Studies on congregating fireflies (Coleoptera; Lampyridae; Pteroptyx sp.) in Sabah, Malaysia

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Congregating Fireflies

- Congregating fireflies – Wetland/ mangrove, genus *Pteroptyx*.
- The first documentation: Engelbert Kaempfer (1680).
- So far only recorded in Southern Asia & western Pacific, from East India through Thailand, Malaysia & Indonesia to the Philippines & Papua New Guinea (Buck & Buck 1978).
Malaysian *Pteroptyx*

- Kuala Selangor - one of the most popular congregating firefly area.
- At least 8 species of *Pteroptyx* can be found in Malaysia (Ballantyne 2001).

<table>
<thead>
<tr>
<th><em>P. asymmetria</em> n. sp.</th>
<th><em>P. malaccae</em> Olivier</th>
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<tbody>
<tr>
<td><em>P. bearni</em> Olivier</td>
<td><em>P. similis</em> n. sp.</td>
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<td><em>P. decolor</em> Olivier</td>
<td><em>P. tener</em> Olivier</td>
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<tr>
<td><em>P. gelasina</em> n. sp.</td>
<td><em>P. valida</em> Olivier</td>
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</table>

- *P. similis* = *P. bearni* (Ballantyne & Lambkin 2013), so now only 7 species of *Pteroptyx* in Malaysia.
- Communal display is some sort of sexual adaptation.
- Male congregate on display trees & flash rhythmically.
- Females then fly up from the undergrowth to mate with the males.
Pteroptyx studies in Sabah

- Studies were only focused on the taxonomic revisions.
- Specimens were from collection of Ivan Polunin from a wide selection of localities & supported by field data.
- 4 sp. of *Pteroptyx* had been recorded in Sabah (Ballantyne 2001).
The 1st sp: *P. gelasina* from Sipitang River collected in 1970 - the holotype specimen of this species.

4 other specimens were collected in Likas & kept as paratypes.

This species is no longer exists in Likas at present time.
The 2nd sp: *P. similis*, collected from Kudat Bay in 1970 - the holotype specimen of this species.

5 other specimens were collected in Likas & kept as paratypes specimens.

A small population of species can still be seen Likas Wetland.

* *P. similis* which was considered endemic to Sabah is actually a synonym for *P. bearni* (Ballantyne and Lambkin 2013).
The 3rd sp: *P. malaccae*, was collected from Sipitang river in 1970.

The 4th sp: *P. tener* was collected in Abai, Lower Kinabatangan in 1970.
In 2007, Mahadimenakbar et al. discovered the 5th species, *P. valida* from Garama River of Klias peninsula, Sabah.

*P. valida* is the biggest in terms of size & the most rare *Pteroptyx* sp. in Sabah.

All together, there are 5 species of *Pteroptyx* in Sabah.
Published congregating firefly studies in Sabah

- Wong, CH, 2010. Conservation of congregating firefly zones (CFZ) in Malaysia. MNS Poster

* Non *Pteroptyx* sp. fireflies
<table>
<thead>
<tr>
<th>River/area</th>
<th>Firefly species</th>
<th>Display tree</th>
<th>Source of info</th>
<th>Remarks</th>
</tr>
</thead>
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<tr>
<td>Sakar Island off coast of Lahad Datu Sabah</td>
<td><em>P. bearni</em> &amp; <em>P. gelasina</em></td>
<td><em>Scyphiphora hydrophyllacea, Rhizophora apiculata, Rhizophora mucronata, Rhizophora stylosa</em></td>
<td>Chey 2011</td>
<td>6 display trees (stations) 1 sampling occasion Threats from oil palm plantation</td>
</tr>
<tr>
<td>Garama River, Klias</td>
<td><em>P. bearni, P. malaccae</em> &amp; <em>P. tener</em></td>
<td><em>Rhizophora apiculata, Ficus microcarpa, Clerodendrum inerme</em></td>
<td>Chey 2010</td>
<td>7 display trees (stations) 1 sampling occasion Threats from oil palm plantation</td>
</tr>
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<td>Klias River, Klias</td>
<td><em>P. bearni, P. malaccae</em> &amp; <em>P. tener</em></td>
<td><em>Rhizophora apiculata, Glochidion littorale</em></td>
<td>Chey 2010</td>
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<td>Trayong, Tuaran</td>
<td><em>P. gelasina &amp; P. bearni</em></td>
<td><em>Scyphiphora hydrophyllacea, Lumnitzera littorea</em></td>
<td>Chey 2009</td>
<td>Random samplings 09/07, 01/08, 05/08 6 sampling occasions</td>
</tr>
<tr>
<td>Mangrove of Sepilok Forest Reserve, Sandakan</td>
<td><em>P. gelasina &amp; P. bearni</em></td>
<td><em>Lumnitzera littorea, Rhizophora apiculata, Scyphiphora hydrophyllacea, Rhizophora mucronata</em></td>
<td>Chey 2008</td>
<td>10 display trees (stations) 1 sampling occasion</td>
</tr>
<tr>
<td>Garama River, Klias</td>
<td><em>P. bearni, P. tener, P. malaccae, P. valida</em></td>
<td><em>Rhizophora apiculata, Bruguiera parvifolia, Nypa fruticans, Excoecaria indica, Ficus binjamina, Hibiscus tiliaceous</em></td>
<td>Mahadimenakbar et al. 2007</td>
<td>14 display trees (stations) April-June 2004 6 sampling occasions Light pollution form nearby villages</td>
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<td>Paitan River</td>
<td><em>P. bearni</em> &amp; <em>P. gelasina</em></td>
<td><em>Avicinia alba</em>, <em>Rhizophora apiculata</em>, <em>Scyphiphora hydrophyllacea</em>, <em>Xylocarpus granatum</em></td>
<td>Chey 2006</td>
<td>4 display trees (stations) 1 sampling occasion</td>
</tr>
<tr>
<td>Kinabatangan river</td>
<td><em>P. tener</em></td>
<td><em>Sonneratia caseolaris</em>, <em>Excoecaria indica</em></td>
<td>Mahadimenakbar et al. 2003</td>
<td>Random samplings</td>
</tr>
</tbody>
</table>
Recent unpublished congregating firefly studies in Sabah

- Azizul S. Ecological study on fireflies (Coleoptera; Lampyridae) in Mangrove forest of Beringgis River, Sabah. SST UMS BSc. Study conducted Jan-Feb 2011.

