

# Rice Technology Bulletin

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Philippine Rice Research Institute (PhilRice)

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## Management Options for the Golden Apple Snail



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# Foreword

The golden apple snail, popularly known as “golden kuhol” [*Pomacea canaliculata* Lamarck], is one of the major pest problems in rice production. In 1989, the Food and Agriculture Organization of the United Nations estimated that yield losses owing to this pest ranged from 1% to 40% of the planted area in the Philippines, resulting in huge production loss.

To control this pest, many farmers resort to the massive use of synthetic molluscicides that are expensive and broad spectrum, affecting non-target organisms including human beings.

This primer was prepared to present additional alternatives and information on golden apple snail management. It contains many new information to reduce the misuse of molluscicides. Discussed here are details of the biology of golden apple snail, including several management options that farmers could use to manage this pest in their farms.

A new recipe for golden apple snail is now available. The product is a *chicharon* (cracker) that is devoid of water, has no offensive odor, with longer shelf-life, and can be readily used as an ingredient in other recipes.

We hope that this primer will help our agricultural technicians, extension workers, and farmers better understand the nature, spread, and management options for golden apple snail.



LEOCADIO S. SEBASTIAN  
Executive Director

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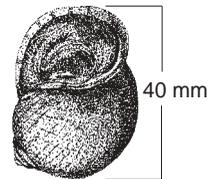
# Introduction

The golden apple snail, popularly known as “golden kuhol” [*Pomacea canaliculata* Lamarck], was introduced into the Philippines between 1982 and 1984. It came from South America (Brazil and Argentina) via Taiwan. Its high nutritive value as food for human beings and farm animals generated interest among both public and private sectors to propagate the production of this organism. However, a few years after its introduction, the golden apple snail became a major pest of rice.

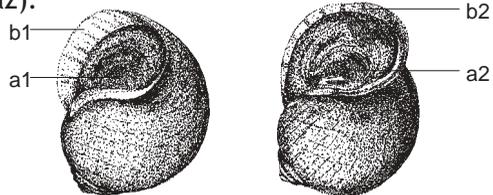
Of the 3 million (M) hectares of rice lands in the Philippines, 1.2-1.6M hectares are infested with golden apple snail. In 1990, P212M was spent to control this pest. The first account that it had become a major pest was recorded in 1986 when about 300 hectares of irrigated rice farms in Region 2 (Cagayan Valley) were heavily damaged. Since then, rice area infested with this pest has been increasing until it became a national menace.

## Characteristics of adult golden apple snails

- The golden apple snail lives for 2-6 years with high fertility.
- Shell is light brown; flesh is creamy white to golden pinkish or orange.
- Size depends on the availability of food.
- Most destructive stage is when the length of the shell is from 10 mm (about the size of a corn seed) to 40 mm (about the size of a pingpong ball).\*



- Female golden apple snail operculum (a1) is concave while it is convex in male (a2).
- The shell of the female adult snail (b1) curves inward; the male shell (b2) curves outward.\*



Female

Male

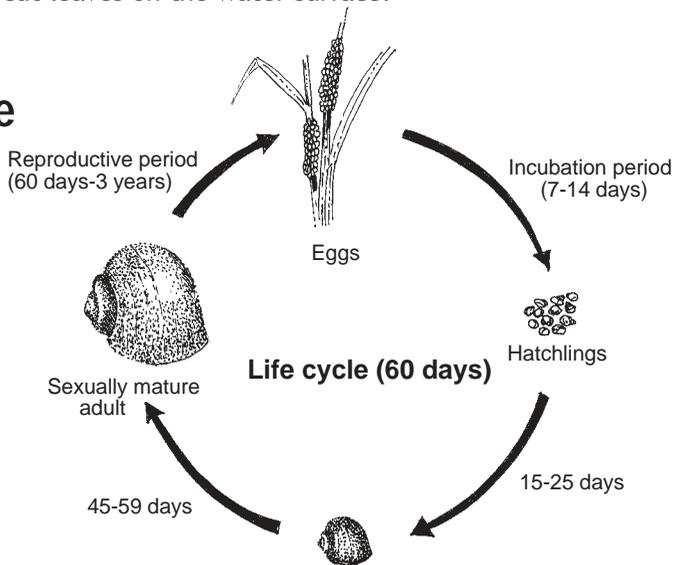
\*Based on the study conducted by MS Dela Cruz, RC Joshi, and AR Martin.

