Gnaraloo
FERAL ANIMAL CONTROL

GNARALOO FERAL ANIMAL CONTROL PROGRAM

REPORT
for sea turtle nesting season 2014/15

Gnaraloo Bay Rookery
Gnaraloo Cape Farquhar Rookery



ANIMAL PEST MANAGEMENT SERVICES

Gnaraloo
SEA TURTLE CONSERVATION

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Table of Contents

1 Location 5

2 Memoranda of Understanding 7

3 Funding and resourcing 8

4 Qualifications of APMS 10

5 Program objectives and desired outcomes 10

6 Program approach and expansion during 2014/15 11

6.1 Approach 11
6.2 Target species 11
6.3 Extended period of control events 12
6.4 Program coverage area 12
6.5 Terrestrial fauna monitoring program 14

7 Methodology 15

8 Results by APMS 18

8.1 Terrestrial fauna monitoring program 18
8.2 Feral and native fauna activity locations during 2014/15 18

9 Independent feral MERI monitoring by the GTCP 21

9.1 MERI methods 21
9.2 MERI Objectives 22
9.3 MERI Results during 2014/15 by GTCP 22
9.4 MERI Results in GBR during 2008/09 – 2014/15 by GTCP 24
9.5 Number of loggerhead turtle eggs protected by the GFACP 25
9.6 Discussion of MERI results 2014/15 by GTCP 27
9.7 Discussion of the multi-year trends in feral animal presence and activity in the monitored rookeries by GTCP 27
9.8 MERI Recommendations by GTCP 28
9.9 MERI Conclusions by GTCP 28

10 Communication 29

10.1 Knowledge-sharing 29
10.2 Education 32
10.3 Media and social outreach 32
10.4 Poster 33
10.5 Vehicle wrap 33
10.6 Award 33

11 Discussion and recommendations for future 35

12 Conclusions 36

13 References 38

MAPS

Map 1: The location of Gnaraloo, Western Australia 5
Map 2: The Gnaraloo Bay Rookery, Western Australia 6
Map 3: The Gnaraloo Cape Farquhar Rookery, Western Australia 7
Map 4: The standardized 119 km APMS monitoring transect 13
Map 5: Activities recorded by APMS on Gnaraloo during 2014/15 20

IMAGES

Image 1: A pitfall trap used by APMS to survey native fauna at Gnaraloo during 2014/15 18
Image 2: Native fauna observed during APMS surveys in 2014/15 19
Image 3: Wild dog activity at a turtle nest in Gnaraloo Bay Rookery during 2014/15 23
Image 4: The Australasian Wildlife Management Society's Award to the GFACP during 2014/15 34

TABLES

Table 1:Funding and resourcing of the GFACP during 2008 - 2015 9
Table 2: Feral animal control and training events during 2014/15 16
Table 3: Loggerhead turtle nests recorded in the Gnaraloo Bay Rookery during 2010 - 2015 ... 26
Table 4: Knowledge sharing by GFACP during 2014/15 29

FIGURES

Figure 1: Number of track days for feral predator species recorded by GTCP in Gnaraloo Bay Rookery, 2008 - 2015 24
Figure 2: Proportion of total feral animal track days recorded by GTCP in Gnaraloo Bay Rookery, 2008 - 2015 25
Figure 3: Sea turtle nests recorded by GTCP in Gnaraloo Bay Rookery, 2008 – 2015 26
Figure 4: Commendation by the Minister of Environment (WA) during 2014/15 31

APPENDICES

Appendix 1: Feral MERI Monitoring Log for Gnaraloo Bay Rookery, 2014/15 40
Appendix 2: Feral MERI Monitoring Log for Gnaraloo Cape Farquhar Rookery, 2014/15 50

1 Location

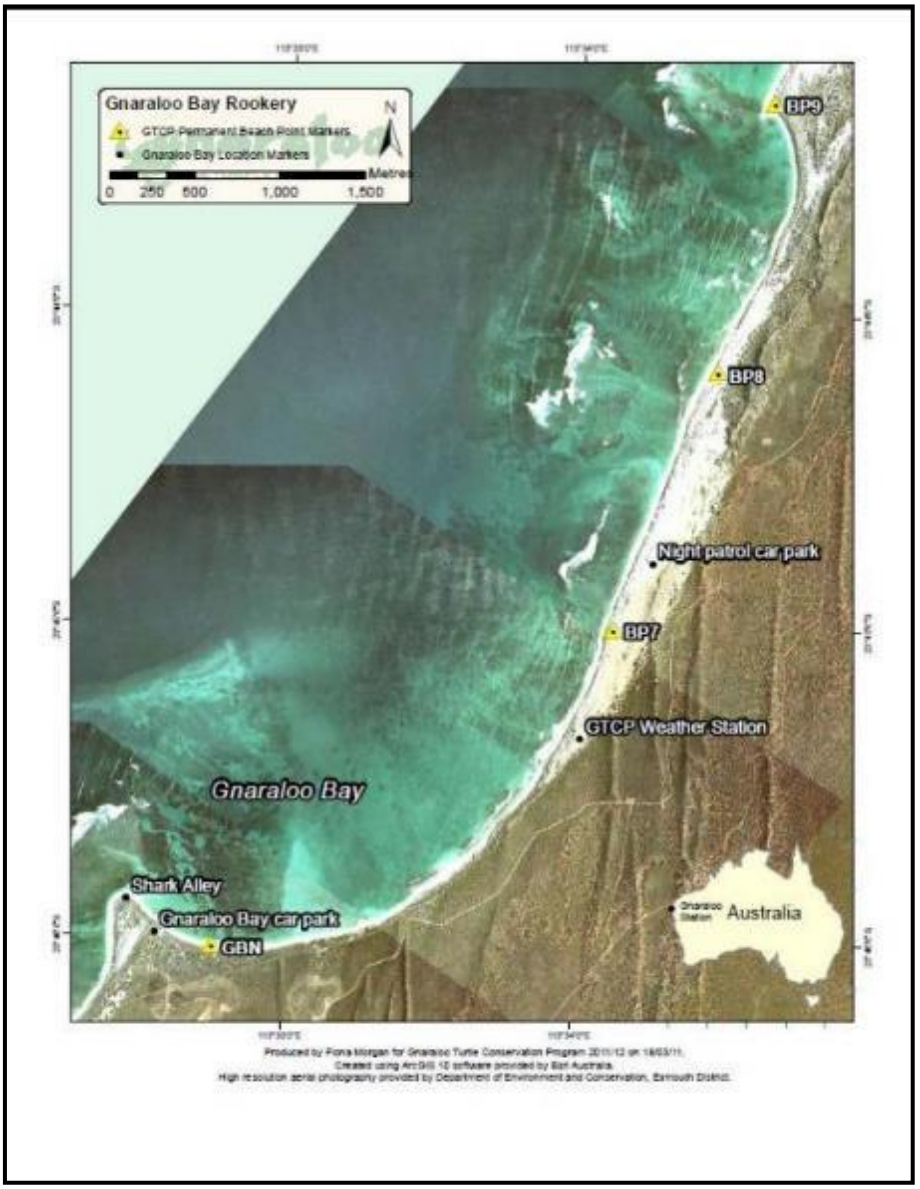
Gnaraloo Station is located about 150 km north of Carnarvon, in Western Australia (**WA**), immediately adjacent to the Ningaloo Marine Park (**NMP**) and the Ningaloo Coast World Heritage Area (**NCWHA**). It abuts 65 km of coastline, including southern parts of the Ningaloo Reef and 4 marine sanctuary zones of the NMP, namely Turtles, 3Mile Lagoon, Gnaraloo Bay and Cape Farquhar. The Indian Ocean borders Gnaraloo to the west (**Map 1**) and the important inland Lake MacLeod wetland system borders it to the east.

Map 1: The location of Gnaraloo, Western Australia

Map by the GTCP

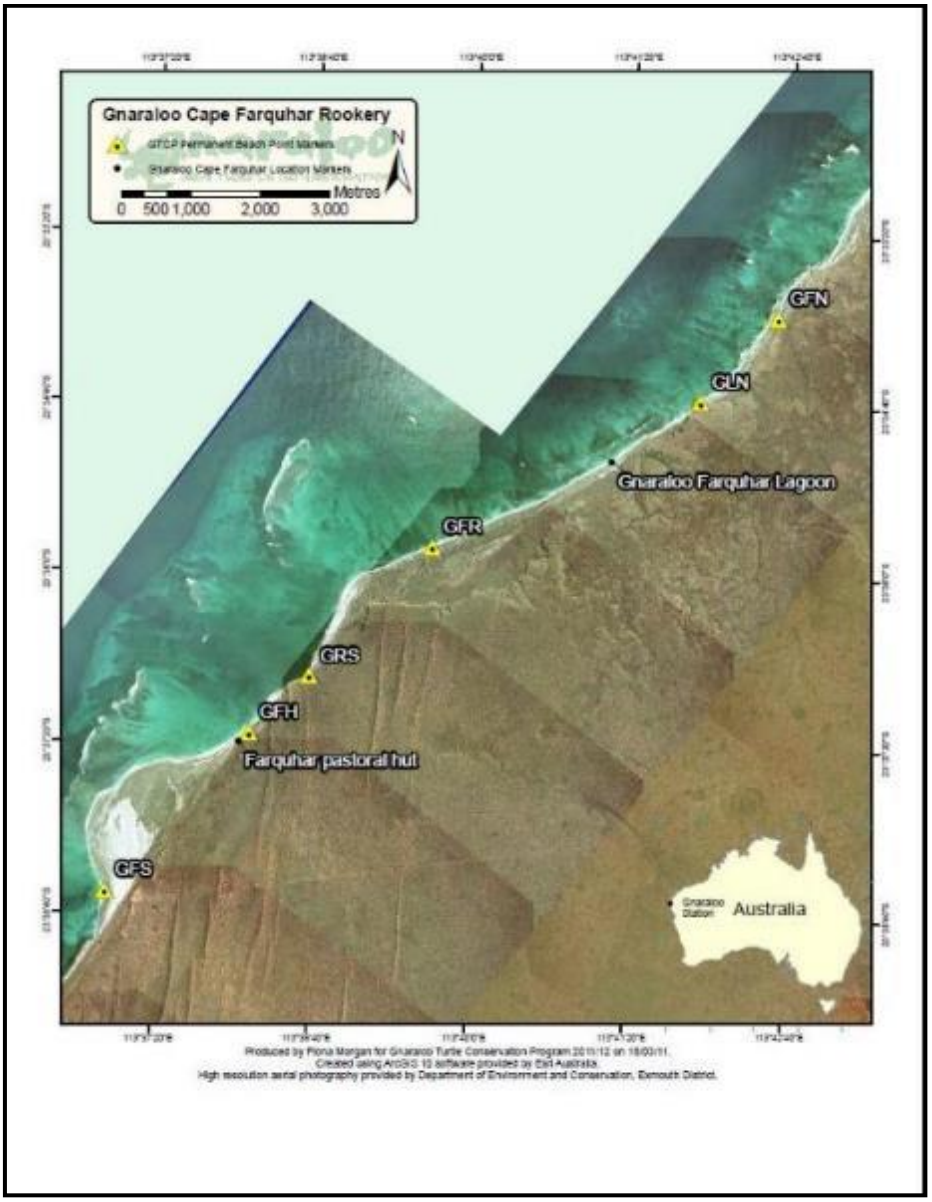
The Gnaraloo Station Trust set up and operates the Gnaraloo Turtle Conservation Program (**GTCP**) and the separate Gnaraloo Feral Animal Control Program (**GFACP**) during 2008/09 – 2014/15. Both programs commenced on-ground in late 2008. The GTCP monitors, manages and protects two important mainland sea turtle nesting rookeries (on beaches, not in-water) on the Gnaraloo coastline, namely the Gnaraloo Bay Rookery (**GBR**) and the Gnaraloo Cape Farquhar Rookery (**GCFR**) (**Map 2 and Map 3)**.

Both of these turtle rookeries are located in the southern section of the NMP. The GBR extends from the GTCP beach survey point named Gnaraloo Bay North (**GBN**) (23.76708ºS; 113.54584ºE) to Beach Point 9 (**BP9**) (23.72195ºS; 113.57750ºE), an area of approximately 7 km long. The GCFR extends from the GTCP beach survey point called Gnaraloo Farquhar South (**GFS**) (23.64168ºS; 113.61544ºE) to Gnaraloo Farquhar North (**GFN**) (23.57697ºS; 113.69830ºE), about 14 km long.



