GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Pomacea canaliculata***

Pomacea canaliculata 简体中文 正體中文

System: Freshwater

Kingdom	Phylum	Class	Order	Family
Animalia	Mollusca	Gastropoda	Architaenioglossa	Ampullariidae

Common name miracle snail (English, Philippines), Gelbe Apfelschnecke (German), golden kuhol (English, Philippines), golden apple snail (English), channeled apple snail (English), apple snail (English)

Synonym *Ampullaria canaliculata* , Lamarck, 1822

Similar species

Summary Pomacea canaliculata is a freshwater snail with a voracious appetite for water plants including lotus, water chestnut, taro and rice. Introduced widely from its native South America by the aquarium trade and as a source of human food, it is a major crop pest in south east Asia (primarily in rice) and Hawaii (taro) and poses a serious threat to many wetlands around the world through potential habitat modification and competition with native species.

view this species on IUCN Red List

Species Description
Large (up to 10cm), more or less globular freshwater snails. Aquarium trade snails are often smaller. Shell colour generally brownish or greenish, often with spiral banding patterns around the whorls. Some aquarium bred animals are bright golden yellow. Body colour can vary from dark, almost black to pale cream. Their presence is often first noted by observation of their bright pink egg masses laid on solid surfaces up to about 50cm above the water surface.

Notes
The true identity of the pest species (perhaps more than one) is not completely clear, partly because the taxonomy of the group of species to which it belongs in its native South America is poorly understood. Much additional information can be found in Cowie, R.H. (2002) *Apple snails as agricultural pests: their biology, impacts and management*.

Lifecycle Stages
Longevity is up to 4 years. Reproductive maturity is reached in 3 months to 2 years, depending on ambient temperature regime.

Habitat Description
P. canaliculata is widely distributed in lakes, ponds and swamps throughout its native range of the Amazon Inferior Basin and the Plata Basin. This amphibious animal remains submerged during the day, hidden in vegetation near the surface. It is more active during the night, and leaves the water in search for fresh vegetation. The activity rate of this snail varies highly with the water temperature. At 18°C they hardly move around, this in contrast with higher temperatures e.g. 25°C. Nevertheless, *Pomacea canaliculata* is more resistant to lower temperatures than most other snails from the genus *Pomacea* (The Apple Snail Website, 1998-2003).

Reproduction
Sexes are separate. Females lay clusters of bright pink eggs attached to solid surfaces (rocks, walls, logs, emergent vegetation, trash) up to usually about 50cm above the water surface. Eggs generally hatch within 7-15 days, but may take longer, probably depending on ambient temperature regime.
Reproductive output can be enormous. Clutch size is up to 1000, but averages probably 200-300. Clutches are laid every few weeks.

Nutrition
A highly generalist and voracious macrophytophagous herbivore. Most plants are eaten, though it does show some preferences, for instance in Hawai'i it will not eat water hyacinth.

General Impacts
Pomacea canalicualata was originally introduced from South America to south-east Asia around 1980, as a local food resource and as a potential gourmet export item. The markets never developed; the snails escaped or were released, and *P. canaliculata* became a serious pest of rice throughout many countries of south-east Asia. In the Philippines, it is considered the number one rice pest and has caused huge economic losses. It was introduced to Hawai'i in 1989, probably from the Philippines, and for the same reasons as for its initial introduction to south-east Asia. Again, the snails rapidly escaped or were released and quickly became major taro pests. *P. canaliculata* can spread rapidly from agricultural areas into wetlands and other natural freshwater systems where it may have a serious impact. These potential impacts could involve destruction of native aquatic vegetation leading to serious habitat modification, as well as competitive interactions with the native aquatic fauna, including native snails. Already, introduced *P. canaliculata* has been implicated in the decline of native species of Pila apple snails in south-east Asia. Also, native species of Pila in the Philippines are reported to have declined as a result of extensive pesticide applications against introduced *P. canaliculata*. Climatic modeling has shown that it has the potential to spread to many as yet uninfested parts of the world, for instance the huge rice-growing areas of India. It has already been introduced to the USA and threatens the major rice-crops of Texas and California. Australia in particular is extremely concerned about its potential introduction to natural wetlands (e.g., Kakadu) as well as to rice-growing areas.

