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The Giant Rainforest Ant, *Camponotus gigas*

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Two giant ants meeting and greeting each other. Note the long and large mandibles.

Whenever we enter a forest, very surely we will be greeted by this magnificent big ant species commonly called the giant ant. This ant species was named *Camponotus gigas* Latreille in 1802 (subgenus *Dinomyrmex*) (Smith, 1858). It is one of the largest ant species in the world measuring between 20.9 – 28.1 mm and is easily found on the forest floor in South-East Asian rain forests, ranging from Sumatra to Thailand. Its habitat is widely distributed ranging from peat swamps to mountain forests at 1500 m above sea level. This species can be commonly found in Malaysian forests and at the forest edge (Pfeiffer, 2010).

Pfeiffer and Linsenmair (2001) who studied the life history of *C. gigas* in detail, found that a colony had a territory of 0.8 ha and a population of ca. 7000 workers, distributed unevenly among an average of 11 nests. The ant is known to nest most commonly in the ground at the base of large trees and in fallen logs (Orr *et al.*, 1996) and forages mainly at night (nocturnal). At dusk large numbers of foraging ants leave their nests and climb up to the forest canopy. The majority of the workers forage between the canopy and nest throughout the night until dawn. Activity is significantly reduced during the day where only small numbers of workers roam the forest floor. During sampling exercises, this species was easily found when baits using tuna and honey solution were placed on the forest floor. This is mainly due to their diet preferences where honeydew makes up 90% of their diet. They will also consume insects and bird droppings. The ant will always approach the bait singly followed later by another worker to bring their food back to the nest.

This species is known to exhibit territorial behavior with long-lasting ritual fights between major workers, both interspecies and intraspecies. Ritual battles will take place at a fixed tournament location and can last for hours every night. The territorial behavior is also evident in their nesting patterns, where nests are connected by trails through the forest canopy (Pfeiffer & Linsenmair, 1998).

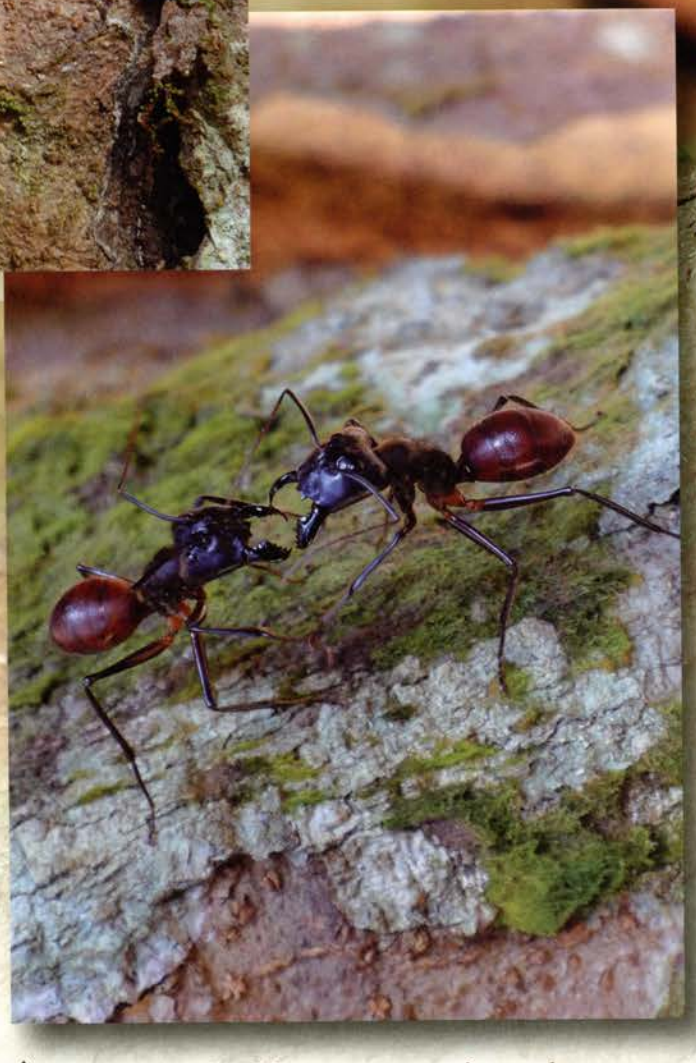
The long and strong mandibles are one of the main characteristics of this species. The strong grip

