The sting of W. auropunctata is noteworthy. These are extremely tiny ants, barely visible in the field. When the senior author first began studying ants in Costa Rica, he was at first puzzled about Wasmannia. By literature accounts Wasmannia was reputed to have a terrible sting, but he had been collecting them for months in Corcovado National Park without ever experiencing the famous sting. One day he was collecting from a populous nest and some workers made it up to the soft skin of his inner forearm and began to sting. The sting was definitely noticeable, about as severe as a fire ant (i.e., Solenopsis geminata) but inordinately strong for an ant that could barely be seen! Workers are so small they cannot sting through the thicker skin of the hands.

Surprisingly, the chemical and toxicological nature of the venom of W. auropunctata has not been investigated. Howard et al. (1982) discovered an alkylpyrazine compound in the mandibular glands, which acted as an attractant to conspecifics and a repellent to heterospecifics. They speculated that the workers might apply the mandibular gland product as an irritating secretion, augmenting the defensive properties of the venomous sting. It would be interesting to investigate whether the venom alone is the powerful agent in this small ant, or if the strong burning sensation is a synergetic effect of venom plus mandibular gland product.
----
this article is quite sad to hear how hawaii has dropped the ball. this should be sent to any politicians, its also very informative and detailed:

ANT MANAGEMENT
Little Fire Ant (Wasmannia auropunctata)
Compiled by the IUCN SSC Invasive Species Specialist Group (ISSG)

1.0 Preventative Measures
Prevention, quarantine and rapid response are the best management strategies for preventing the establishment of invasive ants. To be successful they require active surveying, early detection and subsequent rapid treatment procedures often along with quarantines.

This type of management approach remains the most practical strategy for dealing with invasive ants (Krushelnycky Loope and Reimer 2005).

1.1 Risk Assessments
The first step to solving any problem is to identify whether it exists and define what it is. Preparing risk assessments is a vital management tool for addressing the issue of invasive ants in a country or region.

In New Zealand an invasive ant risk assessment project (prepared for Biosecurity New Zealand by Landcare Research) identified ant species which pose the greatest potential threat to New Zealand. This project was divided into five sections: (i) gathering data on native and non-native New Zealand ants, (ii) producing a preliminary risk, (iii) producing information sheets on medium-risk and high-risk taxa, (iv) producing a detailed pest risk assessment for the eight highest-risk species, and (v) re-ranking these eight species. Of the 75 ant taxa which were ranked the following ants present the greatest potential risk to New Zealand: Anoplolepis gracilipes, Lasius neglectus, Monomorium destructor, Paratrechina longicornis, Solenopsis geminata, Solenopsis richteri, Tapinoma melanocephalum and Wasmannia auropunctata (Harris undated). An assessment of the current risk of W. auropunctata establishing itself in New Zealand (based on climate similarity of native and introduced ranges) lead to the prediction that it would be unlikely to establish outside but may achieve limited distribution in heated buildings (Harris unpubl. data, in Stanley 2004).

1.2 Rapid Response Procedures

As soon as the little fire ant (W. auropunctata) was detected on Hawaii Island the Hawaiian Department of Agriculture (HDOA) developed a pest advisory (Conant et al. 1999) and assigned an entomologist (Patrick Conant) to lead efforts to address this new invasion (Krushelnycky Loope and Reimer 2005). However, the HDOA did not initiate an eradication programme and the limited success to date with this species underscores the importance of early detection and a pre-existing infrastructure ready for a rapid response (Wetterer and Porter 2003, in Krushelnycky Loope and Reimer 2005).

1.3 Quarantine and Monitoring

Inter-island quarantines in the Hawaiian Archipelago may help prevent the spread of the little fire ant in Hawaii. Krushelnycky Loope and Reimer (2005) report on the situation as follows. Plants from nurseries have been identified as potential sources of ant infestation, however, in 2004 they were still being sold. The current quarantine of Hawaii Island involves baiting plants before shipping to the island and, if W. auropunctata is detected, treating plants before leaving they leave the island. However, at least one expert believes this is not rigorous enough and that all high-risk coming from high-risk areas should be treated regardless (E. VanGelder pers. comm., in Krushelnycky Loope and Reimer 2005). While eradication of the little fire ant on Hawaii Island is unlikely (without a very large cash injection) improved intra-island quarantines may confine the ant to Hawaii Island (Krushelnycky Loope and Reimer 2005). Surveying of high-risk areas on all Hawaiian Islands for the presence of W. auropunctata is also necessary, and has begun recently on Maui and Kauai (Krushelnycky Loope and Reimer 2005). High-risk areas include new plantings, especially palms. The little fire ant's inconspicuous behaviour at low densities also makes intensive post-treatment monitoring necessary (Causton et al. in press, in Krushelnycky Loope and Reimer 2005).

