digitally in the Marine Information System (MIS) on the MCB Server and the MCB Server full backup DAT tape. File names for GIS information layers are as follows:

1. whales-line_sba+sbe_20020122_ll_gda94.shp
2. whales-polygon_sba+sbe_20020122_ll_gda94.shp
3. dugongs_sba+sbe_20020122_ll_gda94.shp
4. fish_sba+sbe_20020122_ll_gda94.shp
5. fish-manta-rays_sba+sbe_20020122_ll_gda94.shp
6. fish-snapper-black_sba+sbe_20020122_ll_gda94.shp
7. fish-snapper-pink_sba+sbe_20020122_ll_gda94.shp
8. fish-whale-sharks_sba+sbe_20020122_ll_gda94.shp
9. turtles_sba+sbe_20020122_ll_gda94.shp
10. seabirds-point_sba+sbe_20020122_ll_gda94.shp
11. seabirds-poly_sba+sbe_20020122_ll_gda94.shp

6 REFERENCES

Bannister, J.L. (1994). Report on aerial survey and photoidentification of humpback whales off Western Australia, 1994. Prepared for the Australian Nature Conservation Agency, Perth, Western Australia.

Bejder, L. (2000). Vessel activity, dolphins and dugongs in Red Cliff Bay, Monkey Mia: An overview of accomplishments and preliminary results of the first field season (April - August 2000). Biology Department, Dalhousie University, Halifax, Canada.

Burbidge, A. and Fuller, P. (2000). The breeding seabirds of Shark Bay, Western Australia. CALMScience 3 (2): 109-124.

Burton, C.L.K. (2001). Historical and recent distribution of humpback whales in Shark Bay, Western Australia. *Memoirs of the Queensland Museum* 47(2): 599-611.

Department of Conservation and Land Management (1996). Shark Bay marine reserves management plan 1996-2006. Management Plan No. 34. Department of Conservation and Land Management for the National Parks and Nature Conservation Agency. Perth, Western Australia.

Jenner, C., Jenner, M-N. and McCabe, K. (2000). Geographical and temporal movements of humpback whales in Western Australian waters: A preliminary report and description of a

computer assisted matching system. Centre for Whale Research, Western Australia.

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: 149-161.

Preen, A.R., Marsh, H., Lawler, I.R., Prince, R.I.T., and Shepherd, R. (1997). Distribution and abundance of dugongs, turtles, dolphins and other megafauna in Shark Bay, Ningaloo Reef and Exmouth Gulf, Western Australia. *Wildlife Research* 24: 185-208.

Prince, R.I.T., Anderson, P.K., and Blackman, D. (1981). Status and distribution of dugongs in Western Australia, Perth, Western Australia.

APPENDICES

APPENDIX I: METADATA FOR WHALE MIGRATION PATHWAYS IN THE SHARK BAY REGION

DATASET	
Title	***Whale Migration Paths of the Shark Bay Region***
Custodian	*Department of Conservation and Land Management (CALM)*
Jurisdiction	*Western Australia*
DESCRIPTION	
Abstract	*This dataset consists of lines representing whale migration paths within the Shark Bay Marine Park, proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands) and the Hamelin Pool Marine Nature Reserve.* *The data was generated from anecdotal information provided by experts, and from published information gathered during a literature review of marine wildlife in the region. References include:* *i) Bannister, J.L. (1994). Report on aerial survey and photoidentification of humpback whales off Western Australia, 1994. Prepared by the W.A. Museum for the Australian Nature Conservation Agency, Perth, Western Australia.* *ii) Jenner, C., Jenner, M.-N. & McCabe, K. (2000). Geographical and temporal movements of humpback whales in Western Australia: A preliminary report and description of a computer assisted matching system. Centre for Whale Research (Western Australia) Inc., Perth, Western Australia.* *iii) Burton, C. personal communication (2001).* *The data was generated as a basic requirement for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the resource assessment for the planning of the proposed Shark Bay Marine Park extensions.* *This dataset is complemented by other wildlife datasets within the region including dugongs, manta rays, snapper, whale sharks, seabirds and turtles.* *Polygons were created and attributed by the following methods;* *i) data collated from anecdotal information from experts, published data from literature and during a rapid assessment of the marine wildlife in the region undertaken by Kevin Bancroft was drawn onto hard copy maps.* *ii) the paper base maps were then digitised by Mark Sheridan in Arcview 3.2 and a line dataset was created with the attributes as per the CALM Marine Conservation Branch's attribute and naming standards.* *iii) maps were reviewed by CALM regional staff and commercial tour operators of the area in late 2001 and modifications were incorporated where appropriate by Ben Lamb in Feb 2002 under the instruction of Ray Lawrie and Kevin Bancroft.*
Search Word(s)	

Geographic Extent Name(s)	*Shark Bay (SBY) and Zuytdorp (ZUY) IMCRA Regions*
DATA CURRENCY	
Begin Date	*1/7/2001*
End Date	*Ongoing*
DATASET STATUS	
Progress	*In Progress*
Maintenance & Update Frequency	*As required*
ACCESS	
Stored Data Format	*DIGITAL ArcView shapefile, Geographic, Geocentric Datum of Australia 1994 (GDA94).* *NONDIGITAL Paper base maps containing raw information*
Available Format Type	*DIGITAL ArcView 3.2 shapefile*
Access Constraint	*Data available for external use subject to transfer fee and license conditions. Data is not to be distributed without authorisation from CALM. Contact CALM's database administrator for further details.*
DATA QUALITY	
Lineage	***1.*** *Hardcopy base maps containing a coastline, and broadscale bathymetry information (10m, 20m, 50m, 100m, 200m isobaths) were generated. Maps were produced at a scale of approximately 1:230,000.* ***2.*** *Relevant experts/papers were consulted to delineate areas of wildlife activity on the hard copy base maps. (See attribute SOURCE_A for details).* ***3.*** *Mapped polygons identified by experts/papers were digitised on screen using the hard copy base map as a reference. Digitising was undertaken at scales of between 1:300,000 and 1:900,000 (see the attribute SOURCE_PLP).* ***4.*** *Polygons were attributed as per the base map and other sources (see attribute SOURCE_A), and data was checked for logical consistency.* ***5.*** *Data de-projected from AMG Zone50 to lat/long co-ordinates using the de-project functionality of the extension 'CALM Added Functionality v2000' in Arcview3.2.* ***6.*** *Data datum transformed from AGD84 to GDA94 using the change datum functionality of the extension 'CALM Added Functionality v2000' in Arcview3.2.* ***7.*** *Hardcopy maps containing the digitised data along with a satellite image, coastline, broadscale bathymetry (10m, 20m, 50m, 100m, 200m isobaths), and a graticule and grid were*

	produced at 1:300,000. These maps were sent to CALM regional staff for review, and additions. ***8.*** *Maps were reviewed by CALM regional staff (Kevin Crane and Richard Hall) and local tour operators (Craig and Jessie Shankland) and additions/alterations made at broad scale.* ***9.*** *Data was passed to contract staff (Ben Lamb) for updating based on information contained in review maps.* ***10.*** *The modifications made were attribute related and as such only the attribute table was modified. This was completed in Feb 2002 by Ben Lamb.*
Positional Accuracy	*Due to the nature of the study, positional accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, delineation of areas in which the wildlife is distributed may not be comprehensive.* *The delineation of the extent of the wildlife distribution is shown by hard boundaries. In reality, the distribution is more often a gradual transition from where the wildlife occurs, to where it doesn't occur, i.e. it is 'fuzzy'.* *Positional inaccuracies may also have occurred due to;* *i) the detail of base maps being sufficient for only broad scale delineation of wildlife distribution/activity,* *ii) some information being more precise in it's definition of the extent of location/distribution than others.* *The digitising of the base maps used to delineate areas of wildlife distribution varies in positional accuracy from 300m to approximately 900m (based on accuracy of 1mm at digitising scale).*
Attribute Accuracy	*Due to the nature of the study, attribute accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, the attributes of the wildlife distribution may not be comprehensive.*
Logical Consistency	*Attribute names have been checked and validated for consistency across all wildlife datasets created for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the implementation of the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands).* *Attribute values have been checked and validated for consistency, and checked for logic in relation to attribute names. All attributes that require values have been assigned values.* *The shapefile has been compiled carefully to avoid overlaps or duplication of points.*
Completeness	*The dataset is complete as at the date of this metadata statement. The dataset will be upgraded as priorities, time and resources permit.* *Further work needs to be undertaken on delineation and ground-truthing of many areas of wildlife distribution/activity.*
CONTACT INFORMATION	
Contact	*Department of Conservation and Land Management, Marine Conservation Branch*

