Short Communication

Feeding behavior of *Mimomyia (Etorleptiomyia) luzonensis* (Ludlow, 1905) (Diptera, Culicidae) in Peninsular Malaysia

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**ARTICLE INFO**

**Keywords:**  
*Mimomyia (Etorleptiomyia) luzonensis*  
Mosquito  
*Ingerophrynus parvus*  
Peninsular Malaysia  
Toad  
Arbovirus  
Amphibian  
Nocturnal

**ABSTRACT**

Mosquitoes are vectors of various human diseases in the tropics including yellow fever, dengue, malaria and West Nile virus. Mosquitoes can act as vectors between wildlife and humans, which is particularly important for diseases where wild animals serve as reservoirs of parasites in the absence of human infections. Research has mainly focused on the medical impacts of *Anopheles, Aedes, Mansonia* and *Culex*, however, very little attention has been directed towards other mosquito genera, especially those which act as vectors of diseases of wildlife. We have observed adults of *Mimomyia (Etorleptiomyia) luzonensis* (Ludlow, 1905) feeding on a toad, *Ingerophrynus parvus*, near an oil palm plantation settlement in Setia Alam, Selangor state, Peninsular Malaysia. *Mimomyia* is known to feed on reptiles and amphibians, and is a documented vector of several arboviruses, including West Nile virus. The observation of *Mimomyia* feeding on a common toad near a human settlement highlights a need to understand the relationships between mosquitoes, toads and humans from an ecological perspective. We report on-site observations of the feeding habit of *Mimomyia*; the first records from Malaysia.

1. Introduction

Peninsular Malaysia has a rich and varied mosquito fauna, but studies of the role of mosquitoes in disease transmission have mainly concentrated on those that transmit malaria, dengue, filariasis and chikungunya (Mohd-Zaki et al., 2014). For example, several species have been documented as competent vectors for important zoonotic diseases such as *Anopheles cracens for Knowlesi* malaria (Vythilingam et al., 2008) and *Aedes aegypti for* chikungunya (Sam and Abu Bakar, 2006). Species such as *Aedes albopictus* and *Culex gelidus* are part of an arbovirus transmission cycle, which may include secondary hosts. The endemic transmission cycle involves the mosquito and a bird or small mammal host whereas the epidemic transmission cycle involves humans and larger mammals (Pfeffer and Dobler, 2010). The migration behavior of host birds and adaptability of colonizing mosquitoes encourages the spread of diseases to pandemic level (Pfeffer and Dobler, 2010). The high mean temperature in tropical countries leads to short extrinsic incubation period for flavivirus in mosquito hosts which results in higher infection rate in humans as compared to temperate regions (Parham et al., 2015).

Studies of the vectors of common mosquito-borne diseases such as malaria and dengue have produced a detailed understanding of disease transmission, but in contrast, little is known regarding mosquitoes of less obvious medical importance. For example, certain virus epidemics, such as chikungunya which emerged from an unlikely pairing involving an African virus and an Asian mosquito (Charrel et al., 2007), can leave the medical community unprepared.

The genus *Mimomyia*, comprising five species, one with two recognized subspecies, are poorly studied and the biting habits are virtually unknown in Peninsular Malaysia. The only reference to *Mimomyia* feeding habits in Peninsular Malaysia (specifically *Mimomyia (Etorleptiomyia) luzonensis*), that we are aware of is Macdonald (1957) who stated that ‘blood-fed adults were collected from human-bait trap’ (sic). *Mimomyia* has a preference for feeding on amphibians (Van Beurden, 1980) but at least two species, *M. medioliata* (Theo) and *M. splendens* (Theo), have been shown to occasionally feed on humans, and *M. hispida* (Theo) feeds on other mammals (Boreham et al., 1975). West Nile virus has been isolated from samples...
of Mimomyia spp. from Africa (Hubálek and Halouzka, 1999).

