First record of *Oestrus ovis* Linnaeus, 1758 from Malta, and case reports of myiasis from the Maltese Islands (Diptera: Brachycera)

Paul GATT[1] & Trevor ZAMMIT[2]

ABSTRACT. *Oestrus ovis* is reported for the first time from Malta. An account is given of four cases of myiasis in Malta, one nasopharyngeal in a sheep host involving *O. ovis*, and three cutaneous in a human host and in domestic cats, the latter all involving *Lucilia sericata*.

KEY WORDS. Malta, Myiasis, *Oestrus ovis*, *Lucilia sericata.*

INTRODUCTION

The term myiasis was first used by Hope (1840) to refer to diseases of humans caused specifically by larvae of diptera. It has since then been defined as "the infestation of live 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" (Zumpt, 1965).

Two classifications of myiasis have emerged. The first, an anatomical classification, was proposed by Bishopp (Patton, 1922) and later modified by James (1947). It is based on the anatomical site of the infestation of the host, and is still widely used as it is simple and practical. The second, a parasitological classification proposed by Patton (1922), takes into account the degree of the parasitic dependency of the fly on the host, and is based on evolutionary and biological considerations.

Dermal or subdermal myiasis, also known as cutaneous myiasis, is the invasion of the skin by larvae of Diptera that cause burrows or boils in the dermal layers, invade and enlarge existing wounds (wound and traumatic myiasis) or form wounds themselves (i.e. penetrate unbroken skin). It may be benign, as when facultative species (those normally free living and unable to initiate myiasis) consume dead tissue, or malignant when obligate species (those dependant on myiasis for survival) destroy living, viable tissue. Of some seven families of Diptera that may cause cutaneous myiasis, two - the Calliphoridae and the Sarcophagidae – are the most important world wide.

Nasopharyngeal myiasis is the invasion of the tissues of the nose, paranasal sinuses and pharynx by dipterous larvae. The family Oestridae is the most important dipterous family causing nasopharyngeal myiasis worldwide.

Myiasis of the eye is referred to as ophthalmomyiasis. External ophthalmomyiasis results from the deposition of larvae on the conjunctiva or eyelids.

[1] 56, Godwin Ganado Street, Tal-Virtu, Rabat RBT 2462, Malta. E-mail: paulgatt@onvol.net
[2] 56, Kananea Street, Attard, Malta. E-mail: trevorzammit@gmail.com

Myiasis is a subject of great veterinary, medical and economic importance, and there is a large body of literature on it, referring to myiasis in both the Old and New World. The definitive treatise of myiasis in the Old World remains that of Zumpt (1965) and much useful information may be gathered from Ferrar (1987) and Smith (1989). It is therefore surprising that the subject has attracted very little attention in Malta. Cilia (1975) reports a case of myiasis in the painted frog, *Discoglossus pictus* (Otth, 1837) and concludes that the agent involved was a species of *Lucilia*, possibly *bufonivora* Moniez, 1876, but this was more likely the common *Lucilia sericata* (Meigen, 1826), since the former was never recorded from Malta (Ebejer, 2007). Ebejer (2007), in a recent review of the Calliphoridae of the Maltese Islands, mentions that the few cases of human and animal myiasis that have been brought to the attention of entomologists involved *Chrysomya albiceps* (Wiedemann, 1819) and *Lucilia sericata* but gives no further details. Savona-Ventura (2007) gives an anecdotal account of fly maggots emerging from the gangrenous foot of an elderly patient in a surgical ward in the late 1970's, but no other information is given. Dr Albert Bezzina (*pers. comm*.) has removed small maggots from the conjunctiva of 5 patients presenting with external ophthalmomyiasis in an ophthalmology clinic over the last 25 years, but no material is available for identification.

It is therefore of interest to report on four cases of myiasis - 1 nasopharyngeal and 3 cutaneous - which have come to the attention of the authors over the last 20 years, and in which the agent of myiasis has been identified. In all but 1 case, the material originated from the veterinary practice of one of us (TZ). The material was identified by the senior author and voucher larval and adult specimens are preserved in his private collection in Malta.

RESULTS

Nasopharyngeal myiasis

Oestrus ovis Linnaeus, 1758

Material examined: MALTA: Luqa, 16.iv.2001, 2 mature, 3rd instar larvae, ex. head of sheep, leg. T. Zammit.

Comments: A total of 6 larvae were retrieved from the refrigerated head of a sheep slaughtered for human consumption. The larvae were collected from the rostrum, frontal sinuses, and between the cranium and the meninges of the animal, and were sluggish, but still alive. An unsuccessful attempt was made to rear the larvae to pupariation. This is the first record of this species from Malta.

