

# Towards Eradication of giant African snail *Achatina fulica* in Trinidad and Tobago



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# Introduction

- Giant African snail, *Achatina fulica* Bowdich (Mollusca: Achatinidae) is a serious pest
- One of the worlds worst 100 invasive alien species
- Attacks over 500 species of economic plant species – prefers:
  - breadfruit (*Artocarpus sp.*)
  - cassava (*Manihot esculenta*)
  - cocoa (*Theobroma cacao*)
  - most species of legumes, crucifers and cucurbits

# Distribution

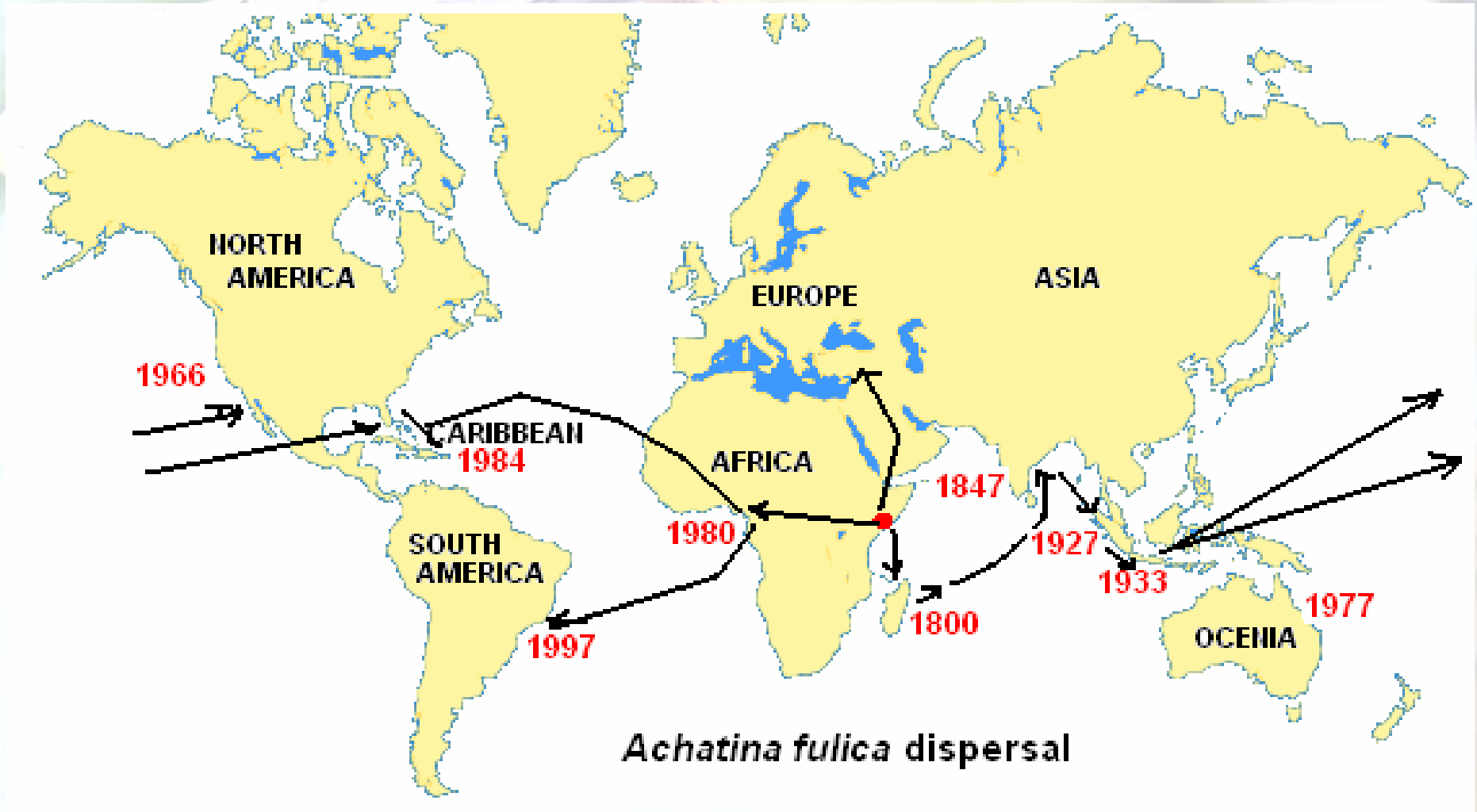


Figure 1: World distribution of *A. fulica*



# Distribution (cont'd)



Figure 2: Distribution of giant African snail in the Caribbean Region

# Biology and Ecology

- Eggs are pale yellow or cream in colour, oval in shape, 4-5mm in diameter
- Laid in clutches from 100-400 three to four times per year
- Lay more than 500 per clutch depending on maturity of the snail, environmental conditions



# Biology and Ecology cont'd

A close-up photograph of a snail on a green leaf. The snail's shell is a light brown color with a spiral pattern. Its body is a pale, translucent greyish-brown. The snail is positioned in the lower right quadrant of the frame, with its head and antennae extended. The background is a soft-focus green, suggesting a natural outdoor setting.

- Most eggs are laid:
  - during the wet season
  - in soil debris
  - in depressions
  - under objects
  - and hatch in 1-17 days



# Biology and Ecology cont'd

- Average live span of *A. fulica* is 4-5 years
- Lives up to 9 years
- Rapidly multiplies and establishes itself in a relatively short time in a new environment
- *Achatina fulica* is nocturnal
- More active in the rainy season
- More abundant after heavy rains

# Biology and Ecology cont'd

- During the day it hides in cool sheltered areas
- Can be found
  - on and in bricks
  - in crevices on walls
  - on plant detritus,
  - within the plant canopy
  - under plants



# Biology and Ecology cont'd

- Signs of snail presence:

- Defoliation
- Extensive rasping
- Slime trails
- Ribbon-like faeces



# Biology and Ecology cont'd

## *A. fulica* :

- may aestivate during dry weather
- emerges from aestivation when conditions become humid and wet to feed
