

# GOLF COURSE QUOKKA POPULATION BENCHMARK SURVEY PRELIMINARY RESULTS

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Prepared by: Environment Team, Marine and Terrestrial Reserve

## 1. Introduction

The quokka (*Setonix brachyurus*) is a small macropod known from seven distinct Western Australian subpopulations: Rottnest Island, Bald Island, northern jarrah forest, central jarrah forest, southern jarrah-karri forest, south coast and Stirling Range<sup>1</sup>. The quokka is listed as 'vulnerable' under the *Environment Protection and Biodiversity Conservation Act 1999* and 'rare or likely to become extinct' under the *Wildlife Conservation Act 1950*. Rottnest supports the largest existing quokka population due to separation from the mainland for 7000 years, a lack of feral predators (e.g. cats and foxes) and minimal current anthropogenic impacts. Rottnest quokka population size is known to fluctuate and reported population estimates vary enormously (8,000-12,000 individuals)<sup>2</sup>.

The quokka is mostly a nocturnal browsing herbivore and anecdotal evidence has previously indicated that the grassed areas around the Settlement and the golf course are relied upon heavily as a food source.

The Rottnest Island Authority (RIA) is advancing plans to revitalise the island's 22 hectare (ha) nine (9) hole public golf course, west of the Thomson Bay settlement. The objective is to improve the existing facilities and to ensure that fairways and greens are green year-round by installing a new irrigation scheme eventually supplied by recycled water from the Rottnest Island wastewater treatment plant (WWTP). The new irrigation scheme will also connect to the existing irrigation scheme for the sports oval adjacent to the golf course, which has been irrigated with recycled water since 1996. The total area to be irrigated is 9.6 ha, comprising 8.5 hectares at the golf course and 1.1 hectares at the oval.

The upgrade of the golf course is a major project which includes reshaping the fairways and greens, installation of an irrigation system complete with weather station and automatic control system, and soil amendment and grass establishment on tees, fairways and greens. No improvements are planned for the sports oval other than connection to the new irrigation system. It is envisaged that construction will occur in 2 stages, with Stage 1 incorporating the shaping and grassing of tees and greens and fairway irrigation installed but not commissioned. It is unknown at this stage when the fairway upgrade and grassing will occur (Stage 2).

The upgrade of the golf course will proceed with the following steps<sup>3</sup>:

- Removal of trees and vegetation in accordance with the Staking, Clearing and Demolition plan.
- Cut and fill for golf course shaping in accordance with the Cut-fill Explanatory Plan. No water-holding pockets will be produced, and natural drainage swales will be used wherever possible.
- Grading and rough shaping of all areas where required.
- Installation of irrigation pipework.
- Excavation and subgrade fine shaping of the green cavity and surrounds.
- Application of greensmix (sand and soil amendments) to the greens.
- Installation of sprinkler heads.
- Grass planting.

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<sup>1</sup> Department of Environment and Conservation (2012). DRAFT Quokka *Setonix brachyurus* Recovery Plan. Wildlife Management Program. Department of Environment and Conservation, Perth, WA.

<sup>2</sup> O'Connor, R. (1999). Population estimates for the Rottnest Island Quokka (*Setonix brachyurus*), east of Narrow Neck, determined by scat counts, January 1999. Unpublished Report. University of New England, Armidale, NSW.

<sup>3</sup> Davey Shearer Golf Design. (2012). *Rottnest Island Golf Course Construction Specification*.

Construction is scheduled to commence in February-March 2013.