1.4 The Hawaii Ant Group

The Hawaiian Ant Group is an informal, inter-agency collaboration established in 1999 to provide technical support to the HDOA, principally for the containment and possible eradication of the little fire ant (W. auropunctata) and the prevention of establishment of the red imported fire ant (S. invicta) (Krushelnycky Loope and Reimer 2005).

1.5 Ant Prevention in the Pacific Region

The Pacific island region includes over 25 countries, most of which are served by two important regional international organizations, the Secretariat of the Pacific Community (SPC), which addresses agricultural issues, and the South Pacific Regional Environment Programme (SPREP), which addresses biodiversity issues. The biodiversity of the Pacific is particularly vulnerable to effects of invasive species (SPREP 2000).
Special concern regarding ant invasions has arisen now that the red imported fire ant occurs at or near the coast on both sides of the Pacific, and the little fire ant has arrived in Hawaii and is spreading in the western Pacific. These and other species threaten all Pacific islands, including Hawaii and the U.S. affiliated islands of Guam, Commonwealth of the Northern Marianas, Federated States of Micronesia, American Samoa, and Palau.

The SPC-Plant Protection Service (SPC-PPS) works in partnership with 22 Pacific members to maintain effective quarantine systems and to assist with regionally coordinated eradication/containment efforts. Priorities for emphasis are determined by member countries, which meet periodically as the Pacific Plant Protection Organization

(PPPO).
A workshop sponsored by the Invasive Species Specialist Group (ISSG) of IUCN was held in Auckland, New Zealand, in September 2003, and resulted in the compilation of a draft Pacific Ant Prevention Plan (Pacific Invasive Ant Group 2004). The Pacific Ant Prevention Plan was presented to and embraced by 21 Pacific island countries and territories present at a PPPO meeting, the "Regional Biosecurity, Plant Protection and Animal Health" meeting held by SPC in Suva, Fiji, in March 2004 (Pacific Plant Protection Organization 2004). Like Hawaii's Red Imported Fire Ant Prevention Plan, the Pacific Ant Prevention Plan is still a conceptual work, but ISSG and others are working toward obtaining the international funding needed to implement the plan with the assistance of SPC. The project presents an exceptional opportunity for agriculture and conservation interests to work together with international and bilateral aid entities at regional and country levels to build much needed quarantine capacity.
Increased quarantine protection is desperately needed by PICT in order to address invasions that jeopardize both agriculture and biodiversity.
The information for this section was sourced directly from Krushelnycky Loope and Reimer (2005).

2.0 Eradication

Ant eradication is expected to be more successful on small islands or in isolated areas where ants cover less than a few dozen hectares. In large islands in the Galapagos Archipelago it is probably impossible to eradicate well-established populations of W. auropunctata. However it on the three-hectare island of Santa Fe (also part of the Galapagos Islands) W. auropunctata was successfully eradicated in the 1980s and 1990s (Krushelnycky Loope and Reimer 2005). The ant could potentially be eradicated from other such small islands in the Galapagos like the 21-hectare Marchena, where currents efforts to eradicate the ant are underway (see 5.1 Eradication Research).

As of 2004 populations of W. auropunctata on Hawaii Island number 31 and cover over 76 hectares of land. While an immediate eradication response may have prevented the initial 3 populations covering 12 hectares from expanding it is now unlikely that any eradication attempt will be successful (in Krushelnycky Loope and Reimer 2005). This highlights the important of addressing ant invasions early on before they are firmly established.

3.0 Chemical Control

3.1 General Considerations

Most if not all ant eradications have employed the use of baits and toxicants, many of which are developed for agriculture or urban settings. However, indiscriminate pesticide use in natural areas and fragile island ecosystems is not advocated. While some toxins such as hydramethylnon break down quickly in the environment, any and all pesticide use is likely to be accompanied by at least some undesirable non-target effects. These include increased runoff or drift outside the intended area, adverse affects on beneficial insects and non-target impacts on native species (Krushelnycky Loope and Reimer 2005).