Organisation	
Contact Position	*Marine GIS Co-ordinator*
Mail Address 1	*47 Henry Street*
Mail Address 2	
Suburb or Place or Locality	*Fremantle*
State or Locality 2	*WA*
Country	*Australia*
Postcode	*6160*
Telephone	*08 9336 0109*
Facsimile	*08 9430 5408*
Electronic Mail Address	*rayl@calm.wa.gov.au*
METADATA DATE	
Metadata Date	*07/03/2002*
ADDITIONAL METADATA	
Additional Metadata	*For further information refer to:* *i) Bannister, J.L. (1994). Report on aerial survey and photoidentification of humpback whales off Western Australia, 1994. Prepared by the W.A. Museum for the Australian Nature Conservation Agency, Perth, Western Australia.* *ii) Jenner, C., Jenner, M.-N. & McCabe, K. (2000). Geographical and temporal movements of humpback whales in Western Australia: A preliminary report and description of a computer assisted matching system. Centre for Whale Research (Western Australia) Inc., Perth, Western Australia.*

APPENDIX II: METADATA FOR WHALE ACTIVITY IN THE SHARK BAY REGION

DATASET	
Title	***Whale Activity (other than migration) of the Shark Bay Region***
Custodian	*Department of Conservation and Land Management (CALM)*
Jurisdiction	*Western Australia*
DESCRIPTION	
Abstract	*This dataset consists of polygons representing areas of Whale activity (other than migration) within the Shark Bay Marine Park, the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands) and the Hamelin Pool Marine Nature Reserve.* *The data was generated from anecdotal information provided by experts, and from published information gathered during a literature review of marine wildlife in the region. References include:* *i) Anderson, P.K. and Prince R.I.T. (1985). Predation on Dugongs: Attacks by Killer Whales. J. Mammal., 66: 554-6.* *ii) Bannister, J.L. (1994). Report on aerial survey and photoidentification of humpback whales off Western Australia, 1994. prepared by the W.A. Museum for the Australian Nature Conservation Agency, Perth, Western Australia.* *iii) Jenner, C., Jenner, M.-N. & McCabe, K. (2000). Geographical and temporal movements of humpback whales in Western Australia: A preliminary report and description of a computer assisted matching system. Centre for Whale Research (Western Australia) Inc., Perth, Western Australia.* *iv) Burton, C. personal communication (2001).* *v) Prince, B. personal communication (2001).* *The data was generated as a basic requirement for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the resource assessment for the planning of the proposed Shark Bay Marine Park extensions.* *This dataset is complemented by other wildlife datasets within the region including dugongs, manta rays, snapper, whale sharks, seabirds and turtles.* *Polygons were created and attributed by the following methods;* *i) data collated from anecdotal information from experts, published data from literature and during a rapid assessment of the marine wildlife in the region undertaken by Kevin Bancroft was drawn onto hard copy maps.* *ii) the paper base maps were then digitised by Mark Sheridan in Arcview 3.2 and a polygonal dataset was created with the attributes as per the CALM Marine Conservation Branch's attribute and naming standards.* *iii) maps were reviewed by CALM regional staff and commercial tour operators of the area in late 2001 and modifications were incorporated where appropriate by Ben Lamb in Feb 2002 under the instruction of Ray Lawrie and Kevin Bancroft.*

Search Word(s)	
Geographic Extent Name(s)	*Shark Bay (SBY) and Zuytdorp (ZUY) IMCRA Regions*
DATA CURRENCY	
Begin Date	*1/7/2001*
End Date	*Ongoing*
DATASET STATUS	
Progress	*In Progress*
Maintenance & Update Frequency	*As required*
ACCESS	
Stored Data Format	*DIGITAL ArcView shapefile, Geographic, Geocentric Datum of Australian 1994 (GDA94).* *NONDIGITAL Paper base maps containing raw information*
Available Format Type	*DIGITAL ArcView 3.2 shapefile*
Access Constraint	*Data available for external use subject to transfer fee and license conditions. Data is not to be distributed without authorisation from CALM. Contact CALM's database administrator for further details.*
DATA QUALITY	
Lineage	***1.*** *Hardcopy base maps containing a coastline, and broadscale bathymetry information (10m, 20m, 50m, 100m, 200m isobaths) were generated. Maps were produced at a scale of approximately 1:230,000.* ***2.*** *Relevant experts/papers were consulted to delineate areas of wildlife activity on the hard copy base maps. (See attribute SOURCE_A for details).* ***3.*** *Mapped polygons identified by experts/papers were digitised on screen using the hard copy base map as a reference. Digitising was undertaken at scales of between 1:200 000 and 1:500 000 (see the attribute SOURCE_PLP).* ***4.*** *Polygons were attributed as per the base map and other sources (see attribute SOURCE_A), and data was checked for logical consistency.* ***5.*** *Data de-projected from AMG Zone50 to lat/long co-ordinates using the de-project functionality of the extension 'CALM Added Functionality v2000' in Arcview3.2.* ***6.*** *Data datum transformed from AGD84 to GDA94 using the change datum functionality of*

	the extension 'CALM Added Functionality v2000' in Arcview3.2. ***7.*** *Hardcopy maps containing the digitised data along with a satellite image, coastline, broadscale bathymetry (10m, 20m, 50m, 100m, 200m isobaths), and a graticule and grid were produced at 1:300,000. These maps were sent to CALM regional staff for review, and additions* ***8.*** *Maps were reviewed by CALM regional staff (Kevin Crane and Richard Hall) and local tour operators (Craig and Jessie Shankland) and additions/alterations made at broad scale.* ***9.*** *Data was passed to contract staff (Ben Lamb) for updating based on information contained in review maps.* ***10.*** *Additions were made to the dataset by appending new polygons to the existing polygons using ArcViews append polygon functionality. The new polygons were attributed with the source and other information.*
Positional Accuracy	*Due to the nature of the study, positional accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, delineation of areas in which the wildlife is distributed may not be comprehensive.* *The delineation of the extent of the wildlife distribution is shown by hard boundaries. In reality, the distribution is more often a gradual transition from where the wildlife occurs, to where it doesn't occur, i.e. it is 'fuzzy'.* *Positional inaccuracies may also have occurred due to;* *i) the detail of base maps being sufficient for only broad scale delineation of wildlife distribution/activity,* *ii) some information being more precise in it's definition of the extent of location/distribution than others.* *The digitising of the hard copy base maps used to delineate areas of wildlife distribution varies in positional accuracy from 200m to approximately 500m (based on accuracy of 1mm at digitising scale).*
Attribute Accuracy	*Due to the nature of the study, attribute accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, the attributes of the wildlife distribution may not be comprehensive.*
Logical Consistency	*Attribute names have been checked and validated for consistency across all wildlife datasets created for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the implementation of the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands).* *Attribute values have been checked and validated for consistency, and checked for logic in relation to attribute names. All attributes that require values have been assigned values.*
Completeness	*The dataset is complete as at the date of this metadata statement. The dataset will be upgraded as priorities, time and resources permit. Further work needs to be undertaken on delineation and ground-truthing of many areas of wildlife distribution/activity.*
CONTACT INFORMATION	

Contact Organisation	*Department of Conservation and Land Management, Marine Conservation Branch*
Contact Position	*Marine GIS Co-ordinator*
Mail Address 1	*47 Henry Street*
Mail Address 2	
Suburb or Place or Locality	*Fremantle*
State or Locality 2	*WA*
Country	*Australia*
Postcode	*6160*
Telephone	*08 9336 0109*
Facsimile	*08 9430 5408*
Electronic Mail Address	*rayl@calm.wa.gov.au*
METADATA DATE	
Metadata Date	*08/03/2002*
ADDITIONAL METADATA	
Additional Metadata	*For further information refer to:* *i) Anderson, P.K. and Prince R.I.T. (1985). Predation on Dugongs: Attacks by Killer Whales. J. Mammal., 66: 554-6.* *ii) Bannister, J.L. (1994). Report on aerial survey and photoidentification of humpback whales off Western Australia, 1994. Prepared by the W.A. Museum for the Australian Nature Conservation Agency, Perth, Western Australia.* *iii) Jenner, C., Jenner, M.-N. & McCabe, K. (2000). Geographical and temporal movements of humpback whales in Western Australia: A preliminary report and description of a computer assisted matching system. Centre for Whale Research (Western Australia) Inc., Perth, Western Australia.*

