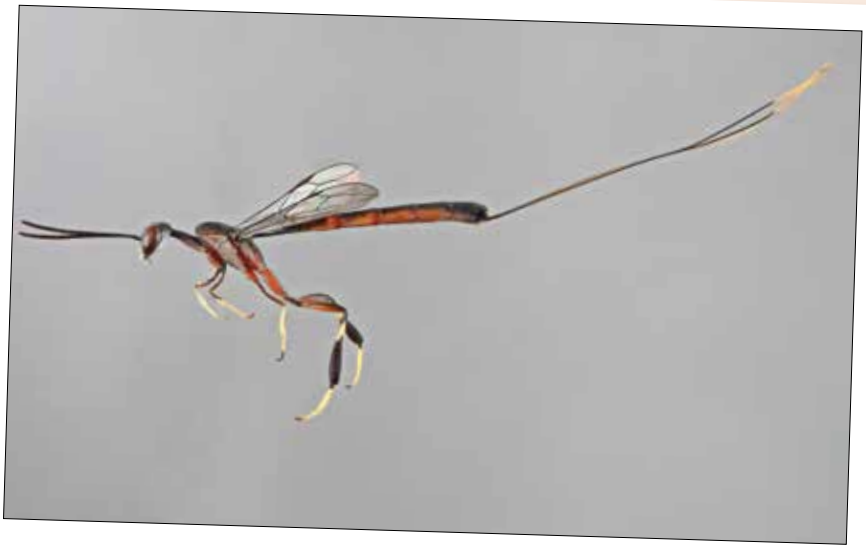

Fat-legged wasps

Searching for food is a primary concern of all animals, and different organisms use a variety of sensory systems including sight, smell and sound. Even humans can attest to sometimes having a preoccupation with finding their next meal. Who hasn't started salivating at the sound of a crisp piece of fruit being chopped or had their stomach start to growl at the smell of a curry? On the flip side of the coin, humans are on the dinner menu for other animals too. But, in Australia we are mainly targeted by mosquitoes or leeches, who dine on our blood rather than consume us as a full-course meal.

Insects are the most diverse group of organisms on Earth. They have a long evolutionary history, numbering millions of species, most of which are yet to be formally described or named in scientific literature. The oldest insects are primitive wingless forms known from Devonian fossils, which existed about 400 million years ago. That's given them plenty of time to exploit virtually every terrestrial and freshwater habitat on the globe, and plenty of time to evolve novel ways of finding food.

A new study published in the journal *Insect Systematics and Diversity* by an international team of scientists, including Nikolai Tatarnic from the Western Australian Museum and Ben Parslow from Flinders University, has found that a distinctive group of wasps use fat bodies – an insect organ analogous (or equivalent) to the human liver – within their legs to detect prey. These wasps, members of the family Gasteruptiidae, are found in many ecosystems around the world and there are currently about 500 named species. They usually have long thin bodies, an elongated head and 'neck' and rather long hind legs. If you have a good eye for wasps, you may have seen females hovering near logs or trees where they are searching for the nests of solitary bees and wasps. Once a female wasp locates a nest, she lays her egg within it. Once the larva has hatched, it consumes the host egg or early instar larva and then consumes the cell contents, which were stocked by the mother.

A rather peculiar feature of many gasteruptiids is the presence of enlarged tibiae of the hind pair of legs, which the authors of the study found possessed unusually large fat reserves that occupy most of the space within the leg segment. They used a variety of methods, including "microscopy, chemical analysis, gene expression, and behavioural observations" to determine what role these fat bodies serve. As clusters of fat cells in the legs are virtually unheard of in insects, the authors were curious about their function. They found that besides its normal detoxification function, the fat body also helped in two ways. The first is that the fat bodies may function to amplify vibrational signals transmitted through the air, enabling them to accurately pinpoint the location of nests. The fat bodies are located near internal mechanoreceptors, the subgenual organs, which are as sensitive as vertebrate hair cells in the cochlea of the inner ear. The fat bodies are thought to accentuate the vibrational signals being delivered to the subgenual organ, which enables the wasps to pinpoint faint movements within wasp and bee nests.

The second possible function is that they enable the wasps to balance themselves and hover around the nest of their host. Many wasps and bees use their hind legs to stabilise themselves while flying, and gasteruptiids are no exception. Indeed, the legs seem to dangle below them. Experiments with wasps have shown that removing their hind legs inhibits their ability to balance and hover accurately.

So, next time you're searching for a nice meal in a restaurant, perhaps you should feel relieved that you don't have to rely on the fat in your legs to search for the perfect snack and marvel at all the ways insects have evolved to help them survive.

Above *Gasteruption longipleurale* are characterised by the unusal fat reserves in their legs.
Photo – Ben Parslow

Discovered is a regular series prepared by scientists at the Western Australian Herbarium (Department of Biodiversity, Conservation and Attractions) and at the Western Australian Museum (Department of Culture and the Arts).