

Rapid response protocol for the eradication of Giant African land snails

Lissachatina fulica

This is a generic document which can be adapted to the needs of any territory. Place where territory-specific details needs to be added are indicated by the **yellow highlight**.



Contents

Introduction	2
Summary of rapid response protocol.....	2
Roles and responsibilities	2
Pre-treatment survey	3
Treating the infested area	4
During-treatment and post-treatment surveys	5
Preventing re-infestation	5
Pathway vectors	6
Raising public awareness	6
Sources	7
Annex 1. Images of giant African snails.	8
Annex 2. Giant African snail monitoring protocol.....	9
Annex 3. Snail baits	11
Annex 4. Favoured habitats for giant African snails.....	11
Annex 5. Equipment needed.....	12
Annex 6. Giant African snails at-a-glance information.....	13

Introduction

A rapid response takes place when a snail sample has been confirmed by a competent authority as the giant African snail *Lissachatina* (syn *Achatina*) *fulica*.

Goal: eradication from [territory].

Objectives:

- Contain and eradicate a newly detected population of Giant African snails.
- Prevent further spread by human mediated means.
- Surveillance of high risk sites to identify other possible incursions.
- Raise public awareness to encourage reporting of any additional infestations.
- Prevent new introductions arriving.

Summary of rapid response protocol

1. Identification of suspected snail find confirmed by a competent laboratory or specialist (e.g. Fera, USDA, APHIS).
2. Conduct pre-treatment survey to determine the infested area.
3. Treat the infested area.
4. Conduct post-treatment surveys for 19 months after treatment.
5. Infested area should be free of snails for 3 years before the snail can be declared eradicated.
6. Determine the pathway of introduction and put in place measures to reduce the likelihood of new incursions.

Roles and responsibilities

The rapid response will be activated and coordinated by the Department of [name of appropriate Department which will lead the response]. The rapid response team membership consists of the following core members, who may choose to recruit additional members to provide specialist input depending on the nature and location of the incursion:

- [list of appropriate names of departments, agencies, or stakeholders involved in delivering the response]

The following specific roles need to be assigned.

Role: Field controller

- Organises surveillance and treatment schedules;
- Responsible for day to day implementation of the operation;
- Ensures that:
 - Appropriate procedures are followed and records are kept;
 - Infested products are disposed of or treated in the most appropriate way;
 - Treatments are applied correctly;
 - Health and safety procedures are followed.

Role: Coordinator

- In charge of administration and finance (note that for large infestations, discussions with land owners/tenants may be necessary to clarify who is responsible for paying for the eradication);
- Coordinate actions and calls rapid response team meetings as required;
- Manages the flow of information;
- Prepares briefing notes to stakeholders;
- Designs and implements public outreach strategy.

Role: Technical adviser

- Provides technical advice on the design, format and progress of the response.

Pre-treatment survey

Aim: establish the extent of the infested area.

The pre-treatment survey consists of both visual and baiting techniques.

Procedure:

If appropriate, ask local people or the person who reported the snail(s) where it was seen.

When arriving at the infested site, park your vehicle well away in order to minimise the chances of live snails climbing on board the vehicle and being transported elsewhere when you leave.

Before leaving the site, check your vehicle, clothing and equipment very carefully to ensure no live snails are being transported from the site.

Visual: Adult giant African snails are large and conspicuous crop pests. Plan surveys on warm nights, early mornings and overcast or rainy days. Surveys are best carried out at night using a flashlight, although this species can also be active in the evening and occasionally during the day if ambient humidity is high. Immature snails can be found under stones or logs and adult snails under plants or in other sheltered locations. Eggs are ovoid, cream to yellow in colouration, about 5 mm in diameter, and are often deposited beneath stones. Attacked plants exhibit extensive rasping and defoliation. Snail presence can also be detected by signs of ribbon-like excrement, and slime trails on plants and buildings. Conduct detection surveys on an ongoing basis, with repeated visits at the beginning, during, and/or just after rain.