- is a hermaphrodite
- produces viable eggs by reciprocal copulation
- could store sperms for > 1 year sperm after a single mating
- can establish a whole colony (single fertilized snail)

# Survival in Trinidad

A close-up photograph of a snail on a green leaf. The snail's shell is a dark, glossy brown with some lighter, yellowish-orange spots. Its body is a lighter, greyish-brown color. The snail is positioned in the upper left quadrant of the frame, facing towards the right. The background is a soft-focus green, suggesting a natural outdoor setting.

In the Northern Range due to:

- soil with high calcium carbonate content
- year round maintenance of shrubs, lawns and trees
- high rainfall and humidity during the wet season
- absence of predators or natural enemies



# Plant Damage

- Frequently reported on crucifers, cucurbits, and legumes
- Not observed in Diego Martin
- Some damage observed:
  - Diego Martin - *Heliconia sp*, *Spathiphyllum sp*.
  - Guadeloupe - sugar cane seedlings, cucumber, yam, dasheen, banana and papaya
  - St. Lucia - papaya, mango, breadfruit, and some ornamentals
  - Barbados - breadfruit, sweet potato, cabbage and cucumber

# Damage of *A. fulica* on *Heliconia sp.*, and *Spathiphyllum sp.*



*Heliconia sp.*



*Spathiphyllum sp.*



# Nuisance Factor

A close-up photograph of a snail on a green leaf. The snail's shell is a reddish-brown color with distinct spiral patterns. Its body is a lighter, greyish-brown color. The snail is positioned in the upper left quadrant of the frame, with its head and antennae extending towards the right. The background is a soft-focus green, suggesting a natural outdoor setting.

Multiplies in such large numbers resulting in

- Nuisance on households/housing communities
- Not possible to walk a pathway without crushing the snail
- Defacement of walls leaving ribbon-like faeces
- Slime trails on walls, floors and concreted areas
- Dead and decomposing snails that leave an obnoxious scent on properties



# Examples of Nuisance



# Vector

A close-up photograph of a snail on a green leaf. The snail's shell is a mix of brown and tan with distinct spiral ridges. Its body is extended, showing its head and legs. The background is a soft-focus green leaf.