Cutaneous myiasis

Lucilia sericata (Meigen, 1826)

Material examined: Case 1: MALTA: Siġġiewi, 20.vi.1993, 6 mature 3rd instar larvae, ex. human leg ulcer, leg. P. Gatt - pupariated 23.vi.1993, 1 ♂ and 1 ♀ emerged 30.vi.1993. **Case 2: MALTA:** Attard, 12.viii.2006, 10 mature 3rd instar larvae, ex. domestic Persian cat, leg. T. Zammit - pupariated 15.viii.2006, 4 ♂♂ and 6 ♀♀ emerged 23.viii.2006. **Case 3: MALTA:** Attard, 13.v.2008, 9 mature 3rd instar larvae, ex. female Persian, domestic short hair cross cat, leg. T. Zammit - pupariated 15.v.2008, 3 ♂♂ and 4 ♀♀ emerged 23.v.2008.

Comments: For Case 1, the larvae were feeding on a necrotic varicose ulcer of a neglected, elderly woman, and dropped to the floor while her dirty bandages, which were seldom changed, were being replaced. For Case 2, the larvae were extracted from the necrotic tissues of the breech of a neglected Persian cat whose fur was matted and soiled with urine and faeces. The ulcer was large and the animal moribund, and had to be euthanized. For Case 3, a cat had a lesion in the femoral region of its right leg probably due to trauma sustained during a fall. The lesion was fresh and clean but covered by a patch of knotted fur. On removing the fur, the lesion was found to be infested by approximately 100 larvae which were feeding subcutaneously and also at various depths inside the exposed muscles of the animal. The wound was very thoroughly cleaned and care was taken to physically remove as many of the larva as possibly. The wound was irrigated with a very mild solution of fipronil after which antibiotics were administered topically and systemically. The animal was revisited the following day and no live larvae were found inside the wound. It recovered fully in 2 weeks time during which the wound healed by secondary intent.

DISCUSSION

The purpose of this article is to review what little has been written on the subject of myiasis in Malta, and to document 4 cases – 1 nasopharyngeal in a sheep caused by *Oestrus ovis* and 3 cutaneous – 1 in a human and 2 in cats, all caused by *Lucilia sericata* - and to provide details of the circumstances in which they occurred. This, and the references provided, will hopefully stimulate further research into this important subject which has hitherto been grossly neglected in Malta.

Animal myiasis has a profound impact on the husbandry, productivity and welfare of livestock. In recent years, there has been concern over the threats of the introduction of alien, exotic species as well as fears of potential changes in arthropod distribution associated with climate change. The most striking example of this was the introduction of the New World screworm fly, *Cochliomyia hominivorax* (Cocquerel, 1858) into Libya in 1988. The subject of livestock ectoparasites in Europe and the Mediterranean, including agents of myiasis, has been recently reviewed by Colebrook & Wall (2004). Traumatic myiasis in humans is much less common than in livestock, but can cause considerable psychological and physical morbidity to those affected by it.

Lucilia sericata is a primary facultative green-bottle blow fly and is the most common and important agent of cutaneous myiasis in most of Northern Europe, particularly in Great Britain (Macleod, 1943). The species is almost cosmopolitan, and is very common in Malta, where it has been reared from human and animal corpses including snails (Ebejer, 2007). It is a species of great hygienic and epidemiological significance (Povolný & Rozsypal, 1968) and its taxonomy and biology have recently been reviewed by Rognes (1991). The larvae are essentially carrion feeders, but can initiate myiasis in living hosts after gravid females lay their eggs on wounds and skin or fur contaminated with faeces or urine. They particularly infest domestic sheep ("sheep strike") and may cause extensive tissue damage. The species has also been reported to cause myiasis in a toad (*Bufo* sp.) (Stewart & Foote, 1974). It is rarely involved in human myiasis and then only in situations of personal neglect (Greenberg, 1984), or in the very young, very old or those unable to maintain good personal hygiene (Hall & Smith, 1993). Larvae usually infest contaminated ulcers of the legs and bed sores (Tikjøb & Haarløv, 1985; Roche *et al*., 1990; Krištofík & Mikulecký, 1991) although other, unusual sites, like the external auditory meatus, have been reported (Meinert, 1888). The ability of the larvae of *Lucilia sericata* and other species to clear necrotic tissue from wounds has been utilised as 'maggot therapy' since antiquity, and the

subject has been recently reviewed by Whitaker *et al.* (2007).