APPENDIX III: METADATA FOR DUGONG ACTIVITY IN THE SHARK BAY REGION

DATASET	
Title	***Dugong Activity of the Shark Bay Region***
Custodian	*Department of Conservation and Land Management (CALM)*
Jurisdiction	*Western Australia*
DESCRIPTION	
Abstract	*This dataset consists of polygons representing areas of dugong activity within the Shark Bay Marine Park, the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands) and the Hamelin Pool Marine Nature Reserve.* *The data was generated from anecdotal information provided by experts, and from published information gathered during a literature review of marine wildlife in the region. References include:* *i) Bejder, L. (2000). Vessel activity, dolphins and dugongs in Red Cliff Bay, Monkey Mia: An overview of accomplishments and preliminary results of the first field season (April - August 2000). Biology Department, Dalhousie University, Halifax, Canada.* *ii) Preen, A.R., Marsh, H., Lawler, I.R., Prince, R.I.T. & Shepherd, R. (1997). Distribution and abundance of dugongs, turtles, dolphins and other megafauna in Shark Bay, Ningaloo Reef and Exmouth Gulf, Western Australia. Wildlife Research 24: 185-208.* *iii) Marsh, H., Prince, R.I.T., Saalfeld, W.K. & Shepherd, R. (1994). The distribution and abundance of the dugong in Shark Bay, Western Australia. Wildlife Research 21 (2): 149-161.* *iv) Prince, R.I.T., Anderson, P.K. & Blackman, D. (1981). Status and distribution of dugongs in Western Australia., Perth, Western Australia.* *v) Holley, D. July 1999 and Feb 2002 aerial survey data.* *vi) Holley, D. ongoing dugong satellite tracking project.* *The data was generated as a basic requirement for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the resource assessment for the planning of the proposed Shark Bay Marine Park extensions.* *This dataset is complemented by other wildlife datasets within the region including manta rays, snapper, whales, whale sharks, seabirds and turtles.* *Polygons were created and attributed by the following methods;* *i) data collated from anecdotal information from experts, published data from literature and during a rapid assessment of the marine wildlife in the region undertaken by Kevin Bancroft was drawn onto hard copy maps.* *ii) the paper base maps were then digitised by Mark Sheridan in Arcview 3.2 and a polygonal dataset was created with the attributes as per the CALM Marine Conservation Branch's attribute and naming standards.* *iii) maps were reviewed by CALM regional staff and commercial tour operators of the area in late 2001 and modifications were incorporated where appropriate by Ben Lamb in Feb 2002*

	under the instruction of Ray Lawrie and Kevin Bancroft.
Search Word(s)	
Geographic Extent Name(s)	*Shark Bay (SBY) and Zuytdorp (ZUY) IMCRA Regions*
DATA CURRENCY	
Begin Date	*1/7/2001*
End Date	*Ongoing*
DATASET STATUS	
Progress	*In Progress*
Maintenance & Update Frequency	*As required*
ACCESS	
Stored Data Format	*DIGITAL ArcView shapefile, Geographic, Geocentric Datum of Australian 1994 (GDA94).* *NONDIGITAL Paper base maps containing raw information*
Available Format Type	*DIGITAL ArcView 3.2 shapefile*
Access Constraint	*Data available for external use subject to transfer fee and license conditions. Data is not to be distributed without authorisation from CALM. Contact CALM's database administrator for further details.*
DATA QUALITY	
Lineage	***1.*** *Hardcopy base maps containing a coastline, and broadscale bathymetry information (10m, 20m, 50m, 100m, 200m isobaths) were generated. Maps were produced at a scale of approximately 1:230,000.* ***2.*** *Relevant experts/papers/survey data were consulted to delineate areas of wildlife activity on the hard copy base maps. (See attribute SOURCE_A for details).* ***3.*** *Mapped polygons identified by experts/papers were digitised on screen using the hard copy base map as a reference. Digitising was undertaken at scales of between 1:200 000 and 1:500 000 (see the attribute SOURCE_PLP).* ***4.*** *Polygons were attributed as per the base map and other sources (see attribute SOURCE_A), and data was checked for logical consistency.* ***5.*** *Data de-projected from AMG Zone50 to lat/long co-ordinates using the de-project functionality of the extension 'CALM Added Functionality v2000' in Arcview3.2.*

	6. *Data datum transformed from AGD84 to GDA94 using the change datum functionality of the extension 'CALM Added Functionality v2000' in Arcview3.2.* ***7.*** *Hardcopy maps containing the digitised data along with a satellite image, coastline, broadscale bathymetry (10m, 20m, 50m, 100m, 200m isobaths), and a graticule and grid were produced at 1:300,000. These maps were sent to CALM regional staff for review, and additions.* ***8.*** *Maps were reviewed by CALM regional staff (Kevin Crane, Richard Hall and Shanklands) and additions/alterations made at broad scale.* ***9.*** *Data was passed to contract staff (Ben Lamb) for updating based on information contained in review maps.* ***10.*** *The additions that were indicated in the review process were digitised using Arcview 3.2. The new polygons were clipped to the existing polygons and attributed with the source of the polygon, the scale at which it was digitised and other attributes associated with the standard attributes and naming structure pertaining to wildlife datasets. Where polygons overlapped then the Source_A was attributed with all the sources for the area of overlap.*
Positional Accuracy	*Due to the nature of the study, positional accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, delineation of areas in which the wildlife is distributed may not be comprehensive.* *The delineation of the extent of the wildlife distribution is shown by hard boundaries. In reality, the distribution is more often a gradual transition from where the wildlife occurs, to where it doesn't occur, i.e. it is 'fuzzy'.* *Positional inaccuracies may also have occurred due to;* *i) the detail of base maps being sufficient for only broad scale delineation of wildlife distribution/activity,* *ii) some information being more precise in it's definition of the extent of location/distribution than others.* *The digitising of the base maps used to delineate areas of wildlife distribution varies in positional accuracy from 200m to approximately 500m (based on accuracy of 1mm at digitising scale).*
Attribute Accuracy	*Due to the nature of the study, attribute accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, the attributes of the wildlife distribution may not be comprehensive.*
Logical Consistency	*Attribute names have been checked and validated for consistency across all wildlife datasets created for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the implementation of the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands).* *Attribute values have been checked and validated for consistency, and checked for logic in relation to attribute names. All attributes that require values have been assigned values.*
Completeness	*The dataset is complete as at the date of this metadata statement. The dataset will be upgraded as priorities, time and resources permit. Further work needs to be undertaken on delineation and ground-truthing of many areas of wildlife distribution/activity.*

CONTACT INFORMATION	
Contact Organisation	*Department of Conservation and Land Management, Marine Conservation Branch*
Contact Position	*Marine GIS Co-ordinator*
Mail Address 1	*47 Henry Street*
Mail Address 2	
Suburb or Place or Locality	*Fremantle*
State or Locality 2	*WA*
Country	*Australia*
Postcode	*6160*
Telephone	*08 9336 0109*
Facsimile	*08 9430 5408*
Electronic Mail Address	*rayl@calm.wa.gov.au*
METADATA DATE	
Metadata Date	*07/03/2002*
ADDITIONAL METADATA	
Additional Metadata	*For further information refer to:* *i) Bejder, L. (2000). Vessel activity, dolphins and dugongs in Red Cliff Bay, Monkey Mia: An overview of accomplishments and preliminary results of the first field season (April - August 2000). Biology Department, Dalhousie University, Halifax, Canada.* *ii) Preen, A.R., Marsh, H., Lawler, I.R., Prince, R.I.T. & Shepherd, R. (1997). Distribution and abundance of dugongs, turtles, dolphins and other megafauna in Shark Bay, Ningaloo Reef and Exmouth Gulf, Western Australia. Wildlife Research 24: 185-208.* *iii) Marsh, H., Prince, R.I.T., Saalfeld, W.K. & Shepherd, R. (1994). The distribution and abundance of the dugong in Shark Bay, Western Australia. Wildlife Research 21 (2): 149-161.*

	iv) Prince, R.I.T., Anderson, P.K. & Blackman, D. (1981). Status and distribution of dugongs in Western Australia., Perth, Western Australia.

