

# The European wasp — here to stay?

'God made the bee but the Devil made the wasp' according to an old German proverb, this denouncement of the wasp perhaps prompted by its failure to provide honey and its ability to sting painfully and repeatedly.



Our age-old suspicion of wasps — King Menes, Pharaoh of Egypt, was fatally stung some 4500 years ago — is not entirely deserved. Many wasp species help to control insect pests such as grubs and caterpillars, and most will only sting under provocation.

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*It could well prove a more serious pest in Australia than in its native range.*

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Nevertheless, the European wasp (*Vespa germanica*), barely tolerated in Europe, is definitely an unwelcome settler in Australasia. Indeed research has shown that it could well prove a more serious pest in the antipodes than in its native range.

The European wasp's presence in Australia has been well publicised, thanks to intense media interest in the so-called 'killer wasp' and numerous public awareness programs set in train by government authorities to alert people to the hazard

**The European wasp, its comb, and (inset) its sting.**

and to assist in location and destruction of nests. But how did the insect get here and what is known about it?

Early reports show that the European wasp, a social insect already present on most continents, came to Australia via New Zealand. It seems that hibernating queens were transported to Hamilton, New Zealand, in 1945 in a consignment of aircraft parts sent from Europe. Within 6 years the species had infested 80 000 sq. km, and it now inhabits both islands.

Nests in Australia were first recorded at Hobart in 1959 and by 1978 had been found in Victoria, New South Wales, South Australia, and Western Australia. Records from Tasmania indicate an annual dispersal rate of 64 km.

However, focal points of initial infestations have invariably been close to seaports or airports, suggesting that accidental transportation of hibernating queens has also assisted the wasp in Australia. And road transport no doubt helps account for the pest's rapid cross-country spread. Foraging



flights by worker wasps rarely exceed 1 km, although long-distance spring migration by queens of closely related species has been recorded in Scandinavia.

The map on the next page shows the present distribution of the wasp. A similar species (the common or English wasp, *V. vulgaris*) is also established in Victoria and New Zealand.

### A resourceful community

Dr Philip Spradbery of the CSIRO Division of Entomology has had an interest in wasps, hornets, and the (unrelated) screw-worm fly for more than 20 years — his studies taking him from Europe to Africa, Japan, New Guinea, and Australia. He has written a book on wasps, and his studies on the European wasp in both England and Australia allow him to compare how its life cycle, behaviour, and ecology vary between these two different environments and, together with other research, indicate the likely consequences of the current wasp invasion.

European wasps have evolved a co-operative society with a generally rigid class structure. Nests are typically initiated in spring by individual queen wasps that have survived the winter in hibernation. After feeding on nectar, honeydew, or some other carbohydrate, the young queen usually chooses a sheltered, often subterranean, site for the 'embryonic nest'. Unaided, she builds a paper comb comprising some 20–30 cells, complete with a protective outer envelope that helps insulate the comb.

Inseminated the previous autumn, the queen now lays an egg in each cell and rears the developing larvae on masticated protein — insect prey or scavenged meat and carrion. Once the first generation of worker

**Tending the larvae.** Adults feed the growing brood on protein and remove excess fluids. Note the large drop of fluid produced by the larva at left.



**Embryo nest of the common wasp *V. vulgaris* (note light-brown colour of carton) with envelopes partly removed to reveal the comb and founding queen.**

wasps (small sterile females) is produced, the queen turns her attention exclusively to egg-laying while members of the worker caste take over the more mundane but essential duties of foraging, nest construction, and defence.

During the summer months, as the worker population grows, the nest site is enlarged (if necessary, by excavation) and additional combs are suspended one below the other, linked by stout pillars of wasp paper or carton. To make this papier-mache-like building material, the wasps scrape dead wood from fence posts or similar sources and chew the wood pulp into a moist paste; this is applied in thin strips and left to dry.

Towards late summer the colony begins producing queens (gynes) and males, the former always in special queen cells — royal suites, some 40% larger than worker cells. Numerically, the colony is now at its peak, and it is at this time, during late summer, that wasps can be a nuisance and that most nests are discovered. With the onset of cool autumn and winter weather and following the death of the founding queen, the colony disintegrates, worker wasps perish, and the young mated queens,



**Embryo nest of the European wasp *V. germanica* with typical grey carton. The umbrella-like envelopes help protect and insulate the brood.**

laden with fat reserves, take refuge in hibernation.

### Perennial colonies — a new strategy

This annual life cycle is typical of European wasps in their home territory. However, in most parts of Australasia colonies have shown a remarkable tendency to ignore convention and continue activities during winter and into the succeeding spring and summer. They achieve this by recruiting new queens in late summer, so the colony — now with up to 100 or so queens, and avoiding the risky business of nest-initiation — can go from strength to strength during the following season, and sometimes even into a third.