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## Mode and signs of damage

- Newly-transplanted rice seedlings up to 15-days after transplanting are vulnerable to golden apple snail damage; from 4 days to 30 days after sowing for direct-seeded rice.
- Golden apple snails devour the base of young seedlings. They can even consume the young plants in a whole paddy overnight.
- Missing hills
- Floating cut leaves on the water surface.

## Life cycle



### Eggs

- Eggs are laid at night on any vegetation, levees, and objects (e.g. twigs, stakes, stones, etc.) above the water surface.
- Egg masses are bright pinkish-red and turn light pink when about to hatch.
- Eggs hatch in 7-14 days.

### Hatchlings and adults

- Hatchlings grow and mature fast. They are voracious feeders.
- Adults mate for 3-4 hours anytime of the day among crowded plants where there is continuous water supply throughout the year.

- 
- Golden apple snails reproduce rapidly. They can lay 1000-1200 eggs in a month. Thus, egg destruction is a very effective control strategy.

## **Where they live**

- Ponds, swamps, irrigated fields, canals and water-logged areas.
- They bury themselves in moist soil during the dry season. They can aestivate for 6 months, then become active again when the soil is flooded.
- They can survive harsh environmental conditions such as pollutants in the water or low oxygen levels.

## **Feeding habits and host range**

- Golden apple snails feed on a wide range of plants such as algae, azolla, duck weed, water hyacinth, rice seedlings, and other succulent leafy plants.
- They prefer young plant parts that are soft because it feeds by scraping plant surface with its rough tongue.
- They also feed on any decomposing organic matter.

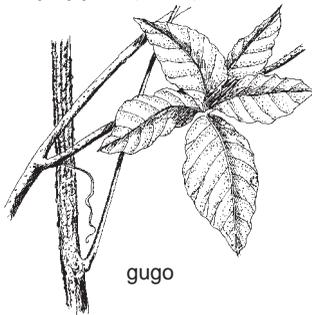
## **Naturally occurring biological control agents**

- Red ants feed on the eggs.
- Ducks eat the flesh and young shell.
- Human beings eat the flesh when it is properly cooked.
- Field rats bite on the shell and eat the flesh.

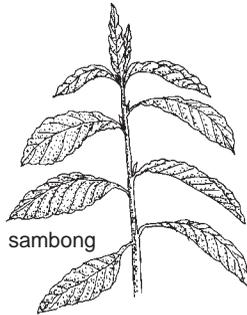
# Management options

## During land preparation

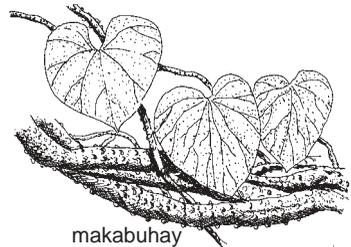
- Before the final harrowing, handpick golden apple snails from rice paddies in the morning and afternoon when they are most active and easy to find.
- Use plants that contain toxic substances against golden apple snail. Examples are *gugo* (bark) [*Entada phaseikaudes* K Meer], *tubang-kamisa* (leaves), *sambong* (leaves) [*Blumea balsamifera*], *tuba-tuba* (leaves), *gabi-gabihan* (leaves) [*Monochoria vaginalis*], tobacco (leaves) [*Nicotiana tabacum* L], *calamansi* (leaves) [*Citrus microcarpa* Bunge], *tubli* (roots), *makabuhay* (leaves) [*Tinospora rumphii* Boerl], and red pepper (fruit).