After working long into the night in the forest canopy, foragers return to the nest in the morning.

of the ant's mandibles allows it to carry food 50 times heavier than its body weight (major workers weigh 372 mg and minors 135 mg). It will also be very painful if they accidently bite us. The Orang Asli once told me that they use these ants as natural wound sutures. They will collect the ants and force them to bite the wound before cutting off their heads. I had always been told by foresters that since this ant contained formic acid, its bite could cause an allergic reaction in persons who were sensitive to it. Many people see this ant as a threat because of its size, but in most cases, it is just a nuisance.

So next time when you enter the forest and encounter this ant species, take a break and enjoy observing their behavior. But be careful not to get bitten by them accidentally.

In Borneo this species is replaced by *Camponotus gigas* var. *borneensis,* a subspecies with yellow legs.



▲ The fighting ritual between two major workers.

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Indirect Biological Control of the Yellow Crazy Ant on Christmas Island, Indian Ocean – an International Collaboration in Classical Biological Control

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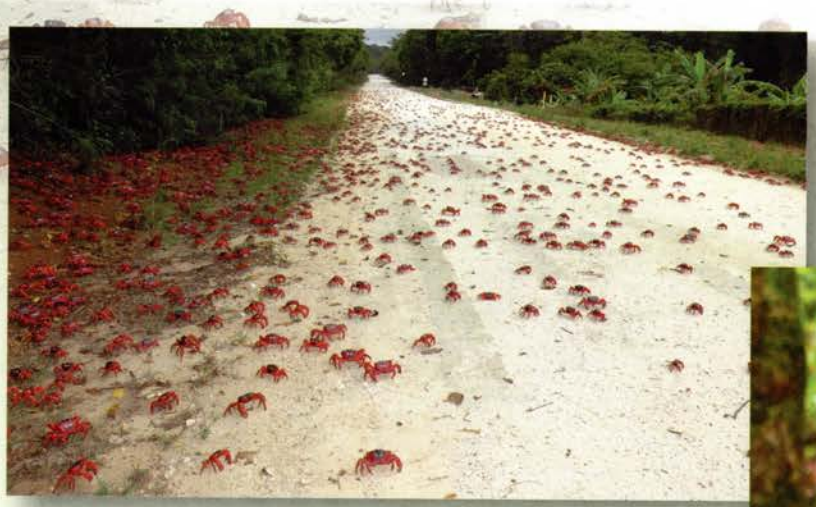


Red crabs migrate from the forests to the shore in great numbers to spawn (Credit: Parks Australia). (Below) The red crab, *Gecarcoidea natalis*.

Christmas Island (Indian Ocean) is located 2600 km north-west of Perth and 350 km south of the island of Java, Indonesia. Christmas Island, along with the Cocos (Keeling) Islands, make up the Indian Ocean Territories of Australia. The island is 135 km^2 in area with 80 km of coastline. The climate is tropical with distinct dry and wet seasons.

Human settlement on the island started at the end of the 19th century after British explorers discovered high quality phosphate. A phosphate mining company was formed in 1897 and the company imported a mostly Chinese and Malay workforce from South-East Asia. The ethnic and cultural mix of the island today still reflects this: the majority of the island's population is Chinese with a significant Malay community and mainland Australians of varied ethnic backgrounds. The official language is English but many locals speak one of several Chinese dialects or Malay as first language.

Like many other remote, isolated oceanic islands, Christmas Island has a unique flora and fauna with relatively low number of species but high rate of endemism. Among the approximately 80,000 sea birds that nest here annually is the world's rarest frigate bird, the endangered Christmas Island frigate bird that nests only on Christmas Island. The island is also the last remaining nesting habitat for the endangered Abbott's booby.