APPENDIX IV: METADATA FOR TURTLE ACTIVITY IN THE SHARK BAY REGION

DATASET	
Title	***Turtle Nesting Beaches of the Shark Bay Region***
Custodian	*Department of Conservation and Land Management (CALM)*
Jurisdiction	*Western Australia*
DESCRIPTION	
Abstract	*This dataset consists of polygons representing nesting beaches for turtles within the Shark Bay Marine Park, the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands) and the Hamelin Pool Marine Nature Reserve .* *The data was generated from anecdotal information provided by experts, and from published information gathered during a literature review of marine wildlife in the region.* *References include:* *i) Prince, B. personal communication (2001) identified as part of the WA Turtle Project.* *The data was generated as a basic requirement for the management of the Shark Bay Marine Park, and the resource assessment for the planning of the proposed Shark Bay Marine Park extensions.* *This dataset is complemented by other wildlife datasets within the region including dugongs, manta rays, snapper, whale sharks, whales and seabirds.* *Polygons were created and attributed by the following methods;* *i) data collated from anecdotal information from experts, published data from literature and during a rapid assessment of the marine wildlife in the region undertaken by Kevin Bancroft was drawn onto hard copy maps.* *ii) the paper base maps were then digitised by Mark Sheridan in Arcview 3.2 and a polygonal dataset was created with the attributes as per the CALM Marine Conservation Branch's attribute and naming standards.* *iii) maps were reviewed by CALM regional staff and commercial tour operators of the area in late 2001 and modifications were incorporated where appropriate by Ben Lamb in Feb 2002 under the instruction of Ray Lawrie and Kevin Bancroft.*
Search Word(s)	
Geographic Extent Name(s)	*Shark Bay (SBY) and Zuytdorp (ZUY) IMCRA Regions*
DATA CURRENCY	

Begin Date	*1/7/2001*
End Date	*Ongoing*
DATASET STATUS	
Progress	*In Progress*
Maintenance & Update Frequency	*As required*
ACCESS	
Stored Data Format	*DIGITAL ArcView shapefile, Geographic, Geocentric Datum of Australian 1994 (GDA94).* *NONDIGITAL Paper base maps containing raw information*
Available Format Type	*DIGITAL ArcView 3.2 shapefile*
Access Constraint	*Data available for external use subject to transfer fee and license conditions. Data is not to be distributed without authorisation from CALM. Contact CALM's database administrator for further details.*
DATA QUALITY	
Lineage	***1.*** *Hardcopy base maps containing a coastline, and broadscale bathymetry information (10m, 20m, 50m, 100m, 200m isobaths) were generated. Maps were produced at a scale of approximately 1:230,000.* ***2.*** *Relevant experts/papers were consulted to delineate areas of wildlife activity on the hard copy base maps. (See attribute SOURCE_A for details).* ***3.*** *Mapped polygons identified by experts/papers were digitised on screen using the hard copy base map as a reference. Digitising was undertaken at a scale of approximately 1:10 000. This was done using as a 2.5m resolution, black and white digital aerial photograph mosaic, dated September 1992 (see the attribute SOURCE_PLP) as a contextual backdrop. This image was rectified to AMG Zone49.* ***4.*** *Polygons were attributed as per the base map and the raw source dataset 'sbmp_turtle_ll_agd84' provided by Kevin Bancroft (see attribute SOURCE_A).* ***5.*** *Data was checked for logical consistency.* ***6.*** *Data de-projected from AMG Zone49 to lat/long co-ordinates using the de-project functionality of 'calm_add_funk_2001.avx' in Arcview3.2.* ***7.*** *Hardcopy maps containing the digitised data along with a satellite image, coastline, broadscale bathymetry (10m, 20m, 50m, 100m, 200m isobaths), and a graticule and grid were produced at 1:300,000. These maps were sent to CALM regional staff for review, and additions.* ***8.*** *Maps were reviewed by CALM regional staff (Kevin Crane and Richard Hall) and local tour operators (Craig and Jessie Shankland) and additions/alterations made at broad scale.* ***9.*** *Data was passed to contract staff (Ben Lamb) for updating based on information contained in*

	review maps. ***10.*** *New turtle nesting beaches were digitised in AGD84, AMG zone 49 coordinates using existing aerial photo mosaics for the area to delineate the sandy beach area for the point indicated on the review map. For the sites on Bernier and Dorre Islands where there was no digital aerial photo coverage, hardcopy aerial photos were used in conjunction with the shoreline habitat study to delineate the areas of sandy beach as indicated on the review map.* ***11.*** *The new turtle nesting beach polygons were then de-projected from AGD84 AMG Zone49 to AGD84 lat/long co-ordinates using the de-project functionality of 'calm_add_funk_2001.avx' in Arcview3.2.* ***12.*** *The datum was then changed from AGD84 to MGA94 using the change datum functionality of calm_add_funk_2001.avx' in Arcview3.2.* ***13.*** *The two MGA94 lat/long turtle nesting datasets were then combined and the new sites were attributed accordingly.*
Positional Accuracy	*Due to the nature of the study, positional accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, delineation of areas in which the wildlife is distributed may not be comprehensive.* *Dune areas have not been included in the polygon as they were not distinctly included in the description of the nesting area i.e. sandy beaches. Future enhancements could incorporate a more definite land-ward boundary to incorporate areas outside the sandy beaches.* *The delineation of the extent of the wildlife distribution is shown by hard boundaries. In reality, the distribution is more often a gradual transition from where the wildlife occurs, to where it doesn't occur, i.e. it is 'fuzzy'.* *Positional inaccuracies may also have occurred due to;* *i) the detail of base maps being sufficient for only broad scale delineation of wildlife distribution/activity,* *ii) some information being more precise in it's definition of the extent of location/distribution than others.* *The digitising of the base maps used to delineate areas of wildlife distribution has a positional accuracy of approximately 10m (based on accuracy of 1mm at digitising scale).*
Attribute Accuracy	*Due to the nature of the study, attribute accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, the attributes of the wildlife distribution may not be comprehensive.*
Logical Consistency	*Attribute names have been checked and validated for consistency across all wildlife datasets created for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the implementation of the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands).* *Attribute values have been checked and validated for consistency, and checked for logic in relation to attribute names. All attributes that require values have been assigned values.* *The shapefile has been compiled carefully to avoid duplication of polygons.*

Completeness	*The dataset is complete as at the date of this metadata statement. The dataset will be upgraded as priorities, time and resources permit. Further work needs to be undertaken on delineation and ground-truthing of many areas of wildlife distribution/activity.*
CONTACT INFORMATION	
Contact Organisation	*Department of Conservation and Land Management, Marine Conservation Branch*
Contact Position	*Marine GIS Co-ordinator*
Mail Address 1	*47 Henry Street*
Mail Address 2	
Suburb or Place or Locality	*Fremantle*
State or Locality 2	*WA*
Country	*Australia*
Postcode	*6160*
Telephone	*08 9336 0109*
Facsimile	*08 9430 5408*
Electronic Mail Address	*rayl@calm.wa.gov.au*
METADATA DATE	
Metadata Date	*07/03/2002*
ADDITIONAL METADATA	
Additional Metadata	

APPENDIX V: METADATA FOR SEABIRD BREEDING ISLANDS IN THE SHARK BAY REGION

DATASET	
Title	***Seabird Breeding Islands of the Shark Bay Region***
Custodian	*Department of Conservation and Land Management (CALM)*
Jurisdiction	*Western Australia*
DESCRIPTION	
Abstract	*This dataset consists of points representing breeding islands for seabirds within the Shark Bay Marine Park, the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands) and the Hamelin Pool Marine Nature Reserve.* *The data was generated as a basic requirement for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the resource assessment for the planning of the proposed Shark Bay Marine Park extensions.* *This dataset is complemented by other wildlife datasets within the region including dugongs, manta rays, snapper, whales, whale sharks and turtles.* *The data is a subset of the larger Seabird Breeding Island dataset held by CALM's Science Division and maintained by Andrew Burbidge, and from published information gathered during a literature review of marine wildlife in the region. References include:* *i) Burbidge, A. & Fuller, P. (2000). The breeding seabirds of Shark Bay, Western Australia. CALMScience 3 (2): 109-124.* *Points were created and attributed by the following methods;* *i) An extraction from the seabird breeding island database was made for the required area.* *ii) Additional locations were included from the literature review and attributed accordingly.* *iii) maps were created and reviewed by CALM regional staff and commercial tour operators of the area in late 2001.*
Search Word(s)	
Geographic Extent Name(s)	*Shark Bay (SBY) and Zuytdorp (ZUY) IMCRA Regions*
DATA CURRENCY	
Begin Date	*1/7/2001*
End Date	*Ongoing*
DATASET STATUS	

