CRUZ ENVIRONMENTAL

Report No. 14

Frog Fauna of Priority Habitats in Transnet Capital Projects Richards Bay Port Expansion Project

A report prepared for AECOM SA (Pty) Ltd, Westville, Durban

by

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1. INTRODUCTION

1.1 FROGS AS INDICATORS

Globally the environment is under pressure and in certain areas habitats are being altered permanently. Ecological indicators have been of tremendous value in assessing the state of the environment (Dale & Beyeler, 2001). To qualify as a suitable indicator a group of organisms or a specific taxon has to meet certain criteria. According to Dale & Beyeler (2001) the following criteria have to be met to qualify as a suitable environmental indicator: a) present for an extended time, b) easily and cost-effectively sampled, c) sensitive to stressors in the environment, d) responsive to such stressors in a predictable way, e) abundant in a healthy system, and f) responses should have a low level of variability. To this list we can add that the taxon should be exposed to the habitat under investigation and should be well studied and well understood.

Anurans are increasingly used as bio-indicators in many parts of the world and examples of their usage are well documented (see Campbell *et al*. 2005; Collins & Storfer 2003; Galatowitsch *et al*. 1999; Hammer et al. 2004; Sheridan & Olson 2003 and Welsh & Ollivier 1998). They are appropriately representative of ecosystems for the following reasons: a) amphibians are found throughout the world and some species are active throughout the year, b) they occupy a key trophic position as both predator and prey, c) They are selective in the type of habitat they require, d) diverse feeding and breeding strategies, seasonally distinct functions and a biphasic life cycle allows them to exploit a wider spectrum of ecological niches than almost any other taxonomic class (except insects). Thus, amphibians are entirely representative of the environmental diversity of the region, e) they are exposed to air, surface and water environmental factors, f) the unique morphology of their skin makes them susceptible to a variety of environmental stressors, g) the biphasic life exposes them to both aquatic and terrestrial environments and h) amphibians are sensitive to environmental stressors.

Because of their abundance under normal conditions frogs are substantial predators, particularly of invertebrates, in contrast to the latter they form an important source prey for a wide diversity of predators including birds, mammals, snakes and other frogs. Thus, frogs play an intermediate role in the food web, meaning that as both predators and prey they play a key role in the stability of most ecosystem communities (Hirai & Matsui, 1999). The

herbivorous tadpoles consume significant amounts of algae and vegetable detritus while also serving as a food resource for aquatic predators, both invertebrate and vertebrate. Although frogs have not been widely used as indicators of ecosystem services in South Africa our huge diversity of 159 currently known species representing 33 genera are most suitable for the task.

1.2 FROGS OF THE RICHARDS BAY AREA

The frogs around Richards Bay are reasonably well researched and would be particularly suitable as bio-indicators because of their abundance, diversity and use of a wide range of different habitats. As with several other plant and animal groups, the Richards Bay area has the richest species diversity in Southern Africa (Carruthers & Du Preez, 2009). Forty-eight frog species in twenty genera have been recorded in the four quarter-degree grid squares around the study area (Minter *et al.*, 2004). This represents 40% of all species occurring in South Africa. Of these, two are listed as being threatened according to the latest IUCN Red List for amphibians. These are *Hyperolius pickersgilli* which is listed as Critically Endangered and *Hemisus guttatus* as Vulnerable. Richards Bay falls at the southernmost distribution of 15 frog species and the northernmost of four other frogs. Of the 48 species recorded in the study area, 32 (67%) have a typically tropical distribution and 16 (33%) have a distribution range centred in southern Africa. Thirteen species (27% of total) are at the southern limit of their range and four species (8% of total) are at the northern limit of their range (Carruthers & Du Preez, 2009).

1.3 AIM

The aims of this amphibian survey were to:

- Evaluate the site as indicated in the brief as habitat for frog species.
- Determine the species diversity in the area.
- Determine whether any threatened species does occur at the site.
- Determine whether the loss of this site will have an adverse effect on the frog populations in the greater Richards Bay area.

2. METHODS

2.1 ON SITE VISITS

The Rail Balloon study area (Figure 2) was visited for the period 29 September – 2 October 2014. The study area was visited during different times of the day to ensure that all species be covered as some frogs only start calling late at night. In addition a visit during the day was made to the Berth 600 Series Extension site.

