Three years: Bionomics of *Anopheles minimus* s.l. malaria vector along the Thai-Myanmar border in Mae Hong Son Province, Thailand

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Over 60 years of malaria control history in Thailand, we have a great successes on malaria reduction especially during the last 15-20 years.
Thai malaria cases = 9,196, 7.6% reduced compare by the same period
Non-Thai malaria cases = 4,577, 46.1% reduced
Hard Core Malaria Areas
Three main groups of malaria vectors

1. Funestus Group
2. Leucosphyrus group
3. Maculatus group
Two minimus complex were found in Thailand

→ Anopheles minimus Theobald
   (former species A)
→ Anopheles harrisoni Harbach & Manguin
   (former species C)

But mainly An. minimus A is prevalence in northern Thailand
Objectives

To investigate the biting patterns and host preference of *Anopheles minimus* s.l. in Mae Hong Son province.

Mae Hong Son has had high malaria incidence reported for several decades. *Anopheles minimus* has been proved as the most predominant malaria vector species. In addition land use has changes, leading to forest fragmentation which positively affected micro-habitat, mosquito ecological, species diversity and density. Moreover, Thailand has strong policy of Thailand Malaria free in 2024 but no new up to date information to understand vector bionomics.
Materials and Methods
Three malaria transmission districts: Sob Moei, Muang Mae Hong Son and Pang Ma Pha were selected.
**Materials & Methods**

Mosquito collection
→ Human Landing collection
→ Animal (cow) bait collection

One pair of collector will collect the landing mosquito for 50 minutes and rest 10 minutes each hour.
Materials & Methods (cont.)

Animal (cow) bait collection

One cow was tether in the mosquito net (4x4x5m) With one pair of collector collected mosquito every 15 minutes and rest 15 minutes each hour
Materials & Methods (cont.)

- Study was carried out from May 2011 - August 2014
- Meteorological data was obtain from Meteorology Chiang Mai Office
- Analysis of Variance for Data analysis was used in this study
RESULTS

14, 15 and 16 Anopheles species were encountered in Pang Ma Pha, Muang and Sob Moei districts respectively. *An. minimus* s.l. was the most abundant species found in all study sites. In Sob Moei district *An. minimus* s.l. collected during cool dry season (November – January) preferred to bite on animal than human (1.14 times) but opposite was recorded in rainy season as it preferred to bite human than animal (1.58 times). The interaction between baits and biting time indicated that *An.minimus* s.l. collected from human peaked during 21.00-24.00 hr. meanwhile it showed late biting in animal (24.00-06.00 hr.). In Muang district *An. minimus* s.l. indicated the same host preference as anthropophilic in both seasons. In addition they attacked more human than animal (0.61 times) and (3.76 times) in cool dry and rainy season respectively. The interaction between baits and biting time indicated that *An.minimus* s.l. collected from human and animal showed similar pattern during 24.00-03.00 hr. In Pang Ma Pha district; 1,647 female Anopheles mosquitoes were collected of which 1,242 were identified as members of 3 most abundance species, *Anopheles minimus* complex (39.77%), *Anopheles peditaeniatus* (31.48%) and *Anopheles sinensis* (28.71%). Blood feeding behavior of *An. minimus* was more pronounced during the second half of the night with significantly (P<0.001) more anthropophilic feeding behavior.
There are at least 16 species were encountered in the three study districts of Muang, Sob Moei and Pang Ma Pha Pha districts in Mae Hong Son province during 2011-2014
The number of *Anopheles minimus* collected monthly in (a) Sob Moei, (b) Muang and (c) Pang Ma Pha showed peak in raining season for human collection but seems to be more abundance in cool dry season on animal collection.

The highest number of *An. minimus* collected in rainy season by indoor HLC > OD, AB.

(a) *An.minimus* showed peak in raining season for human collection but seems to be more abundance in cool dry season on animal collection.

(b) *An.minimus* showed high number collected in rainy season by HLC > AB.
Anopheles minimus, The interaction between biting period (18.00-21.00, 21.00-24.00, 00-03.00, 03.00-06.00) and bait (HLC indoor/outdoor) and animal cow bait in Sob Moei (a), Muang district (b), and Pang Ma Pha (c)
Conclusions

• Among the three groups of malaria vector in Thailand, *Anopheles minimus* s.l. is predominant in three districts (Muang, Sob Moei, Pang Ma Pha) of Mae Hong Son province collected from 2011-2014.

• The host preference showed focal specific, it bite human more than animal in two districts of Muang and Pang Ma Pha but they like to attack more animal than human in Sob Moei district.
Conclusions (cont.)

- Biting Pattern of *Anopheles minimus* s.l. is area specific in Phang Ma Pha is similar pattern to Muang district it prefered to bit after midnight until early morning with peak during 02.00-05.00 hr. while in Sob Moei *An.minimus* showed whole night biting with peak at 22.00 hr and after midnight until morning.
Conclusions

• In the last 15 years, the malaria burden in Thailand has been gradually reduced; however, serious challenges remain.
• Efforts are being made to strengthen malaria control and elimination activities along the Thai border areas to prevent the spread of drug-resistant of *P. falciparum*.
• The difference of mosquito behavior might be related to human activities in each location as well as environmental conditions i.e, working outdoor at night or early morning activities etc.
• The bionomic of vector and its behavior could lead to a better planning and control for example more specific on vector control strategies i.e reduce man-vector –contact, promoting of net using or indoor residual spraying etc. in a particular areas
• In three study districts *An. minimus* complex is the most abundance malaria vector. The biting pattern and host preference indicated site specific. It was possible that the population of *An. minimus* in Sob Moei showed more complexity as a species than the other two districts. This needs molecular technique to confirm these complex. To prevent malaria transmission, self protection is recommended
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