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Short Communication

First report of canine cutaneous myiasis caused by *Chrysomya bezziana* Villeneuve (Diptera: Calliphoridae) in Thailand

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Abstract. Although myiasis caused by the blow fly, *Chrysomya bezziana* Villeneuve (Diptera: Calliphoridae), has been reported in Thailand, all of the cases were human. This study described three cutaneous myiasis cases caused by *C. bezziana* in dogs in Chiang Mai province, northern Thailand. The removal of fly larvae together with specific treatment to cure all cases in this study was represented.

INTRODUCTION

Myiasis refers to an infestation of dipterous larvae that feed on tissue or body fluids of humans or other vertebrates (Zumpt, 1965). Of the flies that cause myiasis worldwide, the Old World Screwworm fly, *Chrysomya bezziana* (Diptera: Calliphoridae) is one of the main species. In Thailand, documented cases of myiasis are few; the first being a human myiasis incidence due to *C. bezziana* infesting the ear of a 44-year-old male (Papasarathorn & Piyarasana, 1962). The second case was found in the head of 3-months-old male (Papasarathorn *et al*., 1967), and later cases were reported sporadically (Koranantakul *et al*., 1991; Nacapunchai & Laohavichit, 1999; Sukontason *et al*., 2006; Ausayakhun *et al*., 2018). From a veterinary perspective, the best of the authors' knowledge and published data in the literature, this study reports the first case of cutaneous myiasis in domestic dogs in Thailand.

MATERIALS AND METHODS

Case history and clinical examination

Case 1

A male Labrador Retriever dog aged 14-years-old and weighing 33.5 kg was referred on April 10th, 2018 at the Small Animal Teaching Hospital, Faculty of Veterinary Medicine, Chiang Mai University, Thailand. It was having a good appetite for food and water and its excrement was also normal. The dog had a body temperature of 39.6 °C. Normal heart sound (116 beats per minute), mildly increased lung sound and normal mucous membrane in gum were observed. It was found hard to walk, but no abdominal cramp. For other clinical indications were normal. Examination of a 4 cm-deep wound in dorsal sacrococcygeal area found slight bleeding and no pus, and revealed ~100 fly larvae (Fig. 1). All fly larvae were removed with forceps and sent alive in a plastic container to the Department of Parasitology,

Figure 1. Clinical view of cutaneous myiasis wound in dorsal sacrococcygeal area of the adult dog (case 1) infested with ~100 fly larvae.

Faculty of Medicine, Chiang Mai University for species identification. After removing the larvae, the dog was treated with 7.0 mg of amoxicillin, 1.75 mg of clavulanic acid (Synulox® RTU) and 1.675 ml of dipyrone (NOVACILAN®) for skin and soft tissue infection, subcutaneously (dose 1 ml per 20 kg body weight) and intramuscularly (dose 25 mg/kg) injected as an analgesic and antipyric, respectively. In the treatment plan, the owner took the dog to remove the larvae, clean the wound and inject medicinal drugs every day for wound healing within 4 weeks.

Case 2

A male Siberian Husky dog aged 1-year- and 4-months-old and weighing 2 kg was referred with the chief complaint of swollen genitalia on September 21th, 2017 at the Small Animal Teaching Hospital, Faculty of Veterinary Medicine, Chiang Mai University, Thailand. The dog had a body temperature of 37.2 °C. Physical examination presented pathologic phimosis due to preputial urethral stricture. A surgical procedure was performed on the pathological phimosis and opening for urine that cause of swollen prepuce area and urine leak at the pre-scrotal area. An X-ray was taken on the following day to check for preputial urethral opening and urinary tract using positive contrast media. NEODEX® was applied around the penis and prepuce for anti-inflammatory. The owner brought the dog back home after wound healing from surgery for 2 weeks. Four months later, the dog was returned and presented with bleeding and inflammation of the penis by self-mutilation. Other symptoms were mild depression, <5% dehydration, aggressiveness, unclean inguinal area and torn penis with necrosis. A trail of pus with small bleeding was observed in the glans penis with >20 fly larvae. The right side of the bulbus glandis had an opening pore of ~1 cm diameter with >40 fly larvae present. Treatment was performed by cleaning the penis and inguinal area while under sedation from 8 ml of propofol, 1.5 ml of intravascularly injected zoletil® and 0.6 ml of subcutaneously injected morphine. The dog was treated with 0.1 ml of clavulanic acid (Synulox® RTU) by subcutaneous injection. All fly larvae were removed with forceps while the dog was under general anesthesia and then 0.6 ml of ivermectin (dose 300 µg/kg) was subcutaneously injected for parasiticides. As for the larvae, they were sent alive in a plastic container to the Department of Parasitology, Faculty of Medicine, Chiang Mai University for species identification.