gugo

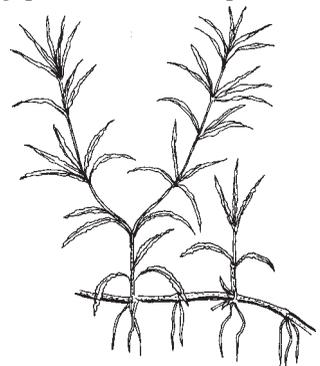


sambong



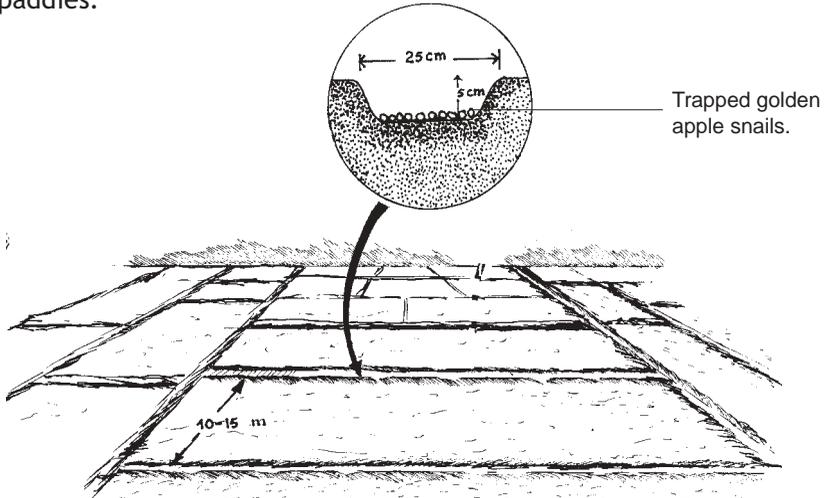
makabuhay

- Other reported plants include starflower (leaves) [*Calatropis gigantea*], neem tree (leaves) [*Azadirachta indica*], and *asyang* [*Mikania cordata*] contain substances that can kill golden apple snails. These are highly recommended before transplanting rice. Simply construct small canals to confine the golden apple snails and right there place the leaves of the said plants that can kill them.
- Use attractants such as leaves of *gabi* [*Colocasia esculenta*], banana [*Musa paradisiaca* L.], papaya [*Carica papaya* L.], trumpet flower, and old newspapers for easy collection of golden apple snails.



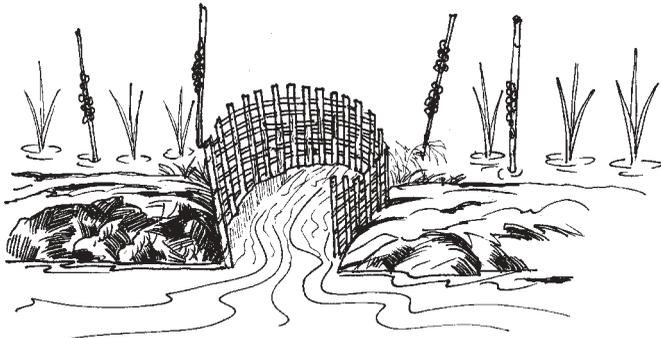
asyang

- During the last harrowing, construct deep strips (at least 25 cm wide and 5 cm deep) in the paddies by pulling a sack containing a heavy object. Provide 10-15 m distance between strips. Likewise, construct small canals (25 cm wide and 5 cm deep) along the edges of rice paddies.



**Small canals, where the golden apple snails will seek refuge if water level is critical, make collection easier.**

- Place a wire or woven bamboo screen on the main irrigation water inlet and outlet to prevent the entry of hatchlings and adults. This also facilitates collection of trapped golden apple snails.



**Screens on the water inlet reduce entry of golden apple snails to the paddy.**

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## During transplanting

- Follow the standard seeding rate and distance so that the plants will have sturdy stems.
- If golden apple snail is a big problem, transplant 25-30-day-old seedlings of early-maturing varieties. In the rice areas of the Cordillera highlands, use 30-35-day-old seedlings of late-maturing varieties.
- Put bamboo stakes on water-logged areas in the paddies or near canals to attract adults for egg laying. This makes collection and crushing of the egg masses easy.
- Maintain shallow paddy water level (2-3 cm shallow) starting 3 days after transplanting.
- Drain the field occasionally to limit snail mobility and feeding activity.



**Draining the field occasionally will limit snail mobility and feeding activity.**

- Collect, cook, then eat the golden apple snails, or crush and feed them to ducks and pigs. Collection is easier by using attractants such as leaves of gabi, papaya, and trumpet flower.
- Use varieties that are high-tillering and least preferred by the golden apple snails such as PSB Rc36, Rc38, Rc40, and Rc68.

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## After harvesting

- Herd ducks in rice paddies immediately after harvest up to the last harrowing for the succeeding crop. Herd them again 30-35 days after transplanting (DAT) early-maturing varieties and 40-45 DAT late-maturing varieties.



