

ENTOMOLOGY

First case of traumatic myiasis caused by *Calliphora vicina* in a crested porcupine *Hystrix cristata* L. in Italy

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Abstract

Calliphora vicina (Diptera: Calliphoridae) it is a facultative ectoparasite responsible for traumatic myiasis in humans and warm-blooded vertebrates in the world. In this work one case of traumatic myiasis caused by *C. vicina* (Diptera Calliphoridae) is reported for the first time in a vulnerable crested porcupine (*Hystrix cristata* Linnaeus, 1758). A total of 30 larvae located in the posterior-dorsal area of the animal were removed from inside the lesion and either preserved in ethanol or reared to the adult stage. This report shows the great ability of *C. vicina* to use many organic matter for the food source's offspring, including many live vertebrates.

Introduction

Myiasis, as defined by Zumpt (1965), is *an infestation of live human and vertebrate animals with dipterous larvae, which, at least for a certain period, feed on the host's dead or living tissue, liquid body-substances, or ingested food.* This parasitosis can be caused by many species of Diptera, but larvae of Calliphoridae,

Sarcophagidae and Muscidae are the main responsible of traumatic myiasis in humans and animals (Zumpt, 1965; Hall & Wall, 1995; Hall, 1997; Hall & Farkas, 2000; Sinha, 2012). Conversely, some Muscidae are active predators of economically important pests (Bonsignore, 2016).

Calliphora vicina Robineau-Desvoidy, 1830 has an almost worldwide distribution; it mainly favours shady situations and urban habitats, where it is often the dominant species on human corpses (Smith, 1986; Bonacci, *et al.*, 2009). *Calliphora vicina* it is known like facultative ectoparasites of many species of wild animals and humans (Dehlaes *et al.*, 2001; Sales *et al.*, 2003; Knotek *et al.*, 2004; Salvetti *et al.*, 2012; Araghi *et al.*, 2015).

The crested porcupine *Hystrix cristata* is distributed in Northern Africa from Morocco to Northern Libya and in sub-Saharan Africa from Senegal to Central Tanzania (Amori *et al.*, 2008; Mohamed, 2011); in Europe it is present only in Italian peninsula, where it shows increasing populations.

Mori *et al.* (2013a,b) summarized the actual distribution of the species in Italy and the steps of a wide spreading still on the move. The northern limit is represented by the province of Verona (Veneto) to the east, and by the province of Piacenza (Emilia Romagna) to the west. The Italian population of *Hystrix cristata* are supposed to be of archaic introduction (Trucchi & Sbordoni, 2009; Masseti *et al.*, 2010) probably during early Medieval times (Masseti *et al.*, 2010).

The crested porcupine is a large rodent with sedentary habits (Amori *et al.*, 2008). Monogamous, the members of a pair forage on the same home range and have large overlap in activity rhythms (Mori *et al.*, 2016). This rodent is very robust, with massive short legs and a median body weight around 11-12 kg (Mori & Lovari, 2014), powerful in defense and burrowing, but causing it to become less efficient in escape from predation (Mohr, 1965) as well as the possibility to avoid problem with vehicles when come across roads. *H. cristata* is a mainly nocturnal animal, living and breeding in burrows or dens. It is a solitary forager, known to travel long distances in search of food. The foraging behavior of the crested porcupine contributes to increase the risk of road accidents in the mosaic of agriculture and urban habitats where they are mostly distributed.

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Materials and methods

A young female of around 4.5 kg (Figure 1) had been discovered in Lido di Classe (RA) (44°19'45.00"N and 12°19'49.00"E, 5 m asl), in December 29, 2016 (December mean environmental

$T=4.5\pm 0.5^{\circ}\text{C}$). The specimen was very debilitated and with great difficulty to move and was brought to the Wildlife Recovery Center of the association *Amici degli animali* where the porcupine died in few hours.

