



Towards a sweeter future

Conserving the giant Asian honey bee in Peninsular Malaysia

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ACROSS SOUTHEAST Asia, the arrival of a giant Asian honey bee (*Apis dorsata*) colony near one's home or garden is regarded as a good luck omen (Oldr d Nanork 2009). And for good reason: these iconic insects, which form conspicuous semi-circular nests on the undersides of tree branches or rock ledges, are respected for the important services they provide to both humans and local forest ecosystems. The relationship between humans and *A. dorsata* is ancient, dating back potentially more than 40,000 years (Crane 1999).

Despite the prominence of these iconic insects in the Asian landscape and their profound biological and cultural significance, however, little is known about *A. dorsata*, including the conservation status of populations in Peninsular Malaysia and beyond. Although insects tend to receive less attention than charismatic megafauna such as hornbills or tigers, it is crucial that basic information on these small but vital pollinators is collected before it is too late.

At home up high

The global distribution of *A. dorsata* stretches from Indonesia in the southeast to western India and Pakistan in the northwest (Hepburn and Radloff 2011), with



Above:
Abandoned *A. dorsata*
combs on the underside
of branches after a honey
harvest

Left:
Ladders are used to climb
tall rainforest trees to
retrieve *A. dorsata* honey

a preference for tall trees with smooth bark, few branches and little surrounding vegetation, such as towering tualang (*Koompassia excelsa*) or dipterocarp (family Dipterocarpaceae) trees. Shielded from predators at such great heights, aggregations of up to 200 nests can occur in a single tree (Starr *et al.* 1987, Oldroyd *et al.* 2000).

As very large honey bees, *A. dorsata* needs a continuous supply of floral resources, necessitating seasonal migration between habitats that may be up to 200km apart (Koeniger and Koeniger 1980). One of the most fascinating aspects of these migrations is that the colonies return to the same trees, sometimes after a period of several years, long after the deaths of worker bees with direct memory of the old nesting site (Neumann *et al.* 2000). Returning colonies may even seek out and nest upon the buildings that have been constructed using wood from their felled home tree (Oldroyd and Nanork 2009).

As the common name “giant Asian honey bee” suggests, *A. dorsata* is one of the largest honey bee species on earth, with individual workers weighing around 120mg (wing length: 16.5-17.5mm) and colonies containing almost 40,000 bees (Dyer and Seeley 1991, Oldroyd and Wongsiri

2006). In Peninsular Malaysia, *A. dorsata* can be easily distinguished from the other honey bee species present, which include *A. cerana*, *A. koschevnikovi*, *A. florea*, and *A. andreniformis*.

Spanning one metre or more in length, the nests are covered by layers of worker bees, with the honey and brood (young developing bees) located beneath. Their open nesting habit

contrasts with the cavity dwelling (living on the inside of tree trunks or other enclosed spaces) habits of some other *Apis* species, including the economically important *A. mellifera* and *A. cerana*.

Defending the sweet life

Because open nests are easily detected by predators, *A. dorsata* is notoriously fierce in defence of its nest (Seeley *et al.* 1982). Like other honey bees, *A. dorsata* relies on stinging to deter vertebrate predators, such as sun bears, honey buzzards, tree shrews and humans. Worker bees die in the process, but in evolutionary terms, this is a small price to pay for defending the nest.

A. dorsata also exhibits other unique defensive behaviour. The approach of a predatory wasp (*Vespa* spp.) or honey buzzard (*Pernis ptylorhynchos*) can elicit a “shimmering” response in which workers on the surface of the hive rear their abdomens in a coordinated wave-like motion, a behaviour which repels and creates confusion among predators (Kastberger *et al.* 2008). If a predatory wasp is caught by guard bees, *A. dorsata* can kill the intruder using a technique called “heat-balling”, whereby a mob of bees forms a tight cluster around the wasp and heats it to death by generating heat with their flight muscles (Ken *et al.* 2005).

More than honey

Honey bees use the nectar of flowers to produce honey, which is one of the sweetest and most energy-dense foods in nature. Perhaps for this reason, humans have valued honey bees since prehistoric times. More than that, in the process of visiting many flowers sequentially, honey bees act as key pollinators by transporting pollen and making it possible for plants to produce viable seeds. As a result, honey bees are necessary for the production of many important agricultural crops including mangos, onions, apples, avocados, cucumbers and thousands of other species.

