Fox Control for Turtle Conservation in Ningaloo Marine Park

1080 Baiting Program Summary 2011-2012

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Ground baiting

- Since 2002/03, a 1080 baiting regime has been implemented at Bateman Bay adjacent to Cardabia Station to protect turtle nests and hatchlings from fox predation.
- Since 2003/04, a 1080 fox baiting regime has been implemented at Jane's Bay, adjacent to Ningaloo Station, as it has been identified as a significant loggerhead turtle rookery.
- Since 2004/05, a 1080 baiting program has been implemented at Five Mile to Trisel beach on the Jurabi Coastal Park as it is a section of a significant green turtle rookery.
- Baiting on Bundera Coastal Protection Area and at Boat Harbour within Cape Range National Park commenced in the 2005/06 season due its location within a significant loggerhead turtle rookery.
- Baiting at Yardie Creek commenced in 2005/06 for the protection of a population of threatened black-footed rock-wallabies.
- 1080 baiting for fox control commenced in 2001 around the Harold E. Holt Naval Communication Station VLF towers and along the tip of the North West Cape on Department of Defence land.
- In November 2010 a 1080 baiting regime was set up at Bungleup, Cape Range National Park as it is a significant loggerhead turtle rockery. Bungleup has also been used to trail a number of bait types. Please refer to the Bungleup baiting report for further information T:\422-Operations (District)\Shared Data\CONSERVATION ESTATE\Estate Management\Pest Animal Management - Vermin\1080 Baiting_Bungelup\Brief and reports

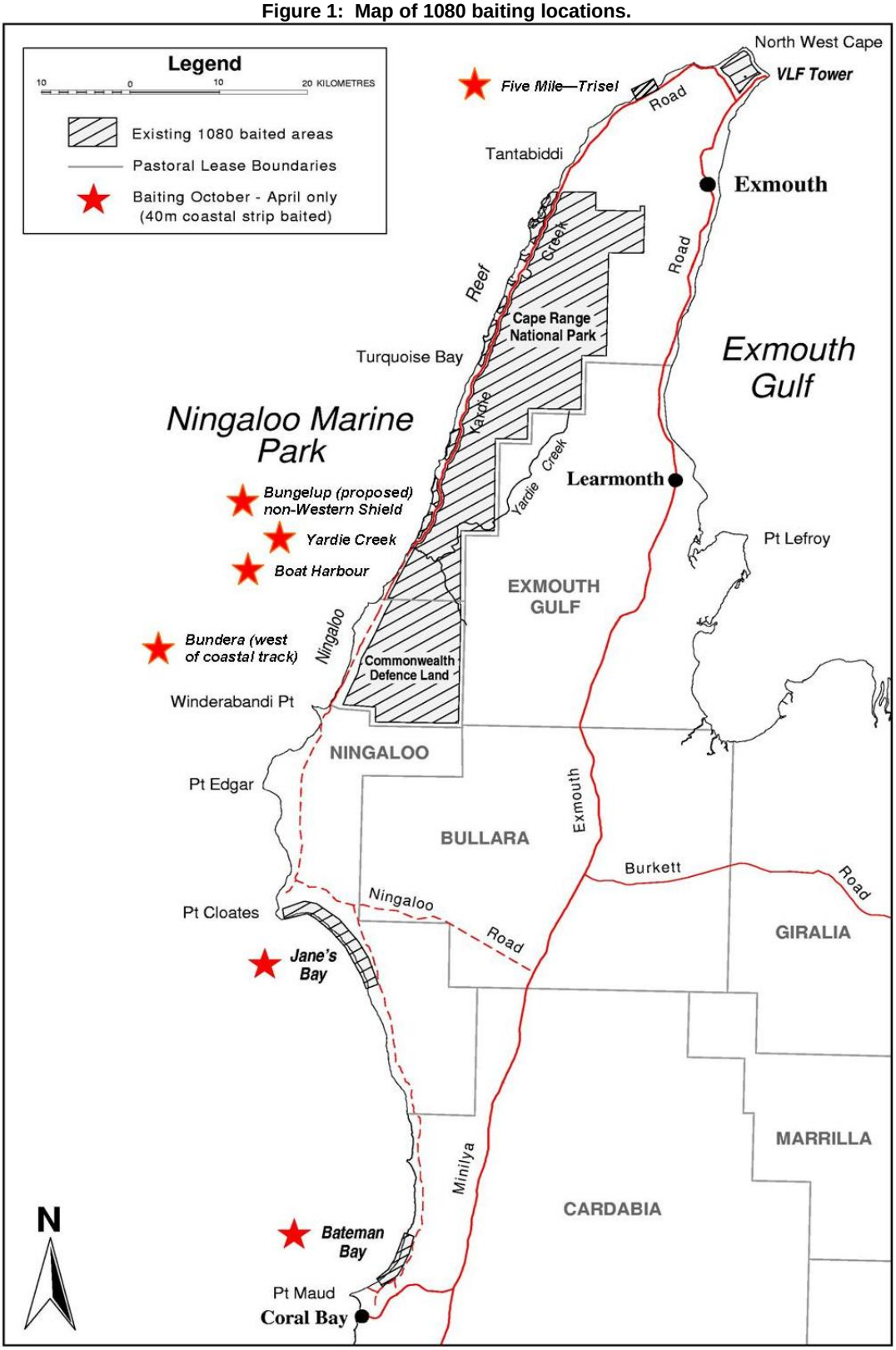
Aerial baiting

Since 1996, aerial baiting of the Cape Range National Park commenced four times per year with the aim to significantly reduce fox numbers throughout the area, protecting the greater Cape Range population of rock wallabies.

