Trapping the *Achatina fulica* in Barbados and beyond: An assessment of trap design effectiveness and potential

By: Brenna Coleman, William Dreyer and Forrest MacDonald.

Introduction

The *Achatina fulica* is a land gastropod native to Eastern Africa. This species was brought to Barbados around 2000, and has now been on the island for approximately 12 years.

The Giant African Snail poses a threat not only to agriculture but also to human health and to the beauty of the island (Provencher et al., 2011). It is well known that the GAS is an invasive species, so their presence on the island of Barbados is not welcome. It has been found that these snails are the intermediate host for angiostrongylid nematodes. One of these nematodes, *A. cantonensis*, causes rat lungworm and may pose a threat to human health, as it is known to cause eosiniophillic meningitis. Eosiniophillic meningitis is a life threatening condition for humans (Slom, 2002).

The GAS also eats more than 500 different types of plants as well as known agricultural crops (U.S. Department of Agriculture, 2012). This can cause huge problems in various ways. First of all, this is a threat to agricultural producers whose crops are being destroyed, and it is a problem for the people who would be buying these crops. Secondly, this poses a threat to the beauty of the island in that the GAS eats some ornamentals; furthermore simply their existence on this island threatens its beauty as most people think they look disgusting. Lastly, the introduction of GAS on the island threatens the natural ecosystem, as they are not a native species. Barbados has a fairly closed system due to its isolation; the introduction of a non-native species that becomes invasive is a huge threat to its ecosystem.

The Project

In 2011, a B.I.T.S. group consisting of Tamara Provencher, Anna Kalkanis-Ellis, and Martin Legault completed a project building traps for the Giant African Snail (GAS). These traps, though effective, could be improved upon. Our group used the expertise gained from a trapping project from 2011 by Provencher et al., to attempt to improve on the traps they designed and to further the knowledge of how to effectively trap the G.A.S. To do this we designed and built two prototypes – one inverted and mounted on a pole planted in the ground and one standing up on the ground. Our objectives when designing and building these traps were: to design and build at least 2 trap models; to use locally available, low cost materials; to make the trap easy-to-use; to reduce contact between the user and the snails; to test the traps and consider improvements; to do a cost-analysis; and to offer advice and recommendations for future trapping projects. All of the trap building was carried out in the Pure and Applied Sciences Workshop at the University of the West Indies. Run by Glendon Pile, the workshop is fully equipped with the necessary tools and machines to construct traps on a very small scale. The production potential at this workshop is sufficient for the purpose of building prototypes, but any scale-up in production would require a move to a commercial workshop or industrial fabricator.

Our Designs

When creating the trap designs, we kept in mind our goals to keep the traps user friendly while being effective. This led to the design and construction of two trap prototypes. We decided to design more than one prototype because different designs might be suited to different environments or settings in Barbados. Both incorporate the basic tenets that we believe will be vital components of a successful trap design. Namely, both traps will use molasses as a bait or attractant to attract the snails, based on the findings of effective bait for the Giant African Snail by Provencher et al. (2011). Both prototypes also utilize a similar design for a one-way door, which serves the purpose of letting snails enter the trap, but blocks them from exiting the trap. This door is designed as a rectangular hole cut in the trap, on the inside of which is a rubber flap cut into strip-like sections. Each section is made firm by a backing of a wire strip. The flaps overlap the rectangular cutouts on the inside of the trap so that they hinge inwards, allowing the snails to push themselves into the trap, but not out of the trap. These doors were designed after Provencher et al. mentioned the problems they experienced with snails being able to escape their doors made of cut up straws, thus we decided to strengthen the doors (Provencher et al, 2011). The third main component of the trap prototypes is a bag/liner system that lines the inside of the trap. The liner is a plastic bag (or potentially a compostable bag in the future) that can be tied off once the trap is full. This idea is akin to using a plastic garbage bag to line a garbage can.

Prototype 1

Prototype 1 is based on the idea that snails like to climb upward. It is a bucket with a removable clear top, which can be inverted and screwed onto a pole that is set into the ground. Once inverted, the entrances face the ground and are in close proximity to the pole that snails would climb in order to reach the bucket. The lining bag, in this case, is upside down. The bottom of the bag is held in place by a clamp system. The bag will be lined with molasses for bait.

Prototype 2

Prototype 2 is a simpler design. It is a two-part trap. The bottom (collector) section is simply a five-gallon bucket, while the top (cover) is a top section of another five-gallon bucket that sits flush on top of the collector. The cover section has three entry points with one-way doors. Directly below these doors on the inside surface are plastic strips hanging downward that act as a sort of one-way speed bump. Once inside, snails will be able to climb downward into the collector, but the plastic strips will discourage any snail climbing upward. The plastic bag liner is simply attached to the cover section and placed inside as the cover is placed on top of the collector.

Testing and Results

We performed controlled testing on both prototypes. We used two different tests: one in which snails were placed around the traps and then observed and one where they were left in snail pens to see whether or not the snails would go into the traps over a 3 day period. Our testing taught us that our doors are not the most effective, and that our trap designs are flawed. Our inability to test earlier in the project due to low availability of snails means that there was no time to make large modifications to our design. We were able to un-invert prototype 1 and snails did eventually go into the trap, though whether or not they could get out is debatable. The issue with snails escaping is that the door was no longer flush with the opening so it was more like an open hole.

Conclusions and Recommendations

The idea of traps is certainly a viable way to deal with the snails, as we learned this summer when we were able to construct traps and deploy them, though ours certainly had their problems. The design was flawed but the actual construction, transport and deployment of the traps are relatively simple, making this idea an interesting one to continue to pursue in the future. We recommend that future projects either consider the design of an effective one-way door or design a trap that involves no doors, as both our project and Provencher et al.'s projects had problems with doors.

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