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E.O. Wilson's last quest: are there ants on the Falkland Islands?

La última búsqueda de E.O. Wilson: ¿hay hormigas en las Islas Malvinas?

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ABSTRACT

The Falkland Islands constitute a remote archipelago in the South Atlantic Ocean that is about 450 km east of continental South America. The invertebrate fauna of the Falkland Islands is poorly known, and thus far no ants have been reported. We conducted surveys for ants on East Falkland Island during the austral summer 2019. No ants were found during our surveys, such that East Falkland Island is one of few oceanic islands that lack native and non-native ants.

Key words: ants, Falkland Islands, oceanic islands, social insects, Southern Atlantic Ocean.

RESUMEN

Las Islas Malvinas constituyen un archipiélago remoto en el Océano Atlántico Sur que se encuentra a unos 450 km al este de América del Sur continental. La fauna de invertebrados en esta zona es poco conocida y hasta el momento no se han reportado hormigas. Realizamos estudios de hormigas en la Isla Malвина Este durante el verano austral de 2019. No se encontraron hormigas durante nuestros estudios, por lo que la Isla Malвина Este es una de las pocas islas oceánicas que carecen de hormigas nativas y no nativas.

Palabras clave: hormigas, Islas Malvinas, islas oceánicas, insectos sociales, Océano Atlántico Sur.

Ants are one of the most successful insect families in the world, as manifested by their absolute numbers, biomass, and occurrence in virtually all terrestrial habitats, including many oceanic islands (Kass *et al.* 2022; Schultheiss *et al.* 2022). The few places that lack ants include extremely inhospitable areas such as Antarctica, very high-elevation habitats, and some remote oceanic islands prior to human intervention, e.g., Hawaii (Wetterer *et al.* 2007), Polynesia east of New Zealand, Rotuma, Samoa, and Tonga (Wilson and Taylor 1967), and Easter Island and the Juan Fernández Islands (Wilson 1967). Some authors have suggested that native ants may have occurred on some of these remote islands, though status (native or non-native) is sometimes difficult to determine (Morrison 2014; Wetterer and Vargo 2003). As a result of human activities, non-native ant species now occur on all of these islands (Ingram *et al.* 2006; Wauters *et al.* 2016; Wetterer 1998), such that ants are ubiquitous or nearly so on oceanic islands (Roura-Pascual *et al.* 2016). One possible exception is the Falkland Islands (= Islas Malvinas), which constitute a remote, oceanic archipelago from which ants have not been recorded. Consequently, we undertook a project to survey for ants on the Falkland Islands.

OVERVIEW OF FALKLAND ISLANDS

The Falkland Islands constitute the largest archipelago in the Southern Ocean, and they consist of two large

islands, East Falkland (= Soledad) and West Falkland (= Gran Malвина) plus 746 smaller islands (Woods 2001). Collectively, these islands encompass an area of approximately 12,200 km². The Falklands are situated at longitudes ranging from approximately 51°10' – 52°25' S, and lie about 450 km from the nearest point on mainland South America (Tierra de Fuego, Argentina), with elevation ranging up to 700–705 m on the two largest islands (Chown *et al.* 1998). Climate is cool temperate oceanic with mean monthly temperature ranging from 2.2° C in July to 9.1° C in February, and mean maximum daily temperature ranging from 4.3° C in July to 13.4° C in February (McAdam 1980). The mean annual sea surface temperature is approximately 7.7° C (Chown *et al.* 1998). Vegetation consists of heath, grassland, bog, and feldmark communities; there are no native tree species (Upson and Lewis 2014). Moreover, the Falkland Islands experience a very cold climate, in contrast to the more tropical islands listed above.