Since 2000, aerial baiting has also been conducted at Learmonth Air Weapons Range on Department of Defence land.

In 2010 extra ground and aerial baiting occurred around the Milyering Centre and Mandu Mandu Gorge for further protection of newly translocated Northern Brush Tail possums. However this was not in close proximity to the turtle rookeries.

Figure 1: Map of 1080 baiting locations.



Jane's Bay

- Since 2003/04, a 1080 fox baiting regime has been implemented at Jane's Bay, adjacent to Ningaloo Station, as it has been identified as a significant loggerhead turtle rookery.
- Negotiations were made with the owners of Ningaloo Station regarding baiting operations in Jane's Bay. Access was granted to Jane's Bay via the station, though there were some concessions to the baiting regime:
  - baits to be removed before visitors arrived around the Easter School Holidays;
  - baiting to be conducted only south of the Jane's Bay access track, removing the first 28 bait stations, leaving 3.6 km of beach un-baited from the original baiting proposal; and
  - bait stations 29, 30 and 31 will not be installed due to the close proximity of the southern beach access.
- During the 2011/12 season, 229 baits were laid along the beach and monitored every four weeks, except during January when baiting did not occur due to cyclonic weather and rain. All baits were replaced on a monthly basis throughout the season.
- A total of 67 baits were removed by predators over the duration of the 2011/12 baiting period which is slightly lower than last year. However may be slightly attributed to the fact that this season we took particular care in insuring the baits were tethered higher off the ground so ghost crabs couldn't reach the baits.
- Since the 2006/07 season Turtle nest monitoring effort has been limited to that conducted by DEC staff during baiting operations. As a consequence and a lack of operation staff, monitoring only occurred three times over the 2011/12 baiting season. During these monitoring trips only one nest predation was observed. Due to lack of monitoring days this brings the level of nest predation to five percent. In a conversation between Roland Mau and Col Limpus, Col suggested that loss of up to 5% of nests to foxes or dogs/dingoes is considered a non-threatening level of nest predation, suggesting that the baiting regime at Jane's Bay was effective in the 2010/12 season.

Table 1: 1080 bait use across seven baiting seasons at Jane's Bay.

BAITS USED	***2003/04***	***2004/05***	***2005/06***	***2006/07***	***2007/08***	***2008/09***	***2009/10***	**2010/11**	**2011/12**
Total no. baits used at season start	*103*	*106*	*104*	*103*	*107*	*107*	*107*	107	*229*
Total no. baits used for replacement	*281*	*224*	*229*	*251*	*138*	*387*	*219*	304	*281*
Total no. baits removed throughout season	*47*	*78*	*72*	*87*	*106*	*256*	*199*	339	*510*
Total no. baits removed by predators	*337*	*252*	*260*	*267*	*139*	*238*	*127*	72	*67*
Total no. baits used	*384*	*330*	*332*	*354*	*245*	*494*	*326*	*411*	*510*

***Table 2: Observed turtle nests and predation* only recorded from new nests the day of monitoring at Jane's Bay between October and April (inclusive) each year (baited and un-baited sections). (Source: NTP database v4)**

NESTING ACTIVITY	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*	**2011/12**
No. of times monitoring conducted	*13*	*24*	*12*	*29*	*22*	*4**	*6*	*7*	3	3
No. of nests observed laid	*68*	*107*	*55*	*142*	*44*	*19*	*8*	*40*	0	5
No. of nests observed predated by fox	*45*	*49*	*15*	*3*	*12*	*1*	*0*	*33*†	0	1
Depredation level as a percentage of observed nests	*66.2%*	*45.8%*	*27.3%*	*2.1%*	*27.3%*	*5.3%*	*0.0%*	*82.5%*	0.0%	20%

** Monitoring was conducted six times throughout the 2007/08 season, however the data sheets for October and November went missing. Results shown in Table24 for 2007/08 are based on four monitoring days which is reflected in the first line of the table (note that a query on the NTP database indicates five monitoring sessions – this is due to the beach being broken into two subsections for one morning of monitoring).*

† 30 predation events were recorded in a manner inconsistent with standard NTP methodology – observations indicated approx. 30 conical fox digs that were deep enough to penetrate an egg chamber. It is unclear at what stage of the nest development these digs occurred i.e. incubating, emergent or post-emergent. To err on the side of caution, a possible maximum for predation has been considered.