Progress	*In Progress*
Maintenance & Update Frequency	*As required*
ACCESS	
Stored Data Format	*DIGITAL ArcView shapefile, Geographic, Geocentric Datum of Australian 1994 (GDA94).* *NONDIGITAL Paper base maps containing raw information*
Available Format Type	*DIGITAL ArcView 3.2 shapefile*
Access Constraint	*Data available for external use subject to transfer fee and license conditions. Data is not to be distributed without authorisation from CALM. Contact CALM's database administrator for further details.*
DATA QUALITY	
Lineage	***1.*** *Seabird breeding islands in the region, and associated attributes were extracted from CALM's seabird breeding island database (seabird-breeding-islands_wa_01061999_amg50_agd84). A link to the original database is maintained in the field INTERNAL_I which contains the seabird breeding island's record id number.* ***2.*** *Additional seabird breeding islands in the region, and associated attribution identified in Burbidge & Fuller (2000), were added to the data (INTERNAL_I = 0). This information was transcribed from the paper by Kevin Bancroft, into the dataset 'sbmp_xtra_birds_ll_agd84'. The location of these nesting points were adjusted by Kevin Bancroft from the original published latitude/longitudes, so as to match the position of the relevant islands. This was undertaken at a scale of 1:10 000. This data was then projected from lat/long to AMG50 using the projection functionality of the calm_add_funk_2001.avx in Arcview3.2, to add to the seabird breeding island database data.* ***3.*** *Attribute data was checked for logical consistency, and adjusted where necessary.* ***4.*** *Data de-projected from AMG Zone50 to lat/long co-ordinates using the de-project functionality of the extension 'CALM Added Functionality v2000' in Arcview3.2.* ***5.*** *Data datum transformed from AGD84 to GDA94 using the change datum functionality of the extension 'CALM Added Functionality v2000' in Arcview3.2.* ***6.*** *New ID added to each record in the attribute table.* ***7.*** *Hardcopy maps containing the digitised data along with a satellite image, coastline, broadscale bathymetry (10m, 20m, 50m, 100m, 200m isobaths), and a graticule and grid were produced at 1:300,000. These maps were sent to CALM regional staff for review, and additions.* ***8.*** *Maps were reviewed by CALM regional staff (Kevin Crane and Richard Hall) and local tour operators (Craig and Jessie Shankland) and additions/alterations made at broad scale.* ***9.*** *Data was passed to contract staff (Ben Lamb) for updating based on information contained in review maps.* *10. Alterations made to the seabird dataset were of a polygonal nature and as such a new*

	polygon dataset was created for these new features.
Positional Accuracy	*Due to the nature of the study, positional accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, delineation of areas in which the wildlife is distributed may not be comprehensive.* *The delineation of the extent of the wildlife distribution is shown by hard boundaries. In reality, the distribution is more often a gradual transition from where the wildlife occurs, to where it doesn't occur, i.e. it is 'fuzzy'.* *Positional inaccuracies may also have occurred due to;* *i) the detail of base maps being sufficient for only broad scale delineation of wildlife distribution/activity,* *ii) some information being more precise in it's definition of the extent of location/distribution than others.* *The digitising of the base maps used to delineate areas of wildlife distribution/activity has a positional accuracy of approximately 10m (based on accuracy of 1mm at digitising scale).*
Attribute Accuracy	*Due to the nature of the study, attribute accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, the attributes of the wildlife distribution may not be comprehensive.*
Logical Consistency	*Attribute names have been checked and validated for consistency across all wildlife datasets created for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the implementation of the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands).* *Attribute values have been checked and validated for consistency, and checked for logic in relation to attribute names. All attributes that require values have been assigned values.* *The shapefile has been compiled carefully to avoid overlaps or duplication of points.*
Completeness	*The dataset is complete as at the date of this metadata statement. The dataset will be upgraded as priorities, time and resources permit. Further work needs to be undertaken on delineation and ground-truthing of many areas of wildlife distribution/activity.*
CONTACT INFORMATION	
Contact Organisation	*Department of Conservation and Land Management, Marine Conservation Branch*
Contact Position	*Marine GIS Co-ordinator*
Mail Address 1	*47 Henry Street*
Mail Address 2	

Suburb or Place or Locality	*Fremantle*
State or Locality 2	*WA*
Country	*Australia*
Postcode	*6160*
Telephone	*08 9336 0109*
Facsimile	*08 9430 5408*
Electronic Mail Address	*rayl@calm.wa.gov.au*
METADATA DATE	
Metadata Date	*07/03/2002*
ADDITIONAL METADATA	
Additional Metadata	*For further information refer to:* *Burbidge, A. & Fuller, P. (2000). The breeding seabirds of Shark Bay, Western Australia. CALMScience 3 (2): 109-124.*

APPENDIX VI: METADATA FOR CORMORANT BREEDING/NESTING AREAS IN THE SHARK BAY REGION

DATASET	
Title	***Cormorant Breeding Areas of the Shark Bay Region***
Custodian	*Department of Conservation and Land Management (CALM)*
Jurisdiction	*Western Australia*
DESCRIPTION	
Abstract	*This dataset consists of polygons representing breeding areas for cormorants within the Shark Bay Marine Park, the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands) and the Hamelin Pool Marine Nature Reserve. The dataset is a result of the review process undertaken for the associated point dataset 'seabird islands of the Shark Bay region' .* *The dataset has been developed as part of CALM Marine Conservation Branch's resource assessment of the region. The study is intended to assist in the planning process for the implementation of a proposed extensions to the Shark Bay Marine Park. This dataset is complemented by other wildlife datasets within the region including dugongs, manta rays, snapper, whale sharks, whales and turtles.* *Polygons were created and attributed by the following methods;* *i) Data was drawn on hard copy maps by CALM regional staff (Kevin Crane and Richard Hall) and local tour operators (Craig and Jessie Shankland) during a rapid assessment of the marine wildlife in the region undertaken by Kevin Bancroft.* *ii) the paper base maps were then digitised by Ben Lamb in Arcview 3.2 and a polygonal dataset was created with the attributes as per the CALM Marine Conservation Branch attribute and naming standards.*
Search Word(s)	
Geographic Extent Name(s)	*Shark Bay (SBY) and Zuytdorp (ZUY) IMCRA Regions*
DATA CURRENCY	
Begin Date	*1/7/2001*
End Date	*Ongoing*
DATASET STATUS	
Progress	*In Progress*
Maintenance & Update	*As required*

Frequency	
ACCESS	
Stored Data Format	*DIGITAL ArcView shapefile, Geographic, Geocentric Datum of Australian 1994 (GDA94).* *NONDIGITAL Paper base maps containing raw information*
Available Format Type	*DIGITAL ArcView 3.2 shapefile*
Access Constraint	*Data available for external use subject to transfer fee and license conditions. Data is not to be distributed without authorisation from CALM. Contact CALM's database administrator for further details.*
DATA QUALITY	
Lineage	***1.*** *Hardcopy maps containing the seabird breeding islands dataset along with a satellite image, coastline, broadscale bathymetry (10m, 20m, 50m, 100m, 200m isobaths), and a graticule and grid were produced at 1:300,000. These maps were sent to CALM regional staff for review, and additions.* ***8.*** *Maps were reviewed by CALM regional staff (Kevin Crane and Richard Hall) and local tour operators (Craig and Jessie Shankland) and additions/alterations made at broad scale.* ***9.*** *Data was passed to contract staff (Ben Lamb) for updating based on information contained in review maps.* ***10.*** *Alterations made to the seabird dataset were of a polygonal nature and as such a new polygon dataset was created for these new features.* ***11.*** *The new polygons were digitised manually in GDA94 geographic coordinates and attributed as per the point dataset.*
Positional Accuracy	*Due to the nature of the study, positional accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, delineation of areas in which the wildlife is distributed may not be comprehensive.* *The delineation of the extent of the wildlife distribution is shown by hard boundaries. In reality, the distribution is more often a gradual transition from where the wildlife occurs, to where it doesn't occur, i.e. it is 'fuzzy'.* *Positional inaccuracies may also have occurred due to;* *i) the detail of base maps being sufficient for only broad scale delineation of wildlife distribution/activity,* *ii) some information being more precise in it's definition of the extent of location/distribution than others.* *The digitising of the base maps used to delineate areas of wildlife distribution has an accuracy of approximately 30m (based on accuracy of 1mm at digitising scale).*
Attribute Accuracy	*Due to the nature of the study, attribute accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken.*