Map 2: The Gnaraloo Bay Rookery, Western Australia

Map by the GTCP



Map 3: The Gnaraloo Cape Farquhar Rookery, Western Australia

Map by the GTCP

2 Memoranda of Understanding

The Gnaraloo Station Trust and Rangelands NRM (WA) entered in a Memorandum of Understanding (**MOU**) concerning the GFACP on 30 May 2015 for the seasons 2013/14 and 2014/15. Target feral animal species under the MOU include the European red fox, feral cats and wild dogs. Objectives of the MOU include:

- work together to continue to monitor, protect, manage, communicate, educate and promote the significant mainland sea turtle nesting rookeries on the Gnaraloo coastline, through work under both the GTCP and the GFACP;
- complement and extend both the GTCP and the GFACP which target Matters of National Environmental Significance under the *Environmental Protection and*

Biodiversity Conservation Act 1999 (**EPBC Act**) (namely nationally significant species and key threatening processes), align with and draw on recommendations from the Sea Turtle National Recovery and Threat Abatement Plans;

- continuously improve feral animal control methods at Gnaraloo through a Monitoring, Evaluation, Reporting, and Improvement (**MERI**) strategy;
- extend communication and educational outreach activities to community participants, primary and high schools and the general public for engagement and involvement with the GTCP and the GFACP.

The Gnaraloo Station Trust and the Department of Parks and Wildlife (**DPaW**) (WA) (then Department of Environment and Conservation) entered in a MOU concerning the GFACP on 31 December 2012 for the season 2012/13. It complimented the Gnaraloo Station Trust for its commitment to sea turtle conservation and feral animal control along the Gnaraloo coastline and stated that the GTCP and GFACP form essential components of integrated feral animal control in the NCWHA and the abutting properties. Objectives of the MOU included continued protection of the significant mainland rookeries of threatened sea turtles along the Gnaraloo coastline through support of the GFACP and continued implementation of the GTCP's feral MERI strategy that was first put in place by the Gnaraloo Station Trust during 2008. This MOU was updated and executed again by the Gnaraloo Station Trust and DPaW on 14 April 2014 with targeted collaboration for the season 2013/14.

3 Funding and resourcing

The GFACP was jointly undertaken by the Gnaraloo Station Trust and Animal Pest Management Services (**APMS**) from 2008/09 to 2014/15. During this time, the Gnaraloo Station Trust and APMS invested over $300,000 into it. Due to land tenure changes by the State Government of the Gnaraloo pastoral lease effective from 1 July 2015, the Gnaraloo Station Trust transferred management of the GFACP to Rangelands NRM and DPaW for the financial years 2015/16 onwards.

Table 1 details the funding and resourcing of the GFACP from 2008/09 – 2014/15 when management ended by the Gnaraloo Station Trust (on 30 June 2015).

Table 1:Funding and resourcing of the GFACP during 2008 - 2015

NUMBER	FINANCIAL YEAR	TOTAL PROGRAM COST	GNARALOO STATION TRUST & APMS	GRANT CONTRIBUTIONS		
				AUSTRALIAN GOV.	RANGELANDS NRM	DPaW
Program start 1	GFACP 2008/09	$77,408.72	$36,169.69 Financial + In-kind	$39,184.85 Financial	-	$2,054.18 In-kind
2	GFACP 2009/10	$77,408.72	$36,169.69 Financial + In-kind	$39,184.85 Financial	-	$2,054.18 In-kind
3	GFACP 2010/11	$77,408.72	$36,169.69 Financial + In-kind	$39,184.85 Financial	-	$2,054.18 In-kind
4	GFACP 2011/12	$70,246	$70,246 Financial + In-kind / Solely Funded	-	-	-
5	GFACP 2012/13	$95,683.50	$70,283.50 Financial + In-kind	-	-	$25,400 Financial
6	GFACP 2013/14	$101,546	$34,690 Financial + In-kind	$14,856 Financial	$44,572 Financial	$7,428 Financial
7	GFACP 2014/15	$100,561	$34,690 Financial + In-kind	$14,856 Financial	$51,015 Financial	-
TOTAL INVESTMENT VALUE OF THE PROGRAM		**$600,262.66**	**$318,418.57**	**$147,266.55**	**$95,587**	**$38,990.54**

Note: Table by the GTCP. All numbers in the table exclude GST.

4 Qualifications of APMS

All APMS operational staff have a Certificate III in Vertebrate Pest Management. The certificate contains specialized training for technicians involved in pest animal management and includes training in the following categories:

- conducting monitoring and surveys of vertebrate pests;
- trapping of wild animals and the legislation requirements;
- specialized training in the trapping of foxes, feral cats, wild dogs and feral pigs;
- specialized training in 1080, strychnine, Pindone and other poisons;
- developing monitoring programs for evaluation of pre and post control efforts;
- Occupational Health and Safety;
- environmentally sustainable work practices specific to vertebrate pest poisons;
- firearms training in humanely destroying animals;
- operating and navigating in remote and isolated areas;
- 4 wheel drive and quad bike use off road.

Senior APMS staff have a Diploma of Pest Management and Certificate IV in Training and Assessment to improve training of personnel involved with the GFACP.

5 Program objectives and desired outcomes

The feral animal control program conducted during the sea turtle nesting season 2014/15 at Gnaraloo complimented the previous control programs completed by the Gnaraloo Station Trust and APMS during the six previous turtle nesting seasons 2008/09 - 2013/14.

Objectives of the specialized GFACP include the following:

- undertake a co-ordinated feral animal control program on Gnaraloo with the aim of protecting important coastal nesting rookeries (beaches, not in-water) of endangered sea turtles in the NCWHA;
- reduce critical threats posed by feral animal predators during the annual turtle nesting season at Gnaraloo;
- aim to achieve continued 100% protection of turtle nests from feral animal disturbance and predation in the identified sea turtle rookeries on Gnaraloo, as has been achieved each consecutive season since 2010/11;
- promote the program through schools and the wider community to local, national and international audiences.

Desired program outcomes include:

- critical threats (in particular feral animal disturbance and predation) to the coastal nesting rookeries of endangered sea turtles at Gnaraloo are reduced, enabling successful turtle egg development, hatching and propagation of the species on a local, national and international scale;

- by protecting the coastal nesting turtle rookeries at Gnaraloo from feral predation, protect other significant terrestrial biodiversity values and outcomes station wide, including native fauna such as small to medium sized mammals, marsupials, ground nesting birds, reptiles and insects, including at and surrounding the significant Lake MacLeod wetland system which adjoins Gnaraloo to the east and which has previously been proposed for listing under The Convention on Wetlands (Ramsar, Iran, 1971) (**Ramsar Convention**) as a 'Wetland of International Significance';
- increased school, community and public knowledge (on a local, national and international scale) of the presence and importance of the sea turtle rookeries at Gnaraloo within the NCWHA and the threats to these rookeries.

6 Program approach and expansion during 2014/15

6.1 Approach

The GFACP uses "Best Practice" which is adopted at a landscape scale, aimed at long term management, involves numerous stakeholders, is locally owned and focused on on-ground outcomes, results and improvements.

APMS uses the principle of "sustaining innovation" to evolve and transform the methodology used for feral animal control at Gnaraloo as well as adaptive management techniques to improve the program's long term effectiveness, such as:

- adjusting and changing the GFACP 2014/15 as a result of the on-ground findings and recommendations of baiting works and surveys at Gnaraloo since 2008 and specifically during the previous seasons of 2012/13 and 2013/14;
- assessing each phase of the program throughout the season 2014/15;
- acting on the real time feral MERI feedback by the GTCP during 2014/15 of the effectiveness of the GFACP in the monitored turtle rookeries (refer chapter on MERI later in the report).

6.2 Target species

The GFACP was previously expanded to include feral cats and wild dog monitoring and control in order to integrate declared animal control responsibilities into the program. This was continued during 2013/14 - 2014/15, but with a greater emphasis on targeting feral cats and wild dogs. APMS again recorded all evidence of feral cats on the 119 km standardized APMS monitoring transect during the season 2014/15 to gather evidence of possible changes to feral cat abundance as a result of the control of foxes through the use of 1080 baits. Previously the surveying and monitoring of feral animal tracks along the standard APMS monitoring transect only included the recording of feral cat activity as a notation in most areas and was more of an observational study than correlative data (the exception is the track that leads from Gnaraloo Cape Farquhar east to 9Mile, where all fox, wild dog and feral cat tracks have been recorded by APMS from 2009 onwards).

6.3 Extended period of control events

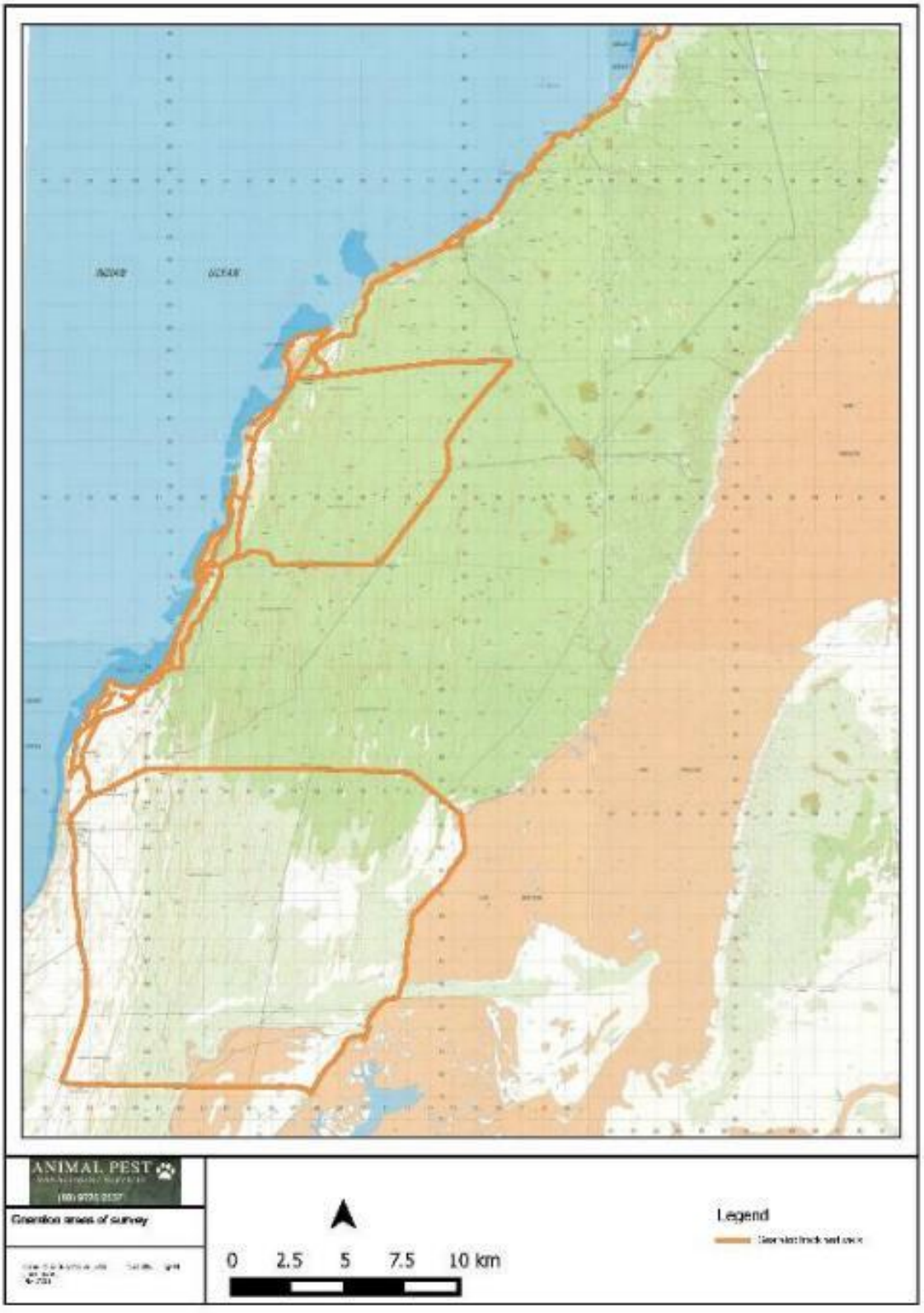
Foxes were found to be present during the season 2012/13, with a declining number of foxes occurring during each visit by APMS between October 2012 to the end of April 2013. During the seasons 2013/14 - 2014/15 at Gnaraloo, no foxes were found to be present on the station. The timing of the foxes found at Gnaraloo (October 2012) indicated that the movement of most foxes into Gnaraloo during 2012/13 occurred as a result of both dispersing juveniles and surplus adults from elsewhere. Additionally, wild dogs were continuously found on Gnaraloo throughout the year. The implications of the above is that the GFACP needed to be extended throughout the year in order to control foxes that are dispersing from elsewhere into Gnaraloo if the conservation of the station's biodiversity was to be adequately protected. As a result of this data, the Gnaraloo Station Trust and APMS extended the GFACP during 2013/14 – 2014/15 to target foxes from September through to June (which covers the peak fox breeding season and winter period to the end of the fiscal year on 30 June).

