Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2016; 4(6): 211-215

Received: 15-09-2016
Accepted: 20-10-2016

WRUA Bandara
Department of Zoology, Faculty of Science, University of Peradeniya, Sri Lanka

WAIP Karunaratne
Department of Zoology, Faculty of Science, University of Peradeniya, Sri Lanka

RM Fuward
Government Veterinary Hospital, Gatambe, Peradeniya, Sri Lanka

A Dangolla
Department of Veterinary Clinical Sciences, Faculty of Veterinary Medicine & Animal Science, University of Peradeniya, Sri Lanka

ADH Yasakeerthi
Department of Veterinary Clinical Sciences, Faculty of Veterinary Medicine & Animal Science, University of Peradeniya, Sri Lanka

Correspondence
WRUA Bandara
Department of Zoology, Faculty of Science, University of Peradeniya, Sri Lanka

Myiasis in dogs and cats treated in two veterinary clinics in peradeniya, Sri Lanka

WRUA Bandara, WAIP Karunaratne, RM Fuward, A Dangolla and ADH Yasakeerthi

Abstract
Myiasis, a maggot infestation of wounds in animals, is classified into three groups; obligatory, facultative and accidental. For the first time in Sri Lanka, the relationship between occurrence of myiasis in dogs and cats with the temperature, rainfall and humidity pattern was examined. The samples were collected from GVH and VTH. In the retrospective study, 299 myiasis cases were reported of which 295 were of dogs and four were from cats. In July 2014, the number of cases was highest since the temperature and humidity were optimum for maggot growth. No clear relationship was seen between myiasis case reports and rainfall. According to the prospective study, all infestations were due to *Chrysomya bezziana*. A majority of reported hosts were males of cross-breeds and were between 0-4 years. It is important that the veterinarians educate pet owners with regard to early recognition of wounds and prompt referral to avoid myiasis.

Keywords: Myiasis, *Chrysomya bezziana*, cats, dogs, weather patterns, occurrence

1. Introduction
Myiasis is commonly defined as the infestation of live vertebrate animals with dipterous larvae for atleast a certain period of their life cycle, feeding on hosts' dead or living tissue, liquid body substances, or ingested food [1]. In a broad manner three groups of fly maggots can be classified depending on their predatory behavior; obligatory, facultative and accidental.
Fly maggots that feed exclusively in or on living vertebrates are obligatory parasites, while that are attracted to foul and fetid odors of dead animals and organic matter are facultative parasites. Fly maggots that accidentally enter the human body through gastrointestinal tract, urinary passage and bladder are accidental parasites [2].
In many parts of the world, myiasis is a major concern of health and economy [3]. It involves cases reported mainly around the tropical countries where the environmental conditions are optimum for growth and dispersal of myiasis-causing dipterans [4].
Myiasis is often a case of negligence or mistreatment in animals and human. Canine and feline myiasis is a widespread infection and number of cases reported all around the world [4-11]. In Sri Lanka there is a privation of published data on animal myiasis to emphasize the importance of this infection.
Therefore, a preliminary study was conducted to identify the fly maggot causing myiasis in dogs and cats reported to two veterinary clinics in Peradeniya and to determine age, sex, breed in occurrence of the victims and, to identify its relationship with temperature, rainfall and humidity.

2. Materials and Methods
2.1 Study site
Two main popular veterinary hospitals in Kandy district were selected namely Veterinary Teaching Hospital, Peradeniya (VTH) and Government Veterinary Hospital, Peradeniya (GVH).

2.2 Retrospective data collection
To identify a relationship between temperature, rainfall and humidity and occurrence of myiasis, retrospective data were collected from January to December 2014 using OPD admission books (VTH) and data collection sheets (GVH). Mean monthly temperature, rainfall and relative humidity were obtained for the period of January to December 2014 from the Natural

Resource Management Centre (NRMC), Department of Agriculture, Peradeniya.

2.3 Prospective data collection and Maggot sample collection

To determine the age, sex, and breed of the victims, data were collected from January to September 2015 using data collection sheets. Maggot sample collection from wounds of the victims was done by the attending doctors to identify the maggots causing myiasis. The attending doctors were given proper instructions in advance on the collection of maggot samples. Twenty to 30 maggots from each victim were collected into a vial containing small amount of 1% NaCl just to cover the bottom of the vial. Each maggot sample thus collected was properly labeled with date, sample number, animal type, age, address and cause of the wound. The collected maggot samples were transported to the Entomology Research Laboratory, Department of Zoology, University of Peradeniya for morphological identification.

