# THE ECOLOGY OF DUTAPHRYNUS IN IPB

**Report submitted to:**
Department of Agriculture and Fisheries
State of Queensland, 203 Tor Street, Toowoomba
Queensland 4350
Australia

**Prepared by**

**Mirza D. Kusrini**


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## ACKNOWLEDGMENTS

The management of IPB University Darmaga campus (Bogor, Indonesia) have given permission to work within the campus areas. We thank the Dean and staff of Faculty of Forestry & Environment, IPB University for their kindly assistance.

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# PROJECT FACT SHEET

**Project Name**
Development of surveillance tools for the Asian black-spined toad (*Duttaphyrnus melanostictus*)

**Country**
Indonesia

**Project Leader**

Dr. Mirza D. Kusrini, MSi
Email: mirza_kusrini@yahoo.com

**Collaborator:**
Prof. Dr. Lin Schwarzkopf
James Cook University

**Project Team**

**Research Assistants**
Yusratul Aini, S.Hut, M.Si.
Ramdani Manurung, S.Hut
Alienda Fauzia, S.Hut
Risqinanti
Loise L. Loar

**Project Duration**
28 January 2021 – 30 April 2023

**Funding Agency**
Department of Agriculture and Fisheries, State of Queensland, Australia

**Collaborating Institutions**
Institut Pertanian Bogor (IPB University)
Fakultas Kehutanan & Lingkungan
Departemen Konservasi Sumberdaya Hutan & Ekowisata
INDONESIA

James Cook University
Townsville QLD 4811
Australia

## I. Introduction

Invasive amphibian often outcompete native organisms, disrupt natural habitats, and can lead to the extinction of native species ((Measey et al. 2016, Falaschi et al. 2020). Controlling invasive species is crucial for maintaining the balance and integrity of ecosystems worldwide. To control invasive species there are several methods and strategies employed in invasive species control, depending on the specific circumstances and characteristics of the invasive species. Here are some commonly used approaches, i.e. prevention, early detection and rapid response, mechanical methods (physically removing invasive species), chemical control and biological control (Louette 2012, Falaschi et al. 2020).

Successful invasive species control requires collaboration and coordination among various stakeholders, including government agencies, conservation organizations, researchers, landowners, and the public. It is crucial to develop comprehensive management plans, establish monitoring systems, and allocate adequate resources to address the challenges posed by invasive species. To prevent the spread of invasive species, eradication of invasive population need to be implemented. To capture invasive amphibian species, various attempts were made to capture (Snow and Witmer 2010) and also using lure by using calls i.e. the cane toad in Australia (Schwarzkopf and Alford 2007, Muller and Schwarzkopf 2017).

The Asian black-spined toad (ABST, *Duttaphrynus melanostictus*) is a medium sized toad, with a broad distribution across Asia (IUCN Red list 2023). It is recorded as one of the invasive frog by the Global Invasive Species Database (GISD 2023) and arrived mostly by human intervention, i.e. in Timor Leste (Trainor 2009), Madagascar (Moore et al. 2015, Vences et al. 2017, Licata et al. 2019), and eastern part of Indonesia (Reilly et al. 2017). It is also reported outside its range in Abu Dhabi (Soorae 2020).

Although there is no current population of ABST in Australia, however it is predicted that much of northern and eastern Australia is suitable for establishment of ABST, including areas outside of the predicted range of cane toads (Mo 2017, Tingley et al. 2018). The establishment of ABST populations in a number of locations outside its native range in Asia, has caused significant economic and environmental impacts (Measey et al. 2016, Wogan et al. 2016, Licata et al. 2019, Pettit et al. 2021).

This project seeks to determine if an audio lure will work for ABST in part of their native range and, if so, to optimize the lure for use in a trap for maximum capture of female ABST. This will be done in the first instance using the methodologies developed by Muller and Schwarzkopf (2017) for cane toads, and adapting the 'Toadinator' trap developed for cane toads. Result of the first phase showed that toadinator trap did not work well to capture ABST, thus in this second part of report we focus using audio lure experiment without toadinator. Research was conducted in Bogor, Indonesia which has natural population of ABST. The objective of the research is to determine if ABST audio calls are effective lures for ABST.

## II. Experiment methodology

The research was conducted at the Darmaga Campus of IPB, Bogor Regency, West Java over an area of ±267 ha. The IPB University Darmaga Campus is one of five campus locations of IPB University. It is located 12 Km west of Bogor City (6°32'41" - 6°33'58"S, 106°42'47" - 106°44'07 E), between 145 – 195 m above sea level. The area is located between the tributaries of Cisadane River, i.e. Ciapus River and Cihideung River, such that it is bordered by two rivers in the north and west, while in the south it is bordered by a provincial road, and in the east it is bordered by a settlement. Bogor is famous as rainy city, with high precipitation that can reach over 4000 mm per year, and experiences nine rainy months per year.