An additional component was added for the season 2014/15 to continue the fox, feral cat and wild dog control program leading into the winter months (which also covers the peak feral breeding season). APMS visited Gnaraloo in July 2014 to assess and control the numbers and locations of foxes, feral cats and wild dogs. Previously, GFACP programs had ceased either in March or May of each fiscal year and there was no knowledge or data of feral animal activity during the winter months at Gnaraloo. This was repeated by APMS in July 2015 (as part of the season 2015/16).

6.4 Program coverage area

In 2014/15, APMS again conducted monitoring surveys and bait works in locations with fox, feral cat and wild dog activity (sightings, tracks and/or scats) through use of transects and downloading of GPS data onto a database and maps used by APMS. Transects covered the Core Bait Areas and Buffer Bait Areas through to the Lake MacLeod wetland system on Gnaraloo's eastern most boundary (**Table 4** and **Chapter 7**). In the short to medium term, this information is helpful for evaluating where baiting is fully effective or needs improvement, where foxes and other feral animals are recorded more frequently before and after baiting and likely pathways for movement of foxes and other feral animals into areas (runs), including monitoring and assessing the incidence of wild dogs and any control required. The monitoring surveys and control works along transects consisted of both daylight surveys and night time spotlighting by APMS, with between 1 - 3 transects conducted during each site visit.

Control works under the GFACP during 2014/15 again covered the area from Gnaraloo's southern boundary to 3Mile Camp and out eastwards to Gnaraloo's main access road. Spotlighting, shooting and trapping of foxes, feral cats and wild dogs occurred throughout this area as the risks to domestic dogs through using toxins (1080 bait placement) were considered too great given that this area is frequented by day visitors and guests of Gnaraloo.



Map 4: The standardized 119 km APMS monitoring transect

Map by APMS

Areas on Gnaraloo again excluded during 2014/15 from baiting works (i.e. 1080 placement) due to the possible presence of domestic pets (dogs) of Gnaraloo guests included:

- 3Mile Camp;
- the coastal area from 3Mile Camp to Gnaraloo's southern boundary extending 3km inland;
- Gnaraloo Homestead area;
- Gnaraloo Bay public use area.

However, baits were laid adjacent to the area and surrounds of 6Mile which is accessible to the public as a shore fishing area, as this is essential to protect the GBR.

As occurred in 2013/14, t**he total area baited at Gnaraloo during 2014/15 was again approximately 750 km^2.** This included approximately 70 km^2 total Core Bait Areas, approximately 280 km^2 total Buffer Bait Areas and approximately 400 km^2 total Remainder Areas. The coastal area from 3Mile Camp to Gnaraloo's southern boundary was subject to trapping and shooting to control foxes and wild dogs in order to provide coverage by control activities of the total area of the station.

A successful outcome during 2014/15 was feral animal control extension work on Warroora Station, immediately to the north of Gnaraloo Station. This increased the effectiveness of feral animal control on Gnaraloo Station, extended the scope of the program's coverage area and overall program success.

6.5 Terrestrial fauna monitoring program

To increase the knowledge of the mammal species that occur on Gnaraloo, surveys by APMS commenced in 2013/14 and continued in 2014/15 to determine the presence of and identify small mammal species in the area adjacent to the GTCP monitoring sites. Trapping occurred through use of pit fall traps and Elliott traps. The fauna surveys by APMS were conducted under a Regulation 17 research licence issued by DPaW under the *Wildlife Conservation Act 1950* (WA).

7 Methodology

Feral animal control works on Gnaraloo Station were again undertaken by APMS during 2014/15, as has occurred since 2008/09.

The GFACP consists of a multi-pronged strategy to target and control feral animals that pose threats to sea turtle nests in the identified sea turtle rookeries on Gnaraloo and the adjacent terrestrial buffer zones. Baited areas are divided into 4 main areas, based on the priority of each area for feral animal control:

1. The areas immediately behind the coastal turtle rookeries, including the GBR and GCFR. These areas are the highest priority for feral animal control. This includes the beach areas where the turtle nests are located and the areas immediately behind the primary dunes, up to approximately 2km inland (**Core Bait Areas**).
2. Surrounding hinterland ranging from 2 - 8km inland from the GBR and GCFR, given accessibility and feral animal activity (**Buffer Bait Areas**).
3. All beaches north and south of the GBR and GCFR, from Gnaraloo's southern to northern boundary (**Remainder Areas**).
4. The remaining Gnaraloo property (i.e. the areas of Gnaraloo other than the above, extending inland to its eastern most boundary with the Lake MacLeod wetland system, particularly surrounding water points and sources) (**Remainder Areas**).

Baiting of the Core Bait Areas is to control feral animals that would have an immediate effect on sea turtles (eggs and/or hatchlings). There is a zero tolerance approach to foxes, feral cats and wild dogs within this area. Buffer areas are important as foxes will re-invade core baited areas rapidly to replace the foxes killed.

The baiting methodology and bait types used during 2014/15 was similar to that conducted during the season 2013/14 season, consisting of Dried Meat Baits (**DMB**) produced by APMS (with 6mg of 1080 per bait) with use as well of 1080 impregnated fowl egg baits (3mg). The DMBs were standardized at 6mg so that wild dogs could be targeted along with foxes. Fox baits contain 3mg of 1080 which may not be sufficient for wild dog control if some of the poison is lost through bacteria, fungi or leaching of the 1080 poison.

A total of 800 DMB and 52 fowl egg baits were used during the season 2014/15.

Feral animal monitoring, control and baiting as well as training events at Gnaraloo during 2014/15 are shown in Table 2.

During 2014/15, 4 of these feral animal control events were funded by Rangelands NRM and 2 by the Australian Government. The additional baiting was funded by the Gnaraloo Station Trust and APMS.

Table 2: Feral animal control and training events during 2014/15

NUMBER	DATES	ACTIVITIES AT GNARALOO	NUMBER OF APMS STAFF
1	21 - 26 July 2014	Assessment and control of the numbers and locations of foxes, feral cats and wild dogs	2
2	4 - 6 September 2014	Assessment and feral animal control, including baiting	2
3	23 – 31 October 2014	Training of GTCP field team 2014/15, monitoring and baiting	1
4	7 – 10 December 2014	Monitoring and feral animal control, including baiting	2
5	29 December 2014 –1 January 2015	Assessment and feral animal control, including baiting	2
6	18 – 21 February 2015	Monitoring and feral animal control, including baiting	2
7	16 – 20 March 2015	Assessment and feral animal control, including baiting	2
8	8 - 11 June 2015	Assessment and feral animal control, including baiting	2

Note: Table by APMS.

The primary baiting strategy used at Gnaraloo consists of "target baiting" rather than "landscape baiting" whereby baits are laid at strategic locations to maximize bait uptake and minimize the number of baits used. This strategy is considered to be more effective in the long term as there is less likely to be baits in the environment that have degraded or lost some 1080 which will likely increase the risk of bait shyness. It is APMS's view that the "target baiting" method used at Gnaraloo is more sustainable, an important part of best practice and is equally as important as bait selection. Field evaluations of bait uptake by foxes in New South Wales (Australia) found that on average 45% of baits are taken by foxes (Saunders et al. 1997). The implications of over 50% of baits left on the ground include non-target losses, development of bait shyness and reduced cost effectiveness (Saunders et al. 1999).

All bait locations are GPS logged to monitor bait take between visits and during each visit. Baits that are taken by foxes, feral cats or wild dogs are replaced.

The average bait lay during the 2014/15 season was 0.79 bait/km^2. The maximum rate of bait lay used was 5 baits/km2 in areas with regular fox or wild dog activity. The average baiting rate during the season 2013/14 was also less than 1 bait/km^2.

Feral cat trapping is undertaken where there is evidence of feral cats that are within an area and the evidence is fresh (<2 days old) and the feral cat(s) are active in an area of <100 ha for more than 2 - 3 days. Feral cat trapping consists of the use of cage traps baited with a food lure.

Feral cats are also susceptible to being captured in traps set for wild dogs.

Trapping for wild dog control is undertaken in conjunction with 1080 baiting. The traps used are typical foot-hold traps used for wild dog control on programs conducted by APMS elsewhere. Traps are set where recent wild dog activity is noted (tracks or scats and sightings). Traps need regular inspection and re-set due to many of the traps being disturbed by goats and kangaroos.

Surveying along the standardized APMS monitoring transect occur at least once during every site visit by APMS. Daytime surveying is undertaken by vehicle along the track, with any tracks of foxes, feral cats or wild dogs GPS logged. Tracks are ignored if they are less than 500 m from the nearest GPS point for that species to avoid or minimize counting the same animal more than once on the survey date. APMS use continuous rather than binary counts to increase sensitivity and to facilitate calculation of variability of the activity indices. Cats, foxes and dingoes are far more detectable through track transects than spotlighting (Read and Eldridge 2010). Spotlighting is also undertaken during the night along the same transect line.

APMS again used remote cameras and sand plots with photo records during 2014/15 to monitor bait-taking and capture photographs of individual feral animals.

In the areas of Gnaraloo were the use of lethal 1080 baits cannot be used due to the risks to domestic animals, control of feral animals is undertaken using roof mounted and handheld spotlights used in conjunction with firearms. Any target feral animals that are sighted, trapped or shot are GPS logged with a record kept of the weight, colour and sex of each animal.

APMS performs autopsies on all controlled feral animals, including recording data on the findings. Stomach contents of feral cats controlled at Gnaraloo often include native animals such as small marsupials, frogs, lizards and skinks.

APMS staff monitor the results of the GFACP during their regular visits to Gnaraloo that occur throughout the season.

Surveys at Gnaraloo for native mammals by APMS are conducted during some of their visits through the use of Elliott and pitfall traps (Error! Reference source not found.).

Image 1: A pitfall trap used by APMS to survey native fauna at Gnaraloo during 2014/15

8 Results by APMS

A cat was shot in August 2014. Three cats were captured in traps and another cat was seen during September 2014 by APMS during their surveys. A male feral cat (tabby, 4kg) was shot between the Homestead area and GBR during February 2015. Its stomach contents included a lizard (unknown species) and fur.

One dog was trapped and two other dogs were seen by APMS personnel during February 2015. Wild dog activity was found at various locations on Gnaraloo (e.g. between Monuments and Roadside Tank, at the Telstra Track intersection between 17Mile east and Farquhar, between Hill Tank and GCFR North, at Farquhar and 17Mile wells (east and west)].