	While every endeavour has been made to faithfully record information, the attributes of the wildlife distribution may not be comprehensive.
Logical Consistency	*Attribute names have been checked and validated for consistency across all wildlife datasets created for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the implementation of the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands).* *Attribute values have been checked and validated for consistency, and checked for logic in relation to attribute names. All attributes that require values have been assigned values.* *The shapefile has been compiled carefully to avoid duplication of polygons.*
Completeness	*The dataset is complete as at the date of this metadata statement. The dataset will be upgraded as priorities, time and resources permit.* *Further work needs to be undertaken on delineation and ground-truthing of many areas of wildlife distribution/activity.*
CONTACT INFORMATION	
Contact Organisation	*Department of Conservation and Land Management, Marine Conservation Branch*
Contact Position	*Marine GIS Co-ordinator*
Mail Address 1	*47 Henry Street*
Mail Address 2	
Suburb or Place or Locality	*Fremantle*
State or Locality 2	*WA*
Country	*Australia*
Postcode	*6160*
Telephone	*08 9336 0109*
Facsimile	*08 9430 5408*
Electronic Mail Address	*rayl@calm.wa.gov.au*
METADATA DATE	

Metadata Date	*07/03/2002*
ADDITIONAL METADATA	
Additional Metadata	

APPENDIX VII: METADATA FOR WHALE SHARK ACTIVITY IN THE SHARK BAY REGION

DATASET	
Title	***Whale Shark Activity of the Shark Bay Region***
Custodian	*Department of Conservation and Land Management (CALM)*
Jurisdiction	*Western Australia*
DESCRIPTION	
Abstract	*This dataset consists of polygons representing areas of whale shark activity within the Shark Bay Marine Park, the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands) and the Hamelin Pool Marine Nature Reserve.* *The data was generated from anecdotal information provided by experts, and from published information gathered during a literature review of marine wildlife in the region. References include:* *i) Preen, A.R., Marsh, H., Lawler, I.R., Prince, R.I.T. & Shepherd, R. (1997). Distribution and abundance of dugongs, turtles, dolphins and other megafauna in Shark Bay, Ningaloo Reef and Exmouth Gulf, Western Australia. Wildlife Research 24: 185-208.* *ii) Prince, B. personal communication (2001)* *The data was generated as a basic requirement for the management of the Shark Bay Marine Park, and the resource assessment for the planning of the proposed Shark Bay Marine Park extensions.* *This dataset is complemented by other wildlife datasets within the region including dugongs, manta rays, snapper, whales, seabirds and turtles.* *Polygons were created and attributed by the following methods;* *i) data collated from anecdotal information from experts, published data from literature and during a rapid assessment of the marine wildlife in the region undertaken by Kevin Bancroft was drawn onto hard copy maps.* *ii) the paper base maps were then digitised by Mark Sheridan in Arcview 3.2 and a polygonal dataset was created with the attributes as per the CALM Marine Conservation Branch attribute and naming standards.* *iii) maps were reviewed by CALM regional staff and commercial tour operators of the area in late 2001 and modifications were incorporated where appropriate by Ben Lamb in Feb 2002 under the instruction of Ray Lawrie and Kevin Bancroft.*
Search Word(s)	
Geographic Extent Name(s)	*Shark Bay (SBY) and Zuytdorp (ZUY) IMCRA Regions*
DATA CURRENCY	

Begin Date	*1/7/2001*
End Date	*Ongoing*
DATASET STATUS	
Progress	*In Progress*
Maintenance & Update Frequency	*As required*
ACCESS	
Stored Data Format	*DIGITAL ArcView shapefile, Geographic, Geocentric Datum of Australian 1994 (GDA94).* *NONDIGITAL Paper base maps containing raw information*
Available Format Type	*DIGITAL ArcView 3.2 shapefile*
Access Constraint	*Data available for external use subject to transfer fee and license conditions. Data is not to be distributed without authorisation from CALM. Contact CALM's database administrator for further details.*
DATA QUALITY	
Lineage	***1.*** *Hardcopy base maps containing a coastline, and broadscale bathymetry information (10m, 20m, 50m, 100m, 200m isobaths) were generated. Maps were produced at a scale of approximately 1:230,000.* ***2.*** *Relevant experts/papers were consulted to delineate areas of wildlife activity on the hard copy base maps. (See attribute SOURCE_A for details).* ***3.*** *Mapped polygons identified by experts/papers were digitised on screen using the hard copy base map as a reference. Digitising was undertaken at scales of between 1:120 000 and 1:350 000 (see the attribute SOURCE_PLP).* ***4.*** *Polygons were attributed as per the base map and other sources (see attribute SOURCE_A), and data was checked for logical consistency.* ***5.*** *Data de-projected from AMG Zone50 to lat/long co-ordinates using the de-project functionality of the extension 'CALM Added Functionality v2000' in Arcview3.2.* ***6.*** *Data datum transformed from AGD84 to GDA94 using the change datum functionality of the extension 'CALM Added Functionality v2000' in Arcview3.2.* ***7.*** *Hardcopy maps containing the digitised data along with a satellite image, coastline, broadscale bathymetry (10m, 20m, 50m, 100m, 200m isobaths), and a graticule and grid were produced at 1:300,000. These maps were sent to CALM regional staff for review, and additions.* ***8.*** *Maps were reviewed by CALM regional staff (Kevin Crane and Richard Hall) and local tour operators (Craig and Jessie Shalkland) and additions/alterations made at broad scale.* ***9.*** *Data was passed to contract staff (Ben Lamb) for updating based on information contained in*

	review maps. ***10.*** *Additions were made to the dataset by appending new polygons to the existing polygons using ArcViews append polygon functionality. The new polygons were attributed with the source and other information.*
Positional Accuracy	*Due to the nature of the study, positional accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, delineation of areas in which the wildlife is distributed may not be comprehensive.* *The delineation of the extent of the wildlife distribution is shown by hard boundaries. In reality, the distribution is more often a gradual transition from where the wildlife occurs, to where it doesn't occur, i.e. it is 'fuzzy'.* *Positional inaccuracies may also have occurred due to;* *i) the detail of base maps being sufficient for only broad scale delineation of wildlife distribution/activity,* *ii) some information being more precise in it's definition of the extent of location/distribution than others.* *The digitising of the base maps used to delineate areas of wildlife distribution varies in positional accuracy from 120m to approximately 350m (based on accuracy of 1mm at digitising scale).*
Attribute Accuracy	*Due to the nature of the study, attribute accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, the attributes of the wildlife distribution may not be comprehensive.*
Logical Consistency	*Attribute names have been checked and validated for consistency across all wildlife datasets created for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the implementation of the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands).* *Attribute values have been checked and validated for consistency, and checked for logic in relation to attribute names. All attributes that require values have been assigned values.*
Completeness	*The dataset is complete as at the date of this metadata statement. The dataset will be upgraded as priorities, time and resources permit. Further work needs to be undertaken on delineation and ground-truthing of many areas of wildlife distribution/activity.*
CONTACT INFORMATION	
Contact Organisation	*Department of Conservation and Land Management, Marine Conservation Branch*
Contact Position	*Marine GIS Co-ordinator*
Mail Address 1	*47 Henry Street*

Mail Address 2	
Suburb or Place or Locality	*Fremantle*
State or Locality 2	*WA*
Country	*Australia*
Postcode	*6160*
Telephone	*08 9336 0109*
Facsimile	*08 9430 5408*
Electronic Mail Address	*rayl@calm.wa.gov.au*
METADATA DATE	
Metadata Date	*07/03/2002*
ADDITIONAL METADATA	
Additional Metadata	*For further information refer to:* *Preen, A.R., Marsh, H., Lawler, I.R., Prince, R.I.T. & Shepherd, R. (1997). Distribution and abundance of dugongs, turtles, dolphins and other megafauna in Shark Bay, Ningaloo Reef and Exmouth Gulf, Western Australia. Wildlife Research 24: 185-208.*