Forest ecosystems are similarly reliant on pollinators. The towering dipterocarp canopy trees of Southeast Asia tend to flower at night and are adapted to pollination by honey bees, particularly *A. dorsata* (Corlett 2011).

Action calls are buzzing

Honey bees worldwide are currently experiencing a period of unprecedented decline (Brown and Paxton 2009), with the spread of diseases and parasites, widespread use of pesticides and agrochemicals, climate change and low genetic diversity implicated as causes (Potts *et al.* 2010). The conservation of honey bees, particularly the European honey bee, *A. mellifera*, has received a great deal of international attention in recent years.

However, concerns about the conservation of Asian honey bees, including *A. dorsata*, have lagged behind because these species are less well known. Conservationists and scientists are now focusing on these species in light of worrying evidence of population declines and increasing knowledge of the vital role these species play in maintaining ecosystems. As the renowned tropical ecologist Richard Corlett writes, "*Apis dorsata*... deserves the sort of conservation

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attention that is normally reserved for charismatic vertebrates" (Corlett 2011).

Two prominent honey bee researchers, Benjamin Oldroyd and Piyamas Nanork, recently outlined the conservation status of Asian honey bees in a scientific journal article (Oldroyd and Nanork 2009). In their startling review, they list 10 of the major threats to conservation currently faced by Asian honey bees. Of these, the two gravest threats appear to be habitat degradation and over-hunting.

Homeless and hunted

Habitat degradation in Southeast Asia has reached unprecedented levels. This region is projected to lose up to 75% of its original forests and 42% of existing biodiversity by the year 2100 (Sodhi *et al.* 2004). Most

clearing of primary forest in Peninsular Malaysia occurs during the harvest of lumber or to accommodate expanding oil palm plantations. Oil palm plantations are essentially uninhabitable for most vertebrate and invertebrate species, including honey bees (Fitzherbert *et al.* 2008). The destruction of tualang and other tall rainforest trees due to illegal logging will also adversely affect *A. dorsata* (Mardan 2007).

Moreover, while nests on rock faces are generally safe from honey hunters, the iconic limestone karsts dotting the southeast Asian landscape are threatened by mining operations which may further reduce suitable *A. dorsata* habitat (Clements *et al.* 2006).

Exploitation by honey hunters has also been strongly implicated in their decline (Oldroyd and Nanork 2009). The pressure on wild *A. dorsata* populations by honey collectors has increased dramatically, particularly due to consumer demand for wild honey, despite it being unremarkable in any measurable respect compared to domestic honey. The frequency

and nature of harvesting practices also play an important role. During night harvests, for example, bees are burned off their nest and the entire comb may be removed, a practice which usually destroys the hive.

Many Malaysians who have first-hand experience with honey bees are acutely aware of the decline of *A. dorsata*. Street vendors selling sugarcane juice report that 20 years ago their carts were covered in bees, whereas now there are few. Honey collectors and traders have reported decreasing rates of colony return and reduced honey yields throughout Peninsular Malaysia (Mardan 2007). Indigenous Orang Asli, for whom the ancient practice of honey hunting is of profound religious and economic value, report that *A. dorsata* abundance, along with wild honey availability, has severely declined over the past three decades.

Lastly, Oldroyd and Nanork's (2009) review shows that we lack basic information about giant Asian honey bee populations and biology. Without knowing the population sizes of these bees, how effectively they are reproducing and whether they survive harvesting events, it is difficult to identify the relative importance of various threats and the level of urgency needed for actions to sustain honey bee populations.

There may be, however, a positive conclusion to be drawn from this discussion: reducing harvesting pressure on *A. dorsata* may be, at least in principle, relatively straightforward. And everyone can play a part.