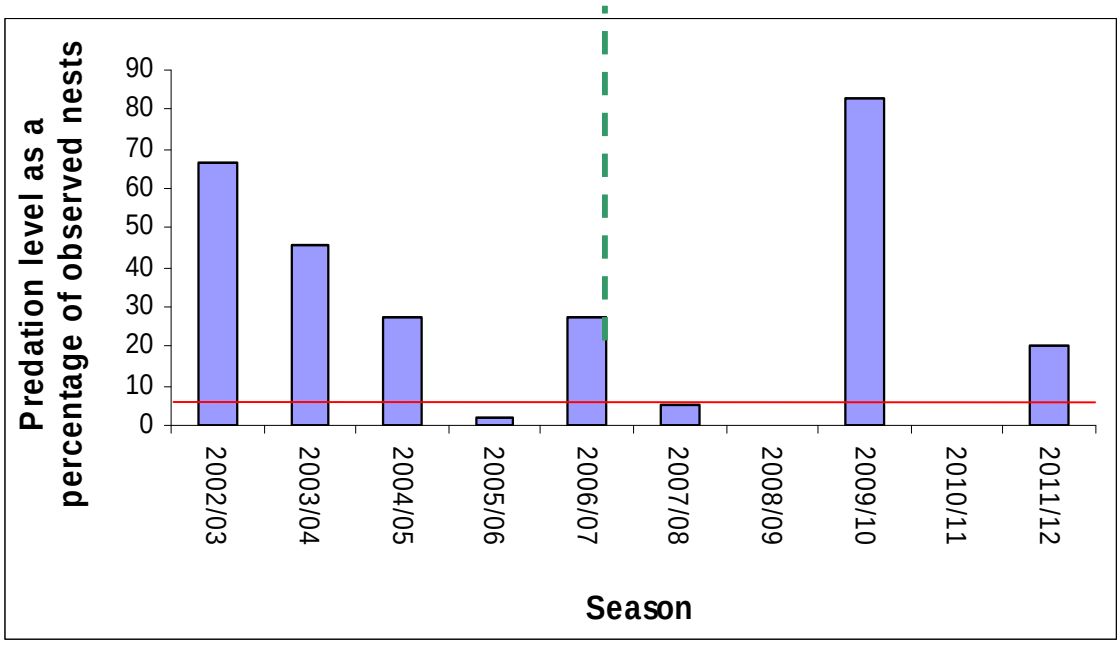


Figure 2: Observed predation levels only recorded from new nests the day of monitoring at Jane's Bay for seasons 2002/03 to 2011/12. The five percent unsustainable threshold for unnatural mortality is depicted in red. The switch from DMBs to Probaits is depicted in green. (Source: NTP database v4.)Note monitoring only occurred 3 times due to lack of operational time e.g. staff did day trips not overnighters.

Bateman Bay

- Since 2002/03, a 1080 baiting regime has been implemented at Bateman Bay adjacent to Cardabia Station to protect turtle nests and hatchlings from fox predation.
- During the 2011/12 season, baits were only laid twice at 53 stations along the beach. Subsequently monitoring too was only conducted twice ad the Coral Bay Ranger was not competent turtle tracker.
- A total of 31 baits were removed by predators over the duration of the 2011/12 baiting period.
    - During the two monitoring sessions no nests we recorded as being predated. In a conversation between Roland Mau and Col Limpus, Col suggested that greater than 5% long term increases in annual mortality from introduced sources will cause population declines (pers comm). These results suggest baiting regime at Batemans was effective in the 2011/12 season. However, it is worth noting that monitoring only occurred twice and in that time only 3 nests were recorded.
- It was also noticed that bait stations did not seem to be located in the most ideal positions. Some bait stations were located several hundred meters from where the vegetation meets the beach.
- It was also noted that high tides often pushed up again the edge of steep dunes providing limited space for turtles to nest in these locations.

Table 3: 1080 bait use across baiting seasons at Bateman Bay.

BAITS USED	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	2010/11	2011/12
Total no. baits used at season start	*53*	*53*	*53*	*53*	*53*	*53*	*53*	*53*	53	53
Total no. baits used for replacement	*66*	*58*	*73*	*153*	*138*	*43*	*132*	*134*	196	106
Total no. baits removed throughout season	*0*	*40*	*36*	*103*	*112*	*63*	*82*	*129*	196	159
Total no. baits removed by predators	*119*	*71*	*90*	*103*	*79*	*33*	*103*	*58*	53	31
Total no. baits used	*119*	*111*	*126*	*206*	*191*	*96*	*185*	*187*	249	128

Table 4: Observed turtle nests and predation only recorded from new nests the day of monitoring at Bateman Bay between October and April (inclusive) each year (Source: NTP database v4).

NESTING ACTIVITY	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*	2011/12
No. of times monitoring conducted	*103*	*100*	*117*	*51*	*76*	*47*	*34*	*8*	*1*	2
No. of nests observed laid	*56*	*63*	*39*	*18*	*47*	*43*	*39*	*17*	*0*	3
No. of nests observed predated by fox	*10*	*1*	*4*	*0*	*4*	*0*	*7*	*5*	*0*	0
Predation level as a percentage of observed nests	*17.9%*	*1.6%*	*10.3%*	*0.0%*	*8.5%*	*0.0%*	*17.9%*	*29.4%*	*0%*	0%