2.4 Preservation and identification of maggots

From each collected sample, two to three larger maggots were preserved in 70% ethyl alcohol and labeled with date and sample number. The instar stages of the preserved maggots were recorded by determining the number of posterior spiracles slits under the STE stereo microscope (×20-40). Identification of maggots was done by closely observing the key characters including anterior spiracles, posterior spiracles, cephaloskeleton and other larval features used in the key [2]. For that all the parts including, anterior spiracles, posterior spiracles, cephaloskeleton and spine bands were slide mounted in Canada balsam using standard entomological techniques and observed under STE stereo microscope for identification. Finally, the identification features of the maggots were photographed by Micro View USB digital microscope (×10-650) and Olympus SZX12 dissecting stereo microscope (×100).

2.5 Rearing and identifying adult flies to confirm the identity of maggots

The remaining live maggots from the sample were placed in a wide mouthed jar with a bovine liver cut in to small pieces and covered with gauze net. The bottom of the jar was covered with a layer of saw dust which provides a dry place for maggots to burrow in for pupation. Once the larvae pupated they were kept until the adult flies emerged. Few emerged flies were killed in ethyl acetate and were pin mounted and curate following entomological techniques. The adult flies were identified to the species level, using an identification key [2].

3. Results

According to the retrospective data, a total of 119 and 180 myiasis cases were reported from the GVH and VTH respectively in 2014. All the reported myiasis cases were canines (295 cases) and felines (only four cases). Highest number of myiasis cases (n=67) was reported in July, 2014 (Mean monthly temperature 25.7 ˚C, Mean monthly relative humidity: 80% and Mean monthly rainfall: 88.1mm). Considering both hospitals, lowest number of myiasis cases (n<10) was recorded during the periods of January-February and October-December when the temperature fluctuates around 24 ˚C (Figure 1). The highest number of myiasis cases was recorded during March to September when the temperature was above 25 ˚C (except in June). During the period of March to October, when myiasis cases were high, relative humidity was 79-80%. There appear to be no clear relationship between myiasis case reports and rainfall during the study period.

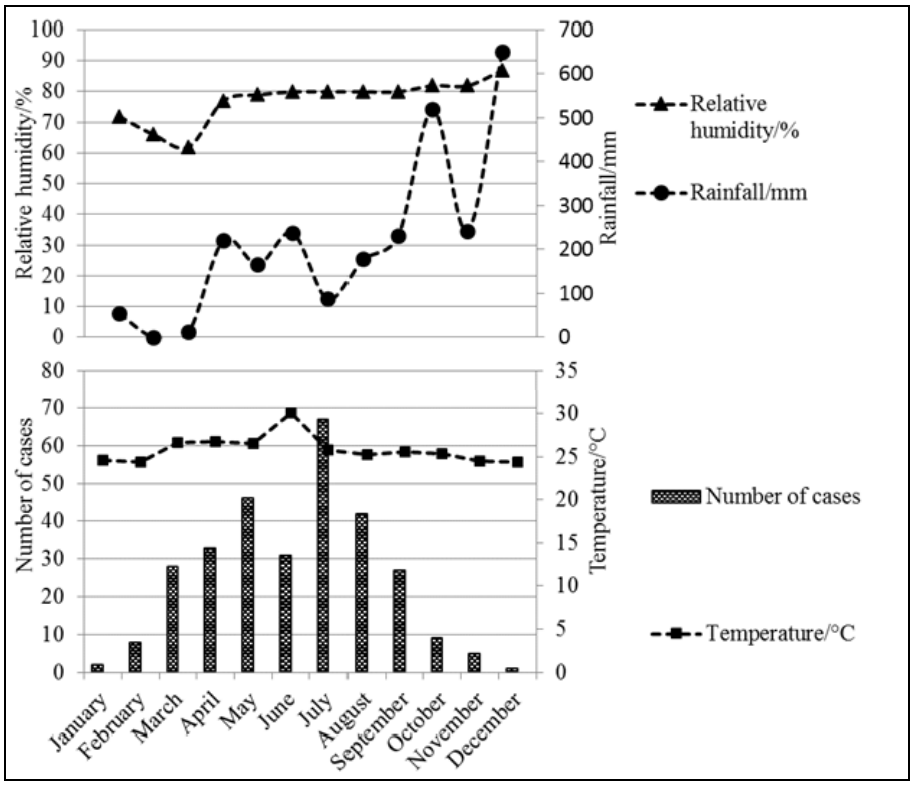

Fig 1: Comparison of the relationship between mean monthly relative humidity, rainfall (mm), and temperature (˚C) and the occurrence of myiasis in domestic animals treated in two veterinary hospitals, Peradeniya.

