Short Communication

A new invasive species in the Canary Islands: a naturalized population of ferrets *Mustela furo* in La Palma Biosphere Reserve

Félix M. Medina and Aurelio Martín

Abstract We present data to confirm that the island of La Palma harbours the first established feral population of ferrets *Mustela furo* on the Canary Islands in the Atlantic Ocean. It is not known when the species was introduced but individuals occasionally lost during hunting appear to have become established sometime in the previous 2 decades. Sightings of ferrets are mainly in the north of the island but they are likely to expand their range southwards, and a few have already been detected in the centre of the island. We report a total of 45 cases of wild ferrets in 28 different localities during 1998–2007. To minimize effects on native species, control measures or eradication are required. Public awareness of the problem and education campaigns, especially among hunters, are needed to reduce the threat of this alien species to the biota of the Canary Islands.

Keywords Canary Islands, established population, ferret, introduced species, *Mustela furo*

The main threats to species are habitat destruction and the effects of non-native species (Van Dyke, 2003) but on oceanic islands, where species have evolved in isolation, the introduction of alien species is considered the principal threat to native species (Courchamp et al., 2003; Whittaker & Fernández-Palacios, 2007). A wide variety of invasive plants and animals have been introduced to island ecosystems (Lever, 1994; Williamson, 1996) but mammalian species, such as feral cats *Felis silvestris catus*, dogs *Canis familiaris* and rats *Rattus* spp., are the most problematic (Courchamp et al., 2003; Nogales et al., 2006).

The Eurasian ferret *Mustela furo* has been introduced to New Zealand, Australia, UK, USA, Canada, Sicily, Sardinia and other countries (Long, 2003; GISD, 2005). Ferrets are kept as pets and used for hunting rabbits but escapees can form feral populations. On the Atlantic Ocean islands feral ferrets occur on the Azores (Mathias et al., 1998) and Madeira (Mathias, 1993). Introduced ferrets are considered an invasive species when they have detrimental effects on native species and cause economic damage (Clapperton, 2001; Byrom, 2002; Courchamp et al., 2003). Ferrets consume a variety of native prey, including birds and their eggs, mammals, reptiles and invertebrates (Roser & Lavers, 1976; Smith et al., 1995; Clapperton, 2001).

Ferrets were probably brought to the Canary Islands, where they are commonly used for hunting rabbits, in the 16th century. Occasionally ferrets are not recaptured after hunting but the species has not been included as a naturalized species in the official species list of the Canary Islands' Government (Izquierdo et al., 2004) or in a list of the 13 invasive, non-native mammals in the Archipelago (Nogales et al., 2006). Long (2003) mentioned that ferrets were probably introduced to the Canary Islands but his original source (Encyclopaedia Britannica, 1976–1978) for this statement may be incorrect as there is not any other literature on this subject. In addition, this source incorrectly indicates that two species of native bat are naturalized.

The terrestrial animal, plant and fungal diversity of the Canary Islands has a high percentage of endemic species (27.5%; Martín et al., 2005), some of which are threatened by invasive species such as feral cats, rats *Rattus rattus* and *Rattus norvegicus*, hedgehogs *Atelerix algirus*, Barbary ground squirrels *Atlantoxerus getulus*, goats *Capra hircus* and Barbary sheep *Ammotragus lervia* (Nogales et al., 2006). Recently, information about predation by ferrets on poultry in the north of La Palma Island, and some ferret road casualties, came to our attention. Here, we report evidence of a naturalized population of ferrets on La Palma Island and discuss the requirement for a control programme.

The 728 km² La Palma (Fig. 1) is a high (2,426 m altitude) and steep island. Its climate is influenced by the humid north-east trade winds, altitude and orientation (Afonso, 1985), and this has resulted in heterogeneous environments (del Arco et al., 1999). Details of the vegetation of La Palma are provided by Santos (1983), Pérez de Paz et al. (1994) and del Arco et al. (1999).

In addition to our own observations and personal communications from other researchers, we compiled data from published and grey literature on the Canary Islands, and from electronic databases using the keywords *Mustela*