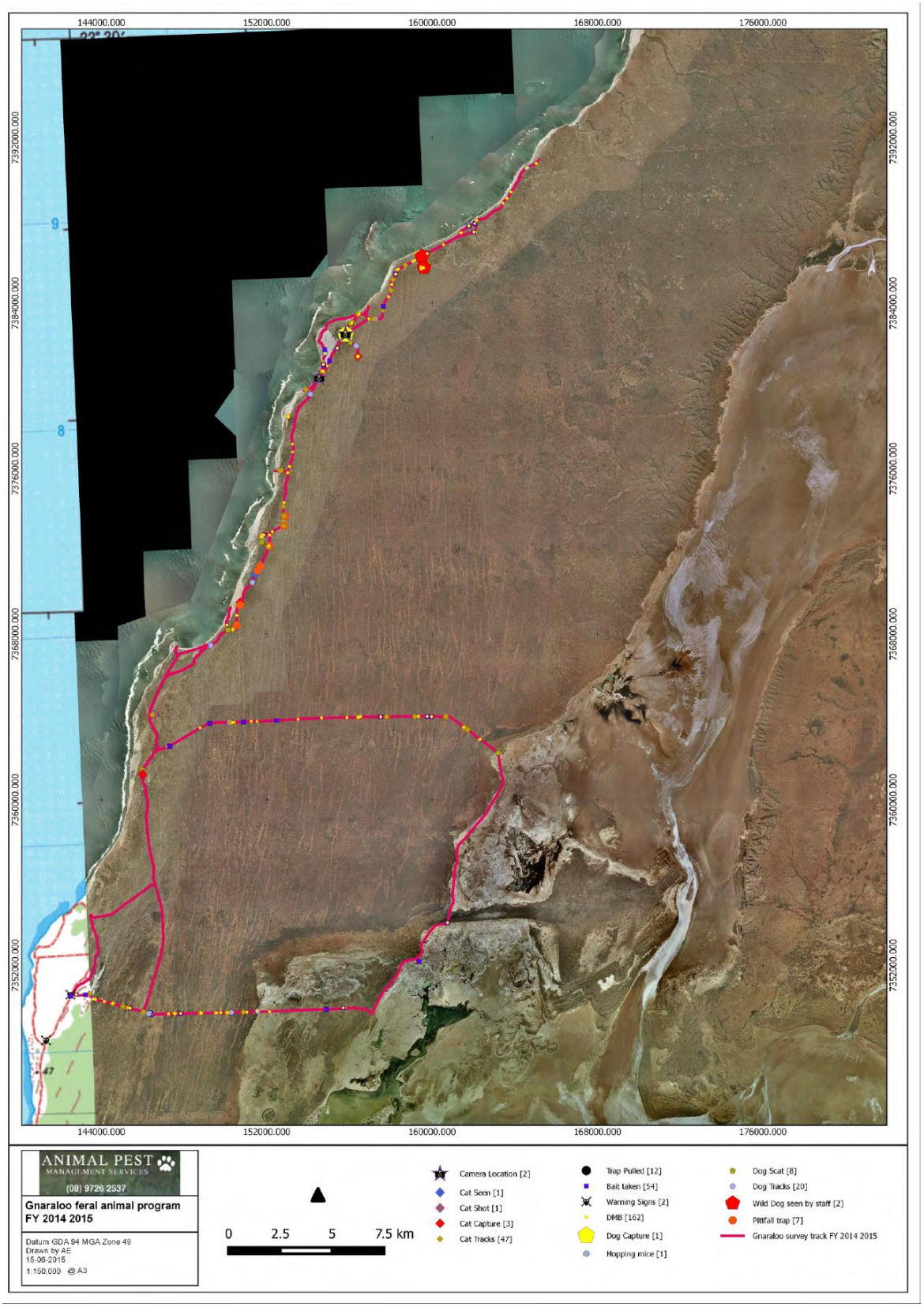
8.1 Terrestrial fauna monitoring program

The terrestrial fauna monitoring program by APMS commenced during the season 2013/14 and limited inferences can be drawn from the work conducted to date. Small mammals recorded to date as result of the surveys include Spinifex Hopping-mouse (*Notomys alexis*), Sandy inland mouse (*Pseudomys hermannsburgensis*) (December 2014), Lesser Hairy-footed Dunnart (*Sminthopsis youngsoni*) and Stripe-faced Dunnart (*Sminthopsis macroura*) (in October 2014, February 2015), gecko (*Diplodactylus stenodactylus*) (February 2015), lizard (*Ctenotus colletti*) (February 2015), unidentified scorpion (February 2015), unidentified snake (February 2015) (**Image**).

8.2 Feral and native fauna activity locations during 2014/15

Refer to **Map 5** for locations and details of feral animal control and terrestrial fauna survey activities recorded by APMS on Gnaraloo during 2014/15. The detailed records by APMS are available separately.

Image 2: Native fauna observed during APMS surveys in 2014/15



Map 5: Activities recorded by APMS on Gnaraloo during 2014/15

Map by APMS

9 Independent feral MERI monitoring by the GTCP

Chapter by the GTCP.

9.1 MERI methods

The GTCP monitors and evaluates the effectiveness of the GFACP (i.e. the extent of positive on-ground outcomes and quantifiable protection provided to endangered sea turtles) in the Gnaraloo turtle rookeries (i.e. the GBR and GCFR) through a self-imposed MERI link between the GTCP and GFACP. GTCP field researchers record and report evidence of feral animal presence (e.g. tracks and scats), disturbance of turtle nests (e.g. digging into nests) and/or predation of turtle eggs (e.g. turtle eggshell fragments, whole turtle eggs or yolky turtle eggshells present at the surface or an exposed egg chamber) in monitored rookeries during early-morning beach surveys. These surveys are conducted 7 days a week for 4 consecutive months (1 November to 28 February) during the annual sea turtle nesting period in the GBR, and for a subset of the peak nesting season in the GCFR. Results of these surveys are entered in an electronic database and communicated in writing by the GTCP, via GFACP MERI Monitoring Logs with GPS details and associated photo evidence, to APMS in real time. Subsequent predator control activities by APMS are requested to focus on specifically observed feral species and/or locations of feral animal activity. APMS acts on the GTCP's feedback to undertake targeted corrective action during their feral animal control activities at Gnaraloo and adjust, where required, the following:

- targeted species and areas;
- bait type used;
- bait placement strategy; and
- control methods used.

The seasonal GTCP field research team is present at Gnaraloo from 1 November to 28 February each year. The GTCP has developed specific training, procedures, protocols and data sheets for its field staff in regards to predator track identification in order to enable accurate daily monitoring of feral animal activity and to monitor the results and success of the GFACP.

During the GTCP season 2014/15, APMS provided training workshops in predator track identification to the GTCP field research team at the start of the season. These workshops included office-based training, written assessments and field demonstrations. This training provided GTCP team members with the knowledge and skills necessary to confidently identify and accurately distinguish between fox, feral cat and wild dog tracks, which is not always easy in windblown locations such as the Gnaraloo coastline. When predator tracks were difficult to identify, photographs were taken and additional support was sought from APMS during the season.

Feral MERI data collection in the field by the GTCP during 2014/15 was undertaken by Melissa Tan (Australia), Toby Ekman (Australia), Andrew Leach (Australia), Bailey Rankine (Canada) and Ronan McGrath (Northern Ireland, part season only). MERI monitoring of the GBR was

funded by Rangelands NRM (WA), while MERI monitoring of the GCFR was funded by the Gnaraloo Station Trust.

9.2 MERI Objectives

The objectives of the MERI link between the GTCP and GFACP are to:

- facilitate informed adaptive management;
- integrate the two programs for the most effective and efficient on-ground protection of the important mainland rookeries of endangered sea turtles at Gnaraloo;
- allow real-time, on-ground responses to control specific feral animal presence in the turtle rookeries;
- objectively demonstrate and report on the effectiveness of the GFACP;
- maintain or improve the results of the GFACP.

9.3 MERI Results during 2014/15 by GTCP

The GTCP monitored feral animal presence and activity in the GBR during 1 November 2014 – 28 February 2015 (120 survey days) and in the GCFR during 27 December 2014 – 9 January 2015 (4 surveys totaling 14 survey days).

Overall, there was 0 % disturbance or predation of sea turtle nests by feral animals in the GBR and the GCFR during the GTCP surveys in 2014/15.

There was no evidence of fox presence (i.e. tracks and scats) or activity (i.e. disturbance or predation of sea turtle nests) in the GBR or GCFR during the GTCP surveys in 2014/15.

In the GBR, in total, observed feral animal activity included feral cat tracks (3 track days) (i.e. days on which one or more fresh tracks were observed) and wild dog tracks (16 track days). Despite the presence of feral cats and wild dogs, no evidence of disturbance or predation of sea turtle nests in the GBR was observed during the surveys.

However, the following is worth of specific mention. On 2 December 2014, GTCP field personnel recorded fresh tracks of 2 wild dogs on and around a turtle's tracks and her nesting activity area. The GTCP monitor witnessed the turtle finishing her nest. There were dog tracks down to the water and around, on top of the turtle's emergence track (so the dogs had been there recently), and all around the turtle nesting activity, however no signs of digging or predation by the dogs (**Image**).

Similarly, in the GCFR, feral animal activity included feral cat tracks (1 track day) and wild dog tracks (2 track days). Again, despite the presence of feral cats and wild dogs in this rookery, no evidence of disturbance or predation of sea turtle nests was observed during the surveys.

Refer to Appendices **(1)** and **(2)** for the GTCP Feral MERI Monitoring Logs 2014/15.

Image 3: Wild dog activity at a turtle nest in Gnaraloo Bay Rookery during 2014/15

9.4 MERI Results in GBR during 2008/09 – 2014/15 by GTCP

Seven years of independent feral MERI monitoring by the GTCP reveals that the composition of the feral animal community around the GBR has changed substantially since the GFACP was initiated by the Gnaraloo Station Trust in 2008/09 (**Figure 1**). During the seasons 2008/09 and 2009/10, 73 and 104 fox track days were recorded in the GBR, respectively. In contrast, in all seasons since 2009/10, only 8 total fox track days have been recorded, which were equally split between seasons 2011/12 and 2012/13.

The number of wild dog track days in the GBR has gradually increased over time, while the number of feral cat track days spiked in season 2011/12 before decreasing in each subsequent season to only 3 during season 2014/15.

Overall, the number of total feral predator track days recorded per season during feral MERI monitoring by the GTCP in the GBR has decreased substantially since the first two years of the GFACP (i.e. 2008/09 – 2009/10), with the notable exception of season 2011/12, during which 55 feral cat track days were recorded.

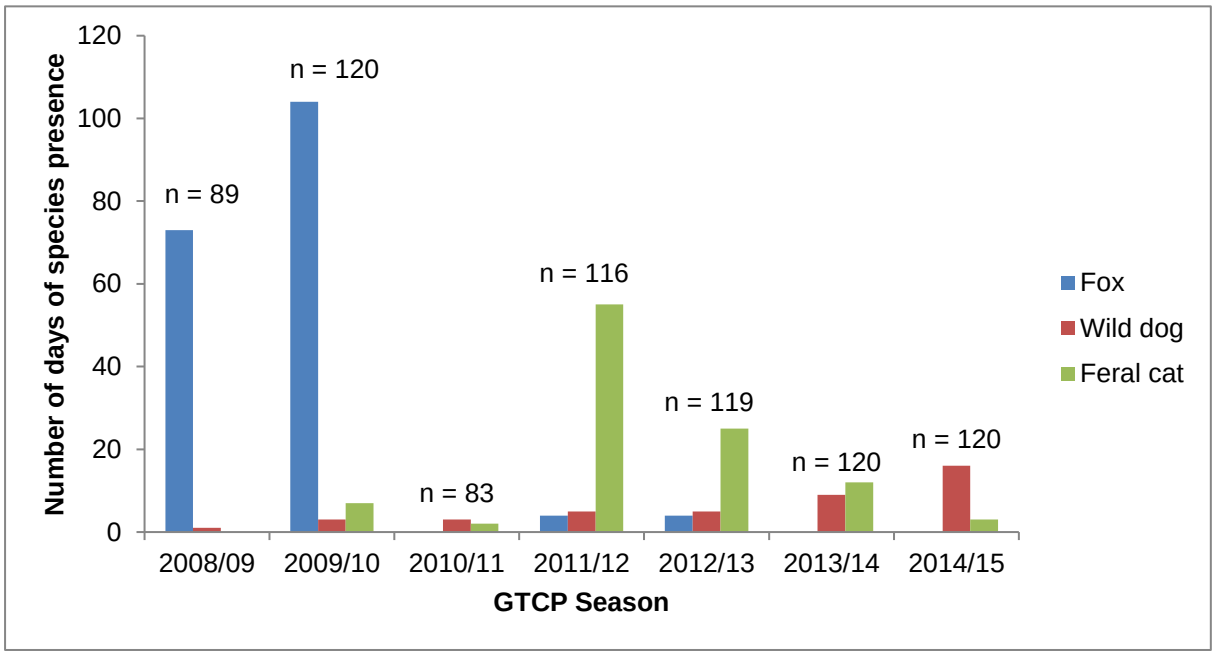


Figure 1: Number of track days for feral predator species recorded by GTCP in Gnaraloo Bay Rookery, 2008 - 2015

Note: Figure by the GTCP. Only data from the GBR Survey Area (GBN – BP9), surveyed during the GTCP field monitoring season (1 November – 28 February), are included in this figure. The number of days on which MERI monitoring was conducted during each season is given above the bars. Feral cat tracks were not recorded during season 2008/09. Two tracks in season 2012/13 was excluded because the species (fox or feral cat) could not be determined with confidence. Dog tracks that were noted as likely to be guest dogs (e.g. those associated with human footprints and/or tire tracks) were excluded.

Correspondingly, the proportion of total track days (i.e. the sum of fox, feral cat and wild dog track days) in the GBR has also changed since the GFACP started in 2008/09 (**Figure 2**). Specifically, the proportion of total track days comprising fox track days decreased from > 90 % during seasons 2008/09 and 2009/10 to < 15 % during seasons 2011/12 and 2012/13 and 0 % during seasons 2010/11, 2013/14 and 2014/15. Feral cat track days, as a proportion of total track days, peaked during season 2011/12, and have decreased consistently in every season since. Wild dog track days, as a proportion of total track days, steadily increased during season 2008/09 – 2010/11 and again from season 2011/12 – 2014/15.

