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The First Record of Gynandromorphism in Lucilia calviceps Bezzi (Diptera: Calliphoridae) from Lanjak Entimau Wildlife Sanctuary, Sarawak, Malaysia

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ABSTRACT

A field-collected gynandromorph of Lucilia calviceps Bezzi was reported in Sarawak, Malaysia. This is the first case of gynandromorphism in the family Calliphoridae worldwide. The fly specimen was collected from Nanga Ju station, Lanjak Entimau Wildlife Sanctuary (LEWS) in 2014. The fly possessed a polar (anterior-posterior) gynandromorph form-female character on the head and male terminalia at the postabdomen. A new distribution data of this species was added to the Sarawak collection.

Keywords: gynandromorph, Lucilia calviceps, Calliphoridae, Sarawak, Malaysia

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A field-collected gynandromorph of *Lucilia calviceps* Bezzi was reported in Sarawak, Malaysia. This is the first case of gynandromorphism in the family Calliphoridae worldwide. The fly specimen was collected from Nanga Ju station, Lanjak Entimau Wildlife Sanctuary (LEWS) in 2014. The fly possessed a polar (anterior-posterior) gynandromorph form-female character on the head and male terminalia at the postabdomen. A new distribution data of this species was added to the Sarawak collection.

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INTRODUCTION

Gynandromorph is a rare phenomenon in nature. It is defined as a sexual mosaic, in which an insect exhibits both male and female characters in one individual (Gordh and Headrick, 2011). In practice, these characters can be easily visible from the exterior characters exhibited on the specimen. However, if these characteristics are expressed in the internal organs, it may be hard to notice. Insect gynandromorph do occasionally happen in Orthoptera (Barranco *et al*., 1995; Iorgu and Heller, 2013) and more frequently in Lepidoptera (Passerin d'Entrèves and Roggero, 2013; Jahner *et al*., 2015). However, it has a very rare occurrence in the Order Diptera.

In Diptera, the most commonly reported occurrence of gynandromorph is found in the family Culicidae (mosquitoes). There are 37 species of Culicidae with such characteristics recorded from either natural or laboratory populations (Narita, 2010). Nevertheless, only a few cases of gynandromorph were reported among calyptrate flies. The calyptrate families that have been reported are limited to Muscidae (Iwasa and Shinonaga, 1982; O'hara, 1983; Cilek and Knapp, 1994; Nihei and Carvalho, 2002), Anthomyiidae (Vosselman, 1978; Blackith and Blackith, 1991), Tachinidae (O'hara, 1983) and Sarcophagidae (Thomas, 1950; Kurahashi, 1977). To date, gynandromorph from the family

Calliphoridae have yet to be discovered although in 1950, *Sarcophaga* (family Sarcophagidae) was placed under the family Calliphoridae (Thomas, 1950).

Generally, gynandromorphism can be categorised into three forms: (1) the bilateral form, (2) the polar form and (3) the irregular form (Iwasa and Shinonaga, 1982). The bilateral form exhibits male features on one side of the longitudinal midline and female features on the other side. While the polar form exhibits an anterior-posterior axis transversely, where one sex characters appear on the head (anterior) and the abdomen (posterior) of the other. In the irregular form of gynandromorph, only a portion of the body exhibits the opposite sex features, with an uneven distribution of both characters appearing on the body and no clear separation line defined.

Lanjak Entimau Wildlife Sanctuary (LEWS) is a protected area in Sarawak for flora and fauna biodiversity conservation. It covers an area of 1,870 km^2, which includes several national parks, such as Batang Ai National Park and Ulu Sebuyau National Park. In the course of the study on "Taxonomy and ecology of two-winged Diptera flies in Sarawak", a field survey on the carrion fly fauna in Nanga Ju Station of Lanjak Entimau Wildlife Sanctuary (LEWS) was conducted in 2014.

Green bottle blow flies, which belongs to genus *Lucilia* is a member of the subfamily Lucilinae under the family of Calliphoridae. *Lucilia calviceps* Bezzi, 1927 is one of the four *Lucilia* species recorded from Sarawak, other than *Lucilia cuprina* (Wiedemann, 1830), *L. papuensis* (Macquart, 1842) and *L. porphyrina* (Walker, 1856) (Kurahashi and Leh, 2007). From the Southeast Asia regions, *L. calviceps* is only recorded from Malaysia (Pahang, Sabah, Sarawak) and the Philippines (Kurahashi *et al*., 1997; Kurahashi and Magpayo, 2000).

In the present paper, a gynandromorph of *L. calviceps* was collected from Lanjak Entimau Wildlife Sanctuary (LEWS) and described for the first time. It is the first record for gynandromorphism reported from the family of Calliphoridae worldwide.

MATERIALS AND METHODS

In collaboration with the Sarawak Museum Department and the Sarawak Forestry Corporation, a field survey was conducted in the Nanga Ju Station of Lanjak Entimau Wildlife Sanctuary from 6th to 17th March 2014. The fly collections were carried out around the Nanga Ju Station due to the low water level condition of the Mujok River during that time. The collection sites covered the primary rainforests and secondary forests beside the mainstream of Ju River, sub-streams of Tuga Ungik, Nyatuk, Lepong Bidai, Jum Mit, Serumau, Lingah, Balabau and Sega Rivers (Figure 1). The collection data such as locality, date, habitat and elevation were recorded.

Dipteran flies of the families Calliphoridae, Sarcophagidae and Muscidae were baited and collected using a sweeping net. The specimens were then killed, pinned at the field station and brought back to the laboratory for species identification. The legs, wings, mouthparts and antennae of the specimens were arranged in the desired position when mounted for the ease of identification. In the