There is little detailed recorded information on animals affected by traumatic myiasis other than humans and sheep, and this should be an area of future study. Hall & Wall (1995) mention *Lucilia sericata* from myiasis infestations of domestic rabbits, dogs, cats and wild hedgehogs and birds. It has also been recorded from geese (Farkas & Szántó, 1998) and horses (Hall & Farkas, 2000). Very few studies have been carried out on the incidence of cutaneous myiasis in pet animals. Anderson & Huitson (2004) report *Lucilia sericata* from myiasis in pet animals in British Columbia. The majority of animals presenting with myiasis were dogs, followed by cats, rabbits and horses, but this may simply reflect the frequency with which each of these animals is kept as a pet. They speculated that a cat's normal scrupulous attention to grooming and personal hygiene protects the animal from infestation. Injured, soiled or long-haired cats were found to be more prone to attack, and this suggested deliberate abuse or neglect. They concluded that the incidence of pet myiasis was probably commoner than that reported, since in cases of abuse or neglect, owners were reluctant to consult a veterinarian for fear of censure. The incidence of cutaneous myiasis in cats in Malta is unknown, but a busy veterinarian would be expected to see about 4 cases a year, based on the clinical experience of one of us (TZ) over the last 20 years.

In the Mediterranean, the obligate myiasis-causing sarcophagid *Wohlfahrtia magnifica* (Schiner, 1862) is a much more important cause of myiasis in sheep, and causes more severe damage, sometimes in the company of *Lucilia sericata*, but this fly has hitherto not been recorded from Malta. It has recently been reported from Crete as a newly introduced species (Sotiraki *et al*., 2003).

Oestrus ovis, the sheep nasal bot fly, is a cosmopolitan species that is found in all sheep raising parts of the world. It is widely distributed in the Mediterranean, and causes nasopharyngeal myiasis (oestrosis) in sheep, and less commonly goats. The highest recorded prevalence from the Mediterranean has been from Sardinia (Scala *et al*., 2001), who reported *Oestrus ovis* larvae in 100% of examined flocks and 91% (514/566) of the sheep heads examined. The mean number of larvae per infested head was 19. Despite the multitude of studies on the prevalence of infestation by *Oestrus ovis*, the economic importance of this parasite remains unclear (Colebrook & Wall, 2004).

The first larval instar of *Oestrus ovis* is also the commonest cause of external ophthalmomyiasis in humans (Krümmel & Brauns, 1956). The larvae never develop beyond the first instar, and cause a catarrhal conjunctivitis which lasts a few days. According to Zumpt (1965) man is affected mainly in regions where the density of sheep and goats is low compared to that of humans, a situation which prevails in Malta. It is therefore reasonable to assume that *Oestrus ovis* was responsible for the ophthalmomyiasis in the patients reported above by Dr Albert Bezzina. This species has been responsible for causing human myiasis on the nearest land mass to Malta, Sicily, for many years (Pampiglione *et al*., 1997).

The single record of *Oestrus ovis* presented here is the first of this species for Malta. The provenance of the infested sheep is unknown, and it could have been imported into the island for slaughter. Though sheep owners have occasionally described clinical signs in their flocks that are highly suggestive of *Oestrus ovis* infestation, mainly sudden onset of sneezing bouts with rubbing of the nostrils against objects and a copious nasal discharge, no data has been published on the status or prevalence of oestrosis in the Maltese Islands.

Collaboration with livestock farmers, abattoir workers and veterinarians, and field work around farm animals is expected to unearth further myiasis-producing agents eg. species of *Sarcophaga* Meigen, 1826 sensu lato, *Hypoderma* Latreille, 1818 and *Gasterophilus* Leach, 1817 and is a potentially fruitful area of research worthy of pursuing.

ACKNOWLEDGEMENTS

The authors would like to thank Dr J. C. Deeming (Cardiff, UK) for confirming the identity of the *Oestrus ovis* larvae reported here; Prof. P. J. Schembri (Malta) for providing literature; Dr A. Bezzina (Malta) for sharing his unpublished observations on ophthalmomyiasis in Malta and Dr M. J. Ebejer, (Cowbridge, UK) for reading a draft of the manuscript and suggesting improvements.

REFERENCES

Anderson, G.S. & Huitson, N.R. (2004) Myiasis in pet animals in British Columbia: The potential of forensic entomology for determining duration of possible neglect. *The Canadian Veterinary Journal*, **45** (12): 993-998.

Cilia, J. (1975) A case of myiasis in the painted frog (*Discoglossus pictus* Otth). *The Maltese Naturalist*, **2** (1): 26.

Colebrook, E. & Wall, R. (2004) Ectoparasites of livestock in Europe and the Mediterranean Region. *Veterinary Parasitology*, **120**: 251-274.

Ebejer, M. J. (2007) The occurrence of *Chrysomya megacephala* (Fabricius) (Diptera, Brachycera) in Malta and records of other Calliphoridae from the Maltese Islands. *Entomologist's monthly Magazine*, **143**: 165-170.

Farkas, R. & Szántó Z. (1998) Traumatic myiasis of geese in Hungary. *Abstracts of 4th International Congress of Dipterology*, 7-11 September 1998, Oxford, UK.

Ferrar, P. (1987) *A Guide to the Breeding Habits and Immature Stages of Diptera Cyclorrhapha.* Entomonograph 8: 1, E. J. Brill/Scandinavian Science Press, 478 pp.