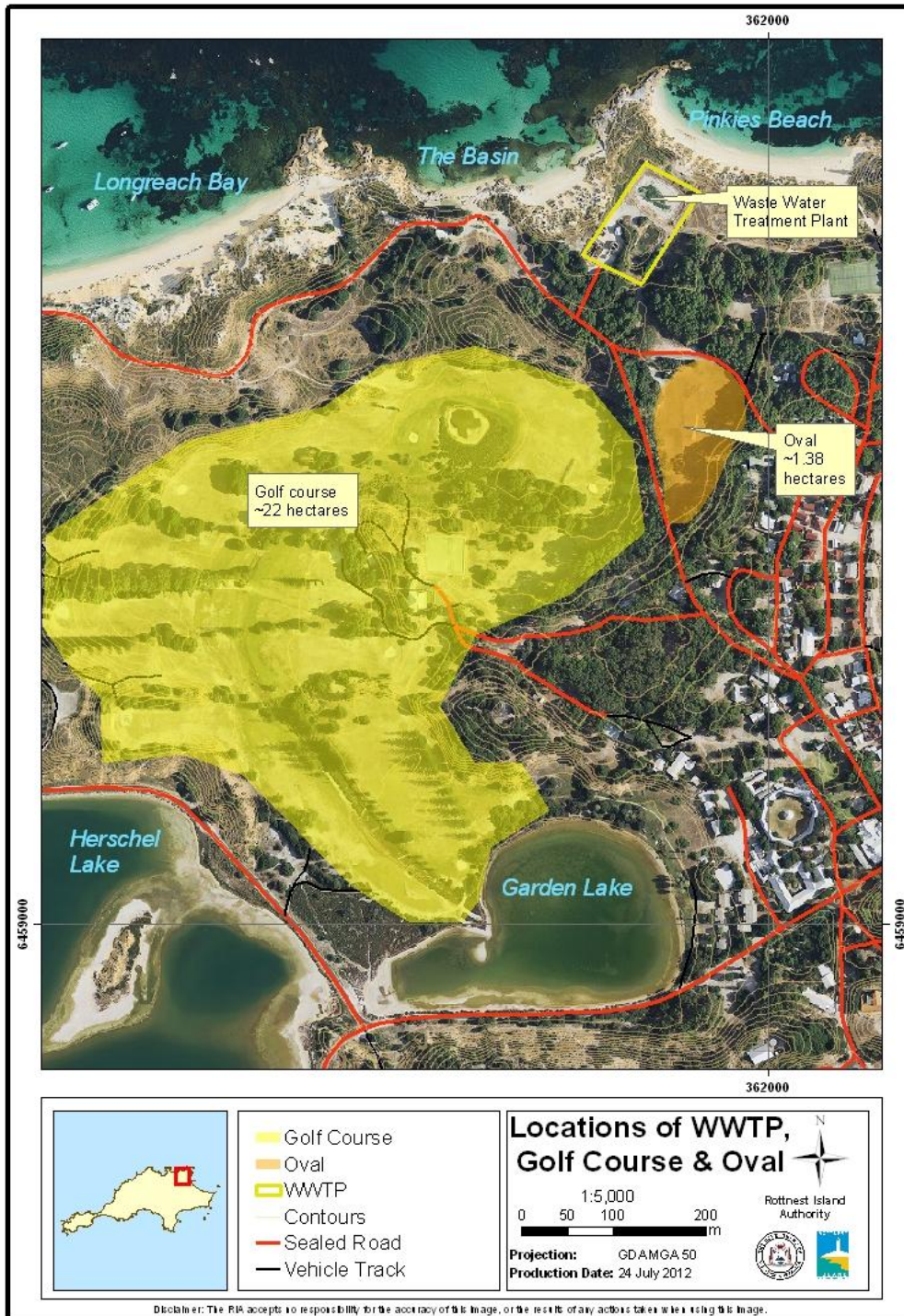
The RIA Development Assessment Team (DAT) received a Development Application (DA07/2012) for the Upgrade and Reticulation of Rottnest Island Golf Course on 24<sup>th</sup> of July 2012. RIA Environment submitted an Environmental Evaluation of DA07/2012 to DAT on 25<sup>th</sup> July 2012. The Environmental Evaluation quantified the risk and detailed the potential impacts the planned golf course upgrade and potential ongoing maintenance activities may have on the quokka population.

A benchmark survey program was developed to:

- a) Ascertain the number of quokkas utilising the golf course as a food source prior to construction commencing;
- b) Determine whether during and post-construction operations have any impacts on golf course quokka numbers and behaviour; and
- c) Identification of the golf course areas most heavily targeted by quokkas.