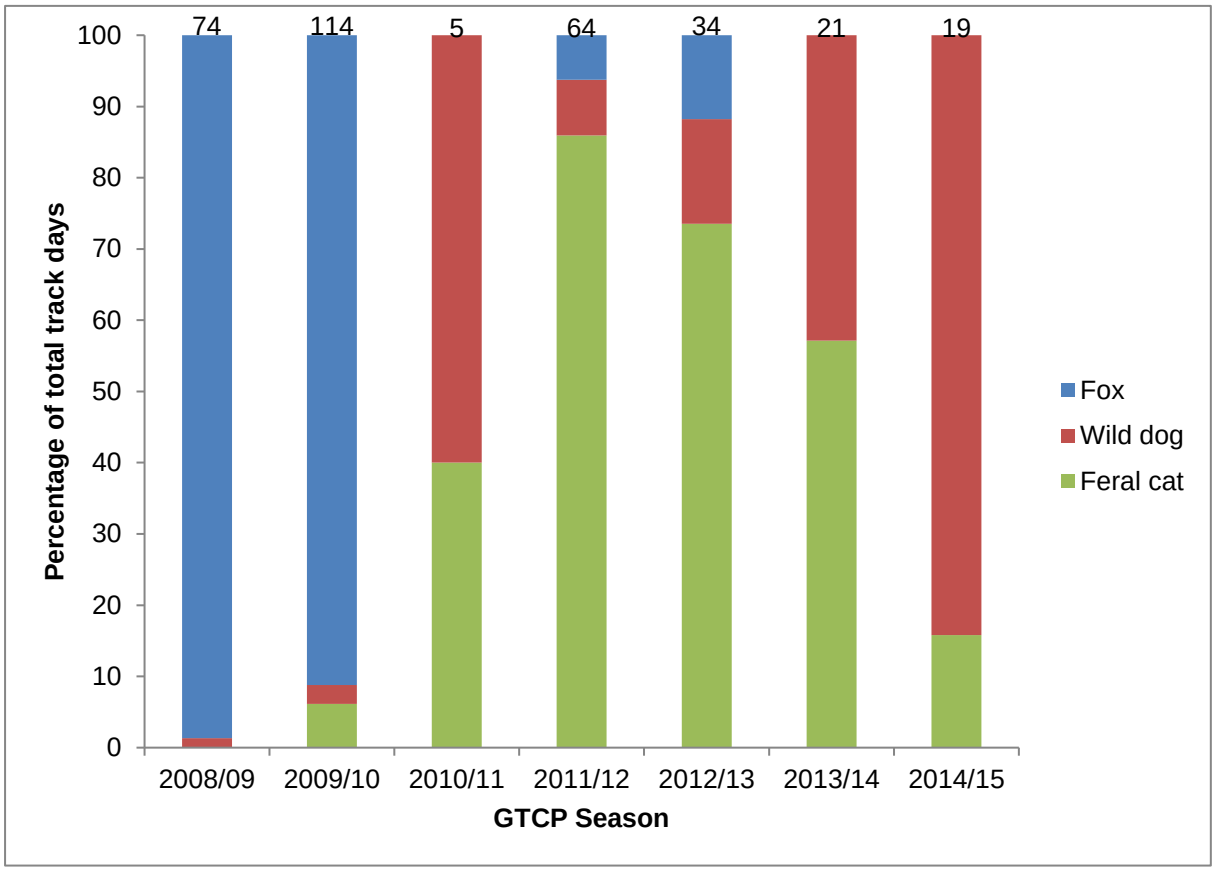


Figure 2: Proportion of total feral animal track days recorded by GTCP in Gnaraloo Bay Rookery, 2008 - 2015

Note: Figure by the GTCP. The total number of feral animal track days recorded during feral MERI monitoring in each GTCP season are given above the bars. See Figure for the number of days that feral MERI monitoring was conducted during each season and for notes regarding criteria for data inclusion in this figure.

9.5 Number of loggerhead turtle eggs protected by the GFACP

At the start of the GFACP in 2008/09, there was 100 % predation of sea turtle nests by feral animals (predominantly foxes) in certain locations in the GBR (Butcher & Hattingh, 2013). While foxes were still present and active in the GBR during the first two years (i.e. GTCP seasons 2008/09 and 2009/10) of the feral control program, the GFACP has afforded 100 % protection of sea turtle nests from feral predation in the GBR from season 2010/11 – 2014/15

(for 5 consecutive seasons).

The average number of loggerhead turtle nests per season in the GBR during seasons 2010/11 – 2014/15 was 355.6 (SD = 51.3), with a total of 1,778 nests dug during that time (**Figure 3** and **Table 3**).

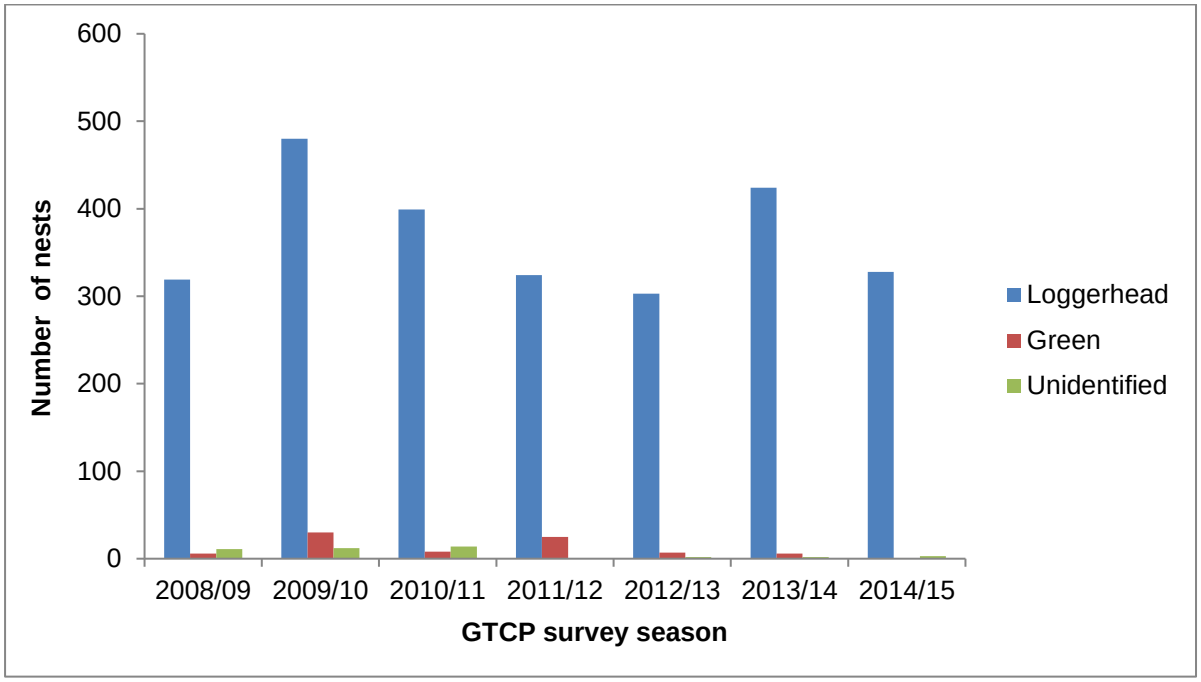


Figure 3: Sea turtle nests recorded by GTCP in Gnaraloo Bay Rookery, 2008 – 2015

Note: Figure by the GTCP.

Table 3: Loggerhead turtle nests recorded in the Gnaraloo Bay Rookery during 2010 - 2015

	2010/11	2011/12	2012/13	2013/14	2014/15	Total
Number of loggerhead (*Caretta caretta*) sea turtle nests	399	324	303	424	328	1,778

Note: Table by the GTCP.

On average, loggerhead turtles lay approximately 112 eggs per clutch (Van Buskirk & Crowder, 1994), so we estimate that the GFACP has protected approximately 199,136 loggerhead turtle eggs from feral predators during seasons 2010/11 – 2014/15 [Note: Impacts on loggerhead nests by factors other than feral predation such as native predators (e.g. ghost crabs) and environmental impacts (e.g. shifting dunes, tides and cyclones) are not accounted for here]. This is about 40,000 eggs per season during 2010/11 – 2014/15.

9.6 Discussion of MERI results 2014/15 by GTCP

Feral animal activity in the GBR during the 120-day survey period in 2014/15 included only feral cat and wild dog tracks, and no evidence of disturbance or predation of turtle nests by either species was observed. Similarly, feral animal activity in the GCFR during the 14-day survey period for this rookery comprised feral cat and wild dog tracks, with no signs of disturbance or predation of turtle nests. There was no evidence of any fox presence or activity in either rookery during the GTCP season 2014/15.

However, during the season 2012/13, the GTCP recorded one instance of disturbance (not predation) of a turtle nest in the GBR, being digging by a feral cat on 17 December 2012 (sub-section BP8 – BP9). On 2 December 2014, the GTCP recorded fresh tracks of 2 wild dogs on and around a turtle's tracks and her nesting activity area (sub-section GBN – BP7) (not predation). This demonstrates feral cats and wild dogs, along with foxes, are definitely interested in the turtle nests as possible food sources if they can get to them.

APMS reported that 54 baits were taken during 2014/15, likely by wild dogs or possibly foxes, so some feral predators are still present in the area even if they were not recorded in the turtle rookeries (D. Butcher, pers. comm.). This provides evidence that the buffer strategy employed by APMS is working as expected.

Overall, GFACP activities continue to be successful in providing sea turtle nests with 100 % protection from feral predators.

9.7 Discussion of the multi-year trends in feral animal presence and activity in the monitored rookeries by GTCP

Seven years of feral MERI monitoring conducted by the GTCP has revealed a clear shift in the species composition of feral predators at Gnaraloo since the GFACP was established in 2008/09. The GFACP has been highly effective at eliminating the impact of foxes on sea turtle nests since the program's second year of operation (i.e. season 2009/10). Indeed, few signs of fox presence have been recorded in the GBR since 2009/10, with the exception of 10 total fox track days observed during GTCP seasons 2011/12 and 2012/13. The GFACP has now afforded sea turtle nests in the GBR 100 % protection from feral animal predation for 5 consecutive seasons (from 2010/11 – 2014/15).

It is hypothesized that the reduction in fox density since 2009/10 as a result of the GFACP activities may have facilitated increases in the number of feral cats and wild dogs accessing the GBR. Indeed, the number of feral cat track days in the GBR spiked during GTCP season 2011/12, after an abrupt drop in the number of fox track days after season 2009/10 (**Figure 1**). The number of wild dog track days has gradually increased since season 2008/09. In response, APMS began targeting feral cats and wild dogs. Furthermore, from season 2013/14 onwards, baiting was expanded to operate from June to September to coincide with the fox whelp period (September) and part of the feral cat breeding season (June). These changes appear to have been effective at maintaining zero fox disturbance and predation on sea turtle nests and at reducing feral cat activity in the GBR. In contrast, wild dog activity has continued to gradually increase.

9.8 MERI Recommendations by GTCP

Feral MERI data collected by the GTCP reveal that GFACP activities have been adequate to eliminate the threat of feral disturbance and predation to turtle nests in monitored rookeries since GTCP season 2009/10. Indeed, while a small number of fox tracks were recorded in the GBR during GTCP MERI surveys in seasons 2011/12 and 2012/13, and there was one instance of a nest disturbance by a cat in 2012/13, no evidence of disturbance or predation has been recorded in this rookery since 2009/10. However, since it is likely that even a small number of foxes could have a substantial impact on turtle reproductive success in Gnaraloo rookeries (i.e. if individual foxes can effectively locate multiple nests and predate entire clutches), following the precautionary principle, fox baiting activities should continue in future seasons to minimize the likelihood of re-invasion of presently controlled areas.

Increasing wild dog incursions into Gnaraloo may be the result of movement of young adults from natal home ranges from surrounding stations (Butcher & Hatting, 2014). The number of wild dogs observed during MERI monitoring in the GBR has increased since 2008/09 and again during GTCP season 2014/15. As such, the GFACP may consider expanding control methods for this species, particularly if evidence emergences that wild dogs begin disturbing or predating turtle nests or have other detrimental effects on native fauna in the area, including at the significant inland Lake MacLeod wetland system to the east.

Monitoring by APMS of bait-taking, through the use of remote cameras and sand plots with photo records, is useful to determine the outcome and fate of different bait types and whether baits are being consumed by the target species. It is recommended that these activities again be included in feral control at Gnaraloo during the season 2015/16, as occurred during 2013/14 – 2014/15.