Keeping them flying

Oldroyd and Nanork (2009) outlined general strategies to address existing threats to



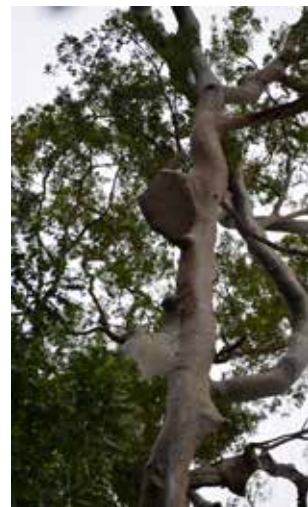
Above:
Freshly harvested *A. dorsata* honeycomb

Below:
Over-harvesting is also a threat to giant Asian honey bees, but alteration to harvesting practices, such as harvesters using smoker tools and protective suits, could inflict less damage to *A. dorsata* colonies

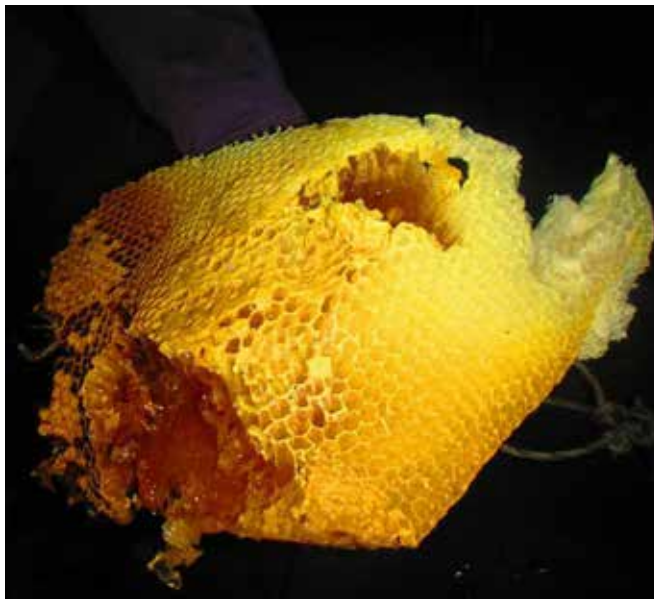
Asian honey bee conservation. First and foremost, in the interest of providing suitable habitat for *A. dorsata*, the protection of rainforest habitat is critical. And as others have noted, tualang trees, and large trees in general, deserve special protection because of their profound importance in *A. dorsata* habitat choice, mating, and migration behaviour. Protection of nesting habitats on limestone karsts would be similarly beneficial.

Over-harvesting can be addressed from several angles. As is the case in Thailand (Oldroyd and Nanork 2009), the overall frequency of harvesting in some areas of Peninsular Malaysia probably needs to be reduced to ensure population viability. Additionally, some traditions of sustainable harvesting are alive and well, and these should be encouraged, examined and emulated as templates for future conservation efforts.

Yet, in general, harvesting practices could also be altered in simple ways to inflict less damage to *A. dorsata* colonies. For example, using smoker tools and protective suits to harvest honey during the day could drastically reduce honey bee mortality and also benefit honey hunters by facilitating several harvests from the same hive during a single season.



Efforts to introduce these techniques in other areas of Southeast Asia have met with great success. Rafter beekeeping, in which *A. dorsata* swarms are purposely drawn to nesting planks kept in backyards, may be an attractive option for some. Although the honey produced using rafter beekeeping can no longer be marketed as “wild”, the honey is of equal quality and it can be harvested without killing the bees.



Freshly harvested *A. dorsata* honeycomb

Consumer behavior is also a fundamental aspect of honey bee conservation, as demand for wild honey is probably a strong driver of unsustainable harvesting rates. There is tremendous transformative potential in this domain through simple changes in the purchasing and eating decisions of Malaysians who consume honey. It is important to recognise where your honey comes from and whether it was sustainably harvested. Ideally, consumers should avoid wild honey if possible. There are many sources of honey, including that of stingless bees, so pursuing alternative honey options may help relieve some pressure on *A. dorsata* populations reeling from over-harvesting.

The conservation of *A. dorsata* and other Asian honey bees is important for everyone. First, preserving the economic viability of honey is necessary for the businesses of traders and harvesters and to sustain the traditional subsistence practices of Orang Asli honey hunters. Second, preserving the pollinator services that honey bees provide is critical for maintaining agricultural yields and the continued survival of Malaysian rainforests. Finally, protecting honey bees in Peninsular Malaysia will ensure that future generations have the opportunity to taste the delicious honey of these iconic social insects that we all enjoy so much today. 🐝

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