



Title	Traumatic myiasis in farmed animals caused by <i>Wohlfahrtia magnifica</i> in southern Italy (Diptera: Sarcophagidae)
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Short scientific noteSubmitted: January 16th, 2017 - Accepted: April 28th, 2017 - Published: June 30th, 2017**Traumatic myiasis in farmed animals caused by *Wohlfahrtia magnifica* in southern Italy (Diptera: Sarcophagidae)**Teresa BONACCI^{1,*}, Giuseppe CURIA², Roberto LEONCINI³, Daniel WHITMORE⁴¹ Dipartimento DiBEST - Università della Calabria, 87036 Rende (CS), Italy -teresa.bonacci@unical.it² Azienda Sanitaria Provinciale di Cosenza, Servizio Veterinario - Cosenza, Italy - peppinocuria@libero.it³ Dipartimento di Biotecnologie mediche - Università di Siena, Siena, Italy - roberto.leoncini@unisi.it⁴ Department of Life Sciences, Natural History Museum - Cromwell Road, London, SW7 5BD, United Kingdom - d.whitmore@nhm.ac.uk

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Abstract

Ten herds of sheep and goats (455 heads) were inspected for the presence of traumatic myiasis between May and September 2013 in the province of Cosenza, Calabria, southern Italy. Nine cases were discovered in sheep, goats and a sheepdog. Infested body sites included external genitalia, wounds (sheep and sheepdog) and hooves (goats). Larvae were removed from the infested body areas and reared to adult stage in the laboratory. Both the larvae and the adults were identified as belonging to the Mediterranean screwworm fly *Wohlfahrtia magnifica* (Schiner, 1862) (Diptera: Sarcophagidae), an obligatory parasite of humans and warm-blooded vertebrates. To our knowledge, these are the first cases of wohlfahrtiosis in sheep and goats to be reported from Calabria. The infested animals were living outdoors in spring and summer, and enclosed in sheds during the autumn and winter months. Observed effects of the myiasis included severely impeded walking and tissue damage. Wohlfahrtiosis can cause significant economic loss to farmers. Data about the local distribution, seasonality and types of infestation caused by *W. magnifica* are useful to farmers and vets to improve control systems, in Calabria as elsewhere within the distributional range of the species.

Key words: Calabria, farm animals, wohlfahrtiosis, *Wohlfahrtia magnifica*, Diptera, Sarcophagidae.**Introduction**

Diptera are agents of myiasis in humans and animals (Zumpt 1965; Hall 1997; Hall & Wall 1995; Farkas & Kepes 2001; Traversa & Otranto 2006). The larvae of many species are responsible for traumatic myiasis in sheep and goats in many geographical areas (Hall & Farkas 2000; El-Abrak et al. 2002; Sotiraki et al. 2005), causing severe economic losses to the livestock industry. The infestations consist of larval masses feeding on the cutaneous tissues of their hosts, in either lesions or natural cavities (Hall 1997; Hall & Farkas 2000). The larvae of the sarcophagid fly *Wohlfahrtia magnifica* (Schiner, 1862), also known as the Mediterranean screwworm, are obligate parasites of warm-blooded vertebrates (Hall 1997; Hall & Farkas 2000; Sotiraki et al. 2002) and are thus very important from a medical and veterinary point of view (Szpila et al. 2014). The Mediterranean screwworm is widely distributed in Eurasia, from the Mediterranean Basin through central and eastern Europe to northern Asia (Ruiz-Martinez & Leclercq 1994; Pape 1996; Sotiraki et al. 2010). In Italy there are few reported cases of severe myiasis caused by *W. magnifica* in sheep and dogs (Ambrosi & Principato

1994; Gaglio et al. 2011; Giangaspero et al. 2011; Bonacci et al. 2013; Giangaspero et al. 2014), and humans (Iori et al. 1999; Panu et al. 2000). The aim of the present study, carried out in Calabria, was to raise awareness on this neglected disease and report new data on its distribution in southern Italy.

Materials and methods

The study was carried out in the province of Cosenza in the region of Calabria, southern Italy (Fig. 1). Ten herds were visited between May and September 2013 in the localities of Montalto Uffugo (39°24'44"N, 16°09'23"E), San Fili (39°20'30"N, 16°08'49"E), Aprigliano (39°14'41"N, 16°20'34"E), Spezzano della Sila (39°17'55"N, 16°20'43"E) and Rende (39°19'40"N, 16°10'55"E), at altitudes ranging between 200 and 800 m above sea level. Two herds consisted of a mixture of sheep and goats, while eight were composed only of sheep. The number of individuals in each herd ranged between 65 and 93, for a total of 445 heads. The herds were visited at random according to their availability in the sampled area, where sheep and goats are



Fig. 1 – Sampled areas of Calabria where sheep, goats and a dog were found to be infested by the Mediterranean screwworm *Wohlfahrtia magnifica* (Schiner).

traditionally kept in wooden sheds during the autumn and winter months and allowed to graze outdoors during the daytime in spring and summer, returning to the sheds overnight. Six of the visited farms were located in areas with hard and rough terrain, while the remaining four were located on flat terrain.



Fig. 2 – Infestation by the Mediterranean screwworm *Wohlfahrtia magnifica* (Schiner). **A** and **B**, severe myiasis of the prepuce of two rams, showing severe damage to the organ (**B**); **C**, severe infestation of the vulvar region in a sheep; **D**, severe myiasis in the hoof of a goat; **E** and **F**, traumatic infestation of a barbed wire lesion in a sheepdog.

