DISTRIBUTION OF FIRE ANTS *SOLENOPSIS GEMINATA* AND *WASMANNIA AUROPUNCTATA* (HYMENOPTERA: FORMICIDAE) IN THE GALAPAGOS ISLANDS

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SUMMARY

The Little Fire Ant *Wasmannia auropunctata* (Roger) and the Tropical Fire Ant *Solenopsis geminata* (Fabricius) are considered two of the most serious threats to the terrestrial fauna of Galapagos, yet little is known about their distribution in the archipelago. Specimens at the Charles Darwin Research Station and literature were reviewed and distribution maps compiled for both species. *W. auropunctata* is currently recorded on nine islands and six islets and *S. geminata* is recorded on seven islands and six islets. New locations were registered, including the first record of *W. auropunctata* on Española and North Seymour islands, and of *S. geminata* on Fernandina Island. We recommend further survey, especially in sensitive areas, in order to plan management of these species.

RESUMEN

La Pequeña Hormiga de Fuego *Wasmannia auropunctata* (Roger) y la Hormiga Tropical de Fuego *Solenopsis geminata* (Fabricius) son especies introducidas consideradas de mayor amenaza a la fauna terrestre de Galápagos, sin embargo poco se conoce sobre su distribución en el archipiélago. A través de consultas bibliográficas y revisiones a los especimenes de la Estación Científica Charles Darwin, se determinó su actual distribución. *W. auropunctata* esta registrada en nueve islas y seis islotes y *S. geminata* se encuentra en siete islas y seis islotes. Se registraron nuevas localidades incluyendo el primer record de *W. auropunctata* en la isla Española y el islote Seymour Norte, y de *S. geminata* en la isla Fernandina. Se recomienda una mayor investigación en cuanto a su distribución en el campo, especialmente en áreas sensibles, a fin de realizar el control de estas especies.

INTRODUCTION

Ants are among the most efficient and widely distributed insect predators (Reimer 1994, Tsutsui & Suárez 2003). Highly aggressive, with a powerful sting and large unicolonial populations, fire ants displace other invertebrates and are among the most successful invasive ants.

Little is known about the ant fauna of the Galapagos Islands (Brandão & Paiva 1994). Of the 48 species reported to date, 30 were probably introduced by humans (HH unpubl.). The fire ants, *Solenopsis geminata* Fabricius and *Wasmannia auropunctata* Roger were first recorded in Galapagos at the beginning of the 20th century (Williams & Whelan 1991, 1992). Several studies have evaluated the impact of the Little Red Fire Ant *W. auropunctata* in Galapagos, although little is known about its current distribution. On Santa Cruz (Lubin 1984) and Marchena islands (Mieles 2002), invertebrate diversity is lower in areas infested by *W. auropunctata*. The Tropical Fire Ant *S. geminata* is less well documented in Galapagos especially in regard to its impact and distribution. *S. geminata* has been suggested to be a threat to the hatchlings of endemic reptiles and birds (Williams & Whelan 1991, Tapia 1997) but studies have not been carried out to confirm this. Because of their known impacts in other parts of the world and in Galapagos (Causton *et al*. 2006) an evaluation of their status in Galapagos is required, in order to determine appropriate management actions.

The purpose of this study was to determine the distribution of *S. geminata* and *W. auropunctata* in Galapagos and identify necessary future studies.

METHODS

Material (*c.* 1800 collections) deposited in the Invertebrates Collection at CDRS, and literature and field reports were reviewed in June 2005. Much of the material was identified for the first time. Previous identifications were confirmed using taxonomic keys and ant databases (*e.g.* Ant Web http://www.antweb.org).

RESULTS

Solenopsis geminata was recorded on seven islands (Fernandina, Floreana, Isabela, San Cristóbal, Santa Cruz, Santa Fe, and Santiago) and six islets (Baltra, Albany, Bainbridge 1, Mao, Marielas 1 and 2) (Table 1, Fig. 1). The Fernandina record is a new island for this species, represented by specimens collected in 2005 from Punta Mangle.

Table 1. Distribution of *Solenopsis geminata* on the Galapagos Islands.