The formal training in feral track identification that APMS provides to the GTCP field monitoring team before MERI monitoring commences is invaluable for obtaining accurate field data. This training should continue during future seasons. Furthermore, following initial training, it is strongly recommended that APMS check and confirm the continued accuracy of GTCP field team track assessments to ensure on-going data reliability. Thus, during each site visit, field data should be compared with photographic evidence and, where necessary, additional training should be provided.

9.9 MERI Conclusions by GTCP

Feral MERI monitoring by the GTCP during the season 2014/15 revealed that the GFACP control activities were successful in affording sea turtle nests 100 % protection from feral predators for a fifth consecutive season. No evidence of fox presence or activity was recorded during feral MERI surveys in the GBR or GCFR during the monitoring periods for these rookeries. Low levels of feral cat and wild dog presence were recorded in both rookeries, but no evidence of disturbance or predation of turtle nests was observed. The feral predator assemblage in Gnaraloo has changed substantially since the inception of the GFACP in 2008/09. Specifically, foxes have been nearly completely absent from the GBR since 2009/10.

This appears to have allowed the number of feral cats and, to a lesser extent, wild dogs to increase. However, targeting of feral cats by the GFACP appears to have resulted in a rapid decline in feral cat activity each year since 2011/12, with only three track days observed during season 2014/15. Wild dog activity, in contrast, has gradually increased since 2008/09. However, no evidence of predation on sea turtle nests by feral cats or wild dogs has been observed. The shift in feral predator species composition in the GBR since 2008/09 revealed through feral MERI monitoring highlights the critical importance of maintaining this independent, adaptive link between the GTCP and GFACP.

10 Communication

10.1 Knowledge-sharing

To share the knowledge gained and findings since 2008 by the GFACP, the Gnaraloo Station Trust contacted key parties involved in feral animal control (**Table 4** lists some of these parties) during February to May 2015. The Gnaraloo Station Trust distributed electronic and hard copies of GFACP and GTCP annual reports (respectively 55 and 42 copies), with personalized cover notes.

Table 4: Knowledge sharing by GFACP during 2014/15

Indian Ocean - South-East Asian (**IOSEA**) Marine Turtle Memorandum of Understanding, International	Threatened Species Commissioner, Australia	Threatened Species Recovery Hub, Australia	Minister for Environment, Australia
Department of Environment, Australia	Invasive Species Council, Australia	Foundation for Australia's Most Endangered Species, Australia	Bush Heritage Australia
Australian Wildlife Conservancy, Australia	WWF Australia	Save our Marine Life, Sydney and WA	CSIRO
Department of Premier and Cabinet, WA	Minister for Environment, WA	Minister for Lands, WA	Minister for Planning, WA
Minister for Agriculture and Food, Fisheries, WA	Ningaloo Coast World Heritage Committee, WA	Department of Environment, WA	Rangelands NRM WA
Department of Agriculture Carnarvon, WA	Biosecurity Council of WA & Departmnt Agriculture, WA	Carnarvon Rangelands Biosecurity Association, WA	The Wilderness Society of WA
Edith Cowan University, WA	ABC Australian Story	Various individuals	

Note: Table by the GTCP.

In response, the GFACP received positive feedback such as the following:

- "These reports show some excellent and important work" (February 2015).
- "It's great to see the feral animal control efforts backed by Gnaraloo Station Trust that are helping the survival of nesting turtles. Well done to all involved. You're a stand-out example of private conservation" (February 2015).
- "I think what you are doing is a good model that could be encouraged and supported" (February 2015).
- "Protecting and managing the loggerhead turtle rookeries along the Ningaloo Coast, including at Gnaraloo, is important to the conservation of this threatened species. Community partnerships like this one bring together the knowledge and resources of a range of organisations and individuals to deliver great conservation benefits" (March 2015).
- "It was a pleasure to read the report. Clearly, the work that you are doing to protect loggerhead turtle nests (And other values) at Gnaraloo is of a high standard and of great value, and it shows what can be achieved by a non-government conservation organisation." (May 2015).

During March 2015, the GTCP requested endorsement by the Carnarvon Regional Biosecurity Association of the GFACP and the GFACP Report 2013/14 as a demonstration of industry driven successful work with demonstrable scientific data and results (**Figure 4**).

Hon Albert Jacob MLA
Minister for Environment; Heritage

Our Ref: 50-07346

Councillor David Tapley
PO Box 199
WALPOLE WA 6398

Dear ~~Councillor Tapley~~ David

I recently received copies of two reports regarding the Gnaraloo Turtle Conservation Program, sent on your behalf by Mr Andrew Campbell, Chief Executive Officer of the Shire of Manjimup, in a letter dated 4 March 2015.

Thank you for providing these reports outlining the success of the turtle conservation and feral animal control programs at Gnaraloo Station on the Ningaloo coast. Protecting and managing the loggerhead turtle rookeries along the Ningaloo coast, including at Gnaraloo, is important to the conservation of this threatened species. Community partnerships like this one bring together the knowledge and resources of a range of organisations and individuals to deliver great conservation benefits.

I am advised that the Department of Parks and Wildlife Exmouth office is very familiar with Gnaraloo's conservation programs and has contributed advice and training and facilitated funding. I look forward to the program continuing its association with Parks and Wildlife.

Thank you for bringing this valuable program to my attention.

Yours sincerely

Albert Jacob MLA
MINISTER FOR ENVIRONMENT; HERITAGE

25 MAR 2015

12th Floor, Dumas House, 2 Havelock Street, West Perth Western Australia 6005
Phone: +61 8 6552 5800 Facsimile: +61 8 6552 5801
Email: Minister.Jacob@dpc.wa.gov.au

Figure 4: Commendation by the Minister of Environment (WA) during 2014/15

10.2 Education

The GTCP hosted a number of visits and meetings by schools and other groups onsite at Gnaraloo during 2014/15, with information briefings and escorted beach patrols with communication about the GFACP and its results, including:

- Ningaloo Coast World Heritage Committee, 16 - 18 November 2014 (15 persons);
- Aust Institute of Marine Science (AIMS), Oceans Institute of University of Western Australia, 13 - 16 December 2014, (6 persons);
- Tom Price Senior High School, Graham Polly Farmer Foundation, 30 - 31 October 2014, (14 persons);
- Carnarvon Clontarf Academy, 5 December 2014, (14 persons);
- St. Mary's Star of the Sea Catholic School (Carnarvon), 2 - 3 December 2014, (11 persons);
- Nagle Catholic College (Geraldton), 8 - 11 December 2014, (13 persons).

The Gnaraloo Station Trust also gave offsite presentations about the GTCP and GFACP during 2014/15 to 64 primary and high schools. The GTCP reached 7,001 persons directly through its onsite and offsite presentations in WA, Victoria and internationally (Canada and Indonesia) during 2014/15.

During the school and community contact by the GTCP, the program received positive feedback. Many school and community participants expressed great interest in the GFACP and were enthusiastic in participating and finding out more information. Audiences were impressed with the successful outcomes of the GFACP in protecting the sea turtle nests from feral predation. Listeners appreciated the importance of the turtle rookeries and the Ningaloo Coast World Heritage Area. Many community members commented on the success of the two programs (i.e. the GTCP and GFACP) and their support for continuation of the work.

APMS also undertook activities to promote the GFACP during 2014/15, including:

- A display at the Dowerin Field day on 27 - 28 August 2014;
- A presentation to the community at the Henderson Environmental Centre on 31 May 2015.

These activities reached an estimated 450 community members directly, with positive feedback received by APMS.

10.3 Media and social outreach

The GTCP undertook various activities to promote the GFACP through the wider community including various media pieces (print and online) and radio interviews that all specifically mention the GFACP and results thereunder. For example,

- Article series ('Notes from Gnaraloo') in The Manitoban newspaper (online), 27 October 2014, http://www.themanitoban.com/2014/10/notes-gnaraloo/21233/;

- Article in RNRM e-news (online), December 2014;
- Article series ('Notes from Gnaraloo') in The Manitoban newspaper (online), 2 December 2014, http://www.themanitoban.com/2014/10/notes-gnaraloo/21233/;
- Radio interview ('A safe and happy new year for Gnaraloo Bay Sea Turtles') with the GTCP Program Assistant on the 'Western Australian Country Hour' show on ABC North West, 2 January 2015 (listen at http://www.abc.net.au/news/2015-01-02/gnaraloo-bay-sea-turtles/5997808);
- Article ('Ín search of sea turtles in Western Australia') in the Canstar Community News Canada (online), 20 January 2015;
- Article ('Turtles of Gnaraloo') in the Animal Ark Newsletter (online), January 2015;
- Various separate postings relating to the GFACP on the Facebook page of the GTCP, https://www.facebook.com/gnaralooturtleconservationprogram.

10.4 Poster

The GTCP also distributed copies of the GTCP / GFACP poster to primary and high schools, community and other groups in Western Australia (61 total) during March – April 2015. For example, to St. Mary's Star of the Sea Catholic School (Carnarvon) who put the poster up in one of their class rooms (Geography and Media) where 500 students view it per school year. The GTCP field team used the poster during their onsite and offsite presentations, in hard copy and as electronically embedded in the information briefings. GTCP personnel also delivered information briefings with the embedded poster in Victoria during July – December 2014. APMS displayed the poster at the Australasian Wildlife Management Society's Conference in Brisbane on 2 - 4 December 2014 (under the Abstract 'Conservation programs benefit from educational participation of schools at Gnaraloo'). The poster was also displayed at the 3Mile and Homestead public reception areas.

10.5 Vehicle wrap

During 2014/15, the GTCP displayed the GFACP vehicle wrap first reported on during 2013/14 at the following venues:

- Australian Marine Turtle Symposium, Perth, 25 - 26 August 2014;
- Western Australia Marine Turtle Symposium, Perth, 27 August 2014;
- Meeting with Kelly Scientific Resources, Perth, 10 October 2014;
- GIS training workshop with esri Australia, Perth, 13 October 2014;
- the extensive offsite presentations to schools, community groups, other organisations and commercial firms in WA during March - June 2015.

10.6 Award

The GFACP, represented by APMS, was awarded the Australasian Wildlife Management Society's Award for the 'Management of Loggerhead Turtles at Gnaraloo Bay, Western Australia' on 2 - 4 December 2014 in Brisbane, Australia (**Image**).

Image 4: The Australasian Wildlife Management Society's Award to the GFACP during 2014/15

11 Discussion and recommendations for future

The control of foxes must be ongoing to maintain the protection of the sea turtle nests with the advantage of also protecting other high conservation areas on and adjoining Gnaraloo Station. Even low levels of foxes can result in high levels of predation on vulnerable species such as marine turtle nests. It is therefore desirable to set the target threshold for foxes within the core value areas (i.e. within range of the turtle rookeries) at zero and at low to zero densities for the remaining area. Until a threshold density of foxes can be determined where predation of turtle nests does not occur, the 'precautionary principle' should be applied that assumes any fox present in the vicinity of the turtle rookeries is likely to prey on turtle nests or hatchlings.

The continued success and results of the GFACP during 2014/15 was due to various factors, including:

- a well thought-out, set, annual program of site baiting events during back-to-back consecutive years;
- effective quality baits (for example, use of good quality DMB as opposed to manufactured baits);
- strategic bait placement (as opposed to standard placement);
- integration with and the adaptive feral MERI link with the GTCP, including daily monitoring of the effectiveness of the feral animal control program by the GTCP scientific field teams during the turtle breeding season;
- targeted follow-up baiting in real time when required necessary by such independent monitoring;
- trapping programs targeting feral cats and wild dogs;
- the removal of feral animals, including foxes, from high risk adjoining areas prior to the dispersal of juvenile feral animals to the sea turtle rookeries on the beaches;
- effective communication, liaison and knowledge-sharing between the project partners, being the Gnaraloo Station Trust, GTCP and APMS.

This combination of activities means that feral animals, including foxes, are reduced to a level where finding evidence of feral animals is the key rather than recording the level of feral animal predation.

As previously stated, the need to determine where new feral animal threats are likely to come from and removing those threats is as important as removing all the feral animals in the target areas. The area around Lake MacLeod is an important ecological and biological system and the presence of feral predators such as foxes, feral cats and wild dogs is also likely to have significant negative impacts generally on biodiversity and conservation values there.

Monitoring of feral animals by APMS, through use of remote cameras and sand plots with photo records, is useful to determine the outcome and fate of different bait types and whether baits are being consumed by feral cats. It is recommended that these activities continue in future.

