Illegal Wildlife Trade (IWT) Challenge Fund Half Year Report

(due 31st October 2017)

Project reference:	IWT039:
Project title:	A novel system to detect illegal wildlife in shipping containers
Country(ies):	Tanzania (APOPO) South Africa (EWT)
Lead organisation:	Endangered Wildlife Trust
Collaborator(s):	APOPO
Project leader:	Adam Pires
Report date and number (e.g. HYR1):	31st October 2017, (HYR1)
Project website/blog/social media etc:	www.ewt.org.za; www.apopo.org

1. Outline progress over the last 6 months (April – Sept) against the agreed project implementation timetable (if your project has started less than 6 months ago, please report on the period since start up to the end September).

Output 1: Proof of concept that African Giant Pouched Rats can detect and discriminate pangolin scents.
*Activity: 1.1 Appropriate training protocols are developed to train the rats to identify odours from target species.*

Due to the delay in procuring pangolin samples (see section 2a), 11 young rats (six males and five females, born 30 November 2016 - 8 December 2016) were trained to detect and indicate on a pure odor solution (citrus). All rats accomplished this goal by scoring the required 100% for the task before being moved to the next phase of training.

Activity: 1.2 Laboratory tests are conducted to test if the rats are able to discriminate between target species and control scents (Referred to as sensitivity).

The rats were then trained to discriminate target scents from an array of items commonly used as masking agents in shipping containers (see Output 2). These were introduced to the rats incrementally until any combination of any number of masking agents could be presented in a line-up.

Accurate and detailed training logs were maintained for all rats and all training sessions. This allowed us to measure the sensitivity (accuracy in detecting the target scent, Activity 1.2) and specificity (correct rejection of non-target scent) of the rats in detecting target samples (false alarm rate Activity 1.3). The data show that the rats improved in both sensitivity and specificity (false alarm rate decreasing) over time (see Figure 1). Decreases in performance noted in Figure 1 (either through temporary decreased sensitivity or increased false alarm rates) coincided directly with increasing difficulty in the training (e.g. adding more masking scents to the line-up). Once the rats mastered the new, more complex task, their performance returned. As training progressed all rats met the required standards to be considered competent.
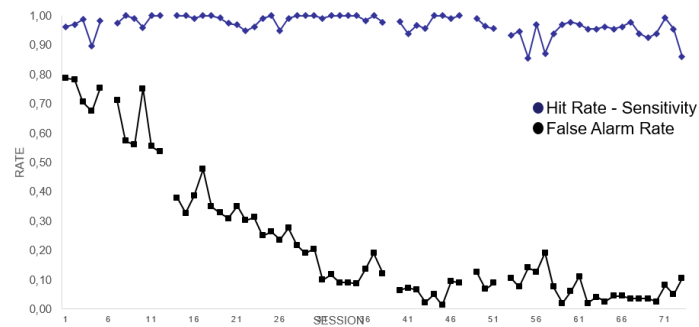
As soon as the pangolin samples have been prepared at APOPO the pure citrus scent will be replaced by the target scent. Previous studies (unpublished) conducted by APOPO show that re-training a new target scent can be done relatively quickly and effectively.

Activity 1.3: The rats have a 98% accuracy rate of detection (Referred to as specificity).

To be completed once pangolin samples are prepared.

Output 2: The African Giant Pouch Rats can detect pangolins and hardwood masked in other scents

2.1 Identification of the most common masking agents through a literature search of seizure data.

This activity was only planned for the fourth quarter of the first year, but has already been completed. These masking agents were identified from the Wildlife Seizure Database that has been maintained by the EWT from open source reports since 2012. These products include socks, electrical cable, cardboard, deunge beans, coffee beans and synthetic hair. Water was also used as a control sample early in training because its appearance did not differ from the liquid pure citrus scent. Thus, the rats must rely only on the odor of the sample to discriminate between the target and non-target water.

Additionally, the photoionization detector (PID) has been procured and is undergoing calibration to ensure that it is operational when needed to carefully monitor the "relative stinkiness" of each sample mixture (target along with non-target masking items) after the rats have successfully mastered identification of the pangolin target scent appearing in isolation versus masking items.

2.2 Procedures to tightly control sample mixture preparation and training procedures are developed

No be addressed in fourth quarter.

2.3 Training on complex scent mixtures, including target scents mixed with commonly used masking agents.

This activity is scheduled for the fourth quarter of the first year and the beginning of year two. Once the pangolin samples are ready and initial training to detect their scent has been completed, we will introduce this activity as planned, by presenting the rats with varying (tightly controlled and measured) combinations of the pangolin target along with masking items, to more closely mimic the real-life setting in shipping containers wherein these substances co-exist within a single container. The PID has been purchased and is currently at APOPO and will be used to measure the exact amount of target scent relative to the masking agents as well as control and measure the "overall stinkiness" of each odor combination presented to the rats. This will ensure that the rats are relying on the unique identity of the pangolin appearing in the mixture rather than just finding the smelliest samples (as might be expected when multiple items are presenting simultaneously in a single sample).

2a. Give details of any notable problems or unexpected developments/lessons learnt that the project has encountered over the last 6 months. Explain what impact these could have on the project and whether the changes will affect the budget and timetable of project activities.