In the prospective study, 51 and seven maggot samples were collected from the respective clinics. All myiasis infestations were due to the fly, *Chrysomya bezziana* of the family Calliphoridae (Order: Diptera) (Figure 2). The number of myiasis cases recorded for males (82.8%) is higher than females (17.2%). Higher number of cases includes cross-breed dogs with 37 cases (63.8%) and lowest number of cases reported in five dog breeds with 1.7% in Rottweiler, Doberman, Lion Shepherd, Terriers and Dalmatian (Table 1). Of the different age groups of dogs, higher number of myiasis cases including 39.6% (23 cases) reported within 0-4years age group and lowest number of cases including 5.2% (Three cases) reported from 12-16years age group (Table 2).

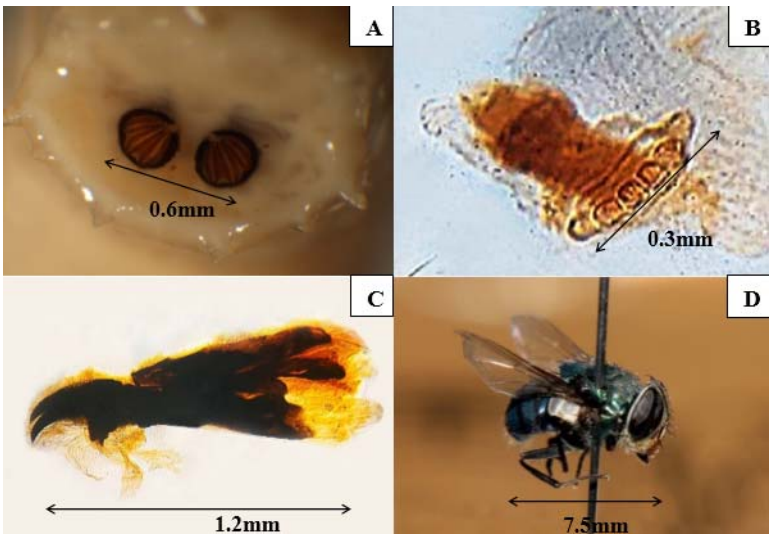

Fig 2: *Chrysomya bezziana*: A) Posterior spiracle, B) Anterior spiracle, C) Cephalopharyngeal skeleton of the maggot, and D) Adult.

Table 1: *Chrysomya bezziana* infestation in 58 dogs reported by their breeds.

Dog breed	Cross breed	German shepherd	Dalmatian	Pomeranian	Bullmastiff	Rottweiler	Doberman	Lion shepherd	Terrier
No. of dogs infested	37	10	1	7	2	1	1	1	1
(%)	63.8	17.2	1.7	12.0	3.4	1.7	1.7	1.7	1.7

Table 2: *Chrysomya bezziana* infestation in 58 dogs reported in this study by age and gender of the victim dogs.

Gender	Age groups (Years)			
	0-4	4-8	8-12	12-16
Male	16	14	10	3
Female	7	5	3	0
Total (%)	23 (39.6)	19 (32.8)	13 (22.4)	3 (5.2)

4. Discussion

According to the hospital records for the period of January to December 2014, a total of 299 myiasis cases were reported from both Veterinary Hospitals. A total of 119 and 180 myiasis cases were reported from the GVH and VTH respectively. When comparing these findings with a similar study done in Hong Kong over a one-year period has recorded 59 dog myiasis cases due to *Chrysomya bezziana* [10], this is considerably a higher incidence. Thus inference can be drawn from the fact that necessary steps should be taken to control this entity in Peradeniya area and it is pivotal to expand complementary studies in to other parts of Sri Lanka.

Interestingly, vast majority including 295 of the myiasis cases in retrospective data were dogs and only four cases reported from cats. Reasons for high prevalence of myiasis in dogs have not yet been studied.

In the present study, number of myiasis cases showed a significant positive relationship with average temperature and relative humidity. The highest number of myiasis cases was recorded during March to September when the temperature was above 25 ˚C (except in June) and relative humidity was 79-80%. Results of this study correspond well with the four climatic seasons experienced in Sri Lanka. Myiasis is well distributed during March-September during the first inter monsoon, Southwest monsoon and decline from December-February in the Northeast monsoon and second inter monsoon. Previous studies have also shown a positive correlation of myiasis with temperature, as peak infestations were in spring and summer, and myiasis cases drop down in the months of fall [13, 14]. However, there appear to be no clear relationship between myiasis case reports and rainfall to the two hospitals during the study period (Figure 1). On the contrary, a similar study recorded a decline in number of cases with respect to increasing rainfall [12]. These disagreements reported could be due to the effect of climatic variations in different geographic locations and different geographic races of this species [15-17].