Island	Locations	First record	Reference
Albany	None specified	2004	CDRS
Bainbridge 1	None specified	2000	CDRS
Baltra	None specified	2005	CDRS
Fernandina	Punta Mangle	2005	CDRS
Floreana	Asilo de la Paz, Cerro Pajas, Las Palmas, Punta Cormorant	1919	Wheeler 1919
Isabela	Caleta Iguana, Cerro Azul, Cinco Cerros, Los Tintos, Punta García, San Pedro, Sierra Negra, Tortuga Negra, Alcedo	1981	Lubin 1984
Mao	None specified	2004	CDRS
Marielas 1, 2	None specified	1998	CDRS
San Cristóbal	EL Progreso, La Lobería, Puerto Chino, Puerta Negra	1891	Brandão & Paiva 1994
Santa Cruz	Basurero Municipal, Bellavista, El Camote, Cerro Crocker, Cerro Dragón, Media Luna, Punta Nuñez, Puerto Ayora, Tortuga Bay	1982	Meier 1994
Santa Fe	La Caleta	1986	CDRS
Santiago	None specified	2006	Causton *et al.* 2006

Wasmannia auropunctata has a wider distribution in Galapagos and is reported from nine islands and six islets (Table 2, Fig. 2). Prior to this study it was reported from Floreana, Isabela, Marchena, Pinzón, San Cristóbal, Santa Cruz, Santa Fe, Santiago and the islets Albany, Cousins, Eden, Mao and Champion. As a result of this study new records were found on Española Island and North Seymour islet. Collection records for these two islands date back to 1998.

DISCUSSION

To date, both species are found on most of the large islands in the centre of the archipelago and some of their associated islets. The extent of the distribution of *S. geminata* on Fernandina and of *W. auropunctata* on Española and North Seymour, newly registered during this study, should be determined as soon as possible in order to plan appropriate management. These islands are relatively pristine and therefore especially vulnerable to introduced species, so the ecological consequences of the fire ants could be disastrous.

Islands with a high number of records are probably the result of greater collecting effort rather than reflecting the current abundance and distribution of the fire ants. Indeed, because ant surveys are incomplete, recent reports may not represent the date of arrival of ants at a location and they may have been resident for many years before that. For example, given that *S. geminata* was first reported from San Cristóbal in 1891 (Brandão & Paiva 1994) and that this species uses nuptial flights to establish new colonies, the lack of records from some islands suggests a need for further sampling rather than a lack of dispersal. On the other hand, some reports have been confirmed as truly recent introductions, such as the new report of *S. geminata* at Punta Mangle, Fernandina, a location that was monitored for fire ants in 1998 (L. Roque-Albelo & C. Causton unpubl.).

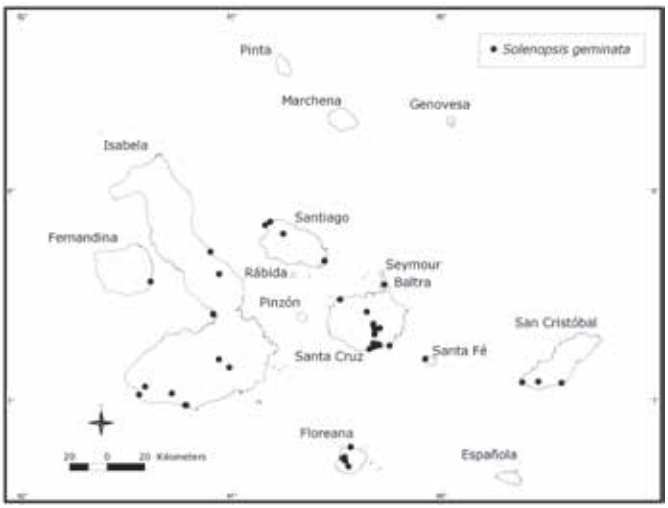

Figure 1. Distribution of *Solenopsis geminata* in Galapagos.

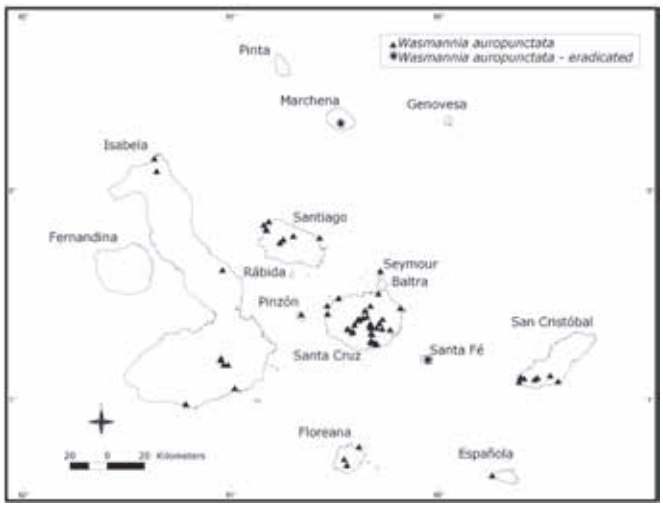

Figure 2. Distribution of *Wasmannia auropunctata* in Galapagos.