- *Angiostrongylus cantonensis*, the rat lungworm
- Causes eosinophilic meningitis in humans
- Bacteria - *Aeromonas hydrophilia* and *Salmonella* - cause several health problems
- Plant pathogens - *Phytophthora spp.*



# Eradication

- Quite costly
- In Florida, estimated that an annual loss of \$US 11 million in 1969 without control measures
- Florida - successfully eradicated in 1975 at a cost of \$US 1.0 million
- In Gordonvale, Queensland, Australia an outbreak was successfully eradicated in 1977
- Currumbin Valley, Australia 1984



# Objectives

A close-up photograph of a snail with a brown, spiral shell and a greyish-brown body. The snail is positioned on a light-colored wooden surface, with its body extended forward. In the background, there is a green leaf and a blurred outdoor setting.

- Eradicate *A. fulica*
- Fulfill the requirements to determine pest free status for *A. fulica* in Trinidad and Tobago.

# Methodology

A close-up photograph of a snail moving across a wooden surface. The snail's shell is a mix of brown and tan colors, and its body is a pale, translucent grey. The background is slightly blurred, showing more of the wooden surface and some green foliage.

## Delimiting Surveys

- Determine the boundaries of the four infested areas
- Core zones
  - Protection
  - Public Outreach Zones

# Eradication Strategies

A close-up photograph of a snail moving across a light-colored wooden surface. The snail's shell is a mix of brown and tan, and its body is a pale, translucent color. The background is slightly blurred, showing more of the wooden surface and some green foliage.

Four-pronged approach:

- Surveillance
- Collection and destruction of snails
- Application of snail baits
- Public education.

In Addition:

- National Task Force on *A. fulica*
- Recommendations were made to declare *A. fulica* a Notifiable Pest
- Samples screened for *Angiostrongylus cantonensis*



# Eradication Strategies (cont'd)

- Every plot of land in each of the core zone was surveyed
- Beyond the core zone random checks were made 50 m apart to in all directions
- Snails were sought
  - under leaf litter
  - discarded boxes
  - walls and shrubs
  - drains
- Snail baits containing 3.0% metaldehyde were applied every two weeks

## **Eradication Strategies (cont'd)**

- Each property was baited an average of 16 times
- Others were baited over 28 times
- More than 1,000 properties were surveyed
- 10,000 cumulative properties were treated with 2.0 tonnes of snail bait

# Monitoring Surveys

A close-up photograph of a snail with a brown, textured shell and a pinkish-brown body, moving across a light-colored wooden surface. The background is blurred, showing green foliage and a wooden fence.

- Conducted every two weeks
- Determine changes in the population over time
- Assess the efficacy of the implemented programme
- Five (5) residential plots were randomly selected within the core zone
- Data collected fortnightly
- Counts of live and dead snails plots



# Public Awareness

- 15,000 brochures and fact sheets on *A. fulica* were distributed
- 5000 brochures were distributed to county offices
- Five seminars and two Town Meetings held
- A full page advertisement was placed on three daily newspapers in August/September 2009
- A 30-second advertisement was aired on three television stations from September to December 2009
- Ministry's website <http://www.//agriculture.gov.tt>

## **Testing for *Angiostrongylus cantonensis***

- Nine samples (a sample consist of 6-9 GAS) of snails were sent to the Veterinary Laboratory

## **Notifiable Pest Status for *A. fulica***

- Request was made to have *A. fulica* declared a Notifiable Pest under Act 13 of 1975

# Results and Discussion

## Delimiting Surveys

- *A. fulica* was confirmed within  $<1.0 \text{ km}^2$  area at each of the four (4) core zones