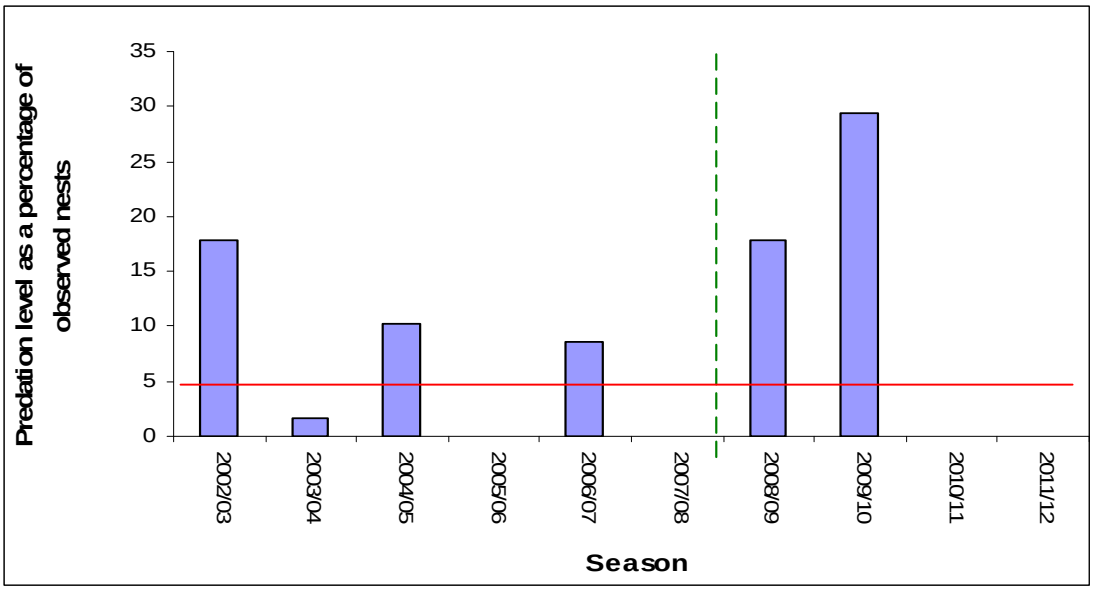


Figure 3: Observed predation levels at Bateman Bay for seasons 2002/03 to 2011/12. The five percent unsustainable threshold for unnatural mortality is depicted in red. The switch from DMBs to Probaits is depicted in green. (Source: NTP database v4)

Bundera/Boat Harbour

- Baiting on Bundera Coastal Protection Area within Learmonth Air Weapons Range (Department of Defence) and at Boat Harbour within Cape Range National Park commenced in the 2005/06 season due its location within a significant loggerhead turtle rookery and high evidence of fox activity in the 2004/05 season.
- During the 2011/12 season, three bait stations were laid at each site and monitored monthly, except January due to cyclonic weather. Removed baits were replaced throughout the season.
- A total of 9 baits were removed by predators at Bundera and Boat Harbour respectively.
- In 2011/12 turtle nesting activities were limited to that conducted by DEC staff during baiting operations. This was the second year that turtle actively was recorded at the actual baiting site. Prior to 2010/11 monitoring of turtle nesting activities and predation of nests were not specifically recorded at Bundera or Boat Harbour. Bungleup was used as a comparison against the Bundera and Boat harbour bait data. Please refer to the Bungelup section of this report for details.
- As seen in 2010/11 no signs of fresh turtle activity were recorded at Boat Harbour or Bundera. There was also no evidence of fox predation on older nests.
- It was also noted as in 2010/11 the high tide often lapped up against steep sand dunes providing limited space for turtles to nest. Therefore the effectiveness of the baiting ones predation cannot be compared. It is recommended that further surveys are conducted to asses if the turtle rookeries have moved and subsequently if we are baiting in the most effective area.

Bundera

Table 5: 1080 bait use across five baiting seasons at Bundera.

BAITS USED	***2005/06***	***2006/07***	***2007/08***	***2008/09***	***2009/10***	***2010/11***	***2011/12***
Total no. baits used at season start	*3*	*3*	*3*	*3*	*3*	3	3
Total no. baits used for replacement	*4*	*9*	*8*	*9*	*13*	12	9
Total no. baits removed throughout season	*2*	*7*	*2*	*3*	*3*	5	6
Total no. baits removed by predators	*5*	*5*	*9*	*9*	*13*	10	6
Total no. baits used	*7*	*12*	*11*	*12*	*16*	15	12

Boat Harbour

Table 6: 1080 bait use across five baiting seasons at Boat Harbour.

BAITS USED	***2005/06***	***2006/07***	***2007/08***	***2008/09***	***2009/10***	***2010/11***	***2011/12***
Total no. baits used at season start	*3*	*3*	*3*	*3*	*3*	3	3
Total no. baits used for replacement	*2*	*6*	*7*	*6*	*12*	12	9
Total no. baits removed throughout season	*1*	*6*	*6*	*5*	*12*	11	*6*
Total no. baits removed by predators	*4*	*3*	*4*	*4*	*3*	4	*3*
Total no. baits used	*5*	*9*	*10*	*9*	*15*	15	*12*

Table 7: Observed turtle nests and predation only recorded from new nests the day of monitoring at Bundera between October and April (inclusive) each year. (Source: NTP database v4)

NESTING ACTIVITY	2010/11	2011/12
No. times monitoring conducted (add together multiple sub-sections)	5	4
No. of nests observed laid	0	0
No. of nests observed predated by fox	0	0
Predation level as a percentage of observed nests	0.0%	0%

Table 8: Observed turtle nests and predation only recorded from new nests the day of monitoring at Boat Harbour between October and April (inclusive) each year. (Source: NTP database v4)

NESTING ACTIVITY	2010/11	2011/12
No. times monitoring conducted (add together multiple sub-sections)	5	4
No. of nests observed laid	0	0
No. of nests observed predated by fox	0	0
Predation level as a percentage of observed nests	0.0%	0%

Bungleup

- In previous years turtle nest predation at Bungelup was used as a surrogate measure of baiting success for the Bundera and Boat Harbour sites as no baiting was conducted at Bungleup**.** However, in 2010 a series of 25 bait stations were set up at Bungelup due to its significance as a Loggerhead rockery and in response to regular fox observations from volunteers, researchers and staff. A number of bait types have been trialled at this site. Please refer to the Bungleup baiting report for futher information T:\422-Operations (District)\Shared Data\CONSERVATION ESTATE\Estate Management\Pest Animal Management - Vermin\1080 Baiting_Bungelup\Brief and reports.
- As seen in 2010/11 no nest predation by foxes was seen during 2011/12 at Bungleup, which keep the level below the five percent target, suggesting that the baiting regime at Bungleup was effective in the 2011/12 season and currently only fox predation has been analyzed however it is worth noting that both 2010/11 and 2011/12 there was one recorded of predation from a dog both years**.**