Non-target impacts must be weighed up carefully against the benefits of ant eradication. Cleary, treating whole ecosystems or islands is too risky as entire populations of rare invertebrates may be at risk of extinction. On the other hand, eradicating populations of exotic ants before they become established in a natural ecosystem or island has the potential to prevent the potentially disastrous consequences of ant invasions (Krushelnycky Loope and Reimer 2005).

Baits should be designed with the specific foraging strategies of the target ant in mind. The preferred size, type and dispersal of bait and the nesting, foraging and behavioural traits of the ant should be considered in the planning stages of the operation. The use of appropriately designed and chosen baits and toxins will help reduce the impact of toxins on native ants and non-target fauna (McGlynn 1999).

3.2 Bait Design
For S. invicta, S. richteri, Monomorium destructor, W. auropunctata and Anoplolepis gracilipes, baiting strategies exist (not in temperate climates), and if the recommended baits are registered, in New Zealand control strategies could be implemented rapidly (Stanley 2004). W. auropunctata primarily nests and forages in the leaf litter and is behaviourally dominant when competing for small sized baits presented in a dispersed fashion (McGlynn 1999). W. auropunctata prefers carbohydrate-rich resources such as honey, water or honeydew to protein-rich resources (McGlynn 1999).

Ant species attracted to lipid baits include Solenopsis invicta, P. megacephala and W. auropunctata (Stanley 2004). In laboratory tests, peanut butter, followed by honey, were more attractive to foragers than all other food types offered (food presented in order of attractiveness: peanut butter, honey, honey water, pineapple juice, tuna oil, dark karo syrup, mint jelly, light karo syrup, soy bean oil, orange juice, molasses, apple juice, coca cola syrup) (Williams and Whelan 1992, in Stanley 2004). Laboratory tests were also conducted on preferences for oil types, and soybean oil was the most attractive to W. auropunctata (oil presented in order of attractiveness: soybean, tuna, sunflower, peanut, safflower, codliver) (Williams and Whelan 1992, in Stanley 2004).

Tuna oil and peanut butter were used in the Galapagos Archipelago on Santa Fe Island and proved highly attractive to ants, but also to birds, lizards and rats (Abedrabbo 1993, in Stanley 2004). Researchers used peanut butter painted monitoring sticks on Marchena Island (Galapagos Archipelago) to detect for ant presence (Causton Sevilla and Porter 2005). Peanut butter bait is also used in quarantines in Hawaii to treat plants before shipping (Krushelnycky Loope and Reimer 2005). Hot dogs on wire flags were used during the eradication programme on Marchena Island in 2001 and were attractive to W. auropunctata; but a large proportion were eaten by lizards and crabs (Causton et al. in prep., in Stanley 2004).

3.3 Ant Toxins
Ant toxins can be classed into three categories: “stomach” poisons (or metabolic inhibitors), Insect Growth Regulators (IGRs) and neurotoxins. Stomach toxins include hydramethylnon (eg: Maxforce® or Amdro®), sulfuramid and sodium tetraborate decahydrate (eg: Borax). IGRs include compounds such as methoprene, fenoxycarb or pyriproxyfen. Neurotoxins include fipronil (eg: Xstinguish®). Stomach poison kills all workers and reproductives it comes into contact with. IGRs work by disrupting development of the queens ovarian tissues, effectively sterilising the colony. Neurological inhibitors disrupt insect central nervous systems by blocking neuron receptors. The onset of mortality is contingent upon the type of active ingredient. In general, ant baits that contain active ingredients that are metabolic inhibitors have a two to three day delay before extensive mortality occurs in the colony (Oi Vail and Williams 2000). Baits containing IGRs take several weeks before colony populations are reduced substantially (Oi Vail and Williams 2000). The latter (IGRs) provide gradual long-term control, while metabolic inhibitors provide short-term, localised and rapid control (Oi Vail and Williams 2000). This is because while stomach poisons are faster than IGRs, they sometimes eliminate workers before the toxin can be effectively distributed throughout

the colony (O'Dowd Green and Lake 1999).

Hawaiian Department of Agriculture employees have primarily used Amdro® granular ant bait to target W. auropunctata. It is effective when it can be evenly broadcast throughout a population and when excessive humidity or rainfall does not disrupt application operations. Thick vegetation may make it difficult to achieve thorough coverage, which is necessitated by the little fire ant's short foraging distance. In addition, frequent rainfall in some regions has hampered the effectiveness of Amdro® applications. Even more problematic are infestations in fruit orchards, where no satisfactory eradication technique is available (Krushelnycky Loope and Reimer 2005).

