The Giant African Snail

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Herbivory by the giant African snail (*Achatina fulica*) severely damages a wide range of plants in Hawai'i. These large, plant-parasitic land snails rasp papaya stem and fruit tissues with bands of stiff, chitinous teeth that move to and fro over a supporting, protrusible radula ("tongue"). This radular tool mechanically scrapes and removes layers of host tissue, conveying this nutrition back into the parasite's gut.

Achatina fulica is the most ecologically damaging land snail. The Global Invasive Species Database ranked it as #2 among the "100 Worst Alien Invasive Species" (Invasive Species Specialist Group 2012). Its host range includes 500 plant species. Although snails symbolize slow movement (snail's pace), the rapidity with which a foraging population can multiply and then decimate crops is disheartening and costly to affected farmers and gardeners.

A giant African snail feeding on a papaya fruit. The damage caused renders the fruit unmarketable.

Diet

Achatina fulica feeds on the stems, leaves, flowers, and/or fruits of a broad range of agriculturally important plants, including the following:

- Banana (*Musa* spp.)
- Bean (*Phaseolus* spp.)
- Breadfruit (*Artocarpus altilis*)
- Cabbage (*Brassica oleracea*, Capitata group)
- Cacao (*Theobroma cacao*)

- Carrot (*Daucus carota* subsp. *sativus*)
- Cauliflower (*Brassica oleracea*, Botrytis group)
- Cassava (*Manihot esculenta*)
- Cotton (*Gossypium hirsutum*)
- Cucumber (*Cucumis sativus*)
- Eggplant (*Solanum melongena*)
- Marigold (*Tagetes patula*)
- Melons (*Cucumis* spp.)
- Noni (*Morinda citrifolia*)
- Okra (*Abelmoschus esculentus*)
- Papaya (*Carica papaya*)
- Peas (*Pisum sativum*)
- Pumpkin (*Cucurbita pepo*)
- Sponge gourd (*Luffa cylindrica*)
- Taro (*Colocasia esculenta*)

The snail also consumes important naturalized and native plants within landscapes, forests, and non-agricultural ecosystems. This animal moves and feeds nocturnally, but it can also parasitize plants during overcast, rainy weather in Hawai'i. *Achatina fulica* may spend daylight hours buried in the soil or litter to avoid sunlight, which can kill it.

Damage

Giant African snails cause extensive damage on farms and in natural ecosystems and pose certain risks to society. They affect farming in the following ways:

- loss of crop yield;
- death of plants from snail damage to stems;
- increased farm costs (labor, materials, traps) associated with control of the snails; and
- loss of the opportunity to grow certain hosts in certain locations due to a crop's susceptibility to the giant African snail.

The habits of *A. fulica* create other problems for humans, environments and society:

- Altered or damaged natural or native ecosystems occur from snail herbivory.
- Altered nutrient cycling ensues in ecosystems due to the large volumes of plant material that passes through the snail's gut.
- Adverse effects on indigenous snails and slugs (gastropods) arise through competition for resources with *A. fulica*.
- There are indirect adverse effects on indigenous gastropods from snail management practices, such as pesticides or biological control. The use of pesticides against *A. fulica* and biological control with the rosy wolfsnail (*Euglandina rosea*) are examples.

- In Hawai'i, *A. fulica* preys on veronicellid slugs in at least two sites on the island of O'ahu. *Achatina fulica* also competes with endemic snails on Lana'i, reducing animal biodioversity.
- In urban areas, *A. fulica* is a nuisance to humans. The decaying bodies of dead snails release a foul odor and masses of crushed snails on roads pose a hazard to drivers, causing cars to skid.
- The calcium carbonate in snail shells neutralizes acidic soils, potentially altering soil properties and the types of plants that can grow in the soil.
- In many Asian, Pacific, and American societies, the giant African snail transmits human parasites and pathogens in slime trails or when infested snails are eaten raw or undercooked. One such pathogen is rat lungworm (*Angiostrongylus cantonensis*), which causes eosinophilic meningoencephalitis in humans.

Management

Eradication of the giant African snail is costly and difficult, even if the target is a new infestation. Large, well-established populations may be virtually impossible to eradicate on Hawai'i farms or within ecosystems that favor the snail's survival. Even effective management of the snail population will cost time, money, and labor. Manage the giant African snail with an integrated approach that combines two or more of the following practices.

Prevention and Avoidance

- Prevent the introduction of *A. fulica* to a new location. Avoid introducing plants, equipment, garden rubbish, building materials, farm vehicles, or soils from infested areas. Inspect agricultural, horticultural, and other commercial products and the containers in which they are shipped for snails and snail eggs. Avoid transporting snails on personal vehicles or in belongings. Do not intentionally introduce *A. fulica* to new locations as pets, as ornaments, for human or animal food, or for any other purpose. Remember, the giant African snail's ability to store sperm enables a population to develop from a single introduced snail.