2.2 SURVEY METHODS

In order to ensure that all frog species present at the time of the survey were encountered a combination of different survey methods were followed and surveys were conducted during daytime and at night. Fixed point acoustic surveys were conducted using sophisticated programmed call recorders (Figure 1). These were placed out and programmed to record continuous from 18h00 – 06h00 the following morning. They were placed at different representative habitats (A-D in Figure 2).

Figure 1: Song meter inside a protective housing

Transect acoustic surveys were undertaken by driving at night through the study area, stopping every 200 m to listen for a period of three minutes. As each species has a species specific call, this method provides an accurate way of determining which frogs are calling. However only male frogs call and males only call when reproductively active. For this reason acoustic surveys have to be combined with other survey methods. Visual encounter surveys were undertaken at night by driving on all roads in the study area and documented all frogs spotted on the road.

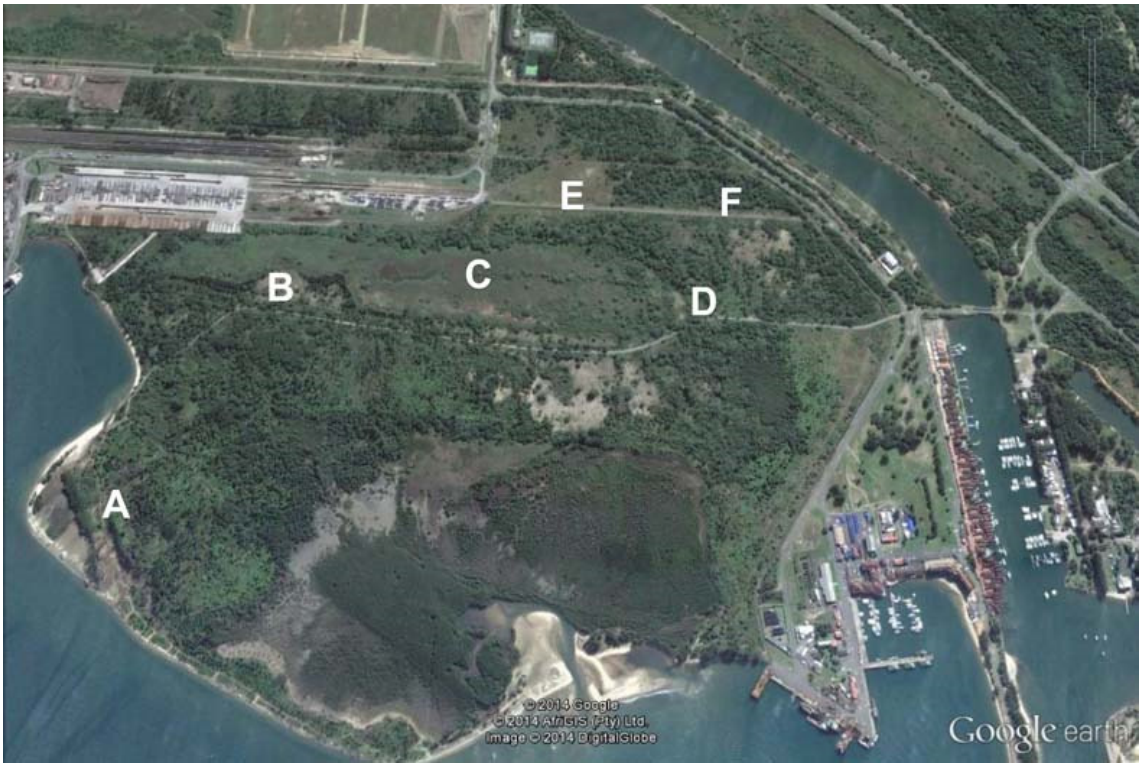

Figure 2: Study area with sampling sites indicated as A – F. Image taken from Google Earth.

2.3 REFERENCE SITES

In order to verify that frogs were active and calling at sites that could be regarded as an ideal frog habitat two sites in the area were visited. Site 1 was an earth walled pond (28,63923S 37,06083E) between Richards Bay and KwaMbonambi and Site 2 a pond South-East of KwaMbonambi (28.6596S, 32.17269E). At both sites species diversity and call activity were noted.