Amdro® (hydramethylnon in soybean oil on corn grit matrix) is very effective at controlling S. invicta and W. auropunctata and suggested for use against the latter by Stanley (2004). Methoprene baits (0.4%) used in a field experiment on Santa Cruz Island (Galapagos Islands) in 1989–90 were highly attractive, but population reductions had only reached 50–75% after 3 months (Ulloa-Chacon and Cherix 1993).
The Australian-manufactured IGR baits developed for S. invicta control, Engage® (methoprene) and Distance® (pyriproxyfen), appear to be the most effective IGR ant baits available. They have a lipid attractant and are also likely to be attractive to Pheidole megacephala, M. destructor, Solenopsis richteri, S. geminata, W. auropunctata and M. pharaonis. Fenoxycarb (Logic®) (1% fenoxycarb) has proved to be repellent to W. auropunctata in laboratory and field tests (Williams and Whelan 1992, in Stanley 2004).

Extinguish Plus® (hydramethylnon and methoprene in soybean oil on corn grit) is a new commercial bait. This combination of rapid mortality toxins (eg: hydramethylnon, fipronil, indoxacarb) and IGRs in commercial baits is likely to become more common in the future. Extinguish Plus® is the only product currently available and is likely to be effective only against species attracted to lipids (eg: S. invicta, P. megacephala, W. auropunctata) (Stanley 2004).

4.0 Integrated Management
The control of the little fire ant in the Galapagos Islands has been by a combination of non-selective ant poisons, fire, and/or by clearing vegetation (Roque-Albelo and Causton 1999).

The potential of certain invasive ant species to reach high densities is particularly great in anthropomorphic (or human-modified) ecosystems. This is particularly evident on land that is intensively used for primary production. W. auropunctata is a great problem in areas in its native South America that have been over-exploited by humans, including in south Colombian sugarcane monocultures and Brazilian cocoa farms (Armbrecht and Ulloa-Chacón 2003). Improved land management, including a reduction in monoculture and an increase in the efficiency of primary production, may help prevent population explosions of invasive ants and reduce the size of source populations from which ants could spread from.

5.0 Research
5.1 Eradication Research
The development of effective techniques to eradicate populations of invasive ants is crucial to the conservation of native biodiversity. A trial eradication of W. auropunctata from 21 hectares of infested land on Marchena Island (Galápagos Archipelago) was conducted by researchers (Causton Sevilla and Porter 2005). Two broadcast

applications of Amdro® and follow-up applications on two small infestations resulted in no W. auropunctata individuals detected since October 2002 (Wetterer and Porter 2003, Causton et al. in prep., C. Causton, pers. comm., in Stanley 2004). Results from trials and control programmes on the Galapagos Islands indicate W. auropunctata can be effectively controlled and even eradicated using Amdro®, provided adequate eradication and monitoring techniques are used and funding is available to complete the task (Abedrabbo 1993, Causton et al. in prep., in Stanley 2004).

5.2 Bait and Toxin Research
Stanley (2004) suggests that future research on W. auropunctata focus on:
Trialling the attractiveness and efficacy of the IGR commercial baits Distance® (pyriproxyfen) and Engage® (methoprene) on as many high risk species as possible (eg: S. geminata, M. destructor, W. auropunctata)
Baiting trials with Advion® should be conducted (have a reduced environmental risk associated with them)
Testing IGRs such as Distance® and Engage® in the long term (for preventing colony recovery by targeting development and reproduction)

5.3 Biosecurity New Zealand
Biosecurity New Zealand, the branch of government responsible for managing invasive species, has responded to a series of incursions of exotic invasive ant species by relying heavily on a small number of baits and toxins. The absence of a wide variety of effective baits may compromise the success of incursion responses. As a first step to ensuring effective incursion response, Biosecurity New Zealand commissioned Landcare Research to research and review international literature about the baits and toxins used for ant control (see Stanley 2004). The next step will be testing the most promising of these against a selected group of high-risk invasive ant species.

6.0 Obstacles to Effective Management
By all accounts W. auropunctata is a very difficult species to eradicate or control (Krushelnycky Loope and Reimer 2005). Hawaiian Department of Agriculture efforts to combat the little fire ant have involved detection, experimental efforts at eradication of local populations, and inter-island quarantine. The following obstacles have hindered them (reported by Krushelnycky Loope and Reimer 2005): lack of staff; lack of public and commercial awareness; lack of access to nursery sales records; lack of registered ant control product for use in orchard fruit and vegetable crops; difficulty detecting the ant, the failure of most people to take the threat of its invasion seriously and the likelihood that the ant had been present for as long as a decade before being discovered.