Taking delivery of the pangolin samples became a far more complex process than we initially envisaged. We were informed of a pangolin specimen available from a zoo in Dar es Salaam; this was finally obtained in until late September 2017. The carcass is now at APOPO being dried and prepared. In the interim we have also managed to find another source of scales in South Africa. Previously we tried to source samples from the National Research Foundation (NRF) but we were not given permission to export these. The samples now sourced in South Africa just need to follow the necessary CITES export regulations to Tanzania. Because pangolins are listed on CITES Appendix 1 we will require an import permit from Tanzania, which will then accompany the application for the export from South Africa. The training of the rats has continued with a surrogate pure citrus scent and a rapid imprinting re-training to detect the pangolin scent will be done as soon as possible – hopefully by December 2017. We have also started to address some of the training that was planned for later in Activity 1 and Activity 2, making us ahead of schedule for these areas. As such we do not foresee any notable delays that will affect the budget and timetable of activities.

2b. Have any of these issues been discussed with LTS International and if so, have changes been made to the original agreement?

Discussed with LTS: No

Formal change request submitted: No

Received confirmation of change acceptance   N/A

3a. Do you currently expect to have any significant (e.g. more than £5,000) underspend in your budget for this year?

Yes ☐ **No** ☒   Estimated underspend: £

3b. If yes, then you need to consider your project budget needs carefully. Please remember that any funds agreed for this financial year are only available to the project in this financial year.

If you anticipate a significant underspend because of justifiable changes within the project, please submit a rebudget Change Request as soon as possible. There is no guarantee that Defra will agree a rebudget, so please ensure you have enough time to make appropriate changes if necessary.

Not applicable.

4. Are there any other issues you wish to raise relating to the project or to IWT challenge Fund management, monitoring, or financial procedures?

Nothing to report

If you were asked to provide a response to this year's annual report review with your next half year report, please attach your response to this document. Additionally, if you were funded under R3 and asked to provide further information by your first half year report, please attach your response as a separate document.

Please note: Any planned modifications to your project schedule/workplan can be discussed in this report but should also be raised with LTS International through a Change Request.

Please send your **completed report by email** to Victoria Pinion at IWT-Fund@ltsi.co.uk. The report should be between 2-3 pages maximum. **Please state your project reference number in the header of your email message e.g. Subject: IWT001 Half Year Report.**

ACTIVITY TABLE FOR THE IWT CHALLENGE FUNDING (C=completed; P=partially completed, O=not yet addressed)

| Output	Activity	Nr Months	Yr 1				Yr 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Output 1	Proof of concept that African Giant Pouched Rats can detect and discriminate pangolin scents									
	1.1 Appropriate training protocols are developed to train the rats to identify odours from target species.	6	C	C						
	1.2 Laboratory tests are conducted to test if the rats are able to discriminate between target species and control scents	6		P	P					
	1.3 The rats have a 98% accuracy rate of detection.	3			P					
Output 2	The African Giant Pouch Rats can detect pangolins and hardwood masked in other scents									
	2.1 Identification of the most common masking agents through a literature search of seizure data.	3				C				
	2.2 Procedures to tightly control sample mixture preparation and training procedures are developed.	3				P				
	2.3 Training on complex scent mixtures, including target scents mixed with commonly used masking agents.	6				O	O			
Output 3	Feasibility of future operational application is assessed through in-depth psychometric analysis of the rat's sensitivity in detection of target samples, including identification of the minimum concentration among masking agents									
	3.1 Determining the concentration gradient for rat scent-detection limits for pangolins.	3						O		
	3.2 Identification and analysis of psychometric properties of rat's pangolin scent detection abilities.	3						O		
	3.3 Assessment of translational relevance to real-life port activity through comparison to seizure data concentrations of illicit material among masking agents.	3						O		
Output 4	An artificial system is developed to signal positive detection of pangolin to the rat handlers in a simulated operational environment (i.e. one that simulates conditions for screening containers in a seaport)									
	4.1 Habituation of the rats to a mock port environment	1-2							O	
	4.2 Assessment of equipment needs to operate in a port environment	1-2							O	
	4.3 Construction of the required equipment	3							O	
	4.4 Assessment of the indication system feasibility in a port environment	3								O
	4.5 Determining other variables for successful detection by the rats, such as sample time in the container, container size, etc.	1-3								O

Rat "Marty" with his trainer, Karim, at one of the training cages used to train discrimination

Rat "Marty" during a training session
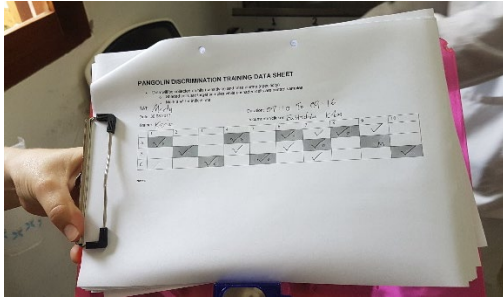
Accurate training records are maintained for every rat at each training session

All kennels are tagged and all rats microchipped to enable accurate husbandry record keeping that is updated daily

Four of the rats with their trainers

Two of the rats at three weeks of age