Management Info
Preventative measures: The primary management approach must be prevention. Strict quarantine must be enforced to prevent introduction and spread. Incipient invasions must be eradicated rapidly while it is still possible to do this. For rice and taro fields, it is preferable to use plants from areas that are known to be apple snail free. If that's not possible, examine the plants and make sure that there are no apple snails or other unwanted snails and also check for egg clutches. The use of a screen on water inlets helps to retard the spread of apple snails. Screens should be cleaned regularly to obstruction. Around rice and taro fields, a barrier of copper could be used to slow the snail spreading to some extent. Copper is toxic to snails and they do not cross this material. The copper wire or strip should be placed above the water level, on the border of the field.
Control: Eradication of established populations is probably not possible. Numerous measures have been tried in attempts to control apple snails in agricultural settings. These include: widespread use of pesticides, with serious environmental and human health consequences; biological control, notably the use of fish and ducks; a range of cultural and mechanical control measures. None has proven entirely effective, safe, and economically viable. None is likely to be appropriate in natural ecosystems. In rice and taro fields, hand picking is a successful method to control apple snail populations without harming the environment. The disadvantage is that it only works when done on regular base. The best results are obtained if the hand picking is done as a community effort. All visible snails should be collected with a scoop net or by hand. After collection the snails can be used for human consumption (beware of parasites!), crushed to serve as a food source for fish or destroyed otherwise. Eggs should not be forgotten during collection! Baited traps filled with lettuce, cassava and taro leaves can be used to attract the snails and to facilitate the collection. All vegetation and obstacles around fields should be removed as much as possible as the snails need this to deposit their eggs. When there are no suitable eggs-laying sites available, the snails are forced to deposit the eggs on the bare ground where the eggs are very vulnerable and easily fall into the water, which drowns the eggs. Before draining a field, make shallow trenches so that the snails will congregate in the trenches and can be captured easily.

Pathway
Imported legally and illegally for development of aquaculture projects for human food.Illegally introduced, usually for development as a human food resource.Possibly introduced as eggs or small juveniles attached to aquatic plants.Developed as a domestic aquarium snail and sold in pet stores.

Principal source:

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ALIEN RANGE

[1] CAMBODIA
[1] DOMINICAN REPUBLIC
[1] HONG KONG
[1] JAPAN
[1] LAO PEOPLE'S DEMOCRATIC REPUBLIC
[1] PAPUA NEW GUINEA
[1] SINGAPORE
[1] TAIWAN
[4] UNITED STATES
[1] CHINA
[1] GUAM
[3] INDONESIA
[1] KOREA, REPUBLIC OF
[2] MALAYSIA
[1] PHILIPPINES
[1] SRI LANKA
[1] THAILAND
[1] VIET NAM

BIBLIOGRAPHY
14 references found for **Pomacea canaliculata**

Managment information

Centre for Environment, Fisheries & Aquaculture Science (CEFAS)., 2008. Decision support tools-Identifying potentially invasive non-native marine and freshwater species: fish, invertebrates, amphibians.

Summary: The electronic tool kits made available on the Cefas page for free download are Crown Copyright (2007-2008). As such, these are freeware and may be freely distributed provided this notice is retained. No warranty, expressed or implied, is made and users should satisfy themselves as to the applicability of the results in any given circumstance. Toolkits available include 1) FISK- Freshwater Fish Invasiveness Scoring Kit (English and Spanish language version); 2) MFISK- Marine Fish Invasiveness Scoring Kit; 3) MI-ISK- Marine invertebrate Invasiveness Scoring Kit; 4) FI-ISK- Freshwater Invertebrate Invasiveness Scoring Kit and AmphISK- Amphibian Invasiveness Scoring Kit. These tool kits were developed by Cefas, with new VisualBasic and computational programming by Lorenzo Vilizzi, David Cooper, Andy South and Gordon H. Copp, based on VisualBasic code in the original Weed Risk Assessment (WRA) tool kit of P.C. Pheloung, P.A. Williams & S.R. Halloy (1999).
The decision support tools are available from:
http://cefas.defra.gov.uk/our-science/ecosystems-and-biodiversity/non-native-species/decision-support-tools.aspx [Accessed 13 October 2011]
The guidance document is available from http://www.cefas.co.uk/media/118009/fisk_guide_v2.pdf [Accessed 13 January 2009].

Cowie, R. H. 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.

Summary: Discusses the conservation related impacts of the introduction of alien land and freshwater snails and slugs to the islands of the Pacific. Provides details of the main alien species of concern, identifies islands most at risk and islands on which to focus conservation efforts. Lists distribution details for all alien snails and slugs in the Pacific.

Cowie, R.H. (2002). Apple snails as agricultural pests: their biology, impacts and management. In G.M. Barker (ed.) Molluscs as Crop Pests. CAB International, Wallingford, UK.

Summary: Major review of all ampullariid species, aspects of biology relevant to their pest status, distribution, agricultural impacts, management options. Key words: ampullariidae, rice, taro, wetland crops, freshwater snails

Hewitt, C.L, Campbell, M.L. and Gollasch, S. 2006. Alien Species in Aquaculture. Considerations for responsible use. IUCN, Gland, Switzerland and Cambridge, UK. viii + 32 pp.

Summary: This publication aims to first provide decision makers and managers with information on the existing international and regional regulations that address the use of alien species in aquaculture, either directly or indirectly; and three examples of national responses to this issue (New Zealand, Australia and Chile).
Available from: http://data.iucn.org/dbtw-wpd/edocs/2006-036.pdf [Accessed 22 September 2008]

Invasions in agriculture: assessing the cost of the golden apple snail in Asia. Ambio 25: 443-448

Summary: Economic assessment of dmage to rice in south-east Asia, especially the Philippines.