The most iconic of all the unique endemic species is the red crab (*Gecarcoidea natalis*), one of the more than 20 species of land crabs found on the island. This species is very abundant on the island and as a keystone species, it is extremely important for the island's ecosystem. Besides recycling nutrients into the soil by cleaning up leaf litter, they also selectively consume seeds and seedlings, thereby influencing the plant species composition of the rain forest and controlling understorey growth. The red crab also consumes some invertebrates and can provide a natural 'resistance' against invading species by feeding on them. For example, at locations where red crabs are abundant, the invasive giant African land snail numbers are greatly reduced or completely eradicated. Every year at the beginning of the wet season in October, the crabs begin their migration from the inland forests to the shores to release eggs.

This synchronised movement of millions of red crabs is truly spectacular. Sir David Attenborough regarded this natural wonder as one of the most "astonishing and wonderful" phenomena he has ever witnessed. Once the crabs reach the shores they mate and the females produce eggs shortly after. The males return to their forest home while the females remain near the shores while their eggs develop. Then, during the last quarter of the moon in the early hours of dawn at the turn of the high tide, they all release their eggs into the ocean. Once spawned, the females immediately start their return migration back into the forest. The eggs hatch on contact with sea water and the young crabs emerge from the sea about four weeks after spawning. Many factors influence the success of the return of the 'baby' crabs; some years only a few return but other years can yield more successful return. January 2015 was exceptionally successful with astronomical numbers of baby crabs returning from the ocean.

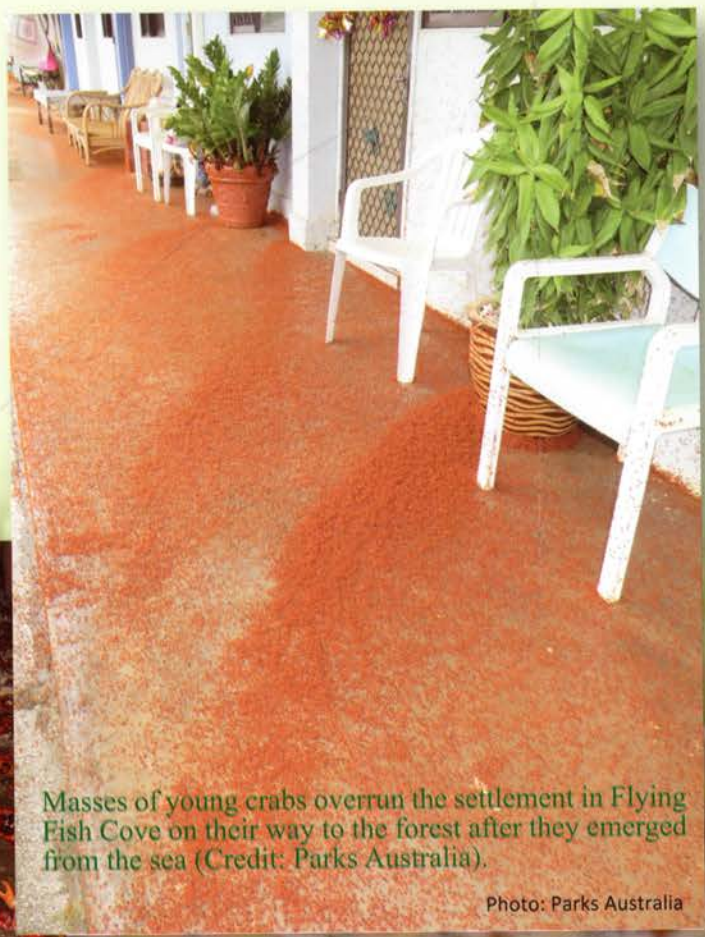
Unfortunately, the red crab (besides many other species on the island) is under attack by the extremely damaging invasive yellow crazy ant, *Anoplolepis gracilipes*. The yellow crazy ant is considered to be one of the worst invasive species in the world. They form large, very high density 'supercolonies' where there can be more than 1000 ants per square meter. The ants spray formic acid as a defense mechanism and to kill prey. Red crabs and other species such as small reptiles are killed in yellow crazy ant supercolonies where the ants are so numerous that they can overpower and consume even the red crabs which are much larger in size. As the crab is a keystone species and greatly influences the ecosystem, the disappearance of the crab triggers a chain of events leading to an invasional ecosystem 'meltdown'. Leaf litter is no longer recycled effectively, and seedlings, undergrowth and invaders such as the giant African land snail and invasive weeds are no longer controlled.

