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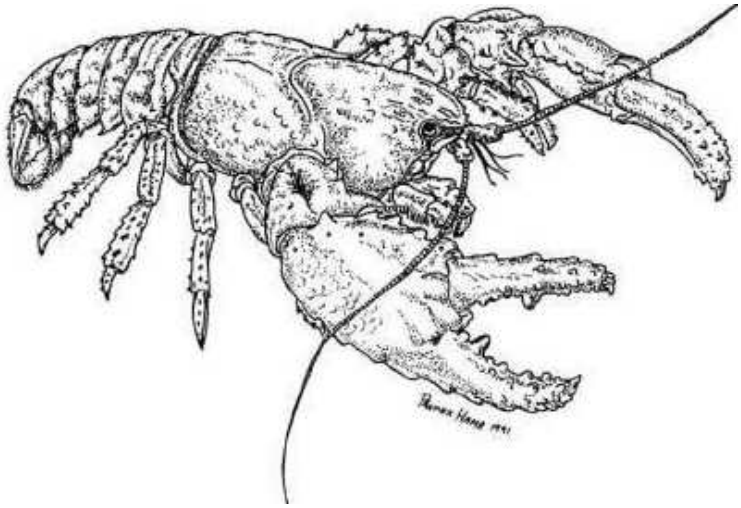

Observed connection between European wasps and willow trees

by **Sue Gebicki**

A few years ago we had a terrible European wasp plague. The air was thick with them, the carcasses on the road were yellow with them. Very few other insects could be found – my brassicas were completely free of cabbage moths and their larvae, the march flies and blowies absent, but tragically everything else had gone too. I began a personal vendetta, locating nests and poisoning them. I lost count after the 70th nest.

More recently, I have noticed that the two large cricket-bat willows (*Salix alba* 'Caerulea') around our house are swarming with European wasps. Closer inspection revealed that the trees are completely infested with aphids, which on research have been found to be *Tuberolachnus salicis*, a very large black

aphid which feeds exclusively on willow trees. These aphids exude a black sticky substance which provides an excellent source of carbohydrate for the wasps.

European wasps (*Vespula germanica*) start a new nest in early spring, with a lone mated queen that has sheltered throughout winter in any available crevices or holes. She feeds on carbohydrates while looking for a suitable spot for a nest where she builds a few small cells from chewed wood fibre, in which she lays eggs. She tends these, and when the larvae hatch she feeds them protein through several stages of growth until they emerge as workers. By early summer the workers have taken over enlarging the nest, building more cells and then tending and feeding the larvae. The queen drops all other tasks and concentrates on laying eggs. In autumn the workers commence building larger cells in which hundreds or even thousands of queens and males are reared. The new queens and males leave the nest, mate, and the young queens then find suitable winter shelter. In warmer areas the nests may survive the winter, however in Tasmania they tend to die.

The workers live 3-4 weeks, and there is high variability in sequence and diversity of tasks performed. To a limited extent they follow temporal polyethism in the nest. This is a mechanism of worker specialization in which workers concentrate on tasks in sequential order throughout their life. Typical order is first, nest duties, second, pulp foraging, third, carbohydrate foraging followed by the fifth, protein foraging. This ensures that the older expendable workers are performing the more dangerous tasks.

European wasps are opportunistic predators and scavengers, and their flexibility in foraging behaviour is a key factor in their rapid colonization. After hibernating queens arrived in New Zealand in 1945, they had infested 80,000 sq. km within 6 years. They came to Australia more recently from New Zealand. Research conducted on the diets of European wasps in New Zealand beech forests found that 15% of returning foragers carried animal prey, 8% wood pulp and 68% clear sugar liquid in their crops. These figures varied a small amount in scrubland, where they carried a smaller proportion of both animal prey and wood pulp. The animal prey was mostly crickets, grasshoppers (Orthoptera) and large bees, ants, wasps (Hymenoptera). On the north island the wasps carried 0.8 million prey loads/ha/season, on the south 4.8. The researchers calculated that the biomass of these loads was 1.4 kg/ha in the north, 8.1 kg/ha in the south. Researchers found that the weight of animal prey taken on the South Island equalled that taken by native insectivorous bird fauna. The carbohydrate was 78 and 343 litres/ha respectively.

Another New Zealand study in a different areas found that the highest proportion of species caught were true flies (Diptera), followed by butterflies, moths larvae (Lepidoptera) then spiders (Arachnida).

A South Australian study also counted the number of animal prey brought back to nests. They found that those most frequently brought back were Diptera (35%) followed by Hymenoptera (mostly *Apis mellifera*, honey bees 9%), Lepidoptera (4%) and Arachnida (3%). Other prey items included grasshoppers, crickets, amphipods, beetles, lacewings, leafhoppers, dragonflies, and unidentified items. There were no records of aphids having been found among the prey. Twenty-two percent of all items were so badly masticated that they could not be identified visually. Interestingly wood pulp accounted for 19%, a much greater proportion than that found in New Zealand. The South Australian researchers surmised that the differences in proportions of prey collected reflected the proportions available, confirming that the wasps are opportunists in their foraging.

My own observation of the wasps indicates that they are carrying water back

to the nest on warm days, as they alight at water sources in great numbers then travel immediately back to their nests. They have also unfortunately prospered greatly from the carcasses of roadkill. The wasps work very long days, they are active in the willows well before sunrise and continue long after the sun has gone, are undeterred by heat or cold until late autumn. Research has shown that they become much less active at less than 10 degrees Celsius (and above 35 degrees, although I don't expect that is an issue here in Tassie).

I was now totally inspired about finding more evidence of wasps using willow aphid secretions as a valuable food source, so examined crack willows along the Meander River from Westbury to Deloraine, and found the same aphid and wasp activity as here. I have also found a difference in infestations in different willow species. We have a tortured willow, *Salix babylonica* var. *pekinensis* 'Tortuosa', which has very few aphids, and my shrub willows, *Salix alba* 'Britzensis' have none. I have not investigated these other trees and shrubs in any other sites.

Tuberolachnus salignus, the giant willow aphid, is very large with a body length of 5.0-5.8mm. Colonies consists of both winged (Alates) and wingless (Apterae) individuals. Adults give birth to miniature adults called nymphs, and each alate produces 34.3 nymphs on average. Time to maturity is dependant on temperature and species of willow, ranging from 17 to 12.21 days. Adults continue to live post-breeding.

Colonies continue feeding and reproducing on willows after leaf fall, which is unusual for aphids. It is not yet known where they go from winter until summer.
Early season colonies appear in summer and are situated at the base of willow trees, moving up the stems with increasing numbers. In summer alates disperse from other infestations, starting higher up the stems. By late summer the colonies can contain tens of thousands of individuals.

So back to our willows. Since the removal of a large number of mature crack willows from our local creek by a 'work for the dole' team several years ago there has been a dramatic drop in the local annual summer infestation of wasps. However inspection of the crack willows (*Salix fragilis*) re-growing along the creek revealed a very heavy load of the willow aphids, and an annually increasing wasp population. One of my cricket bat willows has now been turned into excellent mulch, the other is soon to follow and I will resume my hobby of locating and destroying wasp nests.

Footnote: On my most recent foray into the bush looking for wasp nests, I was eaten alive by march flies. My brassicas are again holey from cabbage moth larvae, although the blue wrens are consistently working on them. I am trying to see these as good signs ...

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Back to top

Home
Why 'disjunct'?
Membership
CDs & Books
Contact Us
Articles
Acoustic Bird Monitoring
Walks & events
Links