Handpicking is recommended for large adult golden snails as these are not fed upon by ducks.

## Integrated management scheme based on rice growth stages

| Pre-establishment | Crop establishment |              |          | Post production  |
|-------------------|--------------------|--------------|----------|------------------|
| Land Preparation  | Vegetative         | Reproductive | Maturity | After harvesting |
| A                 | B and C            |              | D        | E                |

A = Duck pasturing, handpicking, constructing canalets, use of plant attractants, and destruction of egg masses

B = Handpicking, duck pasturing, screen trapping, staking, and destruction of egg masses

C = Water management, handpicking, use of plant attractants, and destruction of egg masses

D = Sustain handpicking and destruction of adults and eggs

E = Duck pasturing, dry land preparation

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## New information

A study conducted by researchers MS Dela Cruz, RC Joshi, and AR Martin from 1999 to 2000 at PhilRice Maligaya found the following:

- Varieties that are least preferred by the golden apple snails are PSB Rc36, Rc38, Rc40, and Rc68.
- Basal application of complete fertilizer and urea incorporated with the soil at recommended rate during the last harrowing reduced golden apple snail population up to 54%.
- Commercial molluscicides (niclosamide and metaldehyde) were effective against golden apple snails that are directly hit. Their efficacy lasted 2-3 days. Molluscicides may no longer kill golden apple snails that will emerge to the soil surface after aestivating and those that would reenter the treated fields. Niclosamide 250EC at half the label recommendation (0.5 li/ha) killed about 80% of the golden apple snails that were sprayed on. Niclosamide kills more native snails than metaldehyde formulations.
- The **Chicharon** (cracker) golden apple snail recipe\* was improved.

### Ingredients

- 1 kg of golden apple snail flesh
- 1 cup vegetable cooking oil
- ½ cup cornstarch or flour
- 1 tsp black pepper
- ¼ cup soy sauce
- 3 tbsv vinegar
- 3 cloves garlic
- 1-2 red chili
- ½ tsp alum (*tawas*)
- 1 egg



Chicharon (cracker) from golden apple snail.

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**Procedure:**

1. Gather 4-6 kg adult golden apple snail, from which some 1 kg flesh will be extracted.
2. Soak the golden apple snail with shell in tap water for 24 hours to remove undigested food. Those that float are dead. Remove them.
3. Boil the golden apple snail in a big kettle for 20-30 minutes.
4. Extract then clean the flesh of golden apple snail. Rinse the flesh with alum (*tawas*) to remove the unpleasant odor.
5. Mix all spices with the golden apple snail. Marinate for 24 hours.
6. Sun-dry the marinated golden apple snail for 2-3 days, or place in oven at 40°C for 48 hours.
7. Air-dry the prepared golden apple snail for 3 days.
8. Deep-fry in vegetable oil for 2 minutes.  
Optional: Roll the flesh of the golden apple snail in batter (cornstarch or flour with egg mixture) before final cooking.
9. For final cooking, deep-fry again for 5 minutes or until it is crispy. Let cool before serving.

*\*Based on the "Kibit" recipe of Ms. Corazon M. Pasion, 124 St., Baler, Aurora; modified by Mario S. Dela Cruz and Ravindra C. Joshi, Crop Protection Division, PhilRice.*

Source: SEAFDEC Asian Agriculture, Vol. 22 No. 4, July-August 2000, page 12.

## Nutritive value of golden apple snail

### Nutritive value of golden apple snail flesh per 100g

|  |             |
|--|-------------|
| Food energy  | 83 calories |
| Protein  | 12.2 g      |
| Fat  | 0.4 g       |
| Carbohydrates  | 6.6 g       |
| Ash  | 3.2 g       |
| Phosphorus   | 61 g        |
| Sodium   | 0.4 mg      |
| Potassium  | 17 mg       |
| Riboflavin   | 12 mg       |
| Niacin   | 1.8 mg      |
| Other food values: Vit. C, zinc, copper, manganese, and iodine |             |