Case 3

A male Shih Tzu dog aged 11-years- and 4 months and weighing 8 kg was referred with the primary complaint of a right swollen eye on November 28th, 2016 at the Small Animal Teaching Hospital, Faculty of Veterinary Medicine, Chiang Mai University, Thailand. In history taking, the dog was lived outdoor and took care by keeper in longan garden for 6 months. Client found the problem of

dog's eye after visiting hometown. Clinical examination of the right wounded eye revealed the presence of ~120 fly larvae in the right eyeball. Treatment was performed under general anesthesia, induced using 1.6 ml of intravascularly injected propofol at 10 mg/kg and 0.48 ml of 50 mg tramadol hydrochloride (Millimed) intravascularly injected at 3 mg/kg. All fly larvae were removed using forceps. The dog was injected subcutaneously using 0.4 ml of clavulanic acid (Synulox® RTU) for ocular infection treatment and then sent alive fly larvae in a plastic container to the Department of Parasitology, Faculty of Medicine, Chiang Mai University for species identification.

Fly identification

After the larvae reaching to the Department of Parasitology, Faculty of Medicine, Chiang Mai University, few larvae were examined under a light microscope (Olympus, Japan) based on the morphological characters for species identification of *C. bezziana* (Sukontason *et al.*, 2006); while the others were reared to adults for species confirmation. The larval specimen preparation was performed in the same procedure as previously described (Sukontason *et al.*, 2006). As for the remaining larvae, they were reared with fresh pork under ambient temperature in the laboratory until developed into adults. After the emergence, adults were identified under a dissecting microscope (Olympus, Japan) using a standard key for blow flies in Thailand (Kurahashi and Bunchu 2011). Both larvae and adults were identified by Prof. Dr. Kabkaew Sukontason.

RESULTS AND DISCUSSIONS

The general morphology of the obtained larvae is illustrated in Figure 2, showing white and fusiform in shape with a stout body. Morphological examination under a light microscope revealed that all the larvae were third instar as they having three slits in each spiracle (Fig. 3). The characteristics of the third instar are its anterior spiracle with 4-6 papillae; cuticular spines in bands between the pro- and mesothorax, each having a single darkened, tapered point (Fig. 3A); and a posterior spiracle with three slits encircled by an incomplete peritreme (Fig. 3B). All these characteristics were the

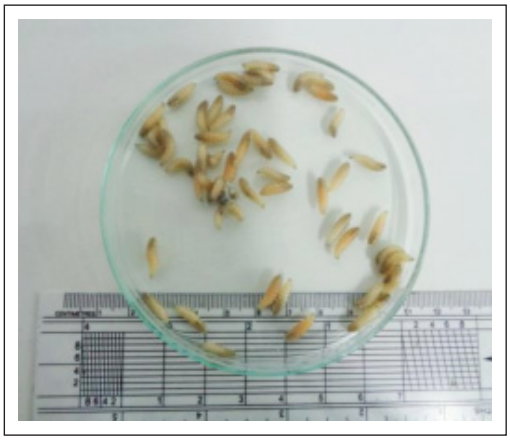

Figure 2. Third instar larvae of *C. bezziana* collected from the myiasis wound of the dog reported in Case 1.

