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Every Perilous Step of the Way

**Three Snails
in a Slugfest**

Crossing Jungle Roads

**Are You Ready to
Do the Big CAT Walk?**

**Reality Bites —
A View to
Lessen the Kill**

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*Limicolaria
flammea*
(West Africa)



Pulmonate Land snail *Limicolaria flammea* of West Africa poses a more recent threat to *A. inversus*. This individual was spotted at Seletar West Farmway. Notice its wavy-patterned shell. Photo: Tan Siong Kiat

Three Snails in a Slugfest

Wijedasa, Tan, Clements and **Sng** go 'slo-mo' as they check out what may be one protracted battle for food and space between a possibly native tree snail and two invading alien African species. The research team is in clear favour of protecting this unique local against such pernicious foreign competition.

Text by **Lahiru S. Wijedasa, Tan Siong Kiat, Gopalasamy R. Clements & Dennis Sng**

Amphidromus is one of the largest groups of colourful tree-dwelling snails to have radiated in the South-east Asian region (Sutcharit & Panha, 2006). The presence of three subspecies belonging to two different *Amphidromus* species is confirmed in Singapore — the nationally endangered green tree snail *Amphidromus atricallosus temasek* of certain forest reserves, *Amphidromus atricallosus perakensis*, so believed to be an introduced member (Davison et al, 2008; Tan et al, 2011; Tan & Chan, 2012; Tan et al, 2012), and the critically endangered *Amphidromus inversus* found only in the 5ha remnant primary forest patch of the Singapore Botanic Gardens (SBG) known as the Gardens Jungle.

The presence of *A. inversus* in Singapore has been mentioned in literature as far back as the 1800s (von Martens, 1867; Tenison-Woods, 1888; Fulton, 1896). Recent authors (Chan, 1996; Maassen, 2001; Chou & Tan, 2008; Lok & Tan, 2008; Tan et al, 2012) have also described its presence in Singapore, but all texts, past and present, do not specifically mention SBG as a habitat. The first known written record of this species as occurring in SBG came from the 1961 Annual Report of the Gardens: “During the year the Director of the National Museum, Singapore, found a thriving colony of *Amphidromus inversus* (Muller) on the trees by the Potting Yard. This snail known to occur in the Riau islands is but dubiously reported from Malaya in a single record of many years ago. This is certainly the first [site] record of it in Singapore ...” (Burkill, 1961).

Singapore’s oldest known collection of this species was however only documented in 1992. This has led to the question of whether *A. inversus* is in fact a native. Could it be a non-native that arrived with plants brought in to the Botanic Gardens at some point in time?



2

Amphidromus inversus
(Singapore?)

***Amphidromus inversus* is possibly a Singapore native. It has conspicuous black rings near the tip of the shell. Photo: Dennis Sng**



3

Achatina fulica
(Madagascar)

Giant African Land snail *Achatina fulica* is a notorious Madagascar native that has made it to IUCN’s Top 100 list of most invasive species on the planet. Photo: Dennis Sng

Distribution

As a genus, *Amphidromus* disperses from the Himalayas to northern Australia. Within this geographical range, each species occupies a more discrete and restricted area of its own (Sutcharit & Panha, 2006). *A. inversus* is one of the most widespread members of the genus, and occurs from mainland Thailand and Cambodia to Sumatra and Riau Archipelago in the south, and eastwards to Borneo, the Sunda Islands and Sulawesi (Laidlaw & Solem, 1961). With such a broad range, some questions may indeed be raised concerning the current distribution of *A. inversus* in SBG.

Besides the population in SBG, we know the only collection of this species in peninsular West Malaysia is that of the distinct subspecies *Amphidromus inversus albulus* from Pulau Kapas, an island off the north-eastern coast of Terengganu. The closest to Singapore

that this species has also been recorded is on Pulau Bintan (Riau Archipelago), where it occurs in coastal forests. A thorough search for other habitats in Singapore has yielded no evidence. Researchers are unable to find empty shells or fragments of this species suggesting that the species could have once existed outside of SBG.

Morphologically speaking, *A. inversus* of Singapore is similar to other populations in southern Sumatra, but not identical by any means (Sutcharit & Panha, 2006).

While the species has a generally wide regional distribution, it is still possible that *A. inversus* may be a native of Singapore with a narrow range restriction. The Gardens Jungle of SBG is one of the few primary rainforest patches remaining on the island and does play host to a significant number of flora and fauna that no longer survive in

other parts of Singapore. For instance, *Memecylon cantleyi*, *Heritiera elata* and *Alangium ridleyi* are such range restricted species originally described by the former director, H. N. Ridley of SBG Rainforest. *Memecylon cantleyi* is still represented in Singapore only by the trees that Ridley had so described and nowhere else.

Threats

Urban transformation (Sodhi et al, 2004) has resulted in the loss of large areas of this possibly native tree snail's natural habitat. The main threat to *A. inversus* in Singapore is, however, a different one. A couple of non-native, aggressive African species presently compete with *A. inversus* for food and habitat space. It is unfortunate that the morphological similarity between these species causes confusion in identification and makes controlling the



Give it a shot. Can you identify the three snail species by carefully looking at their empty shell specimens? Photo: Tan Siong Kiat

The main threat to *A. inversus* in Singapore is, however, a different one. A couple of non-native, aggressive African species presently compete with *A. inversus* for food and habitat space.

invading non-native populations a lot trickier.

The Madagascar native, Giant African Land snail *Achatina fulica*, is a destructive pest in tropical agriculture (Raut & Barker, 2002). It is currently on IUCN's Top 100 list of the worst invasive alien species worldwide (Lowe et al, 2000). First recorded in Singapore circa 1922 (Jarrett, 1923), *A. fulica* is now found throughout the island.

Another threat comes from the more recent invasion of Singapore (and potentially further across the region) by the Pulmonate Land snail of West Africa, *Limicolaria flammea* (Müller's naming, 1774). It was first sighted in 2006 around Tuas and has since penetrated many other parts of the island (Tan et al, 2011 & 2012).

A. fulica is found alongside *Amphidromus inversus* in SBG, but one dreads to think that *L. flammea* (currently located at Tuas, Yio Chu Kang and Braddell Heights) may eventually crawl its way there. While the three species occupy different niches — *A. inversus* lives predominantly in trees, *A. fulica* and *L. flammea* are ground dwellers — they share morphological similarities that can deceive the untrained eye. *A. inversus* even descends to the ground sometimes in close encounter with *A. fulica*. It is important to ensure removal of the invading species by careful identification. Do keep an eye on the snails and report any sightings of the three species that will help us in our field research. 🍄

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