Since almost nothing is known of the feeding habits of Mimomyia in Peninsular Malaysia, this observation is presented here.

2. Study area

The collection was made in an area adjacent to a narrow winding stream in Setia Alam, Petaling district, Selangor state in Peninsular Malaysia (3°5′56.99″N, 101°26′20.37″E). The bank of the stream was covered by intermittent small vegetation and shrubs. The surrounding area had oil palm trees (Elaeis guineensis) and extensive patches of grass. A small settlement of plantation labourers was situated 200 m from the collection site. At 10.00 p.m. it was observed that mosquitoes from the genus Mimomyia and Uranotaenia were feeding on toads that were congregated by the bank of a stream. Feeding was observed on the dorsal aspect of the toad head (Fig. 1A).

3. Results and discussion

The mosquito genus Mimomyia contains generally small mosquito species readily distinguished from other genera, except Ficalbia (represented by one species, F. minima, in Peninsular Malaysia), having a minute maxillary palpus. Worldwide, these genera includes three subgenera: Etorleptomyia (7 species), Ingramia (21 species) and Mimomyia (17 species). Mimomyia occurs in the Australasian, Oriental and Afrotropical regions and two species are found in the Ryukyu Archipelago (Harbach, 2011).

The mosquitoes were identified as Mimomyia (Etorleptomyia) luzonensis (Ludlow, 1905), using the keys in Mattingly (1957). The important characters were: Wings with numerous scattered pales scales; alula with broad scales and squama with narrow ones; anterior fork cell at least about four times as long as its stem; postspiracular area scaly. Dorsal surface of abdomen largely pale except for a conspicuous broad median dark stripe; acrostichal bristles present; proboscis very narrowly dark at tip; second hind tarsus with two well separated dark spots.

The first account of a Mimomyia species feeding on frog was that of Menon and Tampi (1939) in India. They found blooded M. chamberlai (identified by them as Ficalbia (Mimomyia) chamberlai) resting on leaves of Pistia in a tank inhabited by frogs, Rana tigrina (Menon and Tampi, 1939). Examination of blood smears from the mosquitoes matched blood-cells of amphibians. Subsequently, they observed M. chamberlai feeding on R. tigrina. Van Beurden in 1980 observed adults of Mimomyia elegans (Taylor) feeding on the introduced toad, Bufo marinus, in Australia (Van Beurden, 1980).

The toad, Ingerophrynus parvus was identified using figure and description in Berry (1975) where the species was then included in the genus Bufo. The toad is widespread in Peninsular Malaysia and has been collected on forest floor, along jungle footpath, under twigs and dead leaves and near streams in forests (Berry, 1975).

In Peninsular Malaysia, amphibians have been seen with filarial worms: Icosiella innominata was identified in Bufo asper and Waltonella malayensis in Rana species and Amalops larutenis (Yen, 1983). The vectors of both filarial species are unknown. The most common zoonosis pathogen from amphibians is bacteria such as Salmonella (Mermin et al., 2004).

4. Conclusion

Mimomyia (Etorleptomyia) luzonensis was observed within the vicinity of Ingerophrynus parvus nearby a human settlement. The mosquito feeds on the host at night, avoiding predation from its host by feeding on the dorsal surface. Considering that certain Mimomyia species can carry West Nile virus, coupled with their occasional feeding on humans, opens the possible transmission of parasites to humans or livestock. Their observed habitat in disturbed areas nearby human settlement raises the possibility of being medically important upon being in contact with a suitable pathogen, especially with increasing human-assisted movement of animals and change of climate. Further study on their competency as vectors will add to greater understanding of zoonotic transmission of diseases.

Competing interests

The authors have declared that no competing interests exist.

Acknowledgements

This work was supported by grants from the University Malaya Postgraduate Research Fund (PV052/2012A), University of Malaysia FRGS 2010 (FP036/2010A), University of Malaya FRGS 2010 (FP022/2010B); University of Malaya PJP 2008 (FS344/2008C). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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