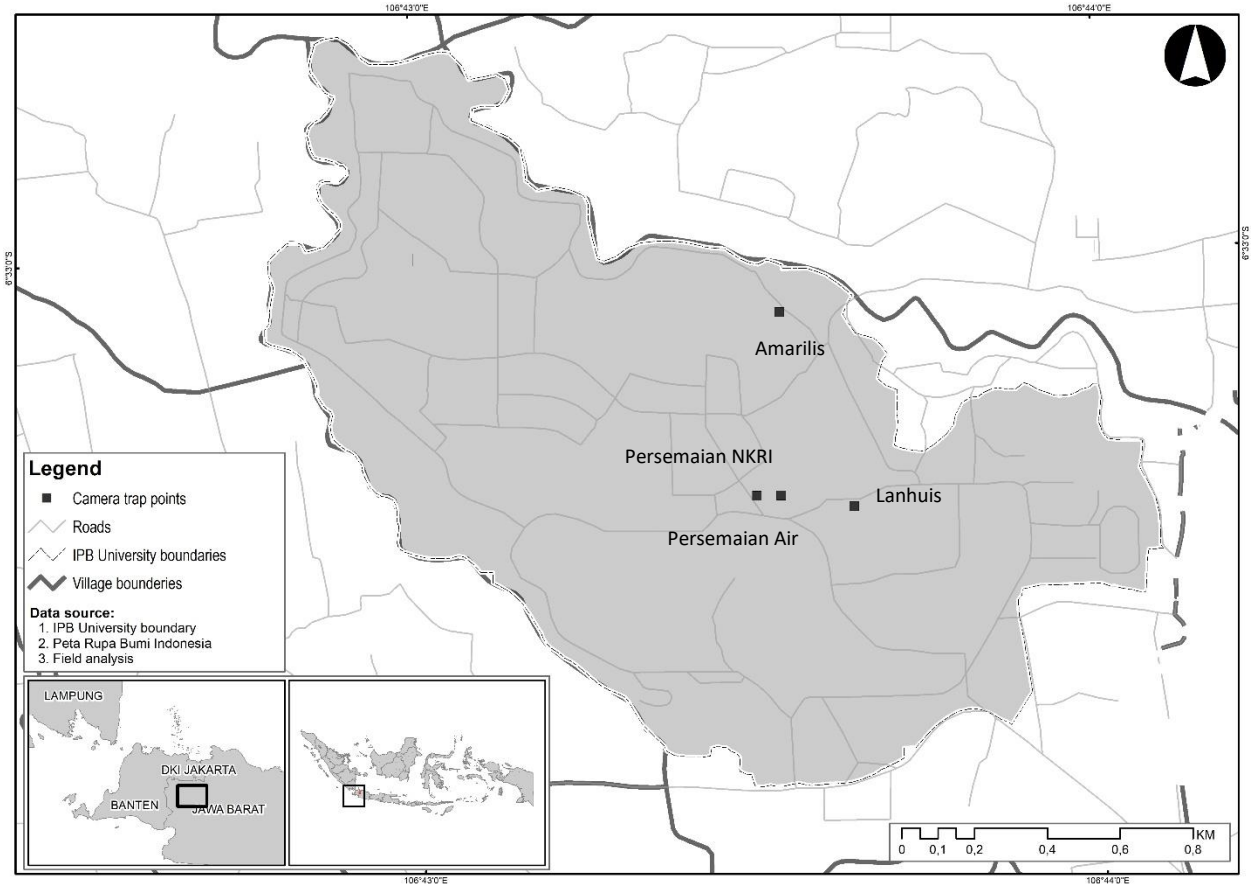



Figure 1. Map of campus IPB University in Darmaga, Bogor, Indonesia and location of 4 ponds used for callback experiment

The university campus was established in 1963 and was previously covered by a rubber plantation, and patches of forest-species tree plantations; however, rapid development that started in the late 1980s and early 1990s to facilitate academic processes has converted the

area to more buildings and other infrastructure. Some forested areas were also converted into an educational agricultural farm (i.e., an experimental field) and other facilities. Settlements around the campus to facilitate off-campus student housings have also been growing fast, making the area more and more similar to urban areas. Based on previous research, we selected 4 man-made ponds in campus which is the main habitat of ABST (Figure 2). The pond forms were irregular; diameter range between 0.5 m diameter (landhuis) to 3 meter (Persemaian NKRI). The ponds were made from clay (landhuis) or cement (Persemaian Air Mancur, Persemaian NKRI and Amarilis). In October 2022, the "Persemaian NKRI" pond were renovated and the base were changed from cement to ceramics. No toads were present afterwards and we disbanded the area. In January 2023 the pond of "Lanhuis" was also demolished by the management for a new look of landscaping.