Note: Giant African snails remain active at a range of temperatures (48–84°F). Aestivation is cued by low humidity (rather than temperature) and can occur at 80-82% RH. Individuals aestivate singly or in aggregations and rainfall of 50 mm+ can terminate aestivation at any time.

Survey site selection: This species can occur in a wide variety of environments (see Annex 4) and has been reported to thrive in forest edge, modified forest, and plantation habitats. When planning the survey route for a particular site, examine the following microhabitats:

- Near heavily vegetated areas, especially gardens and fields where plants have been damaged by feeding;
- Under rocks, asphalt or cement pieces that are in loose contact with the ground surface;
- Under discarded wooden boards and planks, fallen trees, logs, and branches;
- In damp leaf litter (not wet or soggy), compost piles, and rubbish heaps;
- Under flower pots, planters, rubber mats, tires, and other items in contact with the soil;
- Standing rock walls, cement pilings, and broken concrete
- In gardens and fields where plants have been damaged by feeding snails and slugs;
- At the base of the plants, under leaves, or in the “heart” of compact plants, such as lettuce or cabbage.

While conducting a survey, look for clues that suggest the presence of snails:

- Chewing damage to plants
- Eggs, juveniles and adults
- Empty snail shells
- Mucus and slime trails
- Large, ribbon-like faeces
- Dead snails and broken shells on roads killed by traffic

Baiting & trap placement: See Annex 3 for listed baits. Trap snails under wood boards or flower pots positioned throughout the landscape. Inverted melon rinds can also make effective traps. Platform or baiting traps should not be used alone but should be used to supplement visual surveying. Trapping for molluscs is not species-specific and will attract non-target species, including non-molluscs. Trap placement can occur in the same areas that visual surveys occur.

Note: Wear gloves when handling molluscs and wash hands thoroughly after any mollusc survey or inspection activities to minimize the risk of disease transmission.

- Use the giant African snail monitoring protocol (Annex 2), deploying the appropriate trap and bait.
- Each team needs to be made up of two people: one person to record complete sample sheet and/or mark waypoints, one person to deploy baits.

All snail sightings should be mapped, with GPS coordinates recorded if possible.

Snail baiting guidelines:

Given the risk associated with snail baits it is important to notify all residents, businesses and relevant managers within the survey area that a treatment will occur prior to applying baits. Notification should be given that treatment will occur on the property within a certain window of time. People should be asked to contact the lead agency with concerns or questions and to make special arrangements in case pets need to be moved to a different property etc. This also eliminates the need to have direct contact with all residents (i.e. no response is considered as permission to treat the property). Notification that treatment has occurred should also be provided to each resident.

The exact method used may have to be modified depending upon the particular product. Bait should be applied as evenly as possible within 200m of where giant African snails have been detected. Small pellets are easier to distribute evenly in an area, but tend to disintegrate following rain and therefore must be reapplied frequently, (i.e. every 2 weeks). Harder, larger baits are an option in high rainfall areas. Clumps of pellets should be avoided to decrease the risk of poisoning non-targeted species.

If it is anticipated that the infestation is very large, (i.e. thousands of snails), it is recommended to use more than one snail bait. This may be more effective in killing giant African snails and it also reduces the possibility of pesticide resistance.

Treating the infested area

Aim: to eradicate the snails.

Eradicating an established snail infestation is a difficult task. The accepted approach is to repeatedly treat the infested site using traps/poison bait, along with creating a buffer zone, until snails are no longer observed.

Procedure:

The technical adviser will advise on the most appropriate active ingredient and bait. Treat the infested site, and create a buffer zone, on a monthly basis for 17 consecutive months.