Originally the GFACP targeted foxes which is why feral animal control events (including baiting) were generally conducted on Gnaraloo during the period October to May [i.e. prior

(October) to the beginning of the annual sea turtle nesting season, during the annual turtle nesting season (November to May) and prior to the annual fox breeding season (May)]. This was done to protect turtle eggs whilst incubating and to reduce predation on emerging turtle hatchlings later during the season. Feral cats and wild dogs are now established issues on Gnaraloo. Feral animal control should continue in future to include the May to September period to target feral cat breeding times (mid-winter, being June – July) and wild dog breeding times (May - June) so that there is not a 4 month hiatus for feral animal control on Gnaraloo annually. Feral animal control should also be conducted each season to include the period when foxes whelp (September) through to peak fox breeding season (May/June). This means that feral animal control at Gnaraloo should occur year-round to cover all important events that occur through the year (i.e. from beginning July to end June each fiscal year). A late visit in the season during June is advantageous for feral cat control as bait uptake (and control) may be improved by a winter baiting program on feral cats as their alternative food sources are lower at this time of the year.

The pre-season formal training in feral track identification provided by APMS to the GTCP field teams before their feral MERI monitoring activities commences at Gnaraloo each year is invaluable in obtaining accurate and reliable data on feral animal presence and activities in the GBR and GCFR during the season. This training must continue in future. As Quality Assurance / Quality Control (**QA/QC**) post the initial training, it is strongly recommended that APMS check and confirm the continued accuracy of feral track identification (foxes, feral cats and wild dogs) of each scientific GTCP field team member during their site visits to Gnaraloo during the turtle nesting season. Where required, supplementary training should be provided. This will ensure a high quality of collected data on feral animal presence and activities in the monitored rookeries are being maintained during the season.

Fauna surveys by APMS should continue to be used in future to identify the other terrestrial species, biodiversity values and outcomes being protected station wide by feral animal control on Gnaraloo, including at and surrounding the significant Lake MacLeod wetland system. The surveys may record potentially rare native fauna such as small to medium sized mammals, marsupials, ground nesting birds, reptiles and insects.

12 Conclusions

The GFACP is a success and should be repeated during 2015/16 onwards. The program has resulted in protection of loggerhead (an endangered species) sea turtle nests from introduced predators, from 100% occurrence in certain locations in the GBR in 2008 to zero today. The program has protected approximately 199,136 loggerhead turtle eggs in the GBR from feral predators during the seasons 2010/11 – 2014/15, which is about 40,000 eggs per season (not including the number of turtle eggs of multiple species being protected from feral predation in the GCFR as well).

The results of the GFACP during 2014/15 show that the consistent annual on-ground work since 2008/09 at Gnaraloo is achieving positive on-ground outcomes and providing ongoing effective protection. It demonstrates that complete protection of sea turtle rookeries can be achieved

through effective feral animal control programs so long as such programs are well implemented and sustained.

Continued monitoring, assessment and control of feral animals, including foxes, feral cats and wild dogs, must be ongoing on Gnaraloo Station in future to ensure that the GFACP remains at its current level of effectiveness and maintains the protection of the important coastal nesting rookeries of endangered sea turtles by keeping feral animal numbers to a minimum. This will have continued additional advantages of also protecting other high conservation areas on and adjoining Gnaraloo Station, including protection of native fauna at and around the significant inland Lake MacLeod wetland system. The GFACP will also continue to provide valuable data on conservation efforts and predator control over the medium to long term.

Feral animal control at Gnaraloo should be year-round (i.e. from July to June). It must be undertaken during consecutive years to protect the important on-ground achievements since 2008 as any missed year will result in feral predators from areas surrounding Gnaraloo moving into the previously cleared areas to re-establish territory, breed and prey on the sea turtle nests and other native prey species. Without ongoing and consistent feral animal control at Gnaraloo, the objectives and outcomes of both the GFACP and GTCP will be significantly compromised and set back. The investments in and positive results of both programs will be lost if the numbers of feral animals posing threats to the endangered sea turtles at Gnaraloo are allowed to increase again to pre - 2008/09 levels and sea turtle predation at Gnaraloo return to that seen at the commencement of 2008/09 when 100% of turtle nests were predated by feral animals (predominantly foxes) in certain locations in the GBR.

The Gnaraloo Station Trust successfully undertook a significant amount of activities during 2014/15 to promote the GFACP with positive results, feedback and partnerships created throughout the wider community.

The GFACP is a huge success in terms of skills development and knowledge transfer to build the capacity of the natural resource management community in Australia. The approach, methodologies and strategies adopted by the GFACP are efficient, successful and results based to achieve increased community work, skills, knowledge and engagement in natural resource management.

13 References

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Appendix 1: Feral MERI Monitoring Log for Gnaraloo Bay Rookery, 2014/15

DATE	SUB-SECTION	RESEARCHER	LATITUDE AT START (°S)	LONGITUDE AT START (°E)	LATITUDE AT FINISH (°S)	LONGITUDE AT FINISH (°E)	TYPE	POSSIBLE GUEST DOG (Y/N)	ANIMAL SIGHTED (Y/N)	TRACKS (Y/N)	SCATS (Y/N)	DISTURBANCE	PREDATION	COMMENTS	PHOTO LOG
02/11/14	GBN - BP7	Melissa Tan	-23.75037	113.56839	-23.74982	113.56905	Dog	N	N	Y	N	N	N	Tracks followed outside of survey boundary, fresh tracks, possibly two dogs, near vehicle at BP7, near junction to BP7 and 6Mile gate	Multiple photos taken on beach and around car [141102_Dog TracksBP7 MT_1]
02/11/14	GBN - BP7	Melissa Tan	-23.75008	113.56898	-23.74982	113.56905	Dog	N	N	Y	N	N	N	Tracks followed outside of survey boundary, fresh tracks, possibly two dogs, near vehicle at BP7, near junction to BP7 and 6Mile gate	Multiple photos taken on beach and around car [141102_Dog TracksBP7 MT_7]
03/11/14	GBN - BP7	Ronan McGrath	-23.75982	113.56300	-23.75982	113.56300	Cat	N	N	Y	N	N	N	Possible cat, end of tracks not recorded. Only one GPS position recorded. This was up in the dunes because the track length was not very long	0 [141103_CatT racksBP7 RM_1]
10/11/14	GBN - BP7	Melissa Tan	-23.76675	113.54586	-23.76713	113.54638	Dog	N	N	Y	N	N	N	Fresh tracks, went into dunes heading North	Multiple photos taken on beach and around car [141110_Dog TracknearGB N MT_1]
11/11/14	GBN - BP7	Ronan McGrath	-23.75854	113.56428	-23.76337	113.55955	Dog	N	N	Y	N	N	N	Possible pup. Tracks lost at PB6 going south-east	Muitilpe photos of same track [141111_Dog TracksGBNBP 7 AG_1-5]

17/11/14	GBN - BP7	Andrew Leach	-23.76141	113.56144	-23.75978	113.56287	Dog	N	N	Y	N	N	N	Headed south along beach. Near waterline, evidence of digging. Dog looped back around to continue south	0 [141117_DogTracksGBNBP7 AL_1-2, 141117_DogScratchGBNBP7 AL_1]
18/11/14	GBN - BP7	Toby Ekman	-23.76177	113.56142	-23.76298	113.56006	Dog	N	N	Y	N	N	N	0	Wild dog tracks close to BP6 [141118_DogPrintGBNBP7TE_1, 141118_DogTracksGBNBP7TE_1]
22/11/14	GBN - BP7	Melissa Tan	-23.76681	113.55207	-23.76685	113.55186	Dog	N	N	Y	N	N	N	Track headed down toward water before returning up to dunes, headed NW (large paw prints!)	First set of dog tracks found, heading down from dune toward water line, fresh tracks [141122_FirstSetLargeDogTracksGBNBP7MT_1, 141122_FirstSetDogTracksGBNBP7 MT_1]
22/11/14	GBN - BP7	Melissa Tan	-23.76681	113.55207	-23.76700	113.55030	Dog	N	N	Y	N	N	N	Started with other dog (the tracks entered above), some digging near water line near end of track , entered dunes heading east	Digging in wet sand, and the associated dog tracks [141122_DogTracksDiggingGBNBP7 MT_1, 141122_DogTracksNearDiggingGBNBP7 MT_1]
22/11/14	GBN - BP7	Melissa Tan	-23.76698	113.55027	-23.76716	113.54935	Dog	N	N	Y	N	N	N	Track ended heading east into dunes	Third set of dog tracks found that day, possibly running as tracks spaced far apart [141122_Third

														SetofDogTracksRunning MT_1]
22/11/14	GBN - BP7	Melissa Tan	-23.76717	113.54871	-23.76636	113.54587	Dog	N	N	Y	N	N	N	Tracks started in dunes, continued south past GBN out of survey area (down near waterline). Very fresh tracks	Final (fourth) set of dog tracks found that day, appeared from dunes, walked along water line then continued south past GBN marker on the wet sand. Clear prints [141122_DogTracksBeginInnDunesnearGBN MT_1, 141122_DogTracksGBNBP7 MT_1, 141122_DogTracksHeadSouthofGBN MT_1]
25/11/14	GBN - BP7	Andrew Leach	-23.76731	113.54540	-23.76724	113.54640	Cat	N	N	Y	N	N	N	Started near yellow sanctuary zone marker headed towards beach then turned and continued north-east into vegetation	Multiple photos of same track in vegetation [141125_CatTracksGBNBP7 AL_1-3]
27/11/14	GBN - BP7	Toby Ekman	-23.74994	113.56879	-23.75141	113.57052	Dog	N	Y	Y	N	N	N	Dog sighted on dune at BP7. Ran away inland after researcher approached attempting to get a photo. Tracks indicated the dog had followed the program vehicle from the main road	One single print and one double print photo [141127_Dog TrackBP7 TE_1 141127_DogTrackBP7 TE_2]
28/11/14	GBN - BP7	Andrew Leach	-23.76099	113.56187	-23.76140	113.56149	Dog	N	N	Y	N	N	N	Tracks on top of three human footprints (Mel,	Two photos. 1 of two prints and 2 a series

														Bailey and Ione) indicate the dog was following researcher	of prints [041128_Dog TracksGBNBP 7 AL_1-2]
28/11/14	GBN - BP7	Andrew Leach	-23.76342	113.55889	-23.76399	113.55884	Dog	N	N	Y	N	N	N	Tracks start at waterline and head stright to vegetation	Two photos. 3 of two prints and 4 a series of prints [141128_Dog TracksGBNBP 7 AL_3-4]
2/12/14	GBN - BP7	Melissa Tan	-23.75806	113.56471	-23.75816	113.56431	Dog	N	N	Y	N	N	N	Tracks began in dune, ended at waterline	First set of dog tracks observed that day [141202_Dog TracksGBNBP 7 MT_1]
2/12/14	GBN - BP7	Melissa Tan	-23.75845	113.56411	-23.75887	113.56354	Dog	N	N	Y	N	N	N	Tracks began at waterline, ended at waterline	Dog tracks observed fresh in wet sand [141202_Dog TracksGBNBP 7 MT_2, 141202_DogT racksGBNBP7 MT_3]
2/12/14	GBN - BP7	Melissa Tan	-23.75893	113.56397	-23.7592	113.56364	Dog	N	N	Y	N	N	N	Tracks began in dunes near the other track, ended at dune	Dog tracks [141202_Dog TracksGBNBP 7 MT_4, 141202_DogT racksGBNBP7 MT_5]
2/12/14	GBN - BP7	Melissa Tan	-23.75923	113.56364	-23.75934	113.56362	Dog	N	N	Y	N	N	N	Two tracks together - near the turtle (she was still finishing nesting and witnessed by Day Survey) (141202_GBNB P7_NA0004). The tracks went down to water and around, over the turtle emergence track and around the nesting activity.	Tracks of two dogs observed all around turtle nestintg activity - turtle was witnessed finishing her nest by the Day Survey (Mel), there were dog tracks on top of the turtle emrgence track (so the

														dogs had been there recently), tracks all around the turtle, however no sign of digging. [141202_DogTracksAroundTurtleActivityGBNBP7 MT_1, 141202_DogTracksAroundTurtleActivityGBNBP7 MT_2, 141202_DogTracksAroundTurtleActivityGBNBP7 MT_3, 141202_DogTracksAroundTurtleActivityGBNBP7 MT_4, 141202_DogTracksAroundTurtleActivityGBNBP7 MT_5, 141202_DogTracksAroundTurtleActivityGBNBP7 MT_6, 141202_DogTracksAroundTurtleActivityGBNBP7 MT_7, 141202_DogTracksAroundTurtleActivityGBNBP7 MT_8]
2/12/14	GBN - BP7	Melissa Tan	-23.75990	113.56273	-23.76118	113.56180	Dog	N	N	Y	N	N	N	Tracks began on rocks, ended in dunes, heading South	Dog tracks began in the rocks [141202_DogTracksGBNBP7 MT_6]
2/12/14	GBN - BP7	Melissa Tan	-23.76374	113.55894	-23.76418	113.55841	Dog	N	N	Y	N	N	N	Tracks began in dunes, ended in dunes at BP6 heading East	Dog tracks, they finished at BP6 [141202_DogTracksGBNBP7 MT_7, 141202_DogTracksGBNBP7 MT_8]

