APPENDIX 4-3: *EUGLANDINA ROSEA* EXCLOSURE DESCRIPTION

The following sections describe the beginning approach taken by OANRP to exclude *Euglandina rosea*. These preliminary results were presented to potential New Zealand contractors. OANRP is now in the final stages of awarding a contract to construct these barriers in two sites, at Puu Hapapa and Poamoho.

Fence design specifications: The backbone of this fence will be a rat/mouse proof fence based on patented designs from qualified and proven companies such as Pest Proof and Excluder. This fence must have all the necessary components to ensure ungulate and rat/mouse exclusion including a buried section, mesh of an appropriate size, a hood, sturdy construction and long lasting (20 year) galvanized and/or stainless steel components. Poamoho will not be within a larger panel/hog fence. Overall the fence must be at least 1.3 meters high. See pictures below, note the fences shown in photos are taller than what will be built for *E. rosea*, rats and mice.

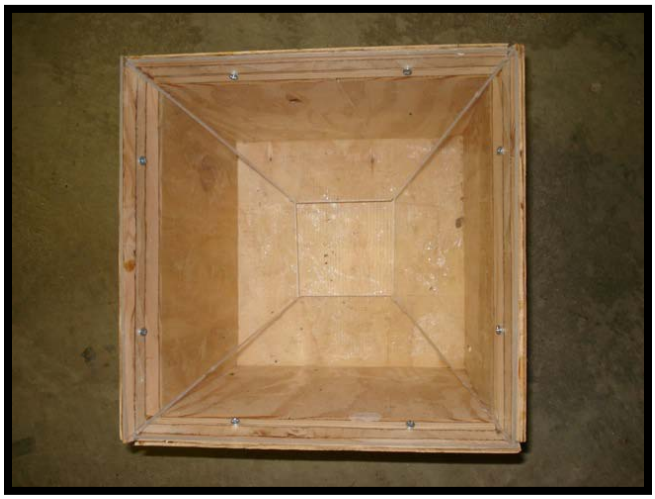
Excluder Fencing

Pest Proof Fencing

***E. rosea* barrier specifications**: The typical predator type fence shown above will be enhanced with additional barriers to exclude *E. rosea*. They will be mounted on a solid stainless, copper or synthetic panel secured to the bottom third of the rat/mouse fence. This barrier must be continuous to ensure juvenile *E. rosea* cannot penetrate it.

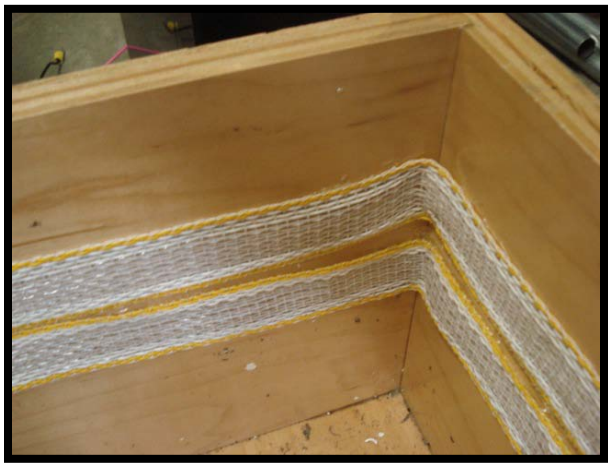
This is the first time that fencing integrating these types of barriers will be constructed. Therefore, there is not an established specification for construction. OANRP has been experimenting with these barriers for some years and has developed the guidelines below. However, OANRP does not have extensive experience in fence construction beyond ungulate type fencing. Therefore, OANRP will collaborate in finalizing the design components of this portion of the fence once the project is awarded. When bidding the project companies should include the cost of this 'design' aspect. Below OANRP describes the parameters of these barriers as developed so far. With this strategy it is the intent of OANRP to utilize the contractor's expertise to collaborate on the final design of these components.

Angle Barrier: The angle barrier is the simplest of the barriers to be installed. A smooth piece of copper or stainless flashing will be attached to the vertical wall of the fence such that it extends down at an angle of 15-20% and at its terminal edge is at least 7 cm from the wall of the fence. These specifications require a flashing of approximately 20-30 cm depending how it is secured. The picture below illustrates the angle barrier inverted to facilitate testing. Corners on the fences should likely be rounded to avoid having to join materials as seen below.



Angle box in lab

Electric Barrier: Using a low voltage barrier has proven to be an extremely efficient method to exclude *E. rosea* in laboratory tests. On small scale trials as illustrated in the picture below two sixteen-wire livestock tapes are glued in parallel to the vertical surface. In alternating sequence eight wires from each tape are then joined to the positive then negative pole of two 12 volt batteries in series for a total of 24 volts.



Livestock tapes mounted in test box

Test box with 12 volt batteries

When *E. rosea* attempt to cross these wires they are effectively deterred by the low current and low amperages encountered. There are a couple of aspects of this barrier that are still under investigation and design. First, a reduced charge encountered by the *E. rosea* at increasing distance from the battery is still under investigation. To ensure that the barrier remains effective it may have to be boosted intermittently along the length of the fence using larger diameter insulated wiring. The best mounting mechanism for the system has yet to be determined. The system must allow for easy maintenance and repair, but must not compromise the integrity of the barrier. The tape must be mounted flush or with 2-3 mm of the vertical surface and must not have any fasteners that bridge the tape allowing for a safe passage across the wire barrier. Currently OANRP has used construction adhesive to fasten the tapes; however this will not allow for maintenance and should be considered a last resort.

Photovoltaic system: To ensure batteries stay charged on site and maintain an effective barrier a simple PV system will be required.

Cut Wire Mesh Barrier: This is the most effective physical barrier that has no electric components. This barrier works by presenting a surface that does not provide adequate adhesion as *E. rosea* traverses it upside-down, thus the snail falls to the ground. The barrier must be fastened to the vertical wall in a perpendicular orientation such that the *E. rosea* must traverse it upside-down and to prevent debris from accumulating on the surface. The grates must be spaced close enough to force *E. rosea* of all sizes to pass over and not through. There are no strict parameters around the fabrication of this barrier. However, it must be constructed out of a long lasting synthetic backing and with copper or stainless components to ensure durability. Specifications are presented below. As discussed with the angle box it may be best to construct this barrier along rounded corners to ensure no gaps in presentation.

This shows the test box barrier upside-down. *E. rosea* were placed in the box and encountered this barrier as they came up the vertical sides and onto the roof of the box.

This is a close up of the barrier constructed with copper screen mesh mounted no more than 4-5 mm apart for a total width of no less than 8 cm.

This picture shows the copper screen presenting a grid of 12 rows of shredded screen.

Barrier sequencing: Currently OANRP staff are still discussing the best barrier arrangement. A hood may also be required over these systems as protection from the elements and to prevent accumulation of debris.

Site Monitoring: With so much invested in the development and construction of these fences a remote monitoring system must also be included to ensure continuous barrier integrity in remote areas. This system must be remotely accessible and updated on the following parameters. First, the system must indicate if there has been anything that has fallen across the barrier. This can be accomplished by using a grounding ring system or something comparable. See picture below.

Second, the integrity of the PV system including the condition of the batteries must be monitored. Third, a weather system to monitor basic environmental conditions to include temperature, wind speed, direction and gust velocity, humidity and rain fall must be included. These parameters can be measured by many types of commercially available weather stations.