In the prospective study, a total of 51 (GVH) and seven (VTH) maggot samples were collected from the respective clinics. It is worth reporting that, all the reported cases of myiasis were due to a single fly species, *Chrysomya bezziana* (Diptera: Calliphoridae), which is an obligatory parasitic species in both humans and animals. In Asian region it has been confirmed that myiasis infestations are mainly due to *Chrysomya bezziana*: 84%-95% cattle myiasis in Malaysia, 95% in Papua New Guinea, 99% cattle myiasis in India and 93% myiasis in goats and sheep in Oman [18]. There are few known reported cases on myiasis in Sri Lanka. A human myiasis case was recorded during an

Epidemiological study in Kalutara and Colombo districts and 16 patients having cutaneous myiasis caused by *Chrysomya*

bezziana in 14 (87.5%) and *C. megacephala* in two (12.5%) patients. This was the first record of cutaneous myiasis in Sri Lanka [19], another human myiasis case caused by a blow-fly infection *Cordylobia anthropophaga* (Diptera: Calliphoridae), the "Tumbu fly" which was reported for the first time in Sri Lanka, in a 10-month old infant [20] and an ophthalmomyiasis caused by sheep botfly *Oestrus ovis* [21]. This is the first report on animal myiasis in Sri Lanka. Myiasis, in addition, is a clinical and surgical complication in livestock, wild and zoo animals and a detailed study is needed.

The reason for more number of male dogs to be reported with Myiasis may be due to frequent wounds caused by male aggression compared to females, which attract adult flies for oviposition [17].

In the present study, the highest number of cases were from cross-breed dogs (37:63.79%) and lowest was from Rottweiler, Doberman, Lion Shepherd and Dalmatian. These results correspond well with the findings of [6] which states that infestation in Mongrels are higher than in other breeds encountered (Rottweiler, Alsatian, Caucasion, Boxers and Germ/Als). According to [6], this is because of the low value placed on other dog breeds as they are with foreign origin, expensive and well cared which result neglect in care and nutrition in local breeds and myiasis infestations are very common. In Sri Lanka, most of the dog owners own dogs with mixed breeds or cross-breeds, as pure breed dogs are relatively expensive to own and manage. Our findings are in disagreement with that of [22] who observed highest and lowest number of cases respectively in breeds Doberman and Alsatian respectively; at the rates of 21.4% and 7.1%. It appears that the affected breed of the dog vary with the available breed in that particular locality.

A higher number of myiasis cases (22: 37.9%) were between 0-4years and it was rare in older dogs. This is in agreement with [23], and is because young dogs have soft skin making it more suitable for larval development.

Some of the cases reported (n=50) were due to wounds on the victim while others were on healthy animals (n=8). Hilker and Meiners (2008) suggests that female flies of *Chrysomya bezziana* attracted to the stimuli influenced by chemical substances emitted from decomposing liver and the "swormlure" of bacterially inoculated blood. Their attraction and oviposition is due to natural wounds in hosts and especially when the wounds are infested with bacteria. It has been suggested that the microorganisms that inhabit in healthy animals can also produce volatile substances which attract female flies for larvipositioning *Wohlfahrtia magnifica* (Sarcophagidae) [24].

The commonest area affected in the body of the victim was perennial area immediately below the anus. This may possibly be due to poor sanitation leading to accumulated faeces or urine on their fur attracting flies.

Data generated herein will be useful to identify the period during which myiasis can occur in dogs and cats which could aid veterinarians to educate the clients on early detection and treatment of wounds. This also opens up a conscious pathway in Sri Lanka in the field of future research in forensic entomology.

5. Conclusions

A high number of myiasis cases were recorded during March to September and the lowest were during October-December and January-February. Highest numbers of myiasis cases were due to favourable temperature (around 25 °C) and relative humidity (79-80%). The only species of flies involved was *Chrysomya bezziana*. There appear to be no clear relationship between myiasis case reports and rainfall. Myiasis is more often reported in male, cross-breed younger dogs. Immediate and proper medical attention to wounds is important to prevent myiasis.