A total of 83 second and third instar larvae were removed from the infested areas by means of forceps, under the supervision of a vet. Thirty-five (35) of the collected larvae were killed and stored in 90% ethanol, while the remaining 48 were reared in the laboratory to the adult stage and stored in 60% ethanol. Both the larvae and the adults were identified as *Wohlfahrtia magnifica* by comparison with illustrations in Rohdendorf (1956) and specimens held in the DiBEST Department collection, University of Calabria (Cosenza, Italy), together with all the material collected during this study.

Results

Cases of myiasis were detected in nine out of the 445 animals examined. Infested body sites included the genitalia (vulva, prepuce) and a wound in the naso-frontal area of sheep, hooves in goats, and a barbed wire wound on the flank of a sheepdog (Fig. 2).

The larval masses found in the infested sites were composed entirely of second and third instars of *Wohlfahrtia magnifica*, and no other myiasis agent was found in the study area. The two infested goats were found together with infested sheep but in two different herds, both grazing on hard and rough terrain at the Spezzano della Sila and Aprigliano localities. This type of terrain may have been responsible for injuries in the goats' hooves, helping attract *W. magnifica* females (Mohammed et al. 1996). Similarly, the barbed wire wound in the dog's flank must have attracted the parasite (Fig. 2 E and F).

In most of the examined cases, wohlfahrtiosis caused tissue destruction (Fig. 2 A, B and D) as well as changes in behaviour in the infested animals, who were motionless and reluctant to graze. Severe myiasis of the genitalia in two rams had caused the destruction of the lumen and obstruction, affecting urination and the ability to mate. In another ram, eight larvae were found in a head lesion caused by a fight with another male. In this case and in the case of the dog, no additional problems were observed in the animals involved. In the goats, the larvae had destroyed the tissues under the hooves, causing difficulties in walking. Infested animals were observed throughout the whole altitudinal range of the study, from 200 to 800 m.

Discussion

Few cases of traumatic myiasis caused by *Wohlfahrtia magnifica* have been documented in Italy, in central and southern regions including Sicily and Sardinia (Ambrosi & Principato 1994; Gaglio et al. 2011; Giangaspero et al. 2011; 2014). Sheep are considered the main host of this parasite (Sotiraki et al. 2010) but goats and dogs can serve as a reservoir for it, as already documented by Gaglio et al. (2011) and Bonacci et al. (2013). The data presented here

confirm the presence of this obligate parasite in Calabria and that it can cause severe traumatic myiasis in sheep, goats and dogs. Although supported by only a low number of observations, our data suggest that sheep are the preferred hosts of *W. magnifica* in the region and confirm goats and dogs as alternative hosts, albeit probably with a lower infestation rate. Our data also confirm that infestations are not only localized to the genital area but may occur also in wounds, even though findings of *W. magnifica* larvae in natural orifices have been reported as very common (Valentin et al. 1997; Sotiraki et al. 2010). Our observations on hoof myiasis in goats are the first for Italy, whereas traumatic myiasis by *W. magnifica* in dogs had been reported by Farkas et al. (2009), Giangaspero et al. (2011) and Bonacci et al. (2013).

The altitudinal range of *W. magnifica* infestations observed in the present study is in agreement with records from other Italian regions, Spain and Greece (Ruiz-Martínez & Leclercq 1994; Sotiraki et al. 2005; Gaglio et al. 2011; Giangaspero et al. 2011; 2014; Whitmore, unpublished data).

Infestations by larvae of Diptera are responsible for important economic losses to the livestock industry and rural farms in many countries of the world. Reduced milk production and reproduction problems are some of the consequences of myiasis (Otranto & Colwell 2008), together with urination problems, lameness, and death (Hall 1997). Although the main targets of *W. magnifica* are sheep, also goats and dogs can become potential hosts of this obligate parasite by living in close proximity to infested animals. Likewise, farmers or shepherds working close to livestock could be parasitized by this fly (e.g., Panu et al. 2000; Tligui et al. 2007). Cases of wohlfahrtiosis in humans have been documented in Asia and Europe, where *W. magnifica* is one of the most frequent parasites producing oral and vulvar myiasis (Sahba 1981; Athari & Fallah 1993; Çiftçioglu et al. 1997; Delir et al. 1999; Iori et al. 1999; Karaman et al. 2009; Tuygun & Taylan-Ozkan 2009; Robbins & Khachemoune 2010). Our data are in agreement with the findings of other authors and suggest that *W. magnifica* is able to infest many domestic animals and that sheep are probably the preferred target. The case of wohlfahrtiosis in a sheepdog is the second reported case on a dog in Calabria in recent years (Bonacci et al. 2013), and suggests that domestic dogs can act as reservoirs of this parasitosis, especially on farms.

Despite recent case reports and reviews by Gaglio et al. (2011), Giangaspero et al. (2011, 2014) and Bonacci et al. (2013), and a recently published study on the geographical origin of Italian populations of the species (Marangi et al. 2016), very little is known of the incidence and distribution of traumatic myiasis caused by *W. magnifica* in Italy. Further data need to be collected in order to develop effective measures for the control of adult populations of this dipteran (see Hall 1995; Hall & Farkas 2000; Sotiraki et al. 2010). Herds should be routinely monitored

in spring and summer, the period of greatest activity of *W. magnifica*; rapid treatment, consisting of manual removal of the larvae from the infested cavity or wound before application of antibacterial and antibiotic solution, should be performed on the infested animals in order to reduce the spread of infestations within herds.

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