## **2. Methodology**

The golf course is located on the northeast corner of Rottnest, south of Longreach Bay and west of the Settlement (Figure 1). Surveys are scheduled to occur on a monthly basis prior to construction commencing, during construction and post-construction, between the hours of 8pm and 11pm. To date, six surveys have been conducted: three in July, and one in August, October and November 2012. September was omitted due to inclement weather and resource restrictions. It is highly likely that survey frequency will be increased during construction activities to ascertain and potentially mitigate (where possible) any impacts construction may have on the quokka population.



**Figure 1. Golf Course location.**

Using ArcGIS, twenty two (22) survey points were selected to encompass the majority of the potential golf course grazing area (Figure 2). Survey methodology involves two RIA staff members walking to each survey point without illumination. This aims to minimise disturbance on the grazing quokkas and provide a more realistic estimate of numbers as quokkas are more inclined to run away from torchlight<sup>4</sup>.

<sup>4</sup> Environment team, personal observation.

Once the survey point is reached, a Maglite torch is switched on and fixed on a certain start point e.g. aboveground bore or distinguishable tree. The Maglite torch is then panned around in a slow circle back to the start point. All quokkas viewed within the illumination circle (both adults and juveniles) are counted silently by both staff members to minimise counting bias and take observer variability into consideration. Predominant behaviour type (e.g. grazing, drinking, interacting with other quokkas, and flight in response to human presence) is recorded.

Once complete, observers compare quokka numbers counted and average the result if any discrepancy arises. The Maglite torch used for each survey has an illumination radius of 30m; therefore, using  $\pi r^2$ , the total area surveyed at each point is 2827.43m<sup>2</sup>. Given that there are 22 survey points on the golf course, the total golf course area surveyed is 62,203.53 m<sup>2</sup> (6.22 hectares or ~73% of the golf course area to be irrigated<sup>5</sup>).

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<sup>5</sup> Rottnest Island Golf Course Irrigation Specifications, Paul F. Jones & Associates Pty Ltd, May 2012.



Figure 2. Golf course quokka benchmark survey points.

### 3. Preliminary Results

To date, total quokka numbers utilising the golf course per survey event have ranged from 368 (July) to 584 (October) (Figure 3). The mean number of quokkas per survey event is 475.83 (std dev. 82.88). There were 46 young quokkas present in July, 161 in October and 68 in November (Figure 3).

Young quokkas were observed at almost all survey points throughout the golf course (Figure 4).

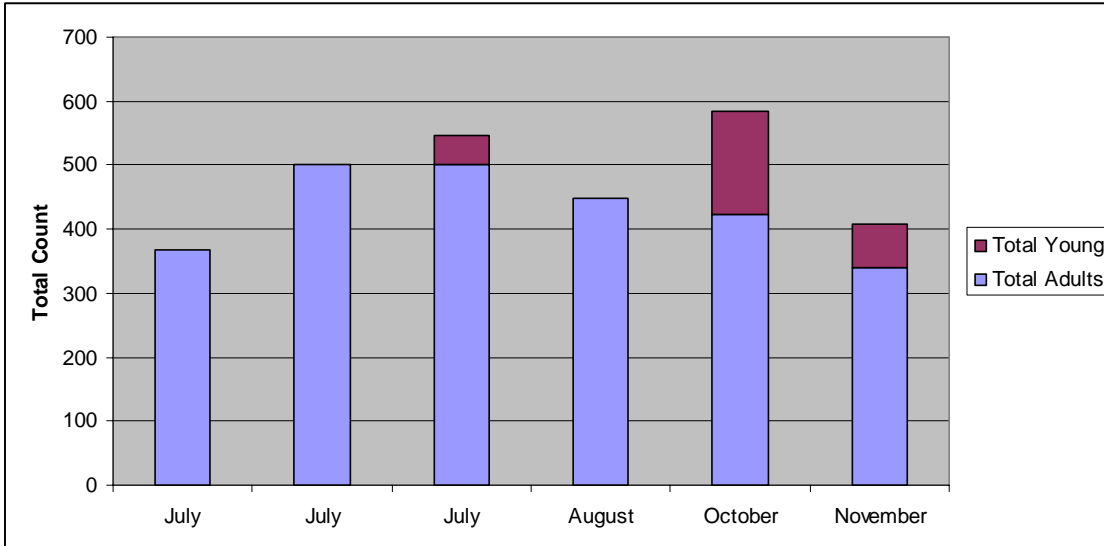


Figure 3. Total count of adults and young per survey event.