6. References

1. Zumpt F. Myiasis in Man and Animals in the Old World, Butterworths, London. 1965; 15:1-267.
2. James MT. The Flies that Cause Myiasis in Man. Washington: United State government printing office, 1947.
3. Mullen GR, Durden LA. Medical and Veterinary entomology.2nd ed. Academic press; San Diego, 2001.
4. Hall M, Wall R. Myiasis of humans and domestic animals. Advanced Parasitology. 1995; 35:258-334.
5. Anderson GS, Huitson NR. Myiasis in pet animals in British Columbia: The potential of forensic entomology for determining duration of possible neglect. Canadian Veterinary Journal. 2004; 45(12):993-998.
6. Chukwu C, Ogo N, Jimoh A, Chukwu D. Pathogenic bacteria associated with cutaneous canine myiasis due to *Cordylobia anthropophaga*. Veterinary World. 2012; 5(10):617.
7. Schnurr HJ, Zivotofsky D, Wilamowski A. Myiasis in domestic animals in Israel. Veterinary Parasitology. 2009; 161(3-4):352-5.
8. Nielsen SC. *Chrysomya bezziana* in pet dogs in Hong Kong: A potential threat to Australia. Australian Veterinary Journal. 2003; 81(4):200-205.
9. James FMK, Poma R. Neurological manifestations of feline cuterebriasis. The Canadian Veterinary Journal. 2010; 51(2):213-5.
10. Rubira R. Retrospective study of old world screw-worm fly (*Chrysomya bezziana*) myiasis in 59 dogs in Hong Kong over a one-year period. Australian Veterinary Journal. 2004; 82(8):478.
11. Mcnae JC, Lewis SJ. Retrospective study of Old World screwworm fly (*Chrysomya bezziana*) myiasis in 59 dogs in Hong Kong over a one year period. Australian Veterinary Journal. 2004; 82(4):211-4.
12. Alahamed AM, Al Dawood AS, Kheir SM. Seasonal Activity of Flies Causing Myiasis in Livestock Animals Using Sticky Traps Baited with Swormlure-4 in Riyadh Region, Saudi Arabia. Science Journal in King Faisal University (Basic and applied sciences). 2009; 7(2):109-119.
13. Arslan MO, Kara M, Gicik Y. Epidemiology of *Oestrus ovis* infestations in sheep in Kars province of north-eastern Turkey. Tropical Animal Health and Product. 2009; 41(3):299-305.
14. Pathak KML. Incidence of *Oestrus ovis* in sheep and goats in Rajasthan state of India. Indian Journal of Animal Science. 1992; 62:50-53.
15. Wardhana AH, Hall MJR, Mahamdallie SS, Muharsini S, Cameron MM, Ready PD. Phylogenetics of the Old World screwworm fly and its significance for planning control and monitoring invasions in Asia. International Journal for Parasitology. 2012a; 42(8):729-38.
16. Wardhana AH, Muharshini S, Ready PD, Cameron MM, Hall MJR. Geographical characteristics of *Chrysomya bezziana* based on external morphology study. Indonesian Journal of Animal and Veterinary Sciences. 2012b; 17(1):36-48.
17. Hall MJR, Edge W, Testa J, Adams ZJO, Ready PD. Old

World screwworm fly, *Chrysomya bezziana* occurs as two geographical races. Medical and Veterinary Entomology. 2001; 15:1-11.
18. Spradbery JP. A Manual for the Diagnosis of Screwworm Fly. CSIRO Division of Entomology. Canberra. Australia, 1991.
19. Kumarasinghe SP, Karunaweera ND, Ihalamulla RL. A study of cutaneous myiasis in Sri Lanka. International Journal of Dermatology. 2001; 39(9):689-694.
20. Edirisinghe JS, Rajapakshe C. Myiasis due to *Cordylobia anthropophaga*, the Tumbu fly in Sri Lankan infant. Ceylon Medical Journal. 1991; 10; 36(5):112-5.
21. Samarasinghe S, Weerakoon U. External Ophthalmomyiasis caused by sheep botfly (*Oestrus ovis*) larvae. Ceylon medical Journal. 2007; 52:31-32.
22. Ojemudia TI, Olabode AO, Okeke OI, Chukwu COO, Duru BN, Adeyanju ON *et al.* Emergence of Zoonotic Myiasis in Vom and Bukuru Metropolis, Jos South LGA, Plateau State, Nigeria. Global Journal of Health Science. 2011; 3(1):104-109.
23. Guimarães JH, Papavero N. Myiasis caused by obligatory parasites. In: Guimarães JH. And Papavero N. Myiasis in man and animals in the neotropical region - bibliographic data base. São Paulo. Plêiade 1998, 257.
24. Tóth E, Farkas R, Marialigeti K, Mokhtar IS. Bacteriological investigations on wound myiasis of sheep caused by *Wohlfahrtia magnifica* (Diptera: Sarcophagidae). Acta Veterinaria Hungarica. 1998; 46(2):219-29.