Greenberg, B. (1984) Two cases of human myiasis caused by *Phaenicia sericata* (Diptera: Calliphoridae) in Chicago area hospitals. *Journal of Medical Entomology*, **21**: 615.

Hall, M. J. R. & Farkas R. (2000). Traumatic myiasis of humans and animals. Pp. 751-768. In: Papp, L. & Darvas, B. [eds.] *Manual of Palaearctic Diptera.* Vol. 1. Science Herald, Budapest, Hungary. 978 pp.

Hall M. J. R. & Smith K. G. V. (1993) Diptera causing myiasis in man. Pp.429-469. In: Lane, R. P. & Crosskey, R.W. [eds.] *Medical Insects and Arachnids*. Chapman & Hall, London, xv + 723 pp.

Hall, M.J.R. & Wall, R. (1995) Myiasis of humans and domestic animals. *Advances in Parasitology*, **35**: 257-334.

Hope, F.W. (1840) On insects and their larvae occasionally found in the human body. *Transactions of the Royal Entomological Society of London*, **2**: 256-271.

James, M. T. (1947) The flies that cause myiasis in man. *United States Department of Agriculture Miscellaneous Publications*, No. 631. 175 pp.

Krištofík, J. & Mikulecký, M. (1991) A case of myiasis in Slovakia caused by *Lucilia sericata* (Meigen, 1826) (Diptera, Calliphoridae). *Biólogia* (*Bratislava*), **46**: 181-182.

Krümmel, H. & Brauns, A. (1956) Myiasis des auges, medizinische und entomologische Grundlagen. *Z. Augenwandte Zool*., **9**: 129.

Macleod, J. (1943) A survey of British sheep blowflies. *Bulletin of Entomological Research*, **34**: 65-88.

Meinert, F. (1888) En spyflue, *Lucilia nobilis*, snyltende hos mennesket. *Ent. Meddr*., **1**: 119-122.

Pampiglione, S., Giannetto, S. & Virga, A. (1997) Persistence of human myiasis by *Oestrus ovis* L. (Diptera: Oestridae) among shepherds of the Etnean area (Sicily) for over 150 years. *Parassitologia*, **39**: 415-418.

Patton, W.S. (1922) Notes on the myiasis producing Diptera of man and animals. *Bulletin of Entomological Research*, **12**: 239-261.

Povolný, D. & Rozsypal, J. (1968) Towards the autecology of *Lucilia sericata* (Meigen, 1826) (Dipt., Call.) and the origin of its synanthropy. *Acta sc. Nat. Brno*, **2** (8): 1-32.

Roche, S., Cross, S., Burgess, I., Pines, C. & Cayley, A.C.D. (1990) Cutaneous myiasis in an elderly debilitated patient. *Postgraduate Medical Journal*, **66**: 776-777.

Rognes, K. (1991) Blowflies (Diptera, Calliphoridae) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica* 24, E. J. Brill/Scandinavian Science Press, 272 pp.

Savona-Ventura, C. (2007) Inverterbrates in the medical service of man: Part II – The Insect Surgeons. *The Synapse Magazine*, **2**: 16-17; Medical Portals Ltd., Dingli, Malta.

Scala, A., Solinas, G., Citterio, C. V., Kramer, L. H. & Genchi, C. (2001) Sheep oestrosis (*Oestrus ovis* Linné 1761, Diptera: Oestridae) in Sardinia, Italy. *Veterinary Parasitology*, **102**: (1-2): 133-141.

Smith, K.G.V. (1989) An introduction to the immature stages of British flies. *Handbooks for the Identification of British Insects*. 10 (14), Royal Entomological Society of London, 280 pp.

Sotiraki, S., Stefanakis A. & Hall, M.J.R. (2003) Assessment of cypermethrin and doramectin for controlling wohlfartiosis in Crete. *Veterinary Parasitology*, **116**: 327-332.

Stewart, S. & Foot, R. H. (1974) An unusual infestation by *Phaenicia sericata* (Mg.) (Diptera: Calliphoridae). *Proceedings of the Entomological Society of Washington*, **76**: 466.

Tikjøb, G. & Haarløv, N. (1985) Myiasis. *Ugeskr. Laeger*, **147**: 1200-1201.

Whitaker, I. S., Twine, C., Whitaker, M. J., Welck, M., Brown, C. S. & Shandall, A. (2007) Larval therapy from antiquity to the present day: mechanisms of action, clinical applications and future potential. *Postgraduate Medical Journal*, **83**: 409-413.

Zumpt, F. (1965) *Myiasis in man and animals in the Old World*. London, Butterworths. 267 pp.

ISSN : 2070-4526
Date of Publication : 31st August 2008

Received: May 9, 2008
Accepted: June 30, 2008