Collect data on the following:

- Dates of treatments
- Location and areas of incursion
- Quantities of each product used on every occasion
- Temperatures and rainfall on the day, and following day, of treatment
- Names of the pest control operatives applying the baits
- Survey results

Physical/mechanical control: Collection and destruction of the snails and their eggs. Barriers or screens can be constructed (e.g. copper or corrugated tin), and ditches dug, around infested areas. For larger infestations, physical control can be efficient by making a strip of 1.5 m wide bare soil or creating a 1.5 m band of sand around the infestation site (giant African snails are reported to rarely move onto bare ground). Snails can be collected on a daily basis and destroyed by freezing, crushing or drowning. If there are large numbers of dead snails, they should be buried to avoid the unpleasant smell associated with decomposition.

Chemical control: Metaldehyde (e.g. Blitzem pellets, Deadline pellets, meta-metaldehyde powder, Murphy Slugit liquid). This compound is toxic to slugs and snails both by ingestion and absorption by the foot of the mollusc. The principal toxic effect of metaldehyde leads to death by dehydration. Another molluscicide is Methiocarb, an organophosphate chemical.

Note: molluscicides are non-selective, thus their use has a chance of endangering the survival of non-target snails.

Tips for Applying Molluscicides:

- Spread baits evenly
- Reverse the pattern of application on repeat treatments (spots may be missed during ground application)
- Use colored pellets for greater visibility
- Use granules when visible bait is undesirable
- Avoid bait applications preceding heavy rainfall to prevent rapid breakdown
- Apply baits following rain, irrigation or dew
- Liquid applications may be effective when bait formulas cannot reach target snails
- Place baits under boards or inverted flower pots to extend the life of the bait and reduce the chance that baits are consumed by non-target animals

SPS measures: The FAO International Plant Quarantine Treatment Manual (1981) describes protocols for treatments to eliminate infestations on non-plant cargo using application of cold treatments and fumigants such as hydrogen cyanide.

During-treatment and post-treatment surveys

Aim: to determine if the treatment is working.

Monitoring should be conducted during the treatment period to check efficacy. A visual survey of the wider surrounding area should also be conducted to ensure no infested areas have been excluded from treatment.

Procedure:

The American Plant Health Inspection Service (APHIS) and the Florida Department of Agriculture and Consumer Services (FDACS) have the following established protocol:

- Surveillance and treatment efforts for 17 months with no detection of live giant African snails;
- An additional 19 months of surveillance with no detection of live giant African snails;
- A minimum of one negative detector dog survey; and
- A minimum of one negative night survey.

Preventing re-infestation

Aim: to reduce the risk of future incursions.

It is important to identify, as far as possible, how the snails were introduced to **[territory]** in order to put measures in place to reduce the risk of future introductions. Major pathways for giant African snail introductions globally include transport on products, vehicles, containers, pallets/crating, quarry products, ornamental rocks, machinery and heavy equipment. Giant African snail have also been smuggled into countries to be sold as pets and intercepted in baggage, cargo, soil (with or without plants), flowers, seeds, and peat. Introduction of a single mated snail is sufficient for the establishment of a colony. Furthermore, it is possible for this species to travel as eggs or small juveniles, which are less readily detected than adult snails.

To reduce the risk of future incursions consider the following:

- Is the incursion clearly associated with a particular pathway, such as fresh produce, construction materials or passengers luggage? Note that the introduction may have occurred several weeks or even months previously.
- If it is not clearly associated with a particular pathway:
 - What are the commonest pathways known for this species?
 - What is its geographic distribution – where could it have entered a pathway?
 - Where is the incursion located in **[territory]**?

- How widespread is the incursion? Smaller infestations are more likely to be of more recent introduction so you are not looking so far into the past to identify how they might have arrived.
- Can a link be made with any recent (within the past few months) imports or arrivals along these common pathways?
- Are there any clues from the ecology and biology of the snail and the location of the incursion?

There are a number of options to reduce the risk of new introductions, most likely pathway of introduction of the present incursion, and practical considerations; see Table 1.

