NON-TARGET SPECIES ATTRACTED TO BAITS USED FOR CONTROL OF YELLOWJACKET WASPS (HYMENOPTERA: VESPIDAE) IN HAWAII

David Foote[1], J. Kiyoko McMurry[1], and Eric B. Spurr[2]

[1]U.S. Geological Survey, Pacific Island Ecosystems Research Center, P.O. Box 52, Hawaii Volcanoes National Park, HI 96718, USA

[2]Landcare Research, P.O. Box 69, Lincoln 8152, New Zealand

Current guidelines for control of alien western yellowjackets (*Vespula pensylvanica*) in Hawaii specify the use of KnoxOut® 2FM, a microencapsulated formulation of the organophosphate insecticide diazinon, mixed with chicken-meat, in bait stations (approximately 1.25 m off the ground). Several non-target invertebrates have been reported to be attracted to these baits, but impacts on populations, particularly of endemic invertebrates, have not been assessed.

We have documented mortality of non-target species, including endemic invertebrates, during toxic baiting for yellowjacket control. Most (>90%) of the non-target species attracted to chicken-meat in bait stations were flies (Diptera), especially Calliphoridae, but also Sarcophagidae, Lonchaeidae, Drosophilidae, Sciaridae, and Ansipodidae. These included endemic flies such as the calliphorid *Dyscritomyia fasciata*, and two species of the rare picture-wing flies (*Drosophila engyochracea* and *D. hawaiiensis*). The latter two have been found dead on KnoxOut® 2FM baits. Other non-target invertebrates attracted to baits in bait stations included honey bees, ants, and paper wasps (Hymenoptera). When baits are placed on the ground additional non-target species included slugs and snails (Mollusca), flatworms (Tricladida), isopods (Isopoda), amphipods (Amphipoda), mites (Acari), millipedes (Diplopoda), springtails (Collembola), cockroaches (Dictyoptera), grasshoppers (Orthoptera), and beetles (Coleoptera).

As a consequence of non-target invertebrate mortality, alternative bait types are being investigated. To date, we have assessed chicken, sardines, salmon, tuna, and mixed fish baits. Chicken remains the most attractive bait to yellowjackets. However, it is also among the most attractive to non-target invertebrates. Since December 2000, KnoxOut® 2FM is no longer manufactured and supplies are limited to stock on hand. Alternative toxicants are under study, including the phenyl pyrazole insecticide fipronil. Fipronil is more efficacious than diazinon in a shorter period of time (1–2 days instead of 6+ weeks), and consequently the toxic baits are less exposed to non-target species. Research is needed on the impacts of fipronil placed in bait stations for yellowjacket control on non-target species, especially rare endemic flies. Research is also needed on the impacts of fipronil carried by foraging yellowjackets into their subterranean colonies, where it is potentially exposed to a diverse assemblage of native and alien soil and litter fauna.

Control of alien yellowjacket wasp populations has been identified as one of the highest priorities for the recovery of endemic invertebrate biodiversity in Hawaii. However, this control must be accomplished without further endangering endemic invertebrates.