These perennial colonies in Australia and New Zealand (where the phenomenon was first recorded) can attain prodigious proportions — up to 100 times the size of European ones. Some contain more than a million cells. The processes giving rise to the production of many new laying queens (polygyny), which are probably daughters

**Queen wasp feeding on nectar during the spring.**







**Distribution of the European wasp**

### The European wasp is extending its range.

of that colony's founding queen, remain a mystery. These new queens or gynes must abandon the winter ovary diapause (arrested egg development) that is so characteristic of queen wasps in Europe. Scientists have yet to work out why this often happens in Australia, yet never in Europe.

Examinations of nests in Europe and Australia show that wasp colonies can remain active for up to 10 months here compared with a 7-month season in temperate Europe. This means that even conventional annual colonies in Australia tend to be larger. European colonies reach a maximum adult population of 3–4000 worker wasps and 12–13 000 cells. By comparison, in Melbourne a researcher from the Department of Agriculture and Rural Affairs recently counted more than 11 000 workers in a single nest comprising some 60 000 cells — more than four times larger than Europe's best.

Our relatively mild climate favours wasps by ensuring abundant winter supplies of nectar (carbohydrate) and insect prey (pro-

**These records illustrate recent acceleration of the wasp invasion. In Melbourne, as many as 100 nests have been recorded in a week in some council areas in recent times.**



### Overwintered (perennial) nests can reach immense proportions.

tein). From research in the University of Tasmania, and from overseas studies, scientists believe that weather (particularly spring rain) and availability of protein for larval wasps may partly account for observed population fluctuations. Wasps can sometimes reach plague proportions in Europe — the wretched 'wasp years'. With abundant winter supplies of nectar and insect prey and a mild climate in Australia, it could well be that most years will prove prosperous for the pest.

### Urban blight, rural pest

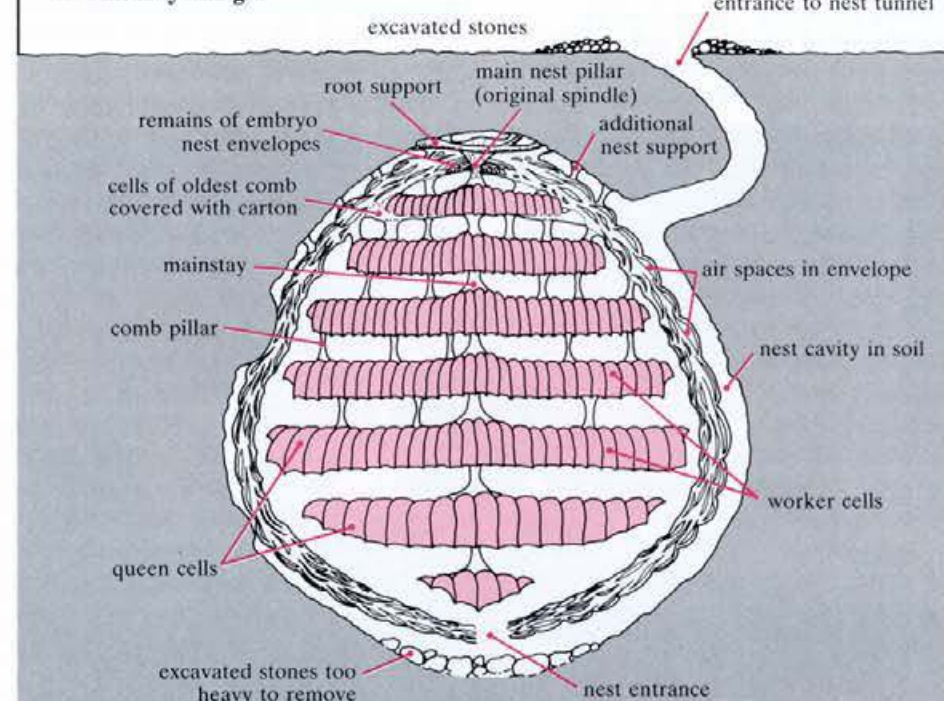
Infamous by virtue of its occasionally fatal sting, the European wasp is perhaps particularly abhorrent to Australians as it threatens that very pillar of our society — the outdoor barbeque! Most press reports emphasise that the wasp, attracted to food and drinks, can enter a drink container and, if swallowed, can sting the mouth and throat with risk of asphyxiation. Unfortunately this is true, but the risk can be

reduced by using a glass or straw — perhaps heralding a new era of civility for barbeque enthusiasts.