Targeting risk industries (e.g. plant nurseries, farm depots) is important to prevent island-wide spread of the snail.

Pathway vectors

Into **[territory; edit as appropriate]:**

- Aircraft
- Personal possession
- Bulk freight and cargo
- Machinery and equipment
- Plant or parts of plants
- Ship structures (above the waterline)
- Soil, sand and gravel

Throughout **[territory edit as appropriate]:**

- Land vehicles
- Plant or parts of plants
- Soil, sand and gravel
- Bulk freight and cargo
- Machinery and equipment
- Debris and waste associates with human activity
- Illicit pet industry

Table 1. Mitigation options for reducing the risk of arrival.

Pre-border	Border	Post-border
<i>For pathways such as fresh produce, luggage, personal effects (intentional introduction plus contaminants)</i>		
Ban importation	Fumigation	Surveillance: visual surveys
Fumigation	Inspection	Surveillance: traps
Inspection	Quarantine	Rapid response
	Destruction	
<i>For pathways such as stone, sand, aggregate, general commodities (contaminants)</i>		
Ban importation	Fumigation	Surveillance: visual surveys
Fumigation	Freezing	Surveillance: traps
Freezing	Inspection	Rapid response
	Quarantine	
	Molluscicide treatment	
	Destruction	
<i>For pathways such as shipping containers (stowaways)</i>		
Fumigation	Fumigation	Surveillance: visual surveys
Pressure washing	Inspection	Surveillance: traps
Cleaning (other)		Rapid response
Inspection		

Raising public awareness

Aim: to reduce the risks of accidental introduction of giant African snails, and also to engage the community to report any giant African snail outbreaks.

The community of **[territory]** is small and relatively easy to access. The activities listed here are intended to take place once an incursion has been detected.

Messages to convey:

OT Biosecurity: monitoring protocol for giant African snails. March 2019

- Giant African snails are a serious threat to agriculture
- Giant African snails are known to transmit human pathogens
- Giant African snails are a threat to native ecosystems, eating native plants, modifying habitats, and outcompeting native species of snail
- “Don’t Pack a Pest” If you are travelling from a region where giant African snails are established, check all your luggage and goods for snails before you leave for home
- “Have you seen this snail?” Report any new or unusual looking snails to the Department of [as appropriate]

Proposed methods:

- Use social media, radio and TV to raise community awareness.
- Put up simple posters in the public domain with a few large images of the giant African snail and key messages in English and other appropriate languages (e.g. Portuguese and Filipino).
- Add the messages above to training materials and briefs sent out to personnel before they arrive to induction talks.

Sources

This protocol has been adapted from:

Threat specific contingency plan for giant African snails (GAS). 2015.

https://www.ngia.com.au/Attachment?Action=Download&Attachment_id=2044

USDA/APHIS 2005. New Pest Response Guidelines. Giant African Snails: Snail Pests in the Family Achatinidae. USDA/APHIS/PPQ/PDMP, Riverdale, Maryland.

<http://www.aphis.usda.gov/ppq/manuals/>

The Global Invasive Species Database. <http://www.iucngisd.org/gisd/speciesname/Achatina+fulica>

CABI Invasive Species Compendium. <https://www.cabi.org/isc/datasheet/2640>

Annex 1. Images of giant African snails.



Internet images

Annex 2. Giant African snail monitoring protocol

Summarized from the *Threat Specific Contingency Plan for Giant African Snails (2015)*.