Figure 2. From top left clockwise: the pond in Amarilis, persemaian NKRI, persemaian air mancur and Landhuis

We used recordings of advertisement call from *D. melanostictus* in the field as sound lure with two frequency, high frequency (1650-1700 Hz), and low frequency (1200-1250 Hz). Callback were played repeatedly for the duration of 18:00-06.00 without any traps from August 2022 to end of February 2023 (seven months) totaling 557 record day (Table 2.1). Every other day sound was switch off and in the next day were change either in high frequency or low frequency. Sound lure were powered with powerbank battery ACMIC PowerSlim 1000 mAh.

Table 1. Number of record days in each ponds from August 2022 – February 2023

| Month | Amarilis | Lanhuis | Persemaian Air Mancur | Persmaian NKRI |
|---|---|---|---|---|
| August 22 | 15 | 29 | 28 | 28 |
| September 22 | 21 | 20 | 25 | 21 |
| October 22 | 30 | 28 | 29 | |
| November 22 | 27 | 27 | 28 | |
| December 22 | 30 | 30 | 31 | |
| January 23 | 28 | 3 | 29 | |
| February 23 | 25 | | 25 | |

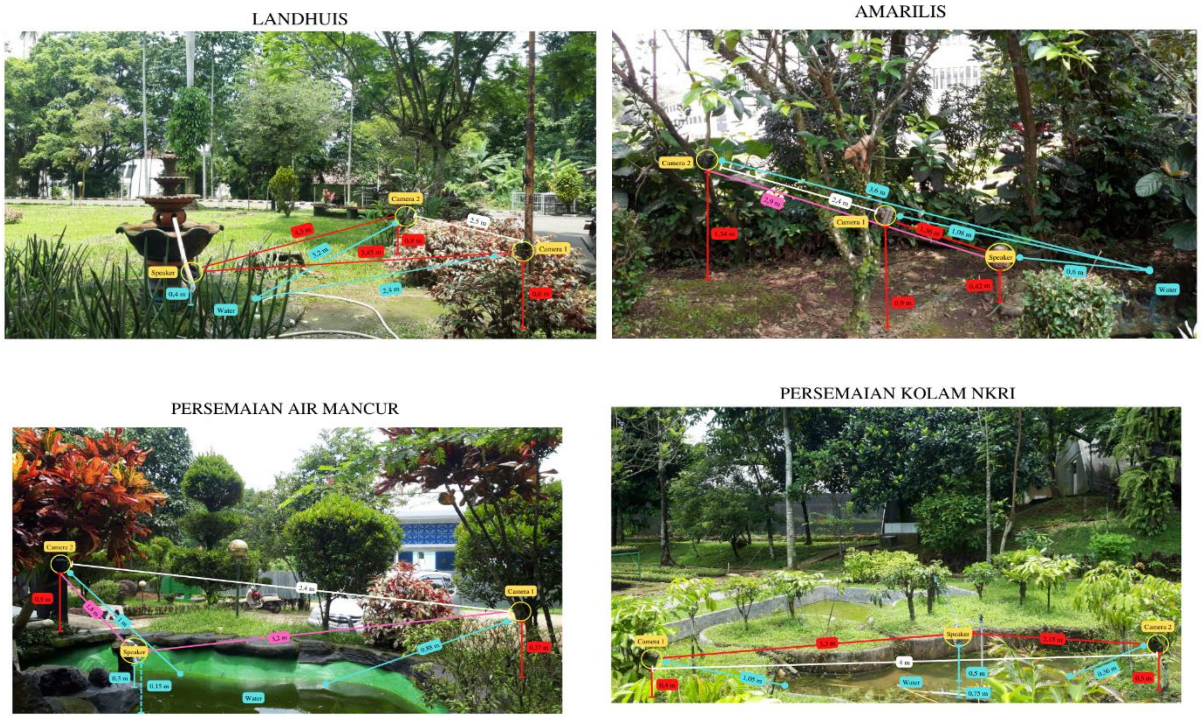



Figure 2. Set up of camera traps from top left clockwise: the pond in Lanhuis, Amarilis, persemaian NKRI, and persemaian air mancur

Trap/lure were set near water source (around 1 m from water source) or if possible in pond. Two camera trap (Bushnell Trophy Cam HD 20 MP 119876 and Bushnell Natureview Cams 12 MP 119739) were deployed in each trap. One camera was set in time-lapse mode taking one picture per minute for 12 hours on each night (from 1800 h to 0600 h (Figure 3). Another were set up using in hybrid mode to collect both images and videos using a medium-level motion sensor with three shots per detection. The duration of video settings were 15 seconds per minute per motion detected by the sensor. Cameras were operated with 12 batteries and equipped with 32 gigabyte SD cards to store images. The SD cards will be removed after 4 days of operation, to investigate whether the lure attracted toads, and to quantify the success rate of the Toadinator traps.