## Collection of snails

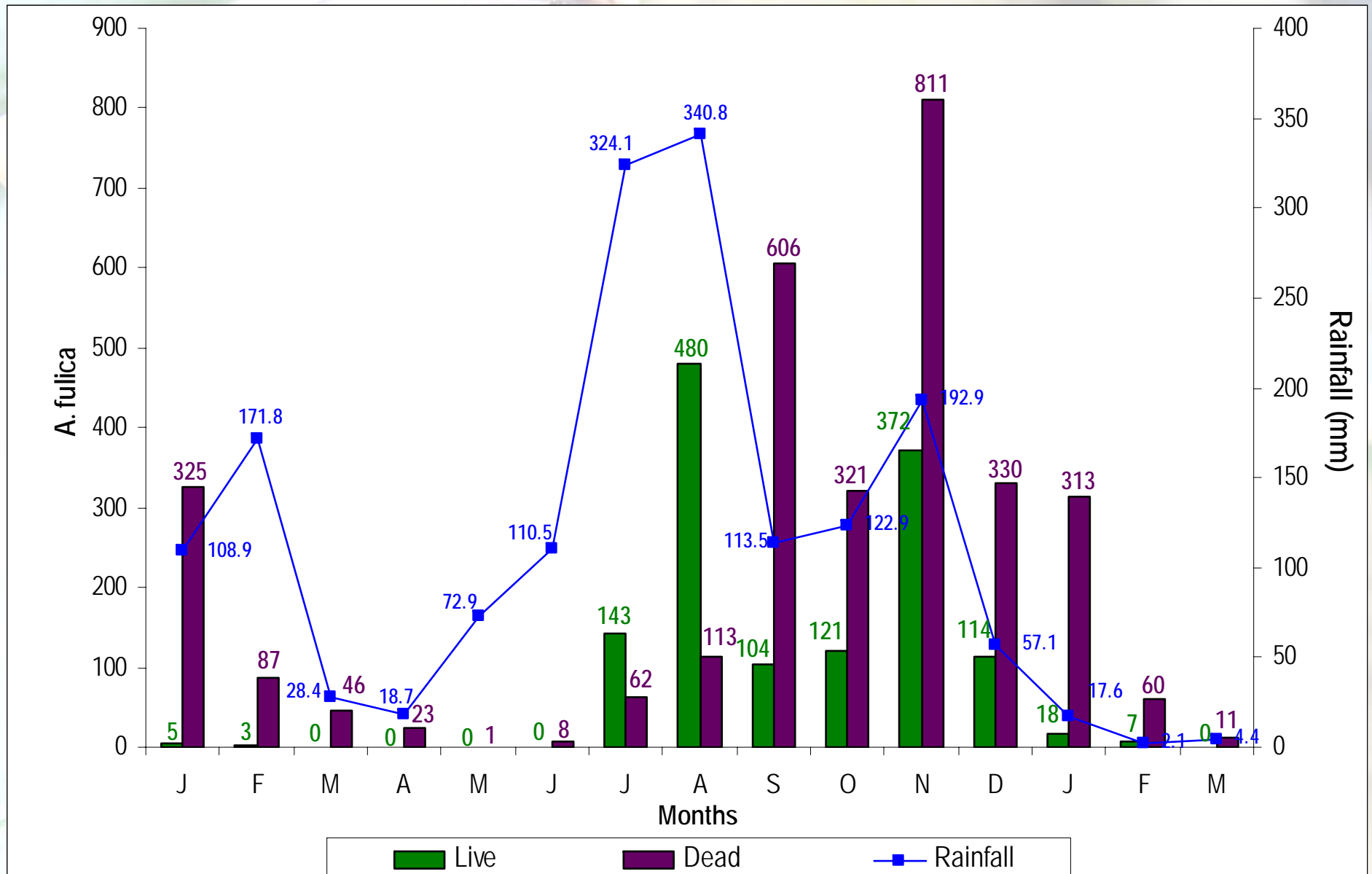
- Approximately 5546 snails (*A. fulica*) were collected over a 17 month period
- greater number of dead snails than live snails