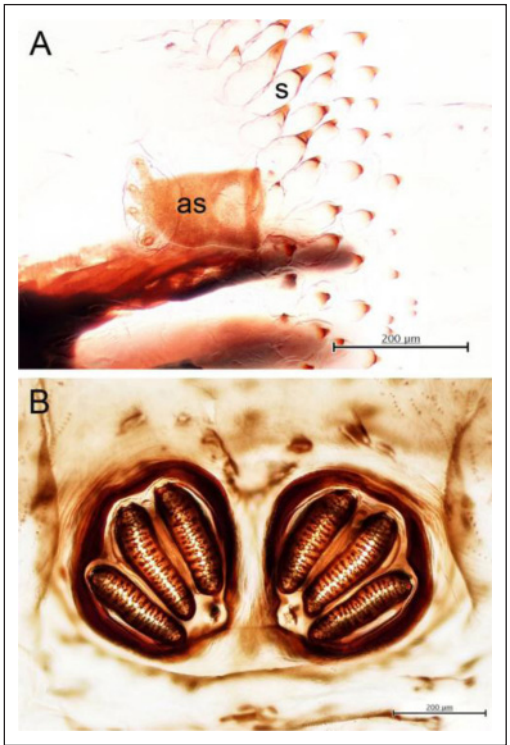

Figure 3. Characteristics of the third instar larvae of *C. bezziana*. A: Anterior part showing the anterior spiracle (as) with four papillae and cuticular spine bands (s) between the pro- and mesothorax. B: Posterior spiracles each with three slits.

unique of *C. bezziana*, thus they were identified as *C. bezziana* (Fig. 3). Regarding the adult flies, they were also identified as *C. bezziana* (Fig. 4). The unique characteristics of adult *C. bezziana* are metallic green color body (Fig. 4A); an orange-yellow gena and postgenal area covered with pale yellow hairs (Fig. 4B), except for immediately around the vibrissa and a white to yellowish-white lower calypter (Fig. 4C). The specimens, both adults and larvae were preserved and deposited at the Department of Parasitology, Faculty of Medicine, Chiang Mai University, Thailand.

Chrysomya bezziana is an important myiasis-producing fly species worldwide. It is a major ectoparasite of animal species in the Old World Tropics, including humans, of which dogs are a common host. Cases of cutaneous myiasis caused by *C. bezziana* in dogs have been documented in Asia on several occasions, for example, in Hong Kong (Chemonges-Nielsen, 2003), Sri Lanka (Bandara *et al.*, 2016), Malaysia (Han *et al.*, 2017) and Indonesia (Wardhana *et al.*, 2018). This report describes three cases of cutaneous myiasis caused by *C. bezziana* in domestic dogs in Thailand.

Several fly species have been reported to cause myiasis in dogs. *C. bezziana* is not the only blow fly species reported to cause myiasis. The following species also have been recognized as causative agents: *Chrysomya albiceps* (Wiedemann) in Iran (Moshaverinia & Mehrjerdi, 2016); *Cochliomyia hominivorax* (Coquerel) in Brazil (Correia *et al.*, 2010); *Lucilia sericata* (Meigen) in Iran (Moshaverinia & Mehrjerdi, 2016), Korea (Choe *et al.*, 2016) and Turkey (Sevgili *et al.*, 2009); *Lucilia eximia* (Wiedemann) in Mexico (Muñoz-García *et al.*, 2016); and *Lucilia* spp. in Turkey (Aldemir *et al.*, 2012). Not only blow flies have been reported as myiasis causative agents, but also other taxa, such as flesh flies (Diptera: Sarcophagidae), e.g., *Wohlfahrtia magnifica* (Schiner) in Morocco (Farkas *et al.*, 2009), Iran (Moshaverinia & Mehrjerdi, 2016), Italy (Gaglio *et al.*, 2011; Giangaspero *et al.*, 2011; Raele *et al.*, 2017), and Greece (Orfanou *et al.*, 2011). Additional fly taxa that can cause canine myiasis include the Lund's fly, *Cordylobia rodhaini* Gedoelst (Diptera: Calliphoridae) and human bot fly, *Dermatobia hominis* (Linnaeus) (Diptera: Cuterebridae) in Ghana (Johnson *et al.*, 2016); African tumbu fly, *Cordylobia anthropophaga* Blanchard (Diptera: Calliphoridae) in Nigeria (Ogo *et*