Table 2. Distribution of *Wasmannia auropunctata* on the Galapagos Islands.

Island	Locations	First record	Reference
Albany	None specified	2000	CDRS
Cousins	None specified	2000	CDRS
Champion	None specified	2006	Causton *et al*. 2006
Edén	None specified	1999	CDRS
Española	Punta Suárez	1998	CDRS
Floreana	Asilo de la Paz, Cerro Pajas	1972	Silberglied 1972
Isabela	Caleta San Pedro, Las Merceditas, Punta Albermarle, Puerto Villamil, Playa Tortuga Negra, San Pedro, Santo Tomás, Sierra Negra, Los Tintos, Alcedo, Wolf	1976	CDRS
Mao	None specified	2000	CDRS
Marchena	Playa Negra	1988	Roque-Albelo *et al*. 2000
Pinzón	Crater	1984	Abedrabbo 1994
San Cristóbal	El Chino, La Lobería, El Progreso, Puerto Baquerizo Moreno, La Toma	1972	Silberglied 1972
Santa Cruz	Antiguo Basurero, Basurero Municipal, Bellavista, El Camote, El Cascajo, Cerro Ballena, Cerro Casifeo, Cerro Colorado, Cerro Crocker, Cerro Dragón, Cerro Maternidad, Cerro Mesa, Cerro Montura, Cerro Pastizal, El Chato, El Garrapatero, Los Gemelos, Mina de Granillo Rojo, Media Luna, Puerto Ayora, Santa Rosa	1905	Silberglied 1972
Santa Fe	None specified	1986	CDRS
Santiago	Los Guayabillos, James Bay, El Mirador, Punta Espumilla, La Trágica	1967	Lubin 1984
North Seymour	None specified	1998	CDRS

The record of *S. geminata* in La Caleta, Santa Fe in 1986 requires confirmation as it was not collected during two surveys in 2000 and 2003 (A. Mieles pers. comm., L. Roque-Albelo, pers. comm.). It is possible that it was eradicated from this area during a campaign to eradicate *W. auropunctata* in the early 1990s (Abedrabbo 1994).

W. auropunctata on Española could pose a threat to the Waved Albatross *Diomedea irrorata* Salvin, since *W. auropunctata* is known to affect the nesting behaviour of birds and reptiles (Roque & Causton 1999, Jourdan *et al*. 2001). The presence of *W. auropunctata* on islets is no less worrying as it has been shown to populate entire small islands and could affect other invertebrates that occupy these areas, in addition to nesting birds. Eradication programmes using Amdro (Hydramethylnon) have been effective against *W. auropunctata* on Marchena and Santa Fe islands in Galapagos (Abedrabbo 1994, Causton *et al.* 2005) and these methods could be applied to these new infestations.

RECOMMENDATIONS

Although ants are known to be among the most invasive insects, few studies have been carried out on them in Galapagos, limiting the ability of the Galapagos National Park Service to make management decisions. An inventory of ants should be conducted, especially in areas that are frequented by humans and that are lacking data, such as Baltra islet (military base) and tourist visitor sites, as well as conservation areas that are most vulnerable to invasive species (Santa Fe, Fernandina, Darwin, Wolf and smaller islands). Other entomological collections that house Galapagos specimens should also be reviewed to establish a baseline for the native and introduced myrmecofauna.

In addition, the distribution of fire ants should be investigated in high priority areas such as nesting areas of threatened species such as the Mangrove Finch *Camarhynchus heliobates* (Snodgrass & Heller), and relatively pristine areas such as Wolf Volcano on Isabela.

Lastly, records of distributional data are important frames of reference (especially aggregated over time) for judging the significance of further incursions or changes in the distribution of invasive ant species. We therefore encourage other practitioners to publish data or submit data to the CDRS in order to build up the databases on these species.

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