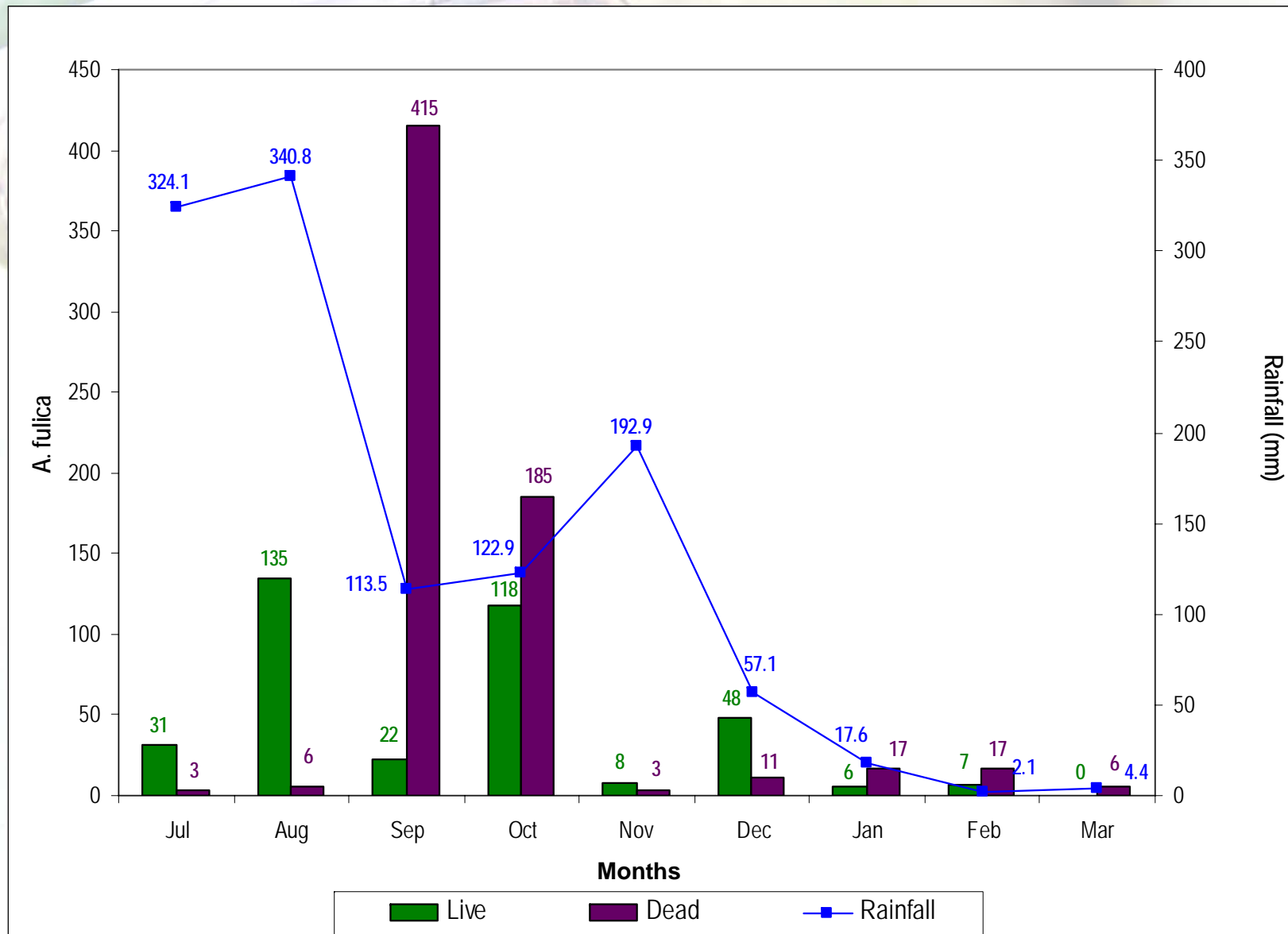
**Table 1. The Number of *A. fulica* collected November 2008 – March 2010**

<b>Year</b>	<b>No. of <i>A. fulica</i></b>
2008	1349
Jan 2009 – March 2010	4197
<b>Total</b>	<b>5546</b>

# Figure 3. The Total number of *A. fulica* collected from January 2009 – March 2010



# Figure 4. Total *A. fulica* Population Dynamics from July 2009 to March 2010





A close-up photograph of a snail moving across a wooden surface. The snail's shell is brown with prominent yellow and white stripes. Its body is a mottled greyish-brown color. Two long eye stalks are extended forward. The background is slightly blurred, showing more of the wooden surface and some green foliage.