APPENDIX VIII: METADATA FOR MANTA RAY ACTIVITY IN THE SHARK BAY REGION

DATASET	
Title	***Manta Ray Activity of the Shark Bay Region***
Custodian	*Department of Conservation and Land Management (CALM)*
Jurisdiction	*Western Australia*
DESCRIPTION	
Abstract	*This dataset consists of polygons representing areas of manta ray activity within the Shark Bay Marine Park, proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands) and the Hamelin Pool Marine Nature Reserve.* *The data was generated from anecdotal information provided by experts, and from published information gathered during a literature review of marine wildlife in the region. References include:* *i) Preen, A.R., Marsh, H., Lawler, I.R., Prince, R.I.T. & Shepherd, R. (1997). Distribution and abundance of dugongs, turtles, dolphins and other megafauna in Shark Bay, Ningaloo Reef and Exmouth Gulf, Western Australia. Wildlife Research 24: 185-208.* *ii) Prince, B. personal communication (2001)* *The data was generated as a basic requirement for the management of the Shark Bay Marine Park, and the resource assessment for the planning of the proposed Shark Bay Marine Park extensions.* *This dataset is complemented by other wildlife datasets within the region including dugongs, snapper, whale sharks, whales, seabirds and turtles.* *Polygons were created and attributed by the following methods;* *i) data collated from anecdotal information from experts, published data from literature and during a rapid assessment of the marine wildlife in the region undertaken by Kevin Bancroft was drawn onto hard copy maps.* *ii) the paper base maps were then digitised by Mark Sheridan in Arcview 3.2 and a polygonal dataset was created with the attributes as per the CALM Marine Conservation Branch attribute and naming standards.* *iii) maps were reviewed by CALM regional staff and commercial tour operators of the area in late 2001 and modifications were incorporated where appropriate by Ben Lamb in Feb 2002 under the instruction of Ray Lawrie and Kevin Bancroft.*
Search Word(s)	
Geographic Extent Name(s)	*Shark Bay (SBY) and Zuytdorp (ZUY) IMCRA Regions*
DATA CURRENCY	

Begin Date	*1/7/2001*
End Date	*Ongoing*
DATASET STATUS	
Progress	*In Progress*
Maintenance & Update Frequency	*As required*
ACCESS	
Stored Data Format	*DIGITAL ArcView shapefile, Geographic, Geocentric Datum of Australian 1994 (GDA94).* *NONDIGITAL Paper base maps containing raw information*
Available Format Type	*DIGITAL ArcView 3.2 shapefile*
Access Constraint	*Data available for external use subject to transfer fee and license conditions. Data is not to be distributed without authorisation from CALM. Contact CALM's database administrator for further details.*
DATA QUALITY	
Lineage	***1.*** *Hardcopy base maps containing a coastline, and broadscale bathymetry information (10m, 20m, 50m, 100m, 200m isobaths) were generated. Maps were produced at a scale of approximately 1:230,000.* ***2.*** *Relevant experts/papers were consulted to delineate areas of wildlife activity on the hard copy base maps. (See attribute SOURCE_A for details).* ***3.*** *Mapped polygons identified by experts/papers were digitised on screen using the hard copy base map as a reference. Digitising was undertaken at scales of between 1:120 000 and 1:350 000 (see the attribute SOURCE_PLP).* ***4.*** *Polygons were attributed as per the base map and other sources (see attribute SOURCE_A), and data was checked for logical consistency.* ***5.*** *Data de-projected from AMG Zone50 to lat/long co-ordinates using the de-project functionality of the extension 'CALM Added Functionality v2000' in Arcview3.2.* ***6.*** *Data datum transformed from AGD84 to GDA94 using the change datum functionality of the extension 'CALM Added Functionality v2000' in Arcview3.2.* ***7.*** *Hardcopy maps containing the digitised data along with a satellite image, coastline, broadscale bathymetry (10m, 20m, 50m, 100m, 200m isobaths), and a graticule and grid were produced at 1:300,000. These maps were sent to CALM regional staff for review, and additions.* ***8.*** *Maps were reviewed by CALM regional staff staff (Kevin Crane and Richard Hall) and local tour operators (Craig and Jessie Shankland) and additions/alterations made at broad scale.*

	9. *Data was passed to contract staff (Ben Lamb) for updating based on information contained in review maps.* ***10.*** *Additions were made to the dataset by appending new polygons to the existing polygons using ArcViews append polygon functionality. The new polygons were attributed with the source and other information.*
Positional Accuracy	*Due to the nature of the study, positional accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, delineation of areas in which the wildlife is distributed may not be comprehensive.* *The delineation of the extent of the wildlife distribution is shown by hard boundaries. In reality, the distribution is more often a gradual transition from where the wildlife occurs, to where it doesn't occur, i.e. it is 'fuzzy'.* *Positional inaccuracies may also have occurred due to;* *i) the detail of base maps being sufficient for only broad scale delineation of wildlife distribution/activity,* *ii) some information being more precise in it's definition of the extent of location/distribution than others.* *The digitising of the base maps used to delineate areas of wildlife distribution varies in positional accuracy from 120m to approximately 350m (based on accuracy of 1mm at digitising scale).*
Attribute Accuracy	*Due to the nature of the study, attribute accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, the attributes of the wildlife distribution may not be comprehensive.*
Logical Consistency	*Attribute names have been checked and validated for consistency across all wildlife datasets created for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the implementation of the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands).* *Attribute values have been checked and validated for consistency, and checked for logic in relation to attribute names. All attributes that require values have been assigned values.*
Completeness	*The dataset is complete as at the date of this metadata statement. The dataset will be upgraded as priorities, time and resources permit. Further work needs to be undertaken on delineation and ground-truthing of many areas of wildlife distribution/activity.*
CONTACT INFORMATION	
Contact Organisation	*Department of Conservation and Land Management, Marine Conservation Branch*
Contact Position	*Marine GIS Co-ordinator*
Mail Address 1	*47 Henry Street*

Mail Address 2	
Suburb or Place or Locality	*Fremantle*
State or Locality 2	*WA*
Country	*Australia*
Postcode	*6160*
Telephone	*08 9336 0109*
Facsimile	*08 9430 5408*
Electronic Mail Address	*rayl@calm.wa.gov.au*
METADATA DATE	
Metadata Date	*07/03/2002*
ADDITIONAL METADATA	
Additional Metadata	*For further information refer to:* *Preen, A.R., Marsh, H., Lawler, I.R., Prince, R.I.T. & Shepherd, R. (1997). Distribution and abundance of dugongs, turtles, dolphins and other megafauna in Shark Bay, Ningaloo Reef and Exmouth Gulf, Western Australia. Wildlife Research 24: 185-208.*

APPENDIX IX: METADATA FOR PINK SNAPPER SPAWNING AND AGGREGATION AREAS IN THE SHARK BAY REGION

DATASET	
Title	***Pink Snapper Spawning and Aggregation Areas of the Shark Bay Region***
Custodian	*Department of Conservation and Land Management (CALM)*
Jurisdiction	*Western Australia*
DESCRIPTION	
Abstract	*This dataset consists of polygons representing areas of pink snapper spawning and aggregation within the Shark Bay Marine Park, proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands) and the Hamelin Pool Marine Nature Reserve.* *The data was generated from information provided by experts and from published information gathered during a literature review of marine wildlife in the region. References include:* *i) Jackson, G. Based on fish larval surveys 1997-2001.* *The data was generated as a basic requirement for the management of the Shark Bay Marine Park, and the resource assessment for the planning of the proposed Shark Bay Marine Park extensions.* *This dataset is complemented by other wildlife datasets within the region including dugongs, manta rays, whale sharks, whales, seabirds and turtles.* *Polygons were created and attributed by the following methods;* *i) data collated from anecdotal information from experts and during a rapid assessment of the marine wildlife in the region undertaken by Kevin Bancroft was drawn onto hard copy maps.* *ii) the paper base maps were then digitised by Ben Lamb in March 2002 using Arcview 3.2 and a polygonal dataset was created with the attributes as per the CALM Marine Conservation Branch attribute and naming standards.*
Search Word(s)	
Geographic Extent Name(s)	*Shark Bay (SBY) and Zuytdorp (ZUY) IMCRA Regions*
DATA CURRENCY	
Begin Date	*1/7/2001*
End Date	*Ongoing*