Joshi, Ravindra C. & Leocadio S. Sebastian (Eds) 2006. Global advances in the ecology and management of golden apple snails. Philippine Rice Research Institute (PhilRice) Sponsers: DICTUC & FAO-UN

Summary: This publication contains all information so far known about golden apple snails (GAS) and the rice systems and countries they have afflicted. Around 500 pages of information are devoted to this species that continue to expand their distribution. No less than US$ 1 billion have been reported as losses due to GAS. 24 chapters cover various aspects of snail taxonomy (traditional as well as molecular tools), impacts of GAS on aquatic ecosystems and farmers health, and pesticide abuse/misuse. Even GAS-invaded countries have submitted their separate country reports. Further, some chapters are dedicated to the utilization of GAS as food and as natural paddy weeder, with some information available on the biorational approach in its management and control. The book has practical applications as well, offering various options for the ecological and sustainable ways to deal with GAS invasions. This book could serve as a manual for all researchers: field research as well as extension workers, and as reference textbook for undergraduate and postgraduate students of biological sciences, as well as industry workers, museums, and even libraries where exhaustive information on this topic is needed.
Details on this featured publication are available from:
http://www.philrice.gov.ph/index.php?option=com_content&task=view&id=104&Itemid=139 [Accessed 28 November 2006]

Levin, Penny., 2006. Statewide Strategic Control Plan For Apple Snail (*Pomacea canaliculata*) in Hawai&#65533;i

Summary: This Hawaii-wide plan for control of apple snail (*Pomacea canaliculata*) consolidates the most relevant information about the ecology and behavior of this serious pest of wetlands and agriculture (particularly taro farms). Environmental, agricultural, health, and cultural impacts of the apple snail in Hawaii are assessed, and its current known distribution in Hawaii is mapped. Historic control measures are itemized, and recommendations for current and future actions are detailed.
Available from: http://www.hear.org/articles/pdfs/applesnailcontrolplanlevin2006.pdf [Accessed 31 January 2007]

Management options for the Golden Apple Snail, 2001. Philippine Rice Research Institute.

Summary: To control this pest in the Philippines, 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.
Website available at http://www.applesnail.net/pestalert/management_guide/pest_management.php

The Apple Snail Website *Pomacea canaliculata* Stijn Ghesquiere, 1998-2003.

Summary: Available from: http://www.applesnail.net/content/species/pomacea_canaliculata.htm [Accessed 2004].

The golden apple snail *Pomacea canaliculata* in Asian rice farming systems: present impact and future threat. International Journal of Pest Management. 40: 199-206

Summary: Discusses impacts on rice and potential control measures. Keywords: South-east Asia, rice, control.

Walker, K. 2006. Golden Apple Snail (*Pomacea canaliculata*) Pest and Diseases Image Library. Updated on 25/09/2006 5:03:31 PM.
Summary: PaDIL (Pests and Diseases Image Library) is a Commonwealth Government initiative, developed and built by Museum Victoria s Online Publishing Team, with support provided by DAFF (Department of Agriculture, Fisheries and Forestry) and PHA (Plant Health Australia), a non-profit public company. Project partners also include Museum Victoria, the Western Australian Department of Agriculture and the Queensland University of Technology. The aim of the project is: 1) Production of high quality images showing primarily exotic targeted organisms of plant health concern to Australia. 2) Assist with plant health diagnostics in all areas, from initial to high level. 3) Capacity building for diagnostics in plant health, including linkage developments between training and research organisations. 4) Create and use educational tools for training undergraduates/postgraduates. 5) Engender public awareness about plant health concerns in Australia. PaDIL is available from : http://www.padil.gov.au/aboutOverview.aspx, this page is available from: http://www.padil.gov.au/viewPestDiagnosticImages.aspx?id=244 [Accessed 6 October 2006]

General information
Food preference and reproductive plasticity in an invasive freshwater snail. Biological Invasions 2(4): 279-288
Summary: Observations and experiments on life history and food preferences in Hawaii. Keywords: life-history, growth, reproduction, invasiveness.
ITIS (Integrated Taxonomic Information System), 2005. Online Database *Pomacea canaliculata*
Summary: An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.
Available from: http://www.cbif.gc.ca/pls/itisca/taxastep?king=every&p_action=containing&taxa=Pomacea+canaliculata&p_format=&p_ifx=plglt&p_lang= [Accessed March 2005]
The golden apple snail, *Pomacea canaliculata* (Lamarck) (Mollusca: Ampullariidae), a potential invader of fresh water habitats in Australia. In: Zalucki, M.P., Drew, R.A.I. and White, G.G. (eds.) Pest management - future challenges. Proceedings of the sixth Australasian applied entomological research conference. Brisbane, Australia. 29 September - 2nd October 1998. Volume 2: 21-26. University of Queensland Printery, Brisbane.
Summary: Uses climatic modeling to ascertain the potential worldwide range of *Pomacea canaliculata*, noting that major as yet uninfested regions of Asia are at risk, as are parts of Australia. Keywords: climate, range, wetlands, rice.