# Core Zones

# Alyce Glen and Environs

A close-up photograph of a snail on a green leaf. The snail's shell is a light brown color with distinct spiral ridges. Its body is a darker, mottled brown. The background is a soft-focus green, suggesting a natural outdoor setting.

- No live snail were collected from March to July 2009
- Resurgence in August
- Snail numbers had declined to two in December 2009
- March 2010, no live snails were collected

# Blue Range/Goodwood Gardens Westmoorings

## At Blue Range

- December 2009, the numbers of live snails collected had drastically reduced to one
- March 2010, no live snails were collected

## At Goodwood Gardens

- Live snails decreased from 103 in July 2009 to one by January 2010 to zero in February and March 2010

## At Westmoorings

- a decline in live snails to zero by March 2010



# Westmoorings



# Snail Decline

A close-up photograph of a snail with a brown, spiral shell and a pinkish-brown body, moving across a light-colored wooden surface. The background is blurred, showing green foliage and a wooden fence.

Decline in the number of live snails may be attributed to:

- Dry weather conditions
- Intensive baiting and collection activities

A close-up photograph of a snail with a large, brown and yellow striped shell. The snail is moving across a wooden surface, with its body extended forward. The background is slightly blurred, showing green foliage and a wooden structure.

# Monitoring Surveys

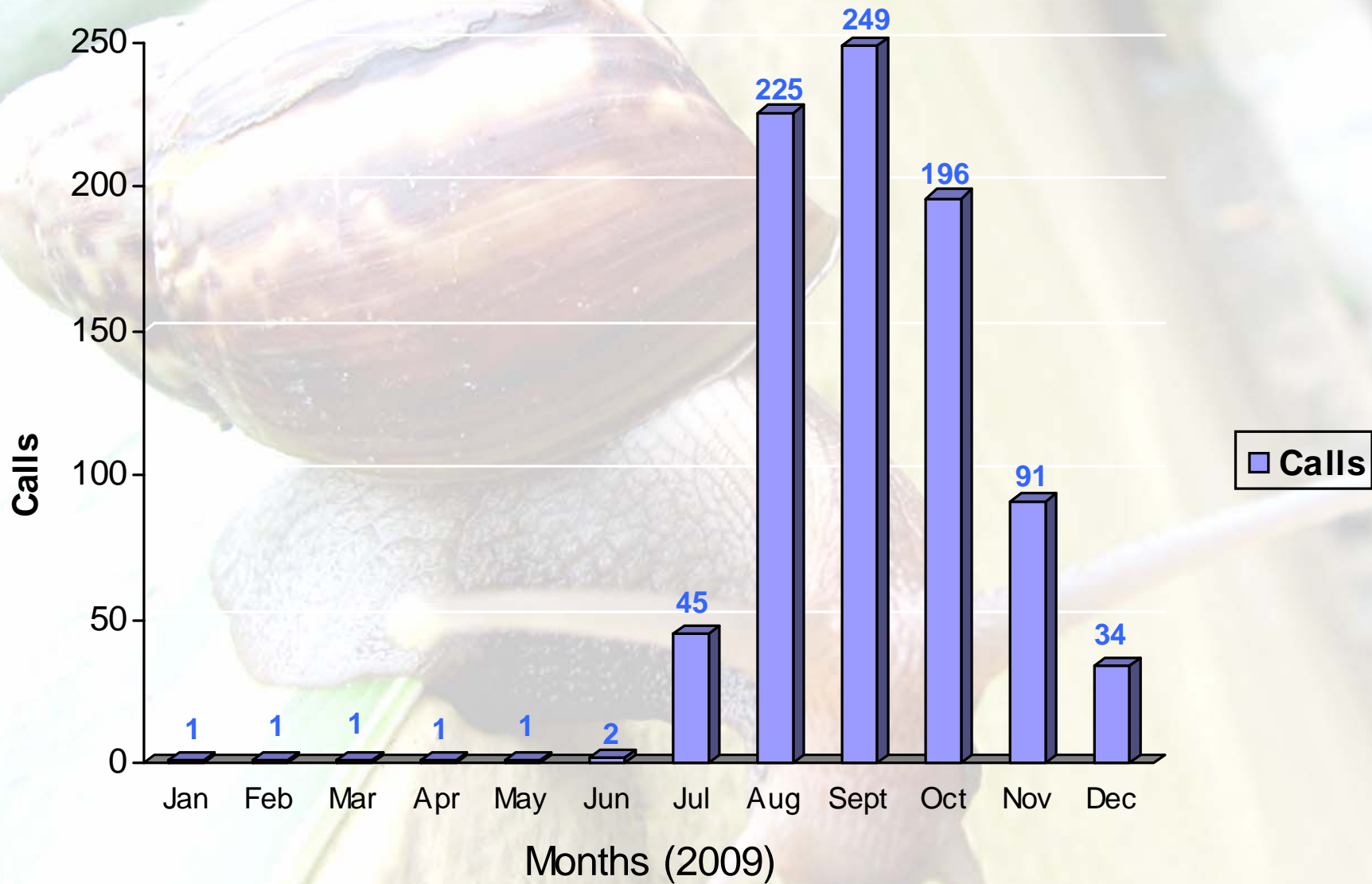


# Population Dynamics

A close-up photograph of a snail on a wooden post. The snail's shell is a mix of brown and tan colors with some darker spots. Its body is a pale, translucent pinkish-brown color. The snail is positioned on a light-colored wooden post, and its two eye stalks are extended forward. The background is a soft-focus outdoor scene with green foliage and a wooden fence.

- Number of live snails peaked in October 2009
- Fluctuated during the drier months from December 2009 to March 2010
- Indication of the effectiveness of the eradication programme