The specimen was sent to the *Istituto Zooprofilattico Sperimentale of Lombardia and Emilia Romagna region* for post-mortem examination and the evaluation of cause of death, in a general protocol on the analysis of wildlife cases. 30 mature larvae were in total removed during the necroscopic examination, directly taken from the necrotic tissue by forceps. 15 specimens were killed by immersion for 1.5 minutes in boiling water and later fixed in 95° ethyl alcohol, while the remaining third instars ($N=15$) were reared in the laboratory to the adult stage. Both the larvae and the adults were identified using the keys of Akbarzadeh *et al.* (2015). Digital photographs were taken with a Sony Super Steadyshot DSC-H2 digital camera. In order to define their length and age, the larvae were measured using a Veho Doscovary VMS equipped with measurement software.

Results and discussion

Young crested porcupine *Hystrix cristata* was found suffering for a severe fracture and decaying wound in the left side of the pelvic girdle, while a large number of maggots were feeding on the dermal and muscle necrotic tissues (Figure 2).

We examined the larvae and emerged adults comparing these with the specimens held in the collection of Forensic entomology



Figure 1. Young female of Crested porcupine *Hystrix cristata*, died few hours after the hospitalization.

laboratory of DiBEST Department, University of Calabria. Both the larvae and the adults were identified as *Calliphora vicina* Robineau-Desvoidy, 1830 (Figure 3).

C. vicina is a cosmopolitan species known as the main forensic indicator on human corpses (Bonacci *et al.*, 2009, 2016) and carrion (Byrd & Castner, 2009). The species is known also as secondary myiasis agent of many wild vertebrates (Araghi *et al.*, 2015) and with *C. vomitoria* are considered thermophobic and adapted to relatively cold and wet habitats (Davies & Lawrence, 1992; Baz *et al.*, 2007; Martinez-Sanchez *et al.*, 2000; Singh & Bharti, 2009; Martin-Vega & Baz, 2013; Greco *et al.*, 2014).

The data on the *C. vicina* life cycle show that at high temperature (20-25°C) the deposited eggs have fast development as well as the entire life cycle. In this case, the presence of larvae of third age of *C. vicina* in relation to environmental temperatures ($T_{\text{mean}}=4.5\pm 0.5^{\circ}\text{C}$), suggest that the porcupine had suffered for many days. The development data of *C. vicina* in lab indicate that the species at the temperature of 5°C need of 8-10 days to reach the evaluated length (13.5 mm) (Bonacci, *unpublished data*). Specifically, this timeframe is related to the colonization time by *C. vicina*. Besides, the low temperatures in December in northern Italy have prevented parasitosis by other facultative or obligate parasites.

Conclusions

In conclusion, this report shows the great ability of *C. vicina* to use many organic matter for the food source's offspring, including many live vertebrates. *C. vicina* it is a cosmopolitan and widespread fly species (Rognes, 1991) and as far as the risk of transmission of contamination agents, *C. vicina* ranks among the most dangerous flies ranging in Europe (Mihályi, 1967). The species contaminating the food with microorganisms present on their body surface, with their feces and regurgitated fluid. Lane & Mader (1996) report that blowfly larvae can provoke more serious health problems in animals kept in captivity. The same authors report on the inflammatory and infection processes of injuries due to the



Figure 2. *Calliphora vicina* (Diptera, Calliphoridae) larvae inside the wound in the left side of the pelvic girdle.



Figure 3. *Calliphora vicina* Robineau-Desvoidy, 1830. A) Cephalopharyngeal skeleton of third instar larva; B) Posterior spiracles of third instar larva. C) Habitus of adult (scale bar: 2 mm), D) adult head, lateral view.

presence of *C. vicina* larvae and maybe also in this case the maggots may have contributed to aggravate the precarious situation of the young animal, resulted fatal as reported for other wounded animals (Knotek *et al.*, 2004). *C. vicina* it is known as the main forensic indicator in the world, it causes myiasis in humans and many vertebrate species and as we reported is a facultative parasite causing traumatic myiasis in the mammal *H. cristata*.

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