3. RESULTS

3.1 STUDY AREA AS HABITAT FOR FROGS

In spite of a big rainstorm the day prior to our visit no water was standing in the study area except in the permanent mangrove swamp to the south-west of the study area. The study area consists mainly of deep sand and it is clear that pools will form only after prolonged heavy rain. To the North of the access road a wetland does exist, however it was dry during the survey. Judging by the *Phagmites* stand it can be assumed that open water will collect in this area but most likely only for a few months a year. Although several other depressions were observed in the study area, based on the vegetation, it became evident that these do not sustain water long enough to support wetland flora and are thus most likely not suitable as breeding areas for frogs. Apart from the *Phragmites* wetland, no other significant freshwater wetlands exist in Rail Balloon area (Figure 2).

The Berth 600 Series site contained a small patches of swamp forest on the far West of the site but it was dry during the visit. The only freshwater found was a 30X30 m old borrow pit which had water in and was filled with reeds. This is potentially a good site for a variety of frog species.

3.2 FROGS DOCUMENTED DURING THE SURVEY

Based on the various survey methods used only four species of frogs were encountered (Table 1; Figure 3).

Table 1: List of frog species documented

Species	Common name	Habitat found	Detection method
Leptopelis natalensis	Natal Tree Frog	Trees & thickets around *Phragmites* wetland	Acoustic
Arthroleptis wahlbergii	Bush squeeker	Thick vegetation	Acoustic
Amietiophrynus garmani	Garmin Toad	On roads	Visual. Specimens collected
Amietiophrynus gutturalis	Guttural toad	On roads & also in Berth 600 Series site.	Visual. Specimens collected

Arthroleptis wahlbergii

Leptopelis natalensis

Amietophrynus garmani

Amietophrynus gutturalis

Figure 3. Frogs documented during the survey

Recordings made by the songmeters were analyzed and based on the calls recorded only two species were calling. The Bush Squeeker (*A. wahlbergii*) was detected at recording sites A, B, C and D. However very few specimens were noted at site A. At all the sites where they were detected they called from 19h00 till 05h00 but the call intensity peaked around 20h00. The Natal Tree Frog (*L. natalensis*) was detected at call sites B-D. They called sporadic from arount 19h00 but stopped calling around 23h00. A spectrogram of the various calls as well as other night sounds are presented as a spectrogram in Figure 4.

At the two reference sites various frog species were noted. At site 1 several Clawed Frogs (*X. laevis*) were found migrating and several were already crushed by car tyres. Species that were actively calling included Olive Toad (*Amietophrynus garmani*), Guttural Toads (*Amietophrynus gutturalis*), Plain Grass Frogs (*Ptychadena anchietae*), Bush Squeekers (*A. wahlbergi*) and Snoring Puddle Frogs (*Phrynobatrachus natalensis*). At site 2 large numbers of the following species were active and calling; Natal Tree Frog (*L. natalensis*), Painted

reed frogs (*Hyperolius marmoratus*), Argus Reed Frogs (*Hyperolius argus*), Red legged Kassina (*Kassina maculata*), Plain Grass Frogs (*P. anchietae*) and Snoring Puddle Frog (*P. natalensis*). Olive toads (*A. garmani*) were present but did not call.