Physical Barriers

- Erect or install physical barriers to prevent the movement of snails, such as a strip of bare soil around a field, a fence of corrugated tin or metal screen, a fence of security wire mesh, or ditches.
- Use salt or copper foil barriers.
- Enclose the base of stems in corrugated tin screen, copper foil, or security wire mesh.

Natural repellants

- The extract of fruits from *Thevetia peruviana* (be-still tree, yellow oleander) repels *A. fulica* (Raut and Barker 2002).

- Use cuttings of *Annona glabra* (alligator apple, bullock's heart, pond apple) to construct softwood fences as a snail repellant to protect nursery beds (Prasad et al. 2004). Although cultivated in some locations in Hawai'i, this plant is a high- risk, invasive weed (Pacific Islands Ecosystems at Risk, 1999), so be sure it is not living.

Cultural Practices

- Collect snails and eggs daily (after sunset, if possible) by hand and destroy them.
- Incinerate snails and eggs with a flame.
- Eat the snails only after cooking them thoroughly.
- Clear scrub brush from around a plantation. Remove alternate or unwanted hosts of *A. fulica* from around and within papaya fields.
- Choose a sunny location with low humidity for a farm. *Achatina fulica* is killed by sunlight.
- Remove debris from fields to eliminate shelter or hiding places for the snail. Pick up fallen fruits.

Traps

Traps set in and around the orchard or home can be effective in reducing snail populations. Here are some common examples and how they work.

- Salt traps: The salt dries and kills them.
- Beer traps: Beer attracts the snails, and the alcohol kills them.
- Tanglefoot® traps: The snail contacts the sticky substance, becomes stuck and dies.
- Tangle Guard Paper Tree Wrap: Snails that try to climb papaya stems stick to the paper and die.
- A piece of wood raised about one inch off the ground can be set out to trap snails. They use it for shelter during the day. Check the traps each morning and destroy any snails hiding there.

Biological Control

Snails that predate and feed upon *A. fulica* include *Euglandina rosea*, *Gonaxis kibweziensis*, *Gonaxis quadrilateralis*, *Edentulina ovoidea*, and *Edentulina affinis*. Although biological control may seem attractive, misguided attempts can severely damage non-target, indigenous snails. According to Cowie, "It cannot be stressed enough that these introductions of putative biological control agents against *Achatina fulica* are extremely dangerous from the perspective of the conservation of native snail species. And in any case, there is no good evidence that they can indeed control *A. fulica* populations" (Cowie 2000).

In 1955 the predatory rosy wolfsnail (*Euglandina rosea*) was introduced into Hawai'i to control *A. fulica*, but non-target impacts included the consumption of native snails. The carnivorous snails have not reduced populations of *A. fulica* but native snail populations have been devas-

tated (Cowie 2000). *Platydemus manokwari*, a turbellarian flat worm, has been used to control the giant African snail in Guam, the Philippines and the Maldives. However, this worm has also been implicated in the decline of native snails (Invasive Species Specialist Group 2012).

Birds such as chickens and ducks eat snails and/or snail eggs and can help to suppress snail populations. However, one should avoid using molluscicides that may harm birds where the birds are used to manage snails.

References

Cowie, RH. 2000. Non-indigenous land and freshwater molluscs in the islands of the Pacific: conservation impacts and threats. In: G. Sherley (ed.) Invasive species in the Pacific: A technical review and regional strategy. South Pacific Regional Environment Programme, Samoa: 143-172. http://www.issg.org/database/species/reference_files/Invasive_strategy_and_species.pdf (accessed 1 June 2012).

Invasive Species Specialist Group. 2012. Global Invasive Species Database. Version 2012. 2. *Achatina fulica* (mollusc). http://www.issg.org/database/species/ecology.asp?si=64&fr=1&sts=&lang=EN (accessed 1 June 2012).

Prasad, GS, Singh, DR, Senani, S, and Medhi, RP. 2004. Eco-friendly way to keep away pestiferous Giant African snail, *Achatina fulica* Bowdich from nursery beds, *Current Science* 87:1657–1659.

Raut, SK, and Barker, GM. 2002. *Achatina fulica* Bowdich and Other Achatinidae as Pests in Tropical Agriculture. In: Barker (Ed.) Molluscs as Crop Pests. CABI.

Sankaran, KV. 2012. Pest Fact Sheet: Giant African Snail. Asia-Pacific Forest Invasive Species Network. http://www.fao.org/forestry/22071-0a714b2449327eb9db0f552d36311fdd7.pdf (accessed 1 June 2012).

Pacific Islands Ecosystems at Risk. 1999. *Annona glabra*. http://www.hear.org/pier/species/annona_glabra.htm (accessed 1 June 2012)

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