The overall survey area will vary depending on the environmental conditions where the snail is detected. However, if this species is detected the following generalised delimiting survey protocol is suggested:

- Giant African snails are more likely to be active approaching darkness, therefore search at dusk
- Survey outwards from the original detection site until all favourable sites within 500m of any detection have been investigated
- Infested premises should be surveyed by searching all favourable sites within 100m of potentially exposed areas. For trace forwards and trace backs that involve very large properties, it will be important to identify areas that could have been exposed to giant African snails and then search within 100m of these areas
- In areas where adult snails have been collected, follow up surveys should be conducted at monthly intervals to allow for the detection of juvenile snails

Depending on the exact area in which giant African snails have been detected, the private property of many residents and business owners may need to be searched. Residents should be notified of a period of time that survey teams will be searching their property, including their backyards. They should be asked to contact the response team to make special arrangements if they wish to be present or have pets that could be either dangerous or escape during surveys. If no response is received it can then be assumed that entry is granted to the property. This correspondence should also inform them of the nature of the problem; include pictures of giant African snails and inform them that it is ill-advised to keep them as pets because they have been known to spread human diseases (e.g. eosinophilic meningoencephalitis).

Sites where giant African snails are detected should be monitored for a minimum of three years. If only one individual is found, it may be possible to consider giant African snails as eradicated much more quickly.

Surveys in production nurseries and nursery retail outlets: Production nurseries and nursery retail outlets are ideal environments for giant African snails. Such properties tend to have large numbers of young tender plants that are wet and have numerous places to hide between and within containers. They also represent a high risk of human assisted dispersal. Speak to managers of the nursery to determine if there is any unexplained removal of foliage anywhere in the nursery. Giant African snail damage may resemble heavy infestations of some herbivorous insects (e.g. caterpillars). It is also recommended to ask if there has been herbivore damage observed recently (or over the period that is considered to be at risk). Surveillance at such businesses should include the following areas:

- Areas which have current or past suspect damage
- Among containers, particularly in shaded areas or areas which are frequently wet
- Propagation areas
- Shaded, wet areas, where plants are on the ground
- Areas with natural environments (which should be treated as natural habitats)
- Areas with ornamental and vegetable gardens, particularly amongst dense clumps of plants
- On building walls, particularly when they are shaded and in humid environments
- Under buildings, amongst machinery, vehicles, trailers
- In and around dispatch areas
- On, around, in and under outdoor furniture, including pallets
- In and around refuse areas, compost heaps and throw-out areas

Surveys in natural habitats: giant African snails are reported to flourish at the edge of forests, modified forests and plantation habitats. The species is particularly well suited to tropical and subtropical moist broadleaf forests, tropical and subtropical dry broadleaf forests. Mature snails also have the ability to bury themselves in soil and remain inactive for up to 10 months. Therefore, surveillance in natural habitats may be difficult and must be completed consistently for long periods of time, particularly when conditions are dry. The following areas should be searched up to 500m from the original detection area:

- On tree trunks, particularly when large populations are present or during wet seasons
- Under logs, stones and other objects, particularly if they are moderately large and in moist conditions
- In holes and hollow logs
- On the ground or leaf litter (particularly in rainforests and humid, relatively dark environments)
- Within leaf litter, particularly in moist shaded areas, down to about 10cm

Surveys in urban and commercial areas: Surveys in urban and commercial areas should combine aspects of those from production nurseries and natural environments. As a matter of course, speak to people residing and working in these areas to ensure that no one has taken any giant African snails home as pets.

Surveys in broadacre cropping environments: Areas with observable foliar herbivore damage should be searched more thoroughly. It is likely that the area under cropping will extend further than the area that requires search.

Trapping: Quarantine services (Department of Agriculture, Australia) have developed traps for giant African snails and other target snails in ports and high-risk areas (one trap placed every 4-6m). This would be particularly helpful if the infestation is in a limited area. If the survey area is very large the frequency of trap placements is not cost effective and reduces trapping viability. This trapping is not considered to be cost effective compared to bait techniques.