Camera traps results were put in data sheets for every 5 minutes. Since we were unable to identified individual toads, we did not add the total toads recorded in one record day as population. We use the highest number of toads in one record days and the % of camera traps pictures where toads were presents to analyse the effectiveness of lure for attracting ABST.

**RESULTS AND DISCUSSIONS.**

The highest number of toads congregate in one record day were from low frequency call back (10 toads in February 2023) however in two incidents higher number of frogs seen were higher during sound lure off (Figure 4). Comparison between the mean number of maximum toad present during high frequency and low frequency showed that there is no significant difference between high and low frequency ($t_{(12)}$=-1.312, p=0.214). However, comparison between mean number of maximum toad present with lure on and lure off also showed no significant difference ($t_{(19)}$=0.689, p=0.499).

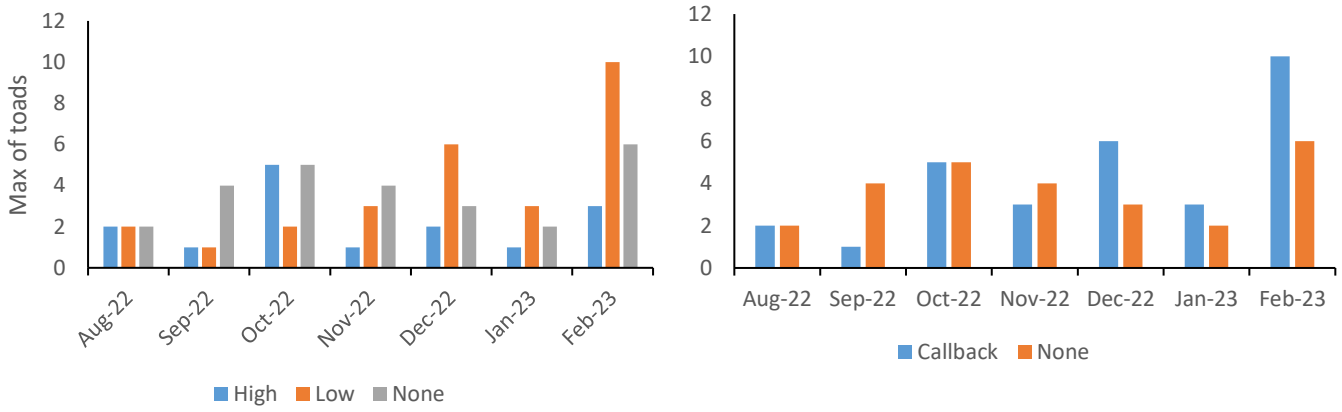
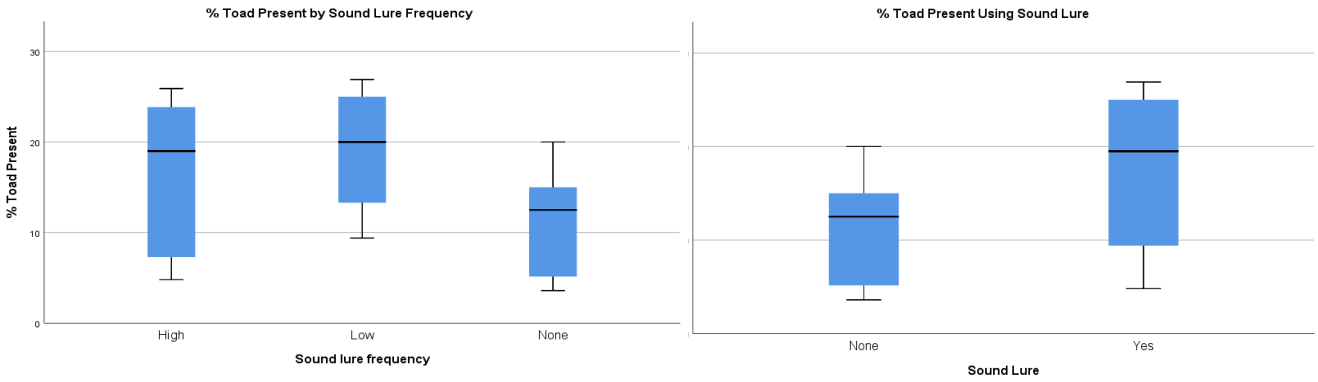



Figure 4. Left: the maximum number of toad present between lure using high frequency and low frequency and no lure. Right: The maximum number of toad present between lure on and lure off.

There is no difference of the mean percentage of toad appearing during sound lure on in high frequency and low frequency ($t(12)=0.682$, $p=0.508$) and toad has a tendency to appear more frequently when sound lure were on compared to no sound lure (Figure 5) however, the differences is not significant ($t(19)=-1.887$, $p=0.075$).

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