

## INSIDE JEB

## Tropical paper wasps serve long apprenticeships



A nest of *Ropalidia marginata* wasps. Photo credit: Souvik Mandal.

Growing up in rural India, Souvik Mandal was always fascinated by the behaviour of the animals that surrounded him. ‘I was intrigued by the “skills” which our domestic cattle, free-ranging poultry, wild birds and honey bees use to return home’, he recalls with a smile. So, when Mandal joined Raghavendra Gadagkar’s lab at the Indian Institute of Science as a graduate student to work on the tropical wasp *Ropalidia marginata*, he was excited by the blank slate that he was offered. ‘Compared to honey bees and ants, very little was known about the landscape-scale navigation in wasps’, he says. Having discovered that the wasps are capable of learning the local landscape and using the information to return home, Mandal and Anindita Brahma, also from the Institute, wanted to understand the insect’s homing strategy. As honey bees take to foraging swiftly after a brief apprenticeship, the duo wondered how the wasps’ foraging strategy develops as they age. But first the pair

had to determine of the ages of all of the foragers in the nest.

After identifying three candidate nests – located in fuse boxes on lampposts in the Institute campus – Mandal and Brahma stood sentry over each nest every night for 6 months to identify and mark the newly emerged foragers with unique sets of paint identification spots. ‘We basically looked for any new black-eyed wasps’, says Mandal, describing how the eyes of recently emerged wasps fade quickly during their first few days. Having established the ages of all of the foragers, the duo staked-out each nest for three consecutive days, filming the wasps’ movements and recording their bearings when they departed and returned, and whether the insects were carrying construction materials, food or water. ‘We had occasional curious visitors’, says Mandal, recalling unwanted attention from humans and animals while he and Brahma attempted to keep track of the busy wasps.

Recording over 4000 trips by 272 foragers, Mandal and Brahma were surprised to see that initially the youngest foragers only left the nest once or twice a day, gradually building up their stamina until they were going out as many as six times a day. The youngsters only began returning with food 2 weeks into their foraging careers, at which point they also began cutting back on the number and duration of foraging trips, increasing their foraging success and efficiency as they grew older. Mandal also analysed the direction of the wasps’ departures and it was clear that they began to specialise as they grew older, heading off in all directions early in their careers, but preferring to visit richer locations later in life. ‘This indicates that wasps probably learn and memorise the location of food availability by acquiring sufficient spatial familiarity with their foraging grounds during their early foraging phase’, says Mandal: ‘They become smarter with age’.

But why are the strategies of tropical wasps and temperate bees so different? Mandal attributes the wasps’ relatively long apprenticeship to the cluttered tropical environment in which they make their homes; they rarely experience uninterrupted views that could allow them to get their bearings. And he adds that the unguided wasps pursue prey that are constantly moving, in contrast to bees, which are directed by nest mates to stationary blooms. ‘This enables us to understand how the environment in which animals evolve shapes different behaviour and strategies’, says Mandal.

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