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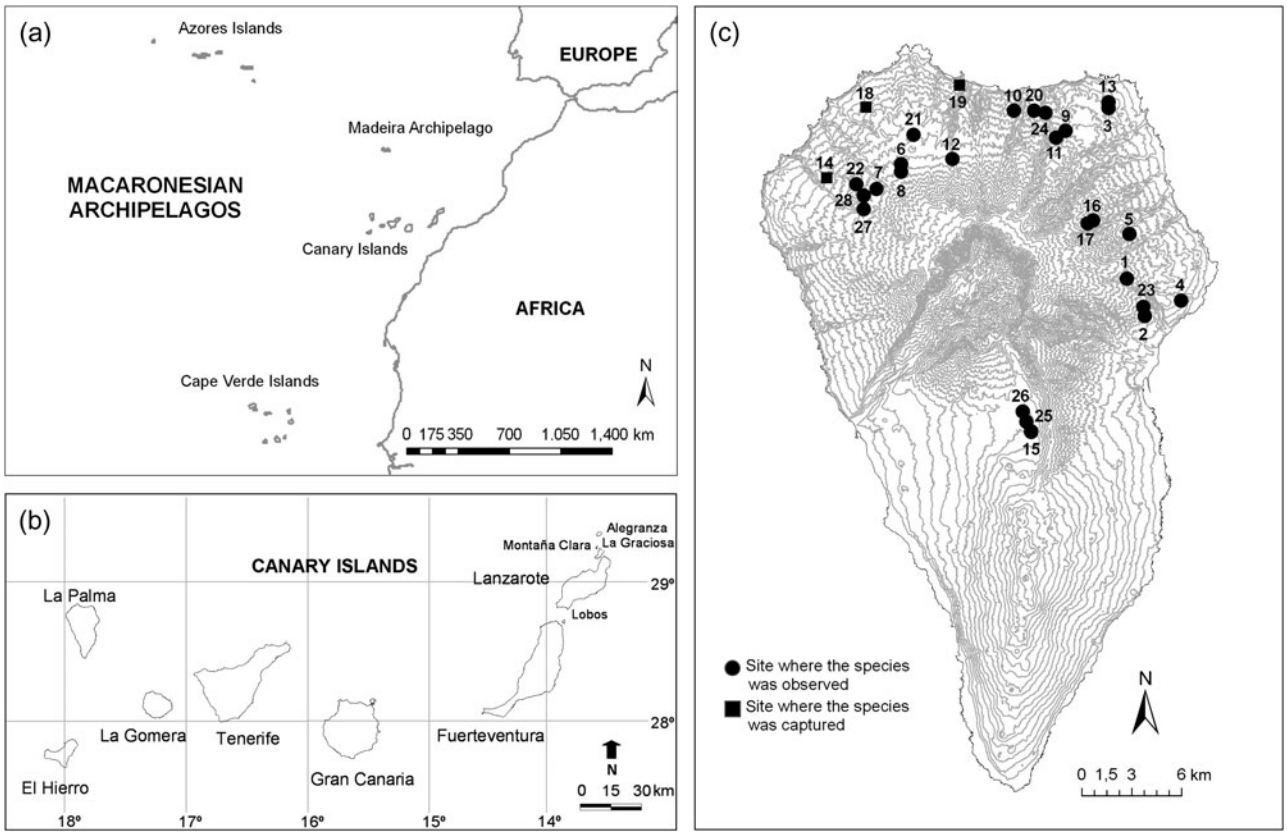

FIG. 1 (a) The location of the Canary Islands in the Atlantic Ocean. (b) The location of La Palma in the archipelago. (c) La Palma, showing the 28 localities where ferrets *Mustela furo* have been observed during 1998–2007 (see numbered locations in Table 1).

furo, ferrets, Canary Islands, islands, exotic species and introduction. We found a total of 45 records of dead or living wild ferrets for 1998–2007 in 28 localities on La Palma (Table 1). The species appears to be widely distributed in the north (Fig. 1) and there is an apparently isolated population at El Paso (Fig. 1). Although most of the records are from 2003 and later the locations suggest that ferrets became established earlier than the first record in 1998 and/or originated from several escapees. The ferrets in El Paso could spread into the nearby La Caldera de Taburiente National Park. During 2007 a pair with three young was seen in Briestas (location 28 in Table 1 and Fig. 1; J.C. Barreto & W. Camacho, pers. comms) confirming that ferrets are breeding in the wild. The 45 records are in forests and in cultivated and rural areas, which is unsurprising given that ferrets are generalists (Clapperton, 2001). In rural areas rabbits *Oryctolagus cuniculus*, the availability of which influences ferret distribution and abundance (Ragg & Moller, 2000), are available as prey (Cabrera-Rodríguez, 1997), and suitable food and shelter are available in other areas (Ragg & Moller, 2000; Morley, 2002).

Ferreting is a long-held tradition in the Canary Islands and is regulated by law. The use of unmuzzled ferrets for hunting is forbidden but there is little or no regulatory compliance. If a ferret goes astray the majority of hunters dedicate a lot of time trying to recapture the individual. However, it is the few uncaptured individuals that have presumably established the feral population on La Palma. It has been suggested that ferrets cannot survive for long in the wild because of road deaths and because they may be captured on farms if they prey on poultry (Umbach, 1997). However, ferrets can survive and reproduce if they have suitable winter resting sites (Ragg & Moller, 2000; Baghli et al., 2005) and prey is available (Morley, 2002).