Using chemicals can be effective in controlling the yellow crazy ant, however it is expensive and not sustainable in the long term, as the ant supercolonies re-form again and again. There are no known direct biological control methods to control the yellow crazy ant, however, indirect biological control is a promising alternative.

Researchers from La Trobe University (Melbourne, Australia) found that honeydew producing scale insects provide sugar in the form of honeydew to the ants, and that this resource is critical for supercolony formation. Results of a field experiment in which ants were blocked from access to scale insects and their honeydew showed that ant densities quickly declined

Egg-laden females release their eggs into the sea; the eggs hatch upon contact with sea water (Credit: Kristy Faulkner).

Photo: Kirsty Faulkner



Masses of young crabs overrun the settlement in Flying Fish Cove on their way to the forest after they emerged from the sea (Credit: Parks Australia).

Photo: Parks Australia

Yellow crazy ant, *Anoplolepis gracilipes* (5.0 mm), tending the yellow lac scale, *Tachardina aurantiaca* (3.5 mm) (Credit: Stephen Belcher).

Tachardiaephagus somervillei, a host-specific parasitoid (1.5–2.0 mm) of the yellow lac scale.

below supercolony densities. There are several species of honeydew-producing scale insects in yellow crazy ant supercolonies, but the most important species by far is the yellow lac scale, *Tachardina aurantiaca*, an invasive insect from South-East Asia. The researchers think that biological control of the lac scale would reduce the honeydew supply effectively enough that ant densities would decline and no longer pose a significant threat to the red crabs.

In the next phase of the research programme, the La Trobe researchers teamed up with collaborators from the Forest Research Institute Malaysia (FRIM) and Sarawak Forestry Corporation (SFC) to study the biology and natural enemies of the yellow lac scale in its native range in Malaysia. The collaboration yielded important information about lac scale biology (Ong *et al.*, 2014). Further, several parasitoids (tiny parasitic wasps that parasitise the lac scale and kill it) were found to attack the yellow lac scale with one species, *Tachardiaephagus somervillei*, being very widespread and effective. This parasitoid was found from Penang to Singapore and also in Sarawak, parasitising the yellow lac scale. Studies showed that this parasitoid is specific to a few species in the lac scale family, and because of this specificity, the introduction of the parasitoid to Christmas Island will pose no threat to native wildlife on Christmas Island. The introduction of any species to Christmas Island as an Australian territory is very strictly regulated. Based on over four years of research and very promising results, an application to import the parasitoid has been submitted to the Australian authorities and if successful, the permit to import the parasitoid as a biological control agent to Christmas Island will most likely be issued by mid-2015.

This project has been a real team effort, involving colleagues and collaborators in institutions and departments in Australia and from all around the world – Parks Australia on Christmas Island, the Australian Departments of Agriculture and Environment, the United States Department of Agriculture, the Australian National University, Aligarh Muslim University in India, the California Department of Food and Agriculture, and the British Museum of Natural History. Most important of all have been collaborators at FRIM and SFC – without them, the research on the biology of the target and its parasitoid in the home range would have been impossible. FRIM will also help play a leading role in exporting the founder population of wasps to Christmas Island.

This biological control programme is a perfect example of the importance of international collaboration in invasive species biological control. Invasive species more often than not originate in foreign countries, and the opportunity for collaboration between research agencies in the target and origin countries is critical for the feasibility and success of these programmes.

