April 2010

Two Strategies for Landmine Detection by Giant Pouched Rats

Alan Poling  
APOPO

Christophe Cox  
APOPO

Bart Weetjens  
APOPO

Negussie Beyene  
APOPO

Andrew Sully  
APOPO

Follow this and additional works at: http://commons.lib.jmu.edu/cisr-journal

Part of the Other Public Affairs, Public Policy and Public Administration Commons, and the Peace and Conflict Studies Commons

Recommended Citation

Poling, Alan; Cox, Christophe; Weetjens, Bart; Beyene, Negussie; and Sully, Andrew (2010) "Two Strategies for Landmine Detection by Giant Pouched Rats," The Journal of ERW and Mine Action : Vol. 14 : Iss. 1 , Article 23. Available at: http://commons.lib.jmu.edu/cisr-journal/vol14/iss1/23

This Article is brought to you for free and open access by the Center for International Stabilization and Recovery at JMU Scholarly Commons. It has been accepted for inclusion in Journal of Conventional Weapons Destruction by an authorized editor of JMU Scholarly Commons. For more information, please contact dc_admin@jmu.edu.
Two Strategies for Landmine Detection by Giant Pouched Rats

This article compares the performance of Giant African Pouched Rats under two different management systems, both appropriate for mine-detection operational use. Employing International Mine Action Standards for accreditation, the researchers outline the process of conditioning and testing these mine-detection animals for field use.

by Alan Poling, Christophe Cox, Bart J. Westenens, Negussie W. Beyene and Andrew Sully [ APOPO ]

In many countries around the world, landmines do great harm by denying people access to their homes and land, as well as by causing bodily harm, death and psychological disorders. Several techniques for detecting mines have been developed, using both automated devices (such as flails and metal detectors) and animals (usually specially trained dogs). Recently, Anti-Persoonsmijnen Ontmijnende Product Ontwikkeling (APOPO) has developed operational procedures for landmine detection using Giant African Pouched Rats (Cricetomys gambianus). In the first nine months of 2009, these procedures were used to demine 199,318 sq m in Mozambique. The rats found a total of 75 landmines and 62 explosive remnants of war.

The rats are initially trained in a series of steps to sniff the ground in front of them and to pause and scratch when they smell TNT or, with appropriate training, another compound associated with a particular kind of mine or ERW. In Blantyre, a rat wears a harness that is attached by a lead to a rope stretched between two handlers who walk parallel paths down manually demined lanes. The rat moves back and forth along the rope, guided by lines attached to its lead, as the handlers move slowly forward. The photo to the right shows a rat working on a rope. This technique allows the animal to sniff all of the ground between the handlers. Two rats sniff the area and an indication of a mine by either rat is followed by manual demining with a metal detector. In Blantyre, the area to be searched is mechanically cleared of vegetation before the rats are used.

This procedure works well but cannot be used when rocks, large trees or other obstacles block the path of the rope. APOPO has developed another system for using rats in such cases, and when the goal of demining is to clear a relatively narrow linear area—for example, a path and the areas immediately alongside it. In this case, the rat’s harness is attached by a lead to a long (2.5-m) lightweight pole, which is moved by the handler to direct the animal slowly across the area to be demined. The photo on the opposite page shows a rat working on a pole. The handler moves along a well-marked, manually demined path. By slowly moving the pole—the handler from side to side as she or he proceeds down the safe path, the handler demines a lane that is roughly twice as wide as the pole is long.

The pole arrangement can also be used as an alternative to the rope system for demining large open areas. In one such application, parallel safe lanes are cleared slightly less than two pole lengths apart, and handlers move down the lanes demining in each side, so there is some overlap in the areas covered by rats demining from adjacent lanes. In the second arrangement, which minimizes the need for manual demining, a safe lane is cleared and the trainer moves down it, directing the rat only to one side. With both systems, a second rat then searches the same area in the same way. If either rat indicates the presence of a mine, that area is manually demined. If neither rat indicates the presence of a mine, the area they have covered is deemed safe. With the second arrangement, a<br>

A pouched rat works under the rope system. (All photos courtesy of APOPO.)

A pouched rat works under the rope system. (All photos courtesy of APOPO.)
the journal of research and development

The rat’s location at any point in time. Each box contained between zero and three mines. Vegetation was regularly hand-clipped from the boxes with machetes to a height of approximately 2.5–3 m. Each rat was tested in four boxes using the pole system and in four other boxes using the rope system. According to International Mine Action Standard 09.42.3 which describes operational testing for mine-detection dogs and handlers and also is applied to rats, the animal and its handlers—who are blind to mine locations—must detect every mine in a test area of at least 400 sq m with two or fewer false alarms (defined as recognition responses located farther than 1 m from the nearest mine). IMAS requires there be five to seven test items in that size area. To approximate the density of mines required by IMAS 09.42, the four 100-400 sq m boxes used with each rat contained a total of four or five mines and no individual box contained more than two mines. Boxes were selected at random with the provision that the number and type of mines used for the two types of testing were approximately equal, and only boxes measuring 20 x 20 m were used for pole tests. Not enough boxes were available to allow only 20 x 20 m ones to be used for all tests and a mix of 10 x 10 m and 20 x 20 m boxes were used with the rope system. Each box was used only once in these tests.