Death can also result from allergic reactions after successive stings. About one person in ten proves allergic to proteins in the wasp venom. The wasp has not killed anybody in Australia to date, but it has hospitalised many people, including one person who was clinically dead on admission. A study in Denmark, part of the European wasp's home range, reports 26 confirmed cases of death from bee and wasp stings between 1960 and 1980, with 15 of these definitely attributable to wasps. Between 1949 and 1969, 70 people died of bee and wasp stings in the United Kingdom, while in the United States more than 50 people die of these causes each year. These figures are probably conservative because many fatalities caused by stings may be misdiagnosed as heart attacks. At best, a

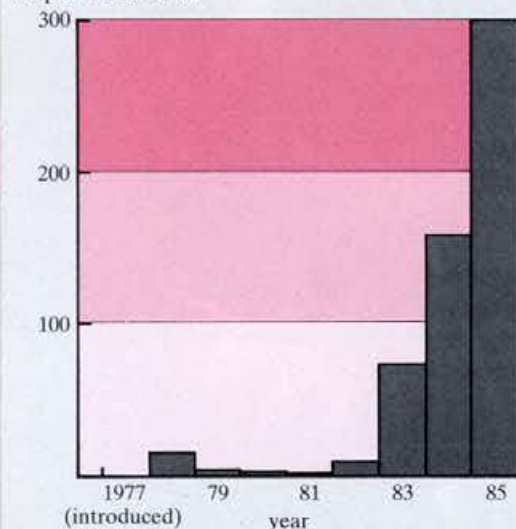
**Most European wasp nests are subterranean or associated with buildings.**

### A masterly design



### Wasp nests in New South Wales

number of European wasp nests recorded





sting from a European wasp is extremely painful!

Dr Struan Sutherland of the Commonwealth Serum Laboratories fears for the safety of people with allergies and of children, as multiple stings could inject an overwhelming amount of venom. Nest sites should be avoided, as the wasps usually attack only if provoked — for example, if somebody blunders into a nest. One attacking wasp can trigger a chain reaction, so an aggressive swarm of wasps descends on the intruder. On a brighter note, Dr Sutherland says special venom preparations and tests to be used in desensitisation of highly allergic patients have now arrived from overseas.

The wasp is also an ecological threat, preying on the indigenous fauna, particularly other insects, with which the foraging workers also compete for nectar. Livestock and pets can be killed, but from overseas experience any economic impact of the pest will hit beekeepers and perhaps berry- and grape-growers the hardest.

Worker wasps raid beehives for both honey and bees. In New Zealand 4.9% of bee colonies (10 000 hives) were seriously affected by wasps in one year and 1.9% were completely destroyed, compared with only 0.44% destruction of hives by American foul brood disease during the same period.

In the United States some grape-growers report losing half their crop to wasps. Another aspect is the risk to fruit-pickers and those handling sweet materials in factories, not to mention the associated time loss and disruption until the offending wasp colony is located and destroyed. Schools and recreational areas can be similarly disrupted.

### Biological control sought

To make matters worse, the wasp's usual predators and parasites are absent from Australia. Of the 148 or so species associated with wasp nests, a rhipiphorid beetle, a mermithid nematode, and a parasitic ichneumonid wasp known as *Sphecochaga vesparum* look the most promising candidates for biological control, but outright eradication by this means is most unlikely.

Dr Ross Field of the Victorian Department of Conservation, Forests and Lands, collaborating with Dr Ben Oldroyd of the Victorian Department of Agriculture and Rural Affairs, is investigating the possibility of using *S. vesparum* for biological control of the European wasp in Australia. They are building up numbers of the parasitic wasp in quarantine, and will make sure that



Male (left), queen (centre), and worker (right) of the European wasp.

it is free of honey-bee diseases and that it doesn't attack harmless and beneficial native wasps (such as our paper wasps) before they release it.

Meanwhile Dr Spradbery and his colleagues in the Division are attempting to ascertain what determines the number of queens in a colony and exactly how the queen or queens exert control over the worker caste in the social colonies. Overwintering colonies with an abundance of queens provide a unique opportunity for Australian researchers to solve the fundamental question of how the social organisation of a wasp colony is established and maintained.

The scientists, in a modest part-time research program, are using tethered queens in sealed perspex containers to

determine whether they emit pheromones and what effect these have on the ovaries of worker wasps. If these experiments establish the existence of a 'queen substance', further studies will be conducted on the structure and biochemistry of the insect's pheromone-producing glands.

This research may duly help in control of the European wasp, particularly if the pheromone can be identified and analogues synthesised for incorporation into specific wasp attractants that could be used to trap or poison wasps, or perhaps to attract them for artificial infection with parasitic nematodes. Meanwhile destruction of nests by trained personnel using chemical insecticides is the best stop-gap measure we have to counter this most unusual pest.

Steve Davidson

### More about the topic

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### Comparing annual and perennial colonies