**List of Fertilizer and Pesticide Authority-registered molluscicides as of 31 March 2000.**

| Formulation Type | Active Ingredient                                     | Product Name           | Concentration | Label Recommendation            | Toxicity Category <sup>1</sup> | Company                              |
|------------------|---|------------------------|---------------|---------------------------------|--------------------------------|--------------------------------------|
| P                | Metaldehyde   | Metabait<br>6% Pellets | 60 g/kg       | 2-4 kg/ha<br>4-8 kg/ha          | 4                              | Agchem Mftg.<br>Corp.                |
| F                | Metaldehyde   | Meta Flo               | 300 g/L       | 16-20 tbsp<br>/16L water        | 2                              |                                      |
| WP               | Metaldehyde   | Porsnail<br>75 WP      | 750 g/kg      | 10 tbsp/16 L<br>water           |                                |                                      |
| G                | Metaldehyde   | Rescue<br>10 G         | 100 g/kg      |                                 |                                |                                      |
| P                | Metaldehyde   | Snailkil<br>6%P        | 60 g/kg       | 2-4 kg/ha(T)<br>4-8 kg/ha(DS)   | 4                              |                                      |
| F                | Chlorothalonil  | Shield                 | 500 g/L       |                                 | 4                              | Aldiz Inc.                           |
| EC               | Nicosamide  | Bayluscide<br>250 EC   | 250 g/L       | 7-14 tbsp/16L<br>water          | 4                              | Bayer Phils., Inc.                   |
| WP               |   | Bayluscide<br>70 WP    | 700 g/kg      |                                 | 4                              |                                      |
| EC               | Nicosamide  | Hit 250 EC             | 250 g/L       | 7-14 tbsp/16L water             | 4                              | Cropking<br>Chem., Inc.              |
| WP               | Nicosamide  | Trap 70 WP             | 700 g/kg      | 35 g/16L water                  | 4                              | Dow Agro<br>Sciences B.V.,<br>Phils. |
| PEL              | Metaldehyde   | Bayonet<br>6% Pellets  | 60 g/kg       | 2-4 kg/ha (T)<br>4-8 kg/ha (DS) | 4                              | Jardine Davies,<br>Inc.              |
| PEL              | Metaldehyde   | Stop 6%<br>Pellets     | 60 g/kg       | 2-4 kg/ha (T)<br>4-8 kg/ha (DS) | 4                              | Leads Agri<br>Product Corp.          |
| WP               | Nicosamide  | Archer<br>50 WP        | 500 g/kg      |                                 | 4                              | Nichimen Corp.                       |
| PEL              | Metaldehyde   | Ciba Meta<br>Bait      | 60 g/kg       | 2-4 kg/ha (T)<br>4-8 kg/ha (DS) | 4                              | Novartis Agro<br>Phils., Inc.        |
| F                | Metaldehyde   | Meta Flo<br>300 FL     | 300 g/L       | 16-20 tbsp/16L<br>water         | 2                              |                                      |
| P                | Tannins,<br>Glycosides,<br>Sterols, and<br>Flavanoids | Kuhold P               | 245 g/kg      | 20 kg/ha                        | 4                              | Pro Green<br>Phils., Inc.            |
| EC               | Nicosamide  | Moluxide<br>250 EC     | 250 g/L       | 7-14 tbsp/16L<br>water          | 4                              | Transworld<br>Trdg.                  |

EC – Emulsifiable Concentrate, F - Flowable, G – Granule, P – Powder,

PEL – Pellet, WP – Wettable Powder, T - Transplanted, DS - Direct Seeded, tbsp - tablespoon

<sup>1</sup>Based on World Health Organization, classification by hazards: 2 – moderately hazardous;

4 – unlikely to present acute hazard in normal case

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# DA-PhilRice

The Philippine Rice Research Institute (PhilRice) is a government corporation attached to the Department of Agriculture (DA). Executive Order 1061 approved on November 5, 1985 and amended by EO 60 dated Nov. 7, 1986 created PhilRice to help develop high-yielding technologies so that farmers can produce enough rice for all Filipinos. PhilRice accomplishes this mission through research, technology promotion, and policy advocacy, which are implemented through a network that includes 57 agencies and 104 seed centers strategically located nationwide.

Its interdisciplinary programs include the following: (1) direct-seeded and (2) transplanted irrigated lowland rice; (3) hybrid rice; (4) rice for adverse environments; (5) rice-based farming systems; (6) rice and rice-based products; (7) policy research and advocacy; and (8) technology promotion and development. With these programs, PhilRice aims to develop and promote technologies that are ecosystem-based, location- and problem-specific, and profitable to the Filipino farmers.

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