Four randomly selected rats were initially tested with the pole system. During this testing, a rat’s usual trainer carried the animal to its first selected test box, attached its harness and fastened the harness to a nylon cord affixed by the trainer to a pole of at least 2.5-m to 3-m fiberglass pole. The trainer then took the animal to the right rear corner of the box and began the training sessions, which were identical to the test sessions, save that trainers knew the location of mines and sounded a clicker immediately upon the rat correctly identifying a mine. Such training was arranged in two separate boxes for each rat. Training days for the rope system followed the majority of pole training procedures.

The other four rats were initially tested with the rope system. Here, two trainers worked with each rat. They brought the animal to the designated field, attached its harness and connected the harness to a nylon cord joined to a swivel through which a nylon rope passed. This arrangement allowed the trainer (and the handler and rat) to move along the length of the rope, which had loops at each end and was slightly longer than the width of the box (approximately 5 to 10 m). A trainer located at the right front of the box placed one foot through one of the loops at called level and the other trainer, who stood at the left front of the box, used the same with the other loop. They stepped apart sufficiently to tighten the rope with the nose placed at the right front corner of the box. The trainers held thin cords attached to the harness rope by hand. By gently pulling on one cord and feeding out the other, the trainer could, if necessary, direct the rat to move along the rope. Pulling was rarely necessary, however, because trained animals independently move from side to side along the rope. Once the rat traversed the length of the rope, both trainers took a sideways step (approximately 0.5 m) and the process was repeated. Such activity continued until the rat reached the left front corner of the box, at which time it had covered the entire test area. As with pole tests, the trainers recorded the time required to complete testing and the location of any indicated mine, did not know the location of mines, and ensured that the presence of a mine had no consequences for the rat. Two rope tests were conducted on each of two days for every animal.

After a rat finished four boxes under its initial testing condition, it was given a training session with the other procedure (rope training for rats initially tested with the pole and vice versa), and then was tested with the other procedure. Conditions of these tests were as just described.

On days immediately prior to pole tests, rats were exposed to training sessions that were identical to the test sessions, save that trainers knew the location of mines and sounded a clicker immediately upon the rat correctly identifying a mine. Such training was arranged in two separate boxes for each rat. Training days for the rope system followed the majority of pole training procedures.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

It is important to emphasize, however, that this assessment occurred under experimental—not operational—conditions, and the data is not large. APOPO is moving toward having rats handled with the pole system approved as mine-action animals in Mozambique and expects to seek approval later in 2010. Once this occurs, the operational settings in which the pole system is especially useful, and the rat’s performance in such settings, will be determined.

As confirmed by APOPO’s practical experience in Mozambique, the rats have some significant general advantages relative to dogs for demining applications. They are easy and inexpensive to procure and they are small (1–1.5 kg), which allows them to be housed humanely in small cages and makes it highly unlikely that they will activate a mine or ERW (which has never occurred during the rats’ demining in Mozambique). Their food requirements are modest and can, if necessary, be obtained locally at little expense. Their health is robust and they are not bothered by the parasites and fungal infections that beset dogs. Unlike many dogs, Cricetomys do not bond with individual handlers and will perform equally well for anyone who knows how to use them. This is not typically impairing, because human dominants do challenging work, such as human dominants do challenging work, often in hot and otherwise difficult conditions; hence, staff turnover can be high. Finally, the rats mature quickly, and training can begin when they are young and be completed relatively early in their life, which can span up to eight years in captivity.

Being able to use both the pole and rope systems increases the rats’ versatility, not unlike the option of using short- and long-lead systems increases the versatility of mine-detection dogs. Using both procedures does not add to the rat’s training; hence, the data set is not large. APOPO is moving toward having rats handled with the pole system approved as mine-action animals in Mozambique and expects to seek approval later in 2010. Once this occurs, the operational settings in which the pole system is especially useful, and the rat’s performance in such settings, will be determined.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

On days immediately prior to pole tests, rats were exposed to training sessions that were identical to the test sessions, save that trainers knew the location of mines and sounded a clicker immediately upon the rat correctly identifying a mine. Such training was arranged in two separate boxes for each rat. Training days for the rope system followed the majority of pole training procedures.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.

The performance of six of the rats under both conditions met IMAS standards for accreditation as described earlier. The performance of the other two rats met IMAS standards under one condition but not the other. Overall, the rats located 31 of 33 mines (91%) under each condition with a single false alarm, which is a very good detection rate.