**Figure 5. The number of hotline calls received, January to December 2009**



**Total number of calls received was 852 of which 841 was investigated**

**Table 2. The number of hotline calls received and investigated in 2009, Trinidad**

<b>County/Location</b>	<b>Calls received</b>	<b>Calls Investigated</b>	<b>Calls positive for GAS</b>	<b>Calls negative</b>	<b>*Calls unknown</b>
St. George West:					
- Petite Valley	82	81	11	42	28
- Diego Martin	267	261	9	192	60
- Westmoorings	66	66	3	41	22
St. George West - other areas	208	207	0	146	61
St. George East	115	115	0	82	33
St. Andrews/ St. David	2	2	0	1	1
Caroni	34	32	0	26	6
Victoria	67	66	0	49	17
St. Patrick East	2	2	0	1	1
St. Patrick West	7	7	0	5	2
Nariva/Mararo	2	2	0	2	0
<b>Total</b>	<b>852</b>	<b>841</b>	<b>23</b>	<b>587</b>	<b>231</b>

\* No snails were observed at these properties





# **Testing for *Angiostrongylus cantonensis***

- *Strongylus sp*

## **Notifiable Pest Status**

- March 2010, - *A. fulica* a Notifiable Pest: citizens are now obligated to report all sightings of giant African snail in their properties

# Outlook

- Study is preliminary
- Requires a period of 2-4 years of monitoring after the last snail sighting to declare an area to be pest free
- Eradication efforts are therefore ongoing through:
  - Public awareness
  - Collection and destruction of snails
  - Application of snail baits
  - Surveillance

Towards achieving pest free status for giant African snail

# Acknowledgements

A close-up photograph of a snail on a wooden post. The snail's shell is a reddish-brown color with distinct spiral ridges. Its body is a greyish-brown color with a textured, wrinkled appearance. The snail is positioned on a light-colored wooden post, and a green leaf is visible in the foreground, partially obscuring the snail's body. The background is a blurred outdoor setting with green foliage and a wooden fence.

- Staff of Entomology
- Support Services
- Vet lab



A close-up photograph of a snail moving across a light-colored wooden plank. The snail's shell is a mix of brown and tan, and its body is a pale, translucent pinkish-brown. The background is slightly blurred, showing more of the wooden surface and some green foliage. A dark teal rectangular box with a 3D effect is overlaid on the image, containing the text 'THANK YOU' in a white, stylized, serif font.

THANK YOU