Table 9: Observed turtle nests and predation only recorded from new nests the day of monitoring at Bungelup between October and April (inclusive) each year. (Source: NTP database v4)

NESTING ACTIVITY	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
No. times monitoring conducted (add together multiple sub-sections)	152	114	120	140	124	72	79	91
No. of nests observed laid	451	693	423	609	550	284	412	443
No. of nests observed predated by fox	0	0	0	*6	12	2	0	0
Predation level as a percentage of observed nests	0.0%	0.0%	0.0%	1.0%	2.2%	0.7%	0.00%	0

** In 2007/08 two nest depredation events were confirmed as fox damage. Observation notes for the four additional damaged nests state that there were fox tracks and also ghost crab holes, with some uncertainty as to which predator damaged the nest. For the purposes of this report and to err on the side of caution, the depredation of all six nests has been attributed to foxes.*

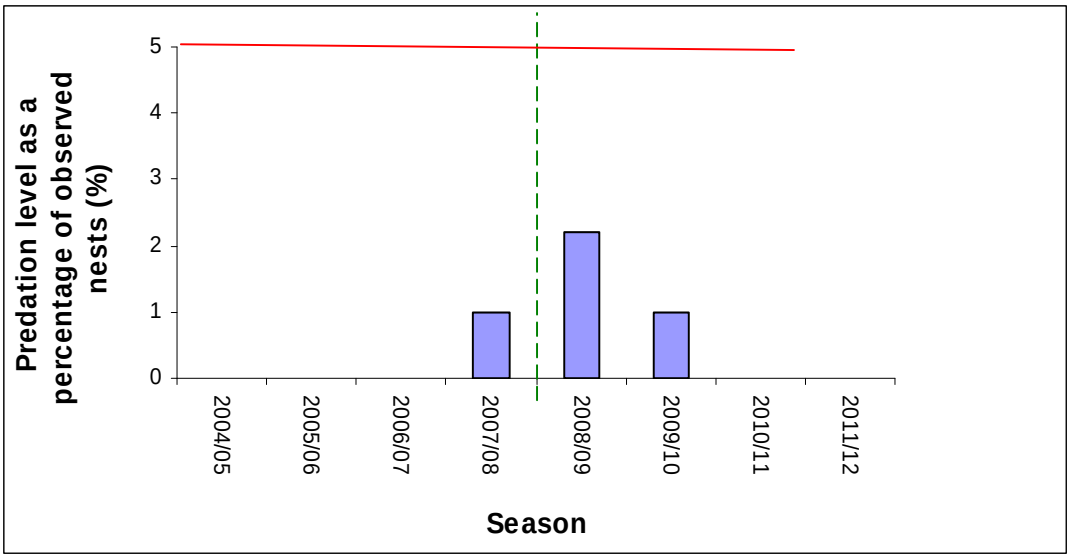


Figure 4: Observed predation levels at Bungelup* only recorded from new nests the day of monitoring *for seasons 2004/05 to 2009/10. The five percent unsustainable threshold for unnatural mortality is depicted in red. The switch from DMBs to Probaits is depicted in green. (Source: NTP database v4).

Five Mile

- Since 2004/05, a 1080 baiting program has been implemented at Five Mile to Trisel beach on the Jurabi Coastal Park as it is a section of a significant green turtle rookery. Considerable fox activity (10.1% of observed nests predated) was recorded at Five Mile to Trisel beach during the 2003/2004 turtle nesting season (McKinna-Jones, 2005).

  *** Note: for whatever reason, this predation wasn't captured in the NTP database **

- During the 2011/12 season, baits were laid at eight stations along the beach and monitored monthly (except January due to cyclonic weather and baits were pulled in one month early during March due to the early start to the school holidays in April and the limited staff available at that time). Removed baits were replaced throughout the season.
- A total of 24 baits were removed by predators over the duration of the 2011/12 baiting period.
- Monitoring of turtle nesting activities and predation of nests was conducted throughout the turtle nesting season as a component of the NTP. NTP monitoring was consolidated during the 2009/10 season resulting in a reduced monitoring effort and hence, a reduction in the number of observed nests (Whiting, 2008).
- During 2011/12 no nest were observed as being predated which keeps the level below the five percent target, suggesting that the baiting regime at Five Mile to Trisel was effective in the 2011/12 season. In a conversation between Roland Mau and Col Limpus, Col suggested that greater than 5% long term increases in annual mortality from introduced sources will cause population declines (pers comm).
- Anecdotal observations from operational staff indicated fox's are still present from Five Mile to Trisel. Fox/dog tracks were recorded regularly throughout the 2011/12 monitoring season (Source: NTP database v4).

Table 10: 1080 bait use across six baiting seasons at Five Mile to Trisel.

