

The Giant African Snail and Barbados: Potential Health Effects and Efforts to Control Snail Population

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The Giant African Snail (GAS), formally recognized in Barbados in 2002, is an invasive species originating in East Africa. It has established populations in South America, Sub Saharan Africa, South and South East Asia, and has been present in other West Indian islands since the 1980s (Fields et. al., 2006).

Since 2002, GAS have spread from their point of origin in the west coast of Barbados to all 11 parishes. Their populations have grown in numbers due to a high rate of reproduction and impressive adaptive measures such as wide range in diet, and egg dispersal on cars, people, and soil.



Figure 1. GAS in the grass.

Health Concerns Related to GAS

GAS can be an intermediate host for the parasitic nematode, *Angiostrongylus cantonensis*. These nematodes can be passed on to humans most commonly through the consumption of uncooked

snails, slugs, or contaminated uncooked vegetables (Pien et. al., 1999). When ingested by humans the nematode will migrate to the brain, spinal cord, and nerves causing Eosinophilic meningitis. This condition causes inflammation of the meninges, which can lead to mental retardation, nerve damage, permanent brain damage, or death. The *A. cantonensis* nematode has been found in Brazil, and in many other countries where GAS are found. The presence of this nematode in Barbados could have serious negative effects on tourism and pose a risk to the health of the local population.

Need for Control

If the nematode *A. cantonensis* is present in Barbados, the importance of control measures becomes paramount. This is due to the risk that meningitis poses not only to public health but possibly to the economy through reduced tourism owing to health concerns. Currently, the main strategy of control being implemented by the government is the Bounty System (est. 2009) which pays Barbadians \$.50 per pound of GAS collected. The success of control is dependent on rates of community participation, within a specified area, with the goal of collection rates being on par or greater than that of GAS reproduction rates.

The Ministry of Agriculture and Rural Development used to offer molluscicide as a method of control, but this was

discontinued due to unsustainable costs and issues of misuse.

Study

To attempt to understand the potential risks posed by GAS, we undertook a survey to search for evidence of *A. cantonensis* in Barbados under the supervision of Dr. Angela Fields, terrestrial mollusk expert at the University of the West Indies. We also examined control measures and behaviors exhibited by the Barbados community under the guidance of Mr. Ian Gibbs, Head of the Entomology Division at the Ministry of Agriculture.



Figure 2. Our group members hunting GAS on the UWI campus.

The protocol used was adapted by Dr. Fields from a protocol by Rosen and Wallace (1969) to sample GAS. Snail samples were collected from every parish. Sites were selected with preference towards locations with higher snail and rat densities (such in and around gullies and near landfills) as these factors would encourage transmission and therefore detection of *A. cantonensis* if present. In total, 30 sites were surveyed.

The investigation of community control behaviors was conducted by an analysis of Bounty System receipt records provided by the Ministry of Agriculture and Rural Development. A survey was conducted which inquired into the snail densities near the homes of respondents, along with specific impacts of GAS on their lives, control measures, observed trends in changes of GAS populations, and whether or not respondents knew of and actively participated in the Bounty System.

Prior to this study, there had been limited analysis of control measures. This survey sought to identify factors that could encourage participation in control programs and improve GAS control.

Results

Of the 30 sites sampled, nematodes were detected at 14 sites. All parishes except St. Lucy and St. Philip were found to have GAS hosting nematodes. While it may be that nematodes are not present owing to the perceived low snail densities within these parishes, given the high mobility of snails and the lack of up-to-date population density studies, the absence of nematodes can only be inconclusive, not definitive.



Figure 3. *Angiostrongylus cantonensis* as seen through the microscope (approx. 2 mm long).

During our analysis of control behaviors, it was found that instead of widespread island participation, there is a distinct and limited group of people who participate in the Bounty System regularly. These individuals bring in from 5 lbs to over a 1000 lbs. Participants tended to collect similar amounts per submission over time.

Based on survey responses where we compared perceived GAS densities, perceived annoyance at GAS, and attitudes toward the Bounty System, we can postulate that those that participate in the bounty system are motivated more by monetary incentives than concerns about snail densities. Many survey participants considered the possibility that bounty system participants would breed snails, add weights to their bags to increase the appearance of additional snails, or use the Bounty System purely as a means for easy income. Due to high frequency of collection and number of pounds collected, it is possible that some individuals are using the bounty system as a source of steady income.

Those that do not participate in the Bounty System tend to do so owing to lack of time and perceived hassle involved with participation. Their responses indicated that they were of sufficient income status to find little motivation in monetary incentives unless these were greatly increased.

Though they do not participate in government organized snail control, every single respondent who had snails on their property were actively engaged in snail control. Many went out daily to spray, stomp on, and drown snails

present on their property. Popular forms of control include salt, bleach, and molluscicide pellets.

Overall, respondents felt that snail densities are increasing slowly but steadily. However it is not definitive if respondents placed a distinction between seasonal and yearly increases.

Analysis

It is extremely important to note that the identification of nematodes in nine out of eleven parishes does not mean that *A. cantonensis* is present on the island. There are many nematodes present in the soil and at this point in the study, definitive confirmation as to the species of nematodes found has not been obtained.

We are confident in asserting that nematodes are present in GAS dwelling in Barbados in a variety of types of sample sites such as gullies, wooded areas, residential locations, and commercial locations. It is interesting to note that our assumption that nematodes would be present in greater numbers in gullies is lacking in empirical support. It is also of note that owing to our limited sample sites, we are unable to claim that they are present in greater numbers in certain parishes as opposed to others.

Results from control measure assessments indicate that limited participation in the Bounty System is not a cause for concern to those interested in GAS control. Many Barbadians actively control at home which is likely to have positive outcomes in snail control. It can be suggested that

the Ministry of Agriculture and Rural Development take measures to use active participants to target specific high density snail areas. We feel that this will be more effective than encouraging random GAS collection as this will probably not result in removal rates conducive to control.

Recommendations for Future Study

For future studies, we strongly recommend that researchers take immediate action to collaborate with the Center for Disease Control or another agency to secure the technological capacity in Barbados for definitive confirmation of *A. cantonensis*. Once nematode speciation can be readily accomplished, a greater number of sample sites should be investigated and individual snails should be analyzed to determine the percentage of snails infected by *A. cantonensis* and other potentially dangerous nematodes carried by snails (and other vectors).

A population study should also be conducted to determine the true nature of snail densities in Barbados. This would be of great benefit to centralized efforts to control the GAS. It is widely perceived by the public and academics alike that eradication of the GAS is unlikely, yet if appropriate steps are taken, control may be possible.

Efforts to refine the Bounty system should continue, in order to maximize its efficacy. Further survey work is indicated, and the survey used here can be widely applied. Further public education on GAS is necessary to

maintain the current momentum, where most homeowners practice snail control. Any knowledge of improved mechanical control measures for GAS should be shared with the public. This is very important because many homeowners, on their own initiative, continue to apply or misapply environmentally-harmful molluscicides.

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