- Walters, A.A. A preliminary study on the influence of abiotic factors on the number of flashing fireflies in KKWC, Sabah. SITF UMS BSc. Study conducted Jan-March 2010.

- Poukin, E. Study on the distribution and abundance of fireflies (Coleoptera: Lampyridae) in Klias River, Beaufort, Sabah, Malaysia. ITBC’s UMS MSc. Study conducted in 2006-2007.
Sipitang River: 1 & 3
Likas: 1 & 2
Tuaran: 1 & 2
Paitan River: 1 & 2
Kudat Bay: 2
Sakar Island: 1 & 2
Sepilok: 1 & 2
Garama River: 2, 3, 4 & 5
Klias River: 2, 3 & 4
Beringis River: 2
Abai: 4
Kinabatangan: 4
1: *P. gelasina*
2: *P. bearini*
3: *P. malaccae*
4: *P. tener*
5: *P. valida*

Published work
Unpublished work
Weston: 2, 3 & 4
Figure 3: Mean abundance of individuals of each species of fireflies collected at 14 study stations for the entire sampling.

Source: Mahadimenakbar et al. 2007
Ongoing studies

- Keong, L.S. The study of firefly ecology of Weston, Beaufort, Sabah.
- Foo, K. Biodiversity of fireflies of Sungai Teratak, Sabah.
- Mobilim, V. The flashing pattern of *Pteroptyx* fireflies in Sabah.
Larva of *P. tener*
Sonneratia
Danau Pitas
Gurah; *Excoecaria indica*
Pteroptyx valida

Pteroptyx gelasina

Pteroptyx similis
Conservation of Congregating Firefly Zones (CFZ) in Malaysia

Introduction
There is great concern about the rapid loss of mangrove forest along the coastal areas that support the Malesian congregating firefly colonies of the genus Pteroptyx.

Current mangrove clearances along these rivers are a threat to the display areas of these firefly colonies. This loss of habitat has a direct effect on the health of the firefly colonies. The loss of display areas will affect the survival rate of the species.

The display areas are the locations where the fireflies congregate. They are located in the mangrove forests and are the sites where the females are attracted to the males.

What is a Congregating Firefly Zone (CFZ)?
A CFZ consists of a group of mangrove areas that are associated with a display area. The display area is where the males gather to attract the females. The CFZ is the area where the display area and the mangroves are situated.

What's a firefly?
A firefly is a beetle which belongs to the family Elateridae. It has a light organ and a light-producing mechanism. The light produced is used for communication and mating.

The congregating fireflies (Genus: Pteroptyx)
There are over 200 species of fireflies in the world. In Malaysia, fireflies are generally divided into two groups:
1. The male fireflies are known as the courting fireflies. They release light to attract females.
2. The female fireflies are known as the incubating fireflies. They use light to attract males.

Threats to the CFZ
River reserves clearing, dam construction, sand mining, and pollution can affect the mangrove forests and the display areas. This can lead to a decrease in the population of fireflies.

For further information, please contact the Department of Environment, Malaysia.
Fireflies Watching Tourism as a Mechanism for Fireflies Conservation

- A number of wildlife tourism operations have successfully conserved several species (e.g. proboscis monkeys, orang utans etc.) while providing economic benefits to host communities.
- Fireflies watching tourism - improve peoples’ attitudes - lead to long-term species conservation.
- Increase support for mangrove conservation initiatives.
- Involve the local community tourism programmes — this can increase conservation awareness.
E.g: in Sukau, Kinabatangan, conservation is now considered as to be a “way of life” as a result of the local community’s recognition of the value of natural resources for tourism.
Mangrove forests need to be protected – important ecosystem & habitat for many organisms.

These forests are in imminent danger of being lost as a result of rapid & indiscriminate clearing for quick socio-economic benefits.

Many are unregulated & some are cleared illegally.

Fireflies can be umbrella\(^1\) or flagship\(^2\) species in the mangroves ecosystem.

1: Umbrella species are species selected for making conservation related decisions, typically because protecting these species indirectly protects the many other species that make up the ecological community of its habitat.

2: Species that can increase awareness of conservation need by helping to gain public & political sympathy, based on their appeal to people. These species are chosen for their vulnerability, attractiveness or distinctiveness in order to engender support and acknowledgment from the public at large.
Most of the studies (published & unpublished) were concentrated in the west coast of Sabah.

This could be due to the easy access to the areas in the west coast as compared to other areas.

More work need to be done at other places.

Most of the published studies were short term studies, mainly looking at the diversity of fireflies & their display trees & all were published locally.

The detailed ecological studies were not published by the researchers.

More studies on life cycle, habitat requirements & preferences, disturbances etc. should be done & published in international journals.
Recommendations for future studies

- *Pteroptyx* sp. can be used as an umbrella sp. to protect mangrove ecosystems through firefly watching activity.
- Firefly watching activity is a year-round activity.
- It can attract a lot of tourists.
- Involvement of the local community in firefly watching activities appears to be increasing & may play a role in preserving the habitat of the fireflies because of the perceived economic benefits.
- Studies on this aspect should also be carried out.
The End...