BAITS USED	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*	*2011/12*
Total no. baits used at season start	*8*	*8*	*8*	*8*	*8*	*8*	*8*	8
Total no. baits used for replacement	*7*	*11*	*24*	*24*	*26*	*31*	*32*	24
Total no. baits removed throughout season	*8*	*10*	*7*	*10*	*23*	*19*	*16*	17
Total no. baits removed by predators	*7*	*9*	*25*	*22*	*11*	*20*	*34*	15
Total no. baits used	*15*	*19*	*32*	*32*	*34*	*39*	*40*	32

Table 11: Observed turtle nests and predation only recorded from new nests the day of monitoring at Five Mile to Trisel between October and April (inclusive) each year. (Source: NTP database v4)

NESTING ACTIVITY	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	2010/11	2011/12
No. of times monitoring conducted	*90*	*98*	*93*	*83*	*84*	*59*	*40*	38	37
No. of nests observed laid	*211*	*146*	*525*	*407*	*435*	*741*	*78*	357	350
No. of nests observed predated by fox	*0*	*0*	*0*	*0*	*0*	*6*	*1*	0	0
Predation level as a percentage of observed nests	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.8%*	*1.3%*	0.0%	0.00%

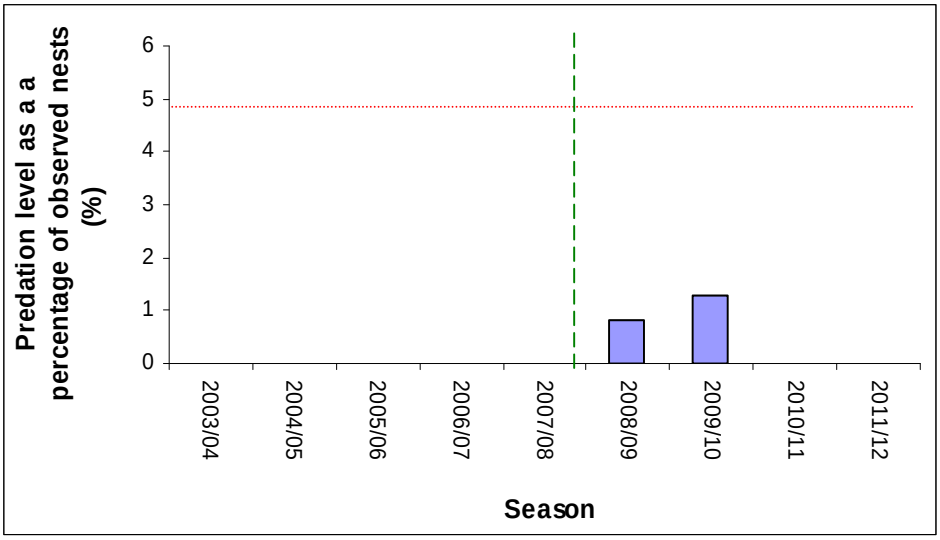


Figure 5: Observed predation levels only recorded from new nests the day of monitoring at Five Mile to Trisel for seasons 2003/04 to 2011/12. The five percent unsustainable threshold for unnatural mortality is depicted in red. The switch from DMBs to Probaits is depicted in green. (Source: NTP database v4)

VLF Towers

- 1080 baiting for fox control commenced in 2001 around the Harold E. Holt Naval Communication Station VLF towers and along the tip of the North West Cape on Department of Defence land.
- During the 2011/12 baiting season 266 baits were laid around the VLF towers and along the North West Cape during six rounds of monitoring (note: periodicity of baiting is typically once every two months throughout the financial year). During May only bait station 1 to 28 were monitored and re-baited as the VLF towers were operational and there was no down time scheduled in the near future. Removed baits were replaced throughout the season.
- A total of 183 baits were removed by predators over the duration of the 2011/12 baiting period.
- As done in 2010/11 baits were tethered to a stake to prevent ghost crab predation and to reduce leaching of the baits when the area is often flooded from heavy rain.
- Monitoring of turtle nesting activities and predation of nests was conducted throughout the season at Lighthouse Bay, an adjacent site to VLF Towers, as a component of the NTP.
- No nests were recorded as predated by NTP in Lighthouse Bay. Therefore keeping the target below five percent suggesting that the baiting regime at the VLF towers was effective in the 2011/12 season.
- Similar to Five Mile, the consolidated NTP monitoring program has implications for using Lighthouse Bay data in evaluating the effectiveness of 1080 baiting.

Table 12: 1080 bait use across five baiting seasons at VLF Towers.

BAITS USED	**2005/ 06**	**2006/ 07**	**2007/ 08**	**2008/ 09**	**2009/ 10**	**2010/ 11**	**2011/ 12**
Total no. baits used for replacement	126	251	217	295	254	302	266
Total no. baits removed throughout season	98	147	140	136	171	172	83
Total no. baits removed by predators	28	144	135	159	83	130	183
Total no. baits used	126	251	217	295	254	302	266

Table 13: Observed turtle nests and predation only recorded from new nests the day of monitoring at Lighthouse Bay between October and April (inclusive) each year. (Source: NTP database v4)

NESTING ACTIVITY	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
No. times monitoring conducted (multiple sub-sections)	127	137	215	260	222	251	147	83	93	97
No. of nests observed laid	194	124	146	561	523	486	591	79	189	689
No. of nests observed predated by fox	0	1	0	0	2	0	3	1	0	0
Predation level as a percentage of observed nests	0%	0.10 %	0%	0%	0.39 %	0%	0.51 %	1.27 %	0.00 %	0.0%
	0.0	0.1	0.0	0.0	0.4	0.0	0.5	1.3	0	0