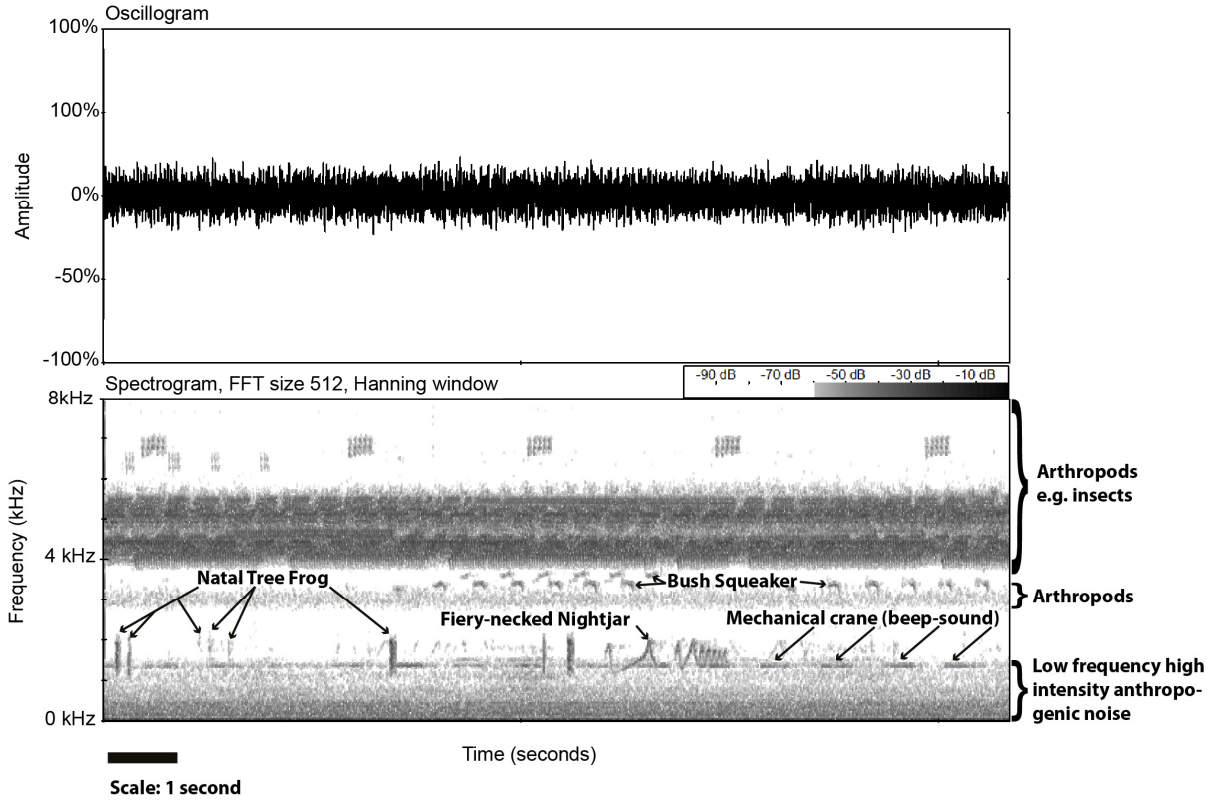

Figure 4. A sample spectrogram of night sounds captured by the songmeter.

At the 600 series site a number of *A. garmani* were calling. This site most likely also serves as breeding site for Painted Reed Frogs (*H. marmoratus)* and Clawed frogs (*Xenopus laevis*) and possibly Argus Reed Frogs (*H. argus*) and Tinker Reed Frogs (*H. tuberilinguis*).

4. DISCUSSION & CONCLUSIONS

4.1 FROGGING CONDITIONS

Although the survey was conducted at the onset of the frogging season, the variety of species noted at the two reference sites confirmed that the frogs were out and active.

4.2 DIVERSITY OF FROGS EXPECTED AND OBSERVED

Based on published literature Carruthers & Du Preez (2009) conducted a thorough desk top study and identified a list of 48 frog species in twenty genera that have been collected around Richards Bay. Based on predictive modelling both threatened species known from the area, mottled Shovel Nosed Frog and the Pickersgill Reed Frog could occur in the study area. However, based on my experience with both these species I am of the opinion that neither of them will occur at the study site. The wetland to the North of the access road will most likely sustain a population of Painted Reed frogs (*Hyperolius marmoratus*), Tinker Reed Frogs (*Hyperolius tuberilinguis*) and possibly Argus Reed Frogs (*H.* argus) but it is not the type of wetland where I would expect Pickersgill Reed Frogs. The list of frogs historically detected in the Richards Bay area, those that are likely to occur at the study site and those that have been detected at the site are listed in Table 2.

Table 2: List of frogs that have been detected in the Richards Bay area with an indication of the likeliness of finding it at the study site. (1 = highly unlikely; 2 = unlikely; 3 = possibly; 4 = most likely and 5 = documented at the site).