Failure of a W. auropunctata eradication programme on Marchena Island in the Galapagos Islands was though to be due to a cessation of funding before control was completed, and the prevalence of El Nino conditions that suited W. auropunctata populations (Causton et al. in prep., in Stanley 2004).

References
Armbrecht, I. and Ulloa-Chacón, P. 2003. The Little Fire ant Wasmannia auropunctata (Roger) (Hymenoptera: Formicidae) as a Diversity Indicator of Ants in Tropical Dry Forest Fragments of Colombia, Environ. Entomol. 32 (3): 542-547. [Accessed 31 March 2007, from: HYPERLINK "http://mafalda.univalle.edu.co/~hormigas/files/Wasmannia_as_indicator.pdf"

http://mafalda.univalle.edu.co/~hormigas/files/Wasmannia_as_indicator.pdf]
Causton , C., Sevilla, C. and Porter, S. 2005. Eradication of the Little Fire Ant, Wasmannia Auropunctata (Hymenoptera: Formicidae), from Marchena Island, Galapagos: on the Edge of Success?, Florida Entomologist. [Accessed 5 April 2007, from: HYPERLINK "http://www.ars.usda.gov/Research/Research.htm" http://www.ars.usda.gov/Research/Research.htm]

Harris, R. Undated. Invasive Ant Pest Risk Assessment Project. [Accessed 29 March 2007, from: HYPERLINK "http://issg.appfa.auckland.ac.nz/database/species/reference_files/Ant_RA/overview.pdf" http://issg.appfa.auckland.ac.nz/database/species/reference_files/Ant_RA/overview.pdf]

Holway, D.A., Lach, L., Suarez, A.V., Tsutsui, N.D. and Case, T.J. 2002. The Causes and Consequences of Ant Invasions, Annu. Rev. Ecol. Syst. 33: 181-233.
Krushelnycky, P.D., Loope, L.L. and Reimer, N.J. 2005. The Ecology, Policy, and Management of Ants in Hawaii, Proc. Hawaiian Entomol. Soc. 37. Accessed 2 April 2007, from HYPERLINK "http://www.ctahr.hawaii.edu/peps/museum/ant_website/Krushelnycky_et_al_Ant_review 2005.pdf" http://www.ctahr.hawaii.edu/peps/museum/ant_website/Krushelnycky_et_al_Ant_review 2005.pdf]

O'Dowd, D.J., Green, P.T. and Lake, P.S. 1999. Status, Impact, and Recommendations for Research and Management of Exotic Invasive Ants in Christmas Island National Park. Centre for the Analysis and Management of Biological Invasions: Clayton (Victoria, Australia). [Accessed 4 April 2007, from: HYPERLINK "http://www.issg.org/database/species/reference_files/Christmas_Island_Report.pdf" http://www.issg.org/database/species/reference_files/Christmas_Island_Report.pdf]

Oi, D.H., Vail, K.M. and Williams, D.F. 2000. Bait distribution among multiple colonies of Pharaoh ants (Hymenoptera: Formicidae), Journal of Economic Entomology 93 (4): 1247 - 1255. [Accessed 13 Friday 2007, from: HYPERLINK "http://www.bioone.org.ezproxy.auckland.ac.nz/archive/0022-0493/93/4/pdf/i0022-0493-93-4-1247.pdf" http://www.bioone.org.ezproxy.auckland.ac.nz/archive/0022-0493/93/4/pdf/i0022-0493-93-4-1247.pdf]
Roque-Albelo, L. and Causton, C. 1999. El Niño and Introduced Insects in the Galápagos Islands: Different Dispersal Strategies, Similar Effects, Noticias de Galápagos (60). [Accessed 24 February 2005, from: HYPERLINK "http://www.darwinfoundation.org/articles/n6000129903.html" http://www.darwinfoundation.org/articles/n6000129903.html]

Stanley, M.C. 2004. Review of the Efficacy of Baits Used for Ant Control and Eradication (Landcare Research Contract Report: LC0405/044). [Accessed 29 March 2007, from: HYPERLINK "http://www.landcareresearch.co.nz/research/biocons/invertebrates/ants/BaitEfficacyReport.pdf" http://www.landcareresearch.co.nz/research/biocons/invertebrates/ants/BaitEfficacyReport.pdf]