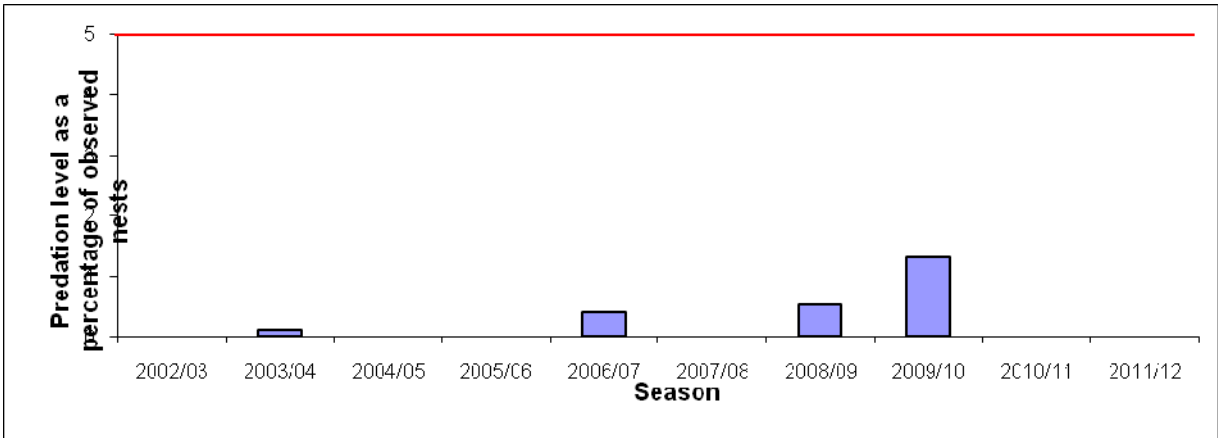


Figure 6: Observed predation levels only recorded from new nests the day of monitoring at Lighthouse Bay for seasons 2002/03 to 2011/12. The five percent unsustainable threshold for unnatural mortality is depicted in red. The switch from DMBs to Probaits is depicted in green. (Source: NTP database v4)

Cape Range National Park

- Since 1996, aerial 1080 fox baiting of Cape Range National Park is conducted four times per year with the aim to significantly reduce fox numbers throughout the area. This protecting the greater Cape Range population of threatened black-flanked rock wallabies (*Petrogale lateralis lateralis*).
- Since 2005/06, 1080 bait stations have also been laid along Yardie Creek in Cape Range National Park for the protection of a population of black-flanked rock wallabies
- During the 2011/12 season, baits were laid at six stations along the gorge. Baits are normally laid monthly from October through till April however, during 2011/12 baits were only laid in October, November and December due to cyclonic activity and Yardie creek boat not being operational. Removed baits were replaced on those occasions. Baits were also pulled in one month early during March due to the early start to the school holidays in April and the limited staff available at that time.
- A total of 18 baits were removed by predators over the duration of the 2011/12 baiting period.
- No measure on the effect of the rock wallabies has been established, though daily rock-wallaby counts are conducted by DEC staff driving the Yardie boat and monitoring of rock-wallabies at key sites in Cape Range National Park has been conducted in the past by Cape Conservation Group.
- The success (or otherwise) of ground and aerial baiting for the protection of black-footed rock wallaby populations in Cape Range National Park has not been established.

Table 14: 1080 bait use across five baiting seasons at Yardie Creek

BAITS USED	***2005/06***	***2006/07***	***2007/08***	***2008/09***	***2009/10***	***2010/11***	***2011/12***
Total no. baits used at season start	*6*	*6*	*6*	*6*	*6*	6	6
Total no. baits used for replacement	*10*	*23*	*21*	*22*	*26*	23	12
Total no. baits removed throughout season	*12*	*18*	*11*	*12*	*14*	5	18
Total no. baits removed by predators	*4*	*11*	*16*	*16*	*18*	24	18
Total no. baits used	*16*	*29*	*27*	*28*	*32*	29	18