2/12/14	GBN - BP7	Melissa Tan	-23.76504	113.55749	-23.76586	113.55592	Dog	N	N	Y	N	N	N	Tracks began in dunes, ended in dunes, heading East	Clear dog track prints in wet sand (dog wandered down around water line) [141202_Dog TracksGBNBP 7 MT_9]
6/12/14	GBN - BP7	Melissa Tan	-23.76062	113.56201	-23.76263	113.56047	Dog	N	N	Y	N	N	N	Tracks began in dunes, went over rocks and near waterline	dog tracks, 2 prints, with scale, dog tracks series of prints [141206_Dog TracksGBNBP 7 MT_1 – 2]
6/12/14	GBN - BP7	Melissa Tan	-23.76353	113.55928	-23.76421	113.55840	Dog	N	N	Y	N	N	N	Tracks began in dunes at BP6, ended in dunes heading SE	Four prints in very hard sand near water line, series of prints [141206_Dog TracksGBNBP 7 MT_3 – 4]
6/12/14	GBN - BP7	Melissa Tan	-23.76421	113.55840	-23.76424	113.55836	Dog	N	N	Y	N	N	N	Tracks began in dune near BP6, stayed around base of dune	Image shows second dog track that begins near the end of the first, at BP6. series of dog tracks, this track was not very long [141206_Dog TracksGBNBP 7 MT_4 – 5]
7/12/14	GBN - BP7	Andrew Leach	-23.76060	113.56209	-23.76117	113.56140	Dog	N	N	Y	N	N	N	Tracks began at rocks and traveled south along beach and was lost at high tide line	One scale shot of prints and one shot of print in series [141207_Dog TrackOneGB NBP7 AL_1 141207_DogT rackOneSerie sGBNBP7 AL_1]

7/12/14	GBN - BP7	Andrew Leach	-23.76229	113.56042	-23.76424	113.55840	Dog	N	N	Y	N	N	N	Tracks began at high tide line travelled south then disappeared in vegetation at BP6	One scale shot of prints and one shot of print in series [141207_DogTrackTwoGBNBP7 AL_1 141207_DogTrackTwoSeriesGBNBP7 AL_1]
17/12/14	GBN - BP7	Andrew Greenley	-23.76680	113.55209	-23.76621	113.55402	Dog	N	N	Y	N	N	N	Couldn't locate exact exit location from beach	0
18/12/14	GBN - BP7	Bailey Rankine	-23.76547	113.55660	-23.76567	113.55604	Dog	N	N	Y	N	N	N	Tracks found from small dog, exits at BP6 with large dog	Print and series of little wild dog tracks [141218_LittleWildDogSeriesGBNBP7 BR_1 141218_LittleWildDogPrintGBNBP7 BR_1]
18/12/14	GBN - BP7	Bailey Rankine	-23.76673	113.55377	-23.76567	113.55604	Dog	N	N	Y	N	N	N	Tracks come onto beach and follow high tide line, exits with small dog at BP6	Little and big wild dog tracks meet up, cluster of tracks. Big wild dog print and series [141218_Big&LittleWildDogTracksGBNBP7 BR_1 141218_BigWildDogPrintGBNBP7 BR_1 141218_BigWildDogSeriesGBNBP7 BR_1]
18/12/14	GBN - BP7	Bailey Rankine	-23.76705	113.54581	-23.76738	113.54779	Dog	N	N	Y	N	N	N	Tracks come onto beach at GBN and exit into veg	Series of multiple wild dog tracks heading into veg from beach [141218_Big

														WildDogSeriesGBNBP7BR_2]
19/12/14	GBN - BP7	Andrew Leach	-23.76576	113.55613	-23.76635	113.55443	Dog	N	N	Y	N	N	N	Tracks from vegetation to waterline, then travel north back to vegetation	0
21/12/14	GBN - BP7	Melissa Tan	-23.76700	113.55029	-23.76696	113.55079	Dog	N	N	Y	N	N	N	Tracks began in dune near dead bird skeleton. Ended in dune heading west	Dog tracks close up and series of dog tracks, with scale [141221_DogTracksGBNBP7 MT_1, 141221_DogTracksGBNBP7MT_2]
21/12/14	GBN - BP7	Melissa Tan	-23.76707	113.54584	-23.76700	113.55029	Dog	N	N	Y	N	N	N	Tracks began at GBN marker (came from the south on the beach). Some digging/scatching in the sand. Ended in dune near dead bird skeleton	Dog tracks close up and series of dog tracks, with scale, also some digging/scratching in the sand [141221_DogTracksGBNBP7 MT_3, 141221_DogTracksGBNBP7MT_4, 141221_DogTracksScratchingGBNBP7MT_1]
27/12/14	GBN - BP7	Andrew Leach	-23.76411	113.55840	-23.76399	113.55817	Dog	Y	N	Y	N	N	N	Multiple tracks. Close to human tracks. Human and dog tracks look like they've been there for the same amount of time. Suspected pet	Scale dog track [141227_DogTracksScaleGBNBP7 AL_1]
28/12/14	BP7 - BP8	Andrew Greenley	-23.74351	113.57128	-23.74351	113.57128	Dog	N	N	Y	N	N	N	Only few prints visible. Washed by high tide. Appeared to	Two pairs of dog prints with scale [141228_Dog

														follow night survey foot prints	TracksBP7BP8 AG_1]
30/12/14	GBN - BP7	Melissa Tan	-23.75870	113.56418	-23.75861	113.56429	Cat	N	N	Y	N	N	N	Short loop of track, began in dunes and ended in dunes. Near the next track (probably same cat)	Four prints with scale, and series of tracks [141230_CatTracksGBNBP7MT_1, 141230_CatTracksGBNBP7MT_2]
30/12/14	GBN - BP7	Melissa Tan	-23.75858	113.56433	-23.75872	113.56392	Cat	N	N	Y	N	N	N	Tracks began in dune, went over rocks, track washed away by tide	Close up of two prints with scale (clipboard) [141230_CatTracksGBNBP7MT_3]
30/12/14	GBN - BP7	Melissa Tan	-23.75957	113.56329	-23.75974	113.56310	Cat	N	N	Y	N	N	N	Tracks began in dune, walked down to rocks then back up to dune	Series of prints with scale (marked stake) [141230_CatTracksGBNBP7MT_4]
30/12/14	GBN - BP7	Melissa Tan	-23.76690	113.54791	-23.76659	113.54597	Dog	Y	N	Y	N	N	N	Possibly guest dog as it was near human footprints, tracks began at waterline and walked along waterline with human prints. Ended at GBN, lots of human prints and dog tracks moving around the area	Image of prints alongside human shoe prints, close up of four prints [141230_DogTracksGBNBP7 MT_1, 141230_DogTracksGBNBP7MT_2]

Legend:

GBR Gnaraloo Bay Rookery.

GBN Gnaraloo Bay North in the Gnaraloo Bay Rookery. The GBN permanent marker, being the vertical yellow Gnaraloo Bay North Marine Sanctuary Zone marker (-23.76708°S/ 113.54584°E) (delineates the southernmost boundary of the Study Area 2014/15).

BP7 Beach Point 7 in the Gnaraloo Bay Rookery. The Beach Point 7 permanent marker, being the vertical white and pink wooden stake affixed atop a fore dune (-23.75001°S / 113.56871°E).

BP8 Beach Point 8 in the Gnaraloo Bay Rookery. The Beach Point 8 permanent marker, being the vertical white and pink wooden stake affixed atop a fore dune (-23.73631°S / 113.57448°E).

BP9 Beach Point 9 in the Gnaraloo Bay Rookery. The Beach Point 9 permanent marker, being the vertical white and pink wooden stake on the primary dunes (-23.72195°S / 113.57750°E) (delineates the northernmost boundary of the Study Area 2014/15).

Y Yes

N No

Notes:

(1) Log by the GTCP.

(2) The GTCP field research team undertook daily surveys (totalling 120 survey days) in the GBR from 1 November 2014 – 28 February 2015 for the season 2014/15.

(3) The GTCP field research team surveys for fox, feral cat and wild dog presence and/or activities in the monitored turtle rookeries.

(4) Only GBR survey days with feral animal presence, disturbance and/or predation in monitored sub-sections of the GBR are shown. Days without data entries equate to no feral animal presence, disturbance and/or predation in the GBR during the survey period.

(5) No fox presence or activities were observed in the GBR during the GTCP surveys 2014/15.

Appendix 2: Feral MERI Monitoring Log for Gnaraloo Cape Farquhar Rookery, 2014/15

DATE	SUB-SECTION	RESEARCHER	LATITUDE AT START (°S)	LONGITUDE AT START (°E)	LATITUDE AT FINISH (°S)	LONGITUDE AT FINISH (°E)	TYPE	POSSIBLE GUEST DOG (Y/N)	ANIMAL SIGHTED (Y/N)	TRACKS (Y/N)	SCATS (Y/N)	DISTURBANCE	PREDATION	COMMENTS	PHOTO LOG
27/12/14	GFR-GLN	Toby Ekman	-23.59435	113.66637	-23.59428	113.66653	Cat	N	Y	N	N	N	0	0	Cat tracks wide view [141227_CatTrackGFRGLNTE_1]
06/01/15	GRS-GFR	Melissa Tan	-23.60612	113.64716	-23.60561	113.54745	Dog	N	Y	N	N	N	N	Tracks began in sand near rock ledge, ended back on rocks near water line	Series of wild dog prints in firmer sand near water line [150106_DogTracksGRSGFRMT_1]
06/01/15	GRS-GFR	Melissa Tan	-23.60883	113.64584	-23.60828	113.64662	Dog	N	Y	N	N	N	N	Tracks began near water line, tracks had been washed over, continued up to dunes headed North-East	Close up of wild dog prints, and series of wild dog prints going into dunes [150106_DogTrackGRSGFRMT_2, 150106_DogTrackGRSGFRMT_3]
07/01/15	GRS-GFR	Andrew Greenley	-23.60910	113.64574	-23.61244	113.64454	Dog	N	Y	N	N	N	N	1 of 2 sets of dog prints. Both walked together for some time. Lost tracks near GRS marker. Heading south-east, up rocky area	Close up and series of wild dog prints; series of prints alongside other set (same pic as below) [150107_1stDogTrac

															kGRSGFR AG_1-2, 150107_B othDogTra cksGRSG FR AG_1]
07/01/15	GRS-GFR	Andrew Greenley	-23.60910	113.64574	-23.61269	113.64432	Dog	N	Y	N	N	N	N	Other set of dog prints. Both walked together for some time. Followed beach almost to end. Heading south-east	Close up and series of wild dog prints; series of prints alongside other set (same pic as above) [150107_2 ndDogTrac kGRSGFR AG_1, 150107_B othDogTra cksGRSG FR AG_1]

Legend:

GCFR Gnaraloo Cape Farquhar Rookery.

GRS Gnaraloo Runway South (-23.61336º S; 113.64379º E) in the Gnaraloo Cape Farquhar Rookery.

GFR Gnaraloo Farquhar Runway (-23.59641º S; 113.66083º E) in the Gnaraloo Cape Farquhar Rookery.

GLN Gnaraloo Lagoon North (-23.57697º S; 113.69828º E) in the Gnaraloo Cape Farquhar Rookery.

Y Yes

N No

Notes:

(1) Log by the GTCP.

(2) The GTCP field research team undertook 4 surveys (totaling 14 survey days) in the GCFR during the period 27 December 2014 – 9 January 2015 for the season 2014/15.

(3) The GTCP field research team surveys for fox, feral cat and wild dog presence and/or activities in the monitored turtle rookeries.

(4) Only GCFR survey days with feral animal presence, disturbance and/or predation in monitored sub-sections of the GCFR are shown. Days without data entries equate to no feral animal presence, disturbance and/or predation in the GCFR during the 4 survey periods.

(5) No fox presence or activities were observed in the GCFR during the 4 GTCP surveys in 2014/15.