Further reading

Ong, S.P., Neumann, G., Khairum, Y., Che Salmah, M.R. & Kirton, L.G. 2014. Development and size-fecundity relationship of the yellow lac scale, *Tachardina aurantiaca* (Hemiptera: Sternorrhyncha: Kerriidae). Journal of Tropical Forest Science 26: 435-441.

http://www.environment.gov.au/topics/national-parks/christmas-island-national-park

http://www.environment.gov.au/resource/crazy-ant-biocontrol

Lagerstroemia calyculata Kurz (Lythraceae), a new species recorded in Malaysia

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During a recent botanical survey at Wang Kelian, Perlis, in northern Peninsular Malaysia, an unfamiliar *Lagerstroemia* was encountered. It is a tall tree with pretty pale purple flowers and grows in forest margins by the side of the main road. We found a few individuals at different locations and elevations. Examination of the material collected and photographs showed it to be *Lagerstroemia calyculata* Kurz, a species known from Myanmar, Thailand, Laos, Cambodia, and east to Vietnam (de Wilde & Duyfjes, 2013). This is the first record for Malaysia. It is surprising that this species had not previously been reported because it seems to be well-established in the forest around Wang Kelian where it can be seen in the forest canopy. There are six other species of *Lagerstroemia* native to Peninsular Malaysia, besides the new record of *L. calyculata*. The structure of the bud surface without ridges distinguishes *L. calyculata* from the other species. The species description provided here is based mainly on the recently collected Malaysian specimens and matches the description given by Furtado & Srisuko (1969) and the isolectotype of *L. angustifolia,* a synonym of *L. calyculata* at Kew (K).

A deciduous tree up to 20–35 m. Bole straight and fluted at the base, 40–80 cm in diam. Bark light brown, flaking into rounded or angular pieces, leaving patches of new whitish bark. Leaves lanceolate, 10–18 x 2–6 cm, base obtuse or rounded, margin entire, apex acute or long acuminate, brown hairy on both sides when young, later except for the midrib glabrescent above, hairy beneath, 6–15 veins on each side, reticulation scalariform, more prominent beneath; petiole 5–10 mm long, brown hairy. Panicle brown hairy, 10–20 cm long with oblique or nearly horizontal side branches, bearing sessile or subsessile flowers. Flower bud obconical, c. 5–7 mm long, *not ridged,* tomentose with brown hairs, slightly nippled at apex. Calyx funnel-shaped, c. 6 mm long, 4 mm broad, erect, not thickened in the margin. Petals mauve, obovate, 7–11 mm long (including 2–3 mm long claw), 8–9 mm broad, undulate in the margin. Stamens many, unequal, exserted, the outer 6 much longer than the numerous inner ones, the former with pink-red filaments, inner filaments pale, whitish. Ovary slightly hairy. Fruiting calyx broadly cup-shaped, c. 6 mm long, c. 6 mm in diam., not ridged, appressed to the fruit; lobes 6, patent or reflexed. Capsule black, oblong, about 10 mm long, 6 mm in diam., 5–6-valved. Specimens examined. Perlis, Wang Kelian, Siti Munirah *et al.* FRI 76276, FRI 76281, FRI 76283, and FRI 76284, May 2013 (KEP).

It is found in semi-deciduous forest, possibly also on limestone, in Mata Ayer Forest Reserve, Perlis, Peninsular

Malaysia; flowering in May. Trees were observed at a few locations along the main road from Kaki Bukit to Wang Kelian at 240 m altitude. In Thailand, where trees can reach a tall size, the trunks become hollow with age and are said to be used by nesting hornbills (de Wilde *et al.*, 2014).

This record is a very important finding for the compilation of plant checklists and the updating of the flora of Peninsular Malaysia. This new record shows that we could possibly even miss big trees by the roadside for inclusion in our list if we do not properly check their taxonomic status. Fortunately, by working for the revision of the species under the Flora of Malaysia Project, this big tree with beautiful flowers was found and its taxonomic status confirmed. The work and effort


Tree

Lagerstroemia calyculata Kurz


Tree crown with pale purple flowers


Fluted base of tree

Bunch of buds with open flower.

Leafy twig (upper surface) with inflorescences.

Tomentose surface of buds.

towards documenting our flora needs to keep going, so that the richness of our flora will be well recorded.

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