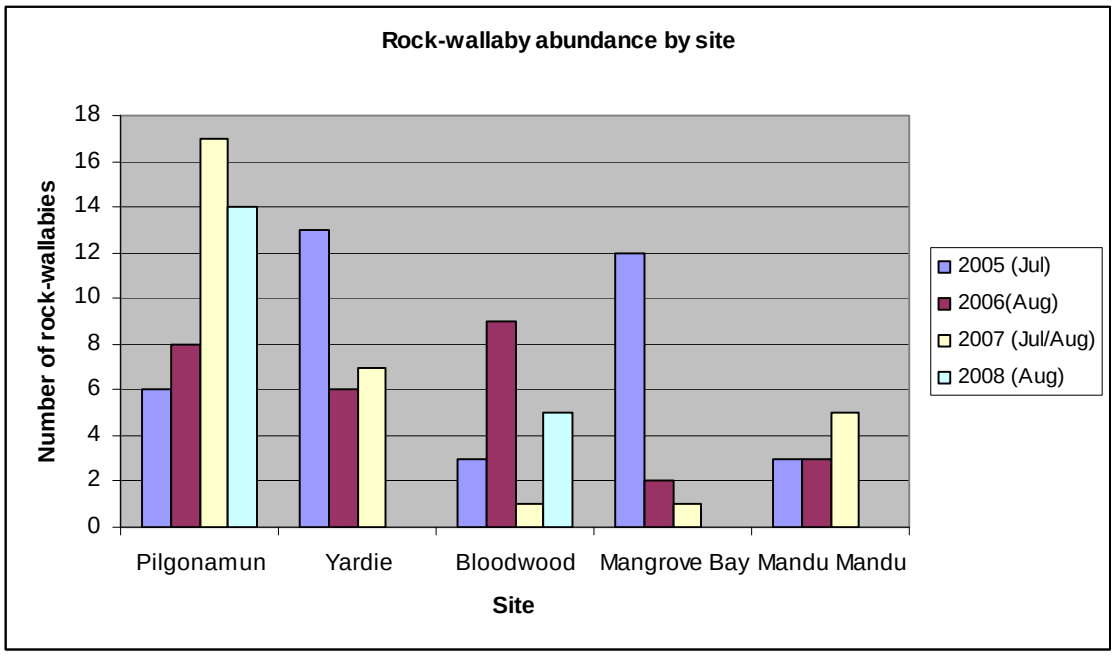


Figure 7: Rock-wallaby abundance by site: 2005 – 2008 (Source: Macgregor, K. and Pearson, D. (2008) Community Monitoring of the Black-footed Rock-wallaby in Cape Range. Progress Report – 2008. Cape Conservation Group, Exmouth WA)

Summary

All of the results show that over the 2011/12 season nest predation is lower than the 5% target , suggesting that the baiting regime was effective in the 2011/12 season.

However, it may be possible the actual level of nest predation is higher than that observed given that:

- Volunteers are not highly trained on identifying predation of nests and may not be accurately recording nest predation. (Identifying predation requires experience).
- The period of time NTP monitoring is conducted may not be the optimal time to be accurately gaining predation information. During the 2003-2004 NTP season fox predation along the Five Mile Beach Subsection (NW Cape Division) was at its highest during March (McKinna-Jones, 2005). Which is consistent with findings by researcher Sabrina Trocini indicating that much of this nest predation occurs towards the end of the incubation period (Trocini, S et al., 2009) , which is largely outside of the NTP monitoring season. McKinna-Jones also found that during the emergent phase nests were predominantly predated by foxes (McKinna-Jones., 2005).
- Trocini. S also found that levels of nest predation at Bungelup were much higher than those observed through the NTP. During the 2007/08 nesting season, 83.3% of nests showed signs of partial or total predation. Over 60% of the monitored nests showed signs of predation by ghost crabs while fox and perentie were responsible for 20% and 16.7% goanna (Trocini, S et al 2009). During monitoring new nests are checked for signs of predation and a large proportion of 'old' nests are not checked for predation (old nests are only recorded on an incidental basis if they are encountered during the monitoring of the new nests), therefore there is a high likelihood of not seeing predated nests and hence underestimating predation levels.
- It is known that foxes are still present at the turtle rookeries from track observations recorded during NTP monitoring and bait uptake monitoring, and from remote camera footage. It may be likely that foxes are predating a higher level of turtle nests than suggested in this report and/or consuming hatchlings.

Recommendations

Summary

All of the results show that over the 2010/11 season nest predation was lower than the 5% target suggesting that the baiting regime was effective in the 2010/11 season.

However, it may be possible the actual level of nest predation is higher than that observed given that:

- Volunteers are not highly trained on identifying predation of nests and may not be accurately recording nest predation. (Identifying predation requires experience).
- The period of time NTP monitoring is conducted may not be the optimal time to be accurately gaining predation information. During the 2003-2004 NTP season fox predation along the Five Mile Beach Subsection (NW Cape Division) was at its highest during March (McKinna-Jones, 2005). This is consistent with findings by researcher Sabrina Trocini indicating that much of this nest predation occurs towards the end of the incubation period (Trocini, S et al., 2009) , which is largely outside of the NTP monitoring season. McKinna-Jones also found that during the emergent phase nests were predominantly predated by foxes (McKinna-Jones., 2005).
- Trocini. S also found that levels of nest predation at Bungelup were much higher than those observed through the NTP. During the 2007/08 nesting season, 83.3% of nests showed signs of partial or total predation. Over 60% of the monitored nests showed signs of predation by ghost crabs while fox and perentie were responsible for 20% and 16.7% goanna (Trocini, S et al 2009). During monitoring new nests are checked for signs of predation and a large proportion of 'old' nests are not checked for predation (old nests are only recorded on an incidental basis if they are encountered during the monitoring of the new nests), therefore there is a high likelihood of not seeing predated nests and hence underestimating predation levels.
- It is known that foxes are still present at the turtle rookeries from track observations recorded during NTP monitoring and bait uptake monitoring, and from remote camera footage. It may be likely that foxes are predating a higher level of turtle nests than suggested in this report and/or consuming hatchlings.

Recommendations

The level of fox predation on turtle nests is an important indicator of the success of 1080 fox baiting regimes. It can take decades for the positive effects of fox control to be seen (Limpus., 2008) so it is important to continue monitoring both turtle nest predation rates and 1080 bait uptake data. However, it is recommended that:

- Additional turtle track monitoring be implemented by DEC staff outside of the baiting and NTP season, with a particular focus on the late incubation and hatchling emergence phase.
- More emphasis and training is provided to volunteers and DEC staff in identifying nest predation.
- Setting up a nesting success project. This would involve marking nests in one or two sections and monitoring through incubation and finally digging up to determine

hatchling success. This would assist in determining what stage of incubation foxes are targeting, for example freshly laid eggs, late incubation, hatchlings, etc. (Scott Whiting, pers. comm.).

- Further track surveys be conducted to asses if turtle rookeries have moved and subsequently if we are baiting in the most effective area. In particular, the southern end of Cape Range National Park.
- Further studies done into bait uptake and effectiveness

References

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