Live-traps are commonly used to capture medium-size mammals (Courchamp et al., 2003) and have been used to control ferrets in New Zealand (Cross et al., 1998). A preliminary control programme was implemented on La Palma (J.C. Barreto & W. Camacho, pers. comms) during 2006. During January–April 36 live-capture traps ($60 \times 30 \times 30$ cm) were placed in lines along vegetation boundaries and paths at Las Tricias (location 14, Fig. 1) and eight ferrets were captured. In addition, two ferrets were captured in live traps at Santo Domingo (location 18) and Don Pedro (location 19) in August and November 2006, respectively. Further such control programmes need to be implemented to halt the spread of ferrets and to minimize damage to native biota. Other methods have been proposed for control of ferrets and other mustelids, such as anaesthetic immobilization (Fournier-Chambrillon et al., 2003) and toxic bait (Spurr

TABLE 1 Locations (see numbers on Fig. 1), dates and numbers of ferrets *Mustela furo* observed on La Palma Island during 1998–2007, with details of observers and any comments.

Locality	Date	No. observed	Observer	Comments
1, Bco. Seco (Puntallana)	21 July 1998	1	J.A. Lorenzo	Alive
2, Carretera Cumbre (Mirca)	1 Sep. 2003	1	F.M. Medina	Road casualty
3, Las Paredes (Barlovento)	1 Jan. 2004	1	F.M. Medina	Road casualty
4, Tenagua (Puntallana)	13 May 2004	1	G. Blanco	Road casualty
5, Pista Asomada Alta (Puntallana)	20 Aug. 2004	1	R. Barone	Alive
6, Hoya Grande (Garafía)	1 Mar. 2005	1	J.C. Barreto and W. Camacho	Road casualty
7, Briestas (Garafía)	15 June 2005	2	F.M. Medina	Alive
8, Carretera Cumbre (Garafía)	6 Sep. 2005	1	A. Rodríguez-Cáceres	Alive
9, Las Mimbreras (Barlovento)	21 Dec. 2005	3	P. Díaz	Alive
10, Franceses (Garafía)	2005	2	A. Martín	Alive & road casualty
11, Bco.Gallegos (Barlovento)	2005	1	J.R. Pedrianes	Alive
12, Bco. Carmona (Garafía)	2005	1	A. García	Alive
13, Barlovento	1 Jan. 2006	1	J.C. Barreto & W. Camacho	Alive
14, Las Tricias (Garafía)	1 Jan. 2006	8	J.C. Barreto & W. Camacho	Captured Jan.–Apr. 2006
15, El Paso	18 June 2006	2	A. Martín	Road casualty
16, Tajadre (Los Galguitos)	10 July 2006	2	E. González-Melián	Alive
17, Tajadre (Los Galguitos)	10 July 2006	1	E. González-Melián	Alive
18, Santo Domingo (Garafía)	1 Aug. 2006	1	J.C. Barreto & W. Camacho	Captured
19, Don Pedro (Garafía)	1 Nov. 2006	1	E. García, J.C. Barreto & W. Camacho	Captured
20, Gallegos (Barlovento)	2006	1	F. Sánchez	Alive
21, Hoya Grande (Garafía)	10 Jan. 2007	1	J.C. Barreto & W. Camacho	Road casualty
22, Briestas (Garafía)	5 Apr. 2007	1	J.A. Lorenzo & E. González-Melián	Road casualty
23, Carretera Cumbre (Mirca)	23 July 2007	1	G. Hernández	Alive
24, Bco. Gallegos (Barlovento)	2 Aug. 2007	1	D. Tavío & A. Martín	Alive (c. 3 months old)
25, El Paso	20 Nov. 2007	1	V. Montero	Road casualty
26, Las Cuevas (El Paso)	3 Dec. 2007	1	J.C. Barreto & W. Camacho	Road casualty
27, Bco. Izcagua (Garafía)	6 Dec. 2007	1	D. Tavío & F.M. Medina	Dead
28, Briestas	2007	5	J.C. Barreto & W. Camacho	Alive

et al., 2005), but these methods could have effects on non-target species (Courchamp et al., 2003).

Ferrets are generalist and opportunist feeders and are able to modify their diet in response to changes in prey abundance and availability (Clapperton, 2001). The main negative impact of ferrets is expected to be on ground-nesting birds such as the white-tailed pigeon *Columba junoniae* and the woodcock *Scolopax rusticola*. Ferrets may also prey upon the endemic lizard subspecies *Gallotia galloti palmae*.

The ferret has the potential to become naturalized and spread to the other islands of the Archipelago, as appears to have occurred on La Graciosa Island (Fig. 1) where ferrets have occasionally been seen. A high number of ferrets are maintained in captivity in the Canary Islands (probably $>$ 20,000) and 9,552 licenses were purchased for using ferrets for hunting (from a total of 25,019 for small game hunting permits) in the Archipelago during 2007. On La Palma, with only 531 ferret licences, the species is employed less for hunting than on other islands but it is unclear why the ferret has become established here rather than elsewhere. Public awareness of the problem and education campaigns, especially among hunters, are needed to reduce the threat of this invasive alien species to the Canary Islands biota. Law enforcement, controls and penalties are urgently needed to change the custom of releasing unmuzzled animals.

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Biographical sketches

Félix M. Medina studies the feeding ecology of feral cats and their impacts on native species on islands and is interested in the effects of introduced species on the conservation of island ecosystems. Aurelio Martín is involved in a programme for the study of endemic species and the effects on their conservation of exotic species.