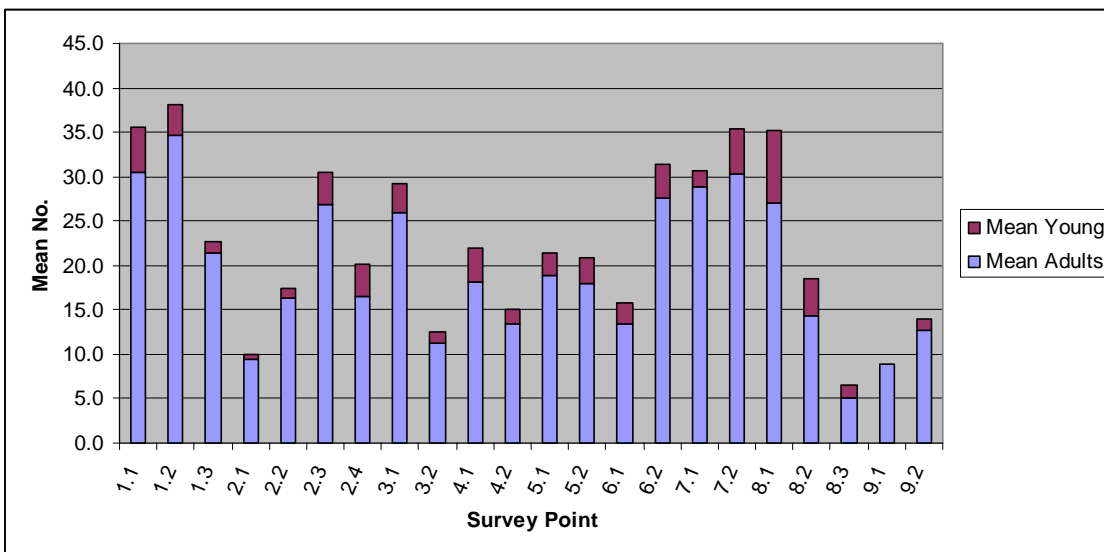


Figure 4. Mean number of young and adult quokkas by survey point.

Quokkas appear to congregate in low-lying areas or adjacent to waterbodies (Figure 4) and grazing is the most common behaviour type observed. Based on the mean number of quokkas per survey event, it is estimated that there are 76.5 quokkas per hectare (0.0076 quokkas per m<sup>2</sup>), however given that quokkas congregate in particular areas, this is not representative of an even distribution of individuals across all areas the golf course. Seasonal variation would also be a contributing factor to population size and distribution across this site.



Figure 4. Mean quokka counts by survey point (n=6).

#### **4. Recommendations**

Recommendations for monitoring quokkas at the golf course include:

- 1) Continue to conduct surveys on a monthly basis prior to construction to determine whether there is any seasonal variation in population levels and utilisation of different areas on the golf course.
- 2) Develop a Standard Operating Procedure (SOP) and mitigation strategies for response to any incidents involving quokkas e.g. injury arising from construction activities, mass mortality due to chemical ingestion etc.
- 3) Incorporate the golf course into the site selection for the RIA-DEC-UWA collaborative Quokka Demographics and Genetics research project, scheduled to commence in early 2013.
- 4) Contractor to develop Construction Environmental Management Plan CEMP incorporating all aspects of quokka management and mitigation strategies.
- 5) Investigate the feasibility and potential impacts of installing fauna exclusion fencing around the golf course during the construction period.
- 6) Increase the frequency of surveys once construction commences to ascertain impacts (if any) construction has on the golf course quokka population.
- 7) Conduct weekly audits of the construction site to ensure contractors are abiding by conditions under the CEMP with respect to chemical storage, handling, rate and timing of fertiliser application etc.
- 8) Continue surveying post-construction on a fortnightly basis for 3 months, then on a monthly basis for another 9 months to assess for impacts on golf course quokka population size, behaviour, demographics and potential impacts from fertiliser/chemical application and excess water/food.