Trace backs and trace forwards: It is important to account for movement of many goods and equipment to establish trace forwards and trace backs. Determine if the following equipment and materials have recently been moved on or off the original detection area:

- Plant and soil material
- Potted plants, including plants sold to and from production nurseries
- Garden trash
- Crates, containers or pallets
- Vehicles and other machinery
- Timber, junk stacks, and any other items that have been in contact with the ground
- Building contractors or landscapers that have operated in the area

The exact length of time within which trace forward and trace back sites should be compiled depends on current knowledge of the infestation. If only one snail has been detected in a container yard, for example, it may be sufficient to conduct extensive searches of the detection site and all sites that received goods from the detection site within about 2 weeks. Whereas detection of many snails over a number of acres would require trace backs and forwards be established from movements over at least 6 months.

Surveillance near the quarantine zone: Formal surveillance by biosecurity staff should be focused within the quarantine zone. However, it is advisable to survey very high risk areas near the quarantine zone. This 'buffer zone' area should be about 500m outside the quarantine zone. High risk sites that should be considered for surveillance will vary. In residential and commercial areas, high risk sites would include businesses selling plants (e.g. production nurseries, retail nurseries, hardware stores, produce stores, etc.), timber yards, landscape suppliers, agricultural suppliers and hardware stores with equipment stored outside. Also included are properties with large junk heaps that have obviously been present for a long period of time as well as rubbish tips or waste transfer stations. In agricultural cropping or the natural environment that have few dwellings in the area, consider surveillance around houses, particularly where regular irrigation is applied to gardens. Areas near livestock water troughs and shelters should also be considered high risk in such areas. Ideally this surveillance should only be done once in summer and perhaps also completed in spring (once warmer temperatures and periods of higher ambient humidity occur). Mail outs, signs, factsheets and other advertising material should be considered in areas near quarantine zones to encourage the public to be on the lookout and report suspicious snails.

Annex 3. Snail baits

Summarized from the *Threat Specific Contingency Plan for Giant African Snails (2015)*.

The combination of iron phosphate, boric acid and metaldehyde is considered the most effective baiting scheme. All products observe a 3m buffer around aquatic areas. If some of the products below are not readily available, metaldehyde is the first bait that should be used in the event of a detection. If the infested area is significant and eradication is deemed feasible then it is recommended to pursue availability of other baits.

Active ingredient	Product name	Rate	Use pattern
Metaldehyde	Ortho Bug-Geta	About 0.5kg/400m ²	Broadcast-applied as a pellet to soil in lawns, near ornamental plants, and open areas where GAS occur.
Metaldehyde	Durham metaldehyde granules (7.5%)	About 0.5kg/230m ²	Broadcast-applied as a pellet to soil in lawns, near ornamental plants, and open areas where GAS occur.
Metaldehyde	Slug-Fest (25%)	About 2-4L/4000m ²	Spot applied as a liquid to areas under plants where high concentrations of GAS occur
Boric acid	NiBan (5% orthoboric acid)	About 1kg/50m ² applied every 4-6 weeks	Broadcast-applied as a pellet to soil in lawns, near ornamental plants, and open areas where GAS occur.
Iron phosphate	Sluggo-AG (1% iron phosphate)	About 10-20kg/4000 m ² applied every 2 weeks	Broadcast-applied as a pellet to soil in lawns, near ornamental plants, and open areas where GAS occur.

Annex 4. Favoured habitats for giant African snails

Category	Sub-Category	Habitat
Terrestrial	Terrestrial – managed	Cultivated / agricultural land
		Managed forests, plantations and orchards
		Disturbed areas
		Urban / peri-urban areas
	Terrestrial - natural / semi-natural	Natural forests
		Riverbanks
		Wetlands
		Scrub / shrublands
Littoral		Coastal areas

Annex 5. Equipment needed

Baits for surveys

70% alcohol for preserving specimens

Nitrile gloves for handling snails and poison baits

Chemical suit, hand spreader, dust mask when applying poison baits

Hi-vis vests

Flagging tape, spray paint to mark bait stations

Notebooks, clipboards, pens

Posters

Digital camera

GPS