Flora and fauna (including insects) of the Falkland Islands show close affinity to Patagonian South America (McDowall 2005; Morrone 2011; Papadopoulou *et al.* 2009; Upson and Lewis 2014), despite the fact that the islands were originally part of South Africa beginning with the breakup of Gondwanaland (Marshall 1994; Stone 2016; but see Ramos *et al.* 2017). The invertebrate fauna of the Falkland Islands is poorly known (Oldfield and Sheppard 1997; Papadopoulou *et al.* 2009), with most information

consisting of species checklists, e.g., insects (Jones 2011; Mclellan *et al.* 1990; Papadopoulou *et al.* 2009; Robinson 1984) and spiders, harvestmen, and pseudoscorpions (Lavery 2017). The Falklands are especially rich in beetles, with the families Carabidae and Curculionidae comprising >15% of all invertebrate species (Jones 2011). Numerous of these invertebrate species are endemic and/or flightless (Robinson 1984).

The Falkland Islands are home to about 3,000 residents, most of whom live in Stanley, plus a military base. Scattered farms practice low intensity ranching (sheep and cattle) throughout the islands. Wildlife tourism is a thriving business and commerce arrives regularly via air and sea, providing an avenue for ingress of non-native species.

METHODS

We surveyed East Falkland Island for ants via hand collecting and pitfall traps from 2–8 February, 2019. Late January through early February is the peak of the austral summer, when temperatures are highest, as is the likelihood of encountering ants. Sample sites (13 for hand collecting, 12 for pitfall traps) were limited by accessibility via roads (Fig. 1). Given that constraint, our sites were chosen to sample as widely as possible across the island. Hand collecting sites ranged from 1.5–25.0 km apart, and pitfall sites ranged from 14.8–28.3 km apart. Hand collecting occurred during daylight hours; under-rock surveys were deemed most likely to find ants and other arthropods because of the increased moisture and temperature below rocks, and indeed we observed and captured numerous arthropods under rocks. Pitfall traps consisted of 240 ml plastic cups buried flush with the soil surface, with the cups partially filled with a mixture of 95% ethanol and saline solution. We placed eight pairs of pitfall traps at each of the 12 sites; each pair of traps was separated by about 30 cm with a piece of aluminum flashing buried between traps that provided a barrier to guide insects toward one of the traps (Fig. 2). Pitfall traps remained in place for 2–3 days for a total of 496 trap-nights. Collections were returned to Arizona State University, Tempe, AZ, USA, where they were sorted, identified, and deposited in the Hasbrouck Insect Collection.

RESULTS

No ants were located during our field surveys either by hand collecting or in pitfall traps.

DISCUSSION

No ants previously have been recorded from the Falkland Islands (see Jones 2011; Robinson 1984), nor did we encounter ants in our surveys during the season of peak insect activity. Our results are bolstered by the fact that we captured around 1000 insects via hand collecting and several thousand additional insects in pitfall traps, demonstrating high activity of insects during our collecting dates. Another researcher also indicated that he had not seen ants during surveys in and near Stanley (Steven Chown, personal com-

munication), and no ants were found during other surveys in July–August, 1995 (austral winter) (see Wetterer *et al.* 2007). Lastly, several lifelong inhabitants of the Falkland Islands voiced that they had never seen ants on the islands either inside or outside of buildings.

The Falkland Islands are part of a larger system of archipelagos and islands, collectively called the Southern Ocean Islands (SOI). The SOI include at least 24 islands, with the Falkland Islands being: (1) largest in area, and (2) closest to the continental mainland (Chown *et al.* 1998). For both reasons, ants are more likely to occur in the Falkland Islands than on any other SOI. Indeed, neither are ants known to occur on Marion, Prince Edward, Possession, Kerguelen, Heard, Gough, Macquarie, and sub-Antarctic New Zealand islands (Steven Chown, personal communication).