SPECIES	LIKELYNESS THAT SPECIES WILL OCCUR AT THE STUDY SITE
FAMILY ARTRHROLEPTIDAE	
Arthroleptis	
Arthroleptis stenodactylus	2
Arthroleptis wahlbergi	5
Leptopelis	
Leptopelis mossambicus	3
Leptopelis natalensis	5
FAMILY BREVICEPTIDAE	
Breviceps	
Breviceps adspersus	3
Breviceps mossambicus	3
Breviceps sopranus	1
Breviceps verrucosus	1
FAMILY BUFONIDAE	
Amietophrynus	
Amietophrynus garmani	5
Amietophrynus gutturalis	5
Amietophrynus rangeri	4
Schismaderma	
Schismaderma carens	3

FAMILY HEMISOTIDAE	
Hemisus	
Hemisus guttatus	1
Hemisus marmoratus	2
FAMILY HYPEROLIIDAE	
Afrixalus	
Afrixalus aureus	3
Afrixalus delicatus	3
Afrixalus fornasinii	3
Afrixalus spinifrons	2
Hyperolius	
Hyperolius poweri	2
Hyperolius argus	3
Hyperolius marmoratus	4
Hyperolius pickersgilli	1
Hyperolius pusillus	2
Hyperolius semidiscus	2
Hyperolius tuberilinguis	3
Kassina	
Kassina maculata	1
Kassina senegalensis	1
FAMILY MICROHYLIDAE	
Phrynomantis	
Phrynomantis bifasciatus	1
Phrynobatrachus	
Phrynobatrachus mababiensis	2
Phrynobatrachus natalensis	2
FAMILY PTYCHADENIDAE	
Ptychadena	
Ptychadena anchietae	1
Ptychadena mascareniensis	1
Ptychadena mossambica	1
Ptychadena oxyrhynchus	1
Ptychadena porosissima	1
Ptychadena taenioscelis	1
FAMILY PIPIDAE	
Xenopus	
Xenopus laevis	4
FAMILY PYXICEPHALIDAE	
Anhydrophryne	
Anhydrophryne hewitti	1
Cacosternum	
Cacosternum boettgeri	2
Cacosternum nanum	2
Cacosternum striatum	1
Amietia	

Amietia quecketti	2
Pyxicephalus	
Pyxicephalus edulis	2
Strongylopus	
Strongylopus fasciatus	2
Strongylopus grayii	2
Tomopterna	
Tomopterna cryptotis	2
Tomopterna natalensis	2
FAMILY RHACOPHORIDAE	
Chiromantis	
Chiromantis xerampelina	1

4.3 LIMITATIONS OF THE STUDY

In spite of the rain that did fall prior to the visit no open water suitable for frogs to breed was present at the site.

4.4 OVERALL CONCLUSIONS

Based on sophisticated recording equipment and scientific experience with the group of organisms I would conclude that:

1) The study area is not a particularly good site for frogs.
2) After prolonged rains the wetland indicated by C in Figure 2 will most likely gather water and will provide suitable breeding habitat for several species including Painted Reed Frogs (*H. marmoratus*), Tinker Reed Frogs (*H. tuberilinguis*) and Water Lily Frogs (*H. pusillus*).
3) Although I cannot exclude it with absolute certainty, in my professional opinion none of the threatened frog species known to occur in the Richards Bay area would be expected to occur in the area studied.
4) Loosing this site will not affect the population of frogs in the greater Richards Bay area.

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Thesis title: Study of factors influencing the nature and extent of host- specificity among polystomatids (Polystomatidae: Monogenoidea) parasitic in Anura of southern Africa.

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Specialisations: Amphibian diversity, conservation, diseases and parasites.

Research output:

9 Books or book chapters (3 as lead author) Including “Complete Guide to Frogs of Southern Africa”
92 Published papers (28 as lead author)
1 Book review
41 Published conference proceedings and other papers (21 as lead author)
6 Technical reports (2 as lead author)
6 Popular scientific articles (4 as lead author)

Conference presentations:

5 Keynote presentations
9 Poster presentations at international symposia
1 Video presentation at an international symposium
58 Oral presentations at international symposia (1 keynote address)
58 Poster presentations at local symposia
1 Video presentation at a local symposium
65 Oral presentations at local symposia

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