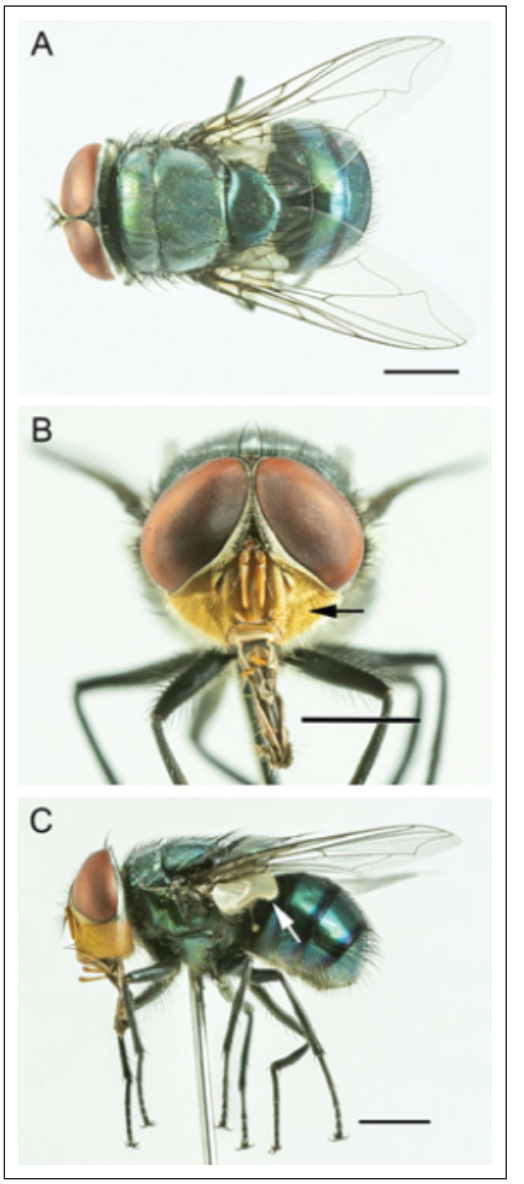

Figure 4. Adult male of *C. bezziana*. A: Dorsal view. B: Frontal view showing an orange-yellow gena and postgenal area covered in pale yellow hairs (black arrow). C: Lateral view showing a white to yellowish-white lower calypter (white arrow). All scale bars = 2 mm.

al., 2009; Chukwu *et al*., 2012); Robust bot fly, *Cuterebra* (Diptera: Oestridae) in the USA (Edelmann *et al*., 2014; Rutland *et al*., 2017); and Sheep bot fly, *Oestrus ovis* (L.) (Diptera: Oestridae) in Spain (Lucientes *et al*., 1997) and the UK (McGarry *et al*., 2012).

Treatment of cutaneous myiasis caused by *C. bezziana* varies from case to case, but all procedures include the removal of fly larvae. The three cases herein represented the satisfactory treatment and cure of myiasis by removal of fly larvae together with specific chemical treatment. For canine myiasis case, it was suggested to remove all larvae under anesthesia for pain management, extirpating necrotic tissues, intensive washing with sterile normal saline solution and antiseptic solution, aseptic wound dressing and systemic antibiotic administration for secondary bacterial infection (Demir *et al*., 2016). Ivermectin may be useful as a larvicidal drug. Larvae were immobilized and facilitate in removal from the wound. Any fragment of larvae should be removed, since this may cause an allergenic effect. Such therapy stimulates wound healing process.

In general, canine myiasis is more likely to occur in dogs that are neglected or those with insufficient care. The three case studies in this report revealed that myiasis can be presented in domestically owned dogs. Lack of awareness, the presence of fly larvae unknown to the owner, or the inability to clean wounds properly make dogs more susceptible to myiasis, especially those kept outside, who are weak or debilitated and/or have wounds or lesions. Three canine myiasis cases in this report were presented on April, September and November, bearing high humidity and temperature in Thailand. This was accordance with the study of myiasis in Sri Lanka, which was well disseminated in similar times for maggot growth (Bandara *et al*., 2016).

In conclusion, this study presents three cases of canine myiasis in Thailand, all of which were caused by *C. bezziana*, as confirmed by morphological identifications of third instar larvae and adults. These cases confirmed that this fly species is not only a myiasis-producing agent in humans, but also in dogs in Thailand. Myiasis cases in domestic pets should create awareness, since *C. bezziana* may pose potential risk of spreading myiasis in the neighborhood of human-risk areas. The epidemiological and therapeutic assessments of canine myiasis need to be addressed in future studies.

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