Absence of ants on the Falkland Islands invites the question of why ants are absent given that native ants occur on numerous, more remote, oceanic islands (see introduction). Ants could disperse to oceanic islands such as the Falkland Islands via mating flights of mated queens and by rafting from the mainland (Morrison 2016). The approximately 450 km distance from mainland South America to the Falkland Islands makes it highly doubtful that mated queens would arrive following mating flights given that 20–25 km is an extreme distance for mated queens to travel (Morrison 2016). Similarly, it seems doubtful that mated queens or small colonies could survive the lengthy trip across frigid waters (mean sea surface temperature 7.7° C) to survive and establish a colony. Even still, colonies would need to survive a very short growing season that would impede establishment and growth of all but the most hardy, cold-adapted ant species. Along this line, we note that several cold-climate ant species occur in Tierra del Fuego, Argentina, e.g., *Lasiophanes picinus* (Roger, 1863) and *Monomorium denticulatum* Mayr, 1887, where climate is similar to that of the Falkland Islands (Kusnezov 1960).

Most invasive ant species could not survive and establish in the cold, short growing season climate presented in the Falkland Islands. However, several invasive ant species could arrive through human commerce and survive in buildings and occasionally forage outside on warmer days, e.g., *Linepithema humile* (Mayr, 1868), *Tapinoma melanocephalum* (Fabricius, 1793), *Wasmannia auropunctata* (Roger, 1863), *Paratrechina longicornis* (Latreille, 1802), and *Monomorium pharaonis* (Linnaeus, 1758). *Monomorium pharaonis* is the only invasive species that might become established outside of buildings (Andy Suarez, personal communication). Overall, we recommend continuation of strong quarantine measures to prevent ants (and other non-native insects) from arriving and possibly colonizing the Falkland Islands.

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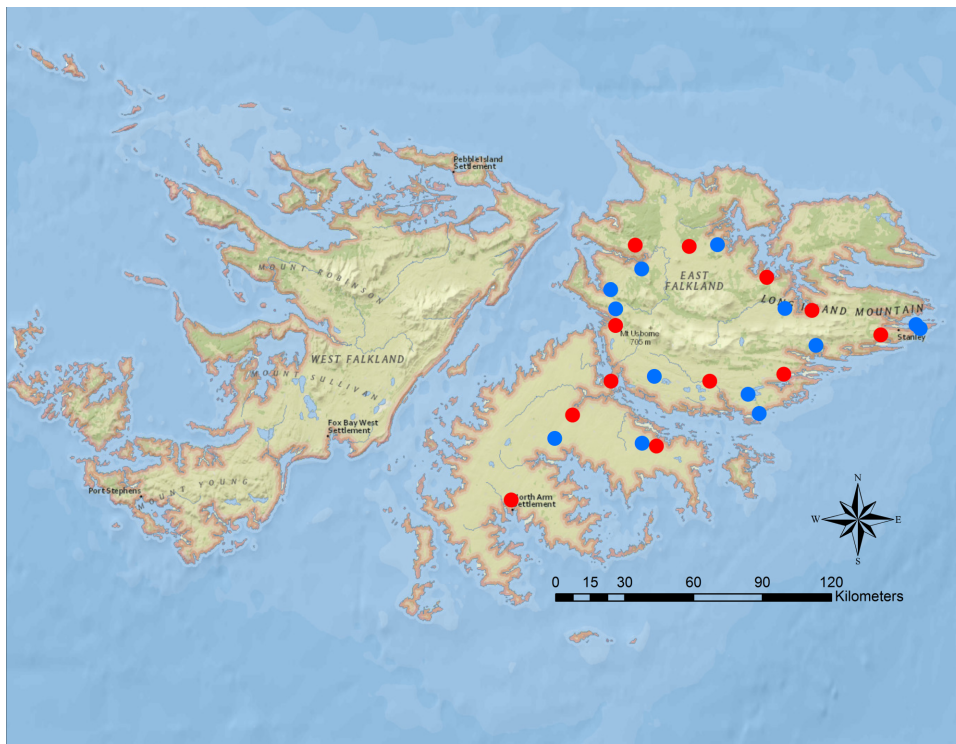


Figure 1. Topographic map of the Falkland Islands showing locations for hand collecting (filled blue circles) and pitfall trap samples (filled red circles).



Figure 2. Photograph showing one pair of pitfall traps separated by a 30 cm piece of aluminum flashing.