DATASET STATUS	
Progress	*In Progress*
Maintenance & Update Frequency	*As required*
ACCESS	
Stored Data Format	*DIGITAL ArcView shapefile, Geographic, Geocentric Datum of Australian 1994 (GDA94). NONDIGITAL Paper base maps containing raw information*
Available Format Type	*DIGITAL ArcView 3.2 shapefile*
Access Constraint	*Data available for external use subject to transfer fee and license conditions. Data is not to be distributed without authorisation from CALM. Contact CALM's database administrator for further details.*
DATA QUALITY	
Lineage	***1.*** *Hardcopy base maps containing a coastline, and broadscale bathymetry information (10m, 20m, 50m, 100m, 200m isobaths) were generated. Maps were produced at a scale of approximately 1:300,000.* ***2.*** *Relevant experts/papers were consulted to delineate areas of wildlife activity on the hard copy base maps. (See attribute SOURCE_A for details).* ***3.*** *Mapped polygons identified by experts/papers were digitised on screen by Ben Lamb in March 2002 using the hard copy base map as a reference. Digitising was undertaken at a scale of 1:300,000 (see the attribute SOURCE_PLP).* ***4.*** *Polygons were attributed as per the base map and other sources (see attribute SOURCE_A), and data was checked for logical consistency.*
Positional Accuracy	*Due to the nature of the study, positional accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, delineation of areas in which the wildlife is distributed may not be comprehensive.* *The delineation of the extent of the wildlife distribution is shown by hard boundaries. In reality, the distribution is more often a gradual transition from where the wildlife occurs, to where it doesn't occur, i.e. it is 'fuzzy'.* *Positional inaccuracies may also have occurred due to;* *i) the detail of base maps being sufficient for only broad scale delineation of wildlife distribution/activity,* *ii) some information being more precise in it's definition of the extent of location/distribution than others.* *The digitising of the base maps used to delineate areas of wildlife distribution has a positional accuracy of approximately 300m (based on accuracy of 1mm at digitising scale).*

Attribute Accuracy	*Due to the nature of the study, attribute accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, the attributes of the wildlife distribution may not be comprehensive.*
Logical Consistency	*Attribute names have been checked and validated for consistency across all wildlife datasets created for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the implementation of the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands).* *Attribute values have been checked and validated for consistency, and checked for logic in relation to attribute names. All attributes that require values have been assigned values.*
Completeness	*The dataset is complete as at the date of this metadata statement. The dataset will be upgraded as priorities, time and resources permit. Further work needs to be undertaken on delineation and ground-truthing of many areas of wildlife distribution/activity.*
CONTACT INFORMATION	
Contact Organisation	*Department of Conservation and Land Management, Marine Conservation Branch*
Contact Position	*Marine GIS Co-ordinator*
Mail Address 1	*47 Henry Street*
Mail Address 2	
Suburb or Place or Locality	*Fremantle*
State or Locality 2	*WA*
Country	*Australia*
Postcode	*6160*
Telephone	*08 9336 0109*
Facsimile	*08 9430 5408*

Electronic Mail Address	*rayl@calm.wa.gov.au*
METADATA DATE	
Metadata Date	*07/03/2002*
ADDITIONAL METADATA	
Additional Metadata	

APPENDIX X: METADATA FOR BLACK SNAPPER SPAWNING AND AGGREGATION AREAS IN THE SHARK BAY REGION

DATASET	
Title	***Black Snapper Spawning and Aggregation Areas of the Shark Bay Region***
Custodian	*Department of Conservation and Land Management (CALM)*
Jurisdiction	*Western Australia*
DESCRIPTION	
Abstract	*This dataset consists of polygons representing areas of black snapper spawning and aggregation within the Shark Bay Marine Park, proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands) and the Hamelin Pool Marine Nature Reserve.* *The data was generated from information provided by experts and from published information gathered during a literature review of marine wildlife in the region. References include:* *i) Ayvazian, S. and Kay, I. ARC Project "The age, growth, reproductive biology and stock assessment of grass snapper, Lethrinus laticaudis in Shark Bay, Western Australia."* *The data was generated as a basic requirement for the management of the Shark Bay Marine Park and the resource assessment for the planning of the proposed Shark Bay Marine Park extensions.* *This dataset is complemented by other wildlife datasets within the region including dugongs, manta rays, whale sharks, whales, seabirds and turtles.* *Polygons were created and attributed by the following methods;* *i) data collated from anecdotal information from experts, published data from literature and during a rapid assessment of the marine wildlife in the region undertaken by Kevin Bancroft was drawn onto hard copy maps.* *ii) the paper base maps were then digitised by Ben Lamb in March 2002 using Arcview 3.2 and a polygonal dataset was created with the attributes as per the CALM Marine Conservation Branch attribute and naming standards.*
Search Word(s)	
Geographic Extent Name(s)	*Shark Bay (SBY) and Zuytdorp (ZUY) IMCRA Regions*
DATA CURRENCY	
Begin Date	*1/7/2001*
End Date	*Ongoing*
DATASET STATUS	

Progress	*In Progress*
Maintenance & Update Frequency	*As required*
ACCESS	
Stored Data Format	*DIGITAL ArcView shapefile, Geographic, Geocentric Datum of Australian 1994 (GDA94).* *NONDIGITAL Paper base maps containing raw information*
Available Format Type	*DIGITAL ArcView 3.2 shapefile*
Access Constraint	*Data available for external use subject to transfer fee and license conditions. Data is not to be distributed without authorisation from CALM. Contact CALM's database administrator for further details.*
DATA QUALITY	
Lineage	***1.*** *Hardcopy base maps containing a coastline, and broadscale bathymetry information (10m, 20m, 50m, 100m, 200m isobaths) were generated. Maps were produced at a scale of approximately 1:300,000.* ***2.*** *Relevant experts/papers were consulted to delineate areas of wildlife activity on the hard copy base maps. (See attribute SOURCE_A for details).* ***3.*** *Mapped polygons identified by experts/papers were digitised on screen by Ben Lamb in March 2002 using the hard copy base map as a reference. Digitising was undertaken at scale of between 1:100,000 and 1:300,000 (see the attribute SOURCE_PLP).* ***4.*** *Polygons were attributed as per the base map and other sources (see attribute SOURCE_A), and data was checked for logical consistency.*
Positional Accuracy	*Due to the nature of the study, positional accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, delineation of areas in which the wildlife is distributed may not be comprehensive.* *The delineation of the extent of the wildlife distribution is shown by hard boundaries. In reality, the distribution is more often a gradual transition from where the wildlife occurs, to where it doesn't occur, i.e. it is 'fuzzy'.* *Positional inaccuracies may also have occurred due to;* *i) the detail of base maps being sufficient for only broad scale delineation of wildlife distribution/activity,* *ii) some information being more precise in it's definition of the extent of location/distribution than others.* *The digitising of the base maps used to delineate areas of wildlife distribution varies in positional accuracy from 100m to approximately 200m (based on accuracy of 1mm at digitising scale).*

Attribute Accuracy	*Due to the nature of the study, attribute accuracy should be considered as approximate only. The data has been collected from anecdotal information provided by experts and a literature review. Resource and time constraints prevented more detailed survey work being undertaken. While every endeavour has been made to faithfully record information, the attributes of the wildlife distribution may not be comprehensive.*
Logical Consistency	*Attribute names have been checked and validated for consistency across all wildlife datasets created for the management of the Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve and the implementation of the proposed Shark Bay Marine Park extensions (Bernier, Dorre and Dirk Hartog Islands).* *Attribute values have been checked and validated for consistency, and checked for logic in relation to attribute names. All attributes that require values have been assigned values.*
Completeness	*The dataset is complete as at the date of this metadata statement. The dataset will be upgraded as priorities, time and resources permit. Further work needs to be undertaken on delineation and ground-truthing of many areas of wildlife distribution/activity.*
CONTACT INFORMATION	
Contact Organisation	*Department of Conservation and Land Management, Marine Conservation Branch*
Contact Position	*Marine GIS Co-ordinator*
Mail Address 1	*47 Henry Street*
Mail Address 2	
Suburb or Place or Locality	*Fremantle*
State or Locality 2	*WA*
Country	*Australia*
Postcode	*6160*
Telephone	*08 9336 0109*
Facsimile	*08 9430 5408*
Electronic Mail Address	*rayl@calm.wa.gov.au*
METADATA DATE	

Metadata Date	*07/03/2002*
ADDITIONAL METADATA	
Additional Metadata	*For further information refer to:* *Ayvazian, S. and Kay, I. ARC Project "The age, growth, reproductive biology and stock assessment of grass snapper, Lethrinus laticaudis in Shark Bay, Western Australia."*