

Lepidopteran fauna of Mandaitivu Mangrove Ecosystem, Jaffna, Sri Lanka

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Abstract – The mangrove forests, which support the survival of both terrestrial and aquatic inhabitants, are considered some of the most productive ecosystems. Mangrove faunal diversity is well known for the vertebrates and invertebrates but is poorly known for insects. Mangroves and insects have strong relationships in which mangroves provide a suitable habitat for insect habitation. In contrast, the feeding activities of insects contribute to the litter detritus formation and sustainability of the mangrove ecosystem. They connect mangroves with adjoining terrestrial and marine ecosystems by their eco-services such as pollination, herbivory, predation, and being food for other predators. Lepidopterans, consisting of moths and butterflies, are the most widely recognized insects as indicators of the ecosystem's health and are considered in conservation strategies. As the information on the Lepidopteran fauna of mangrove has not been revealed in Sri Lanka, this study was performed to explore the diversity of butterflies and moths in the Mandaitivu mangrove ecosystem from August 2019 to March 2020 located in the Northern Province of Sri Lanka. True mangrove species such as *Avicennia marina*, *Rhizophora mucronata*, *Ceriops tagal* and *Pemphis acidula* are distributed as patches around this island. Adult as well as larval stages of butterflies and moths were collected from two different locations based on the abundance of the mangrove vegetation at the west and south border of the Mandaitivu Island through sweep netting and hand-picking methods. They were then identified based on their morphological characteristics. A total of 13 butterfly species, belonging to four families, and 6 moth species, belonging to three families were recorded. The highest species composition was recorded from *Avicennia marina* than *Rhizophora mucronata* which has fewer insects probably due to the thickness of their leaves. The plain tiger (*Danaus chrysippus*) was the most common and abundant butterfly followed by Mottled Emigrant (*Catopsilia pyranthe*) and the Small Salmon Arab (*Colotis amata*). The Yellow Pansy (*Junonia hierta*), the critically endangered (CR) species was also found. The other twelve species are listed as least concerned (LC) nationally. All the moth species recorded are listed as not assessed as per the IUCN red list. These results confirm that further extensive surveys in the Mandaitivu mangrove ecosystem will expose more diverse assemblages of lepidopterans that can be utilized in threat assessment and conservation strategy planning.

Keywords: Butterfly, Moth, Mangrove ecosystem

1. INTRODUCTION

The mangrove forest is considered as an extremely productive ecosystem because, it occupies at the intertidal zone and continuously interacts with aquatic, inshore and adjoining terrestrial ecosystems (Macintosh and Ashton, 2002).

Mangrove faunal diversity is well known for the vertebrate and invertebrates but poorly known for insects. Mangroves and insects have strong relationships in which mangroves provide a suitable habitat for insect habitation, while insects through its feeding activities contribute to the litter detritus formation and sustainability

of the mangrove ecosystem. They connect mangroves with adjoining terrestrial and marine ecosystems by their eco-services as pollination, herbivory, predation, and being as food for other predators. Among the insects, lepidopteran consisting moths and butterflies, are the most widely recognized insects as indicators of the health of the ecosystem and considered in conservation strategies (Thomes *et al.*, 1998).

Mangrove lepidopterans have been studied in India (Kanagaraj and Kathirvelu, 2018; Mitra *et al.*, 2017; Rahaman, 2002), Bangladesh (Hossain, 2014) Singapore (Murphy, 1990). Fruits of *Sonneratia caseolaris* apple in the Southern province of Sri Lanka are frequently

infested by an unidentified fruit borer moth species of family Noctuidae (Rajapaksha *et al.*, 2010), and with no other information on butterflies or moth from Mangroves in Sri Lanka so far.

Among the total mangrove areas available in Sri Lanka, more than 40% are situated in Northern districts, and the status of these forests is not much studied compared to other areas due to the civil war that prevailed in the northern areas of the country (Alawaththugoda *et al.*, 2018). There are only a few studies on the lepidopteran fauna in the northern region for the same reason. Asela *et al.*, (2014) recorded 20% of the Sri Lankan butterfly species in this Northern region by a rapid survey.

Mandaitivu is one of the islands (9°36'35.2"N 79°59'39.1"E) off the coast of the Jaffna Peninsula in the Northern Province of Sri Lanka, located approximately 3 km south of the city of Jaffna. Mandaitivu was connected to the Jaffna peninsula mainland and the neighboring island of "Velanai" by a causeway. Tides, sandy mudflats, and mangroves are salient features that can be seen throughout the island (Kattupotha, 2018).

The floral diversity of the Mandaitivu mangrove ecosystem is comprised of five true mangrove species, namely *Avicennia marina*, *Rhizophora mucronata*, *Pemphis acidula*, *Ceriops tagal*, and *Bruguiera cylindrical*. Among them, *A. marina* is dominant (Gunavarshan *et al.*, 2014). Mangrove associates such as *Clerodendrum inerme*, *Calotropis gigantea* and salt marsh species such as *Halosarcia indica* (syn: *Arthrocnemum indicum*), *Salicornia brachiata*, *Suaeda maritima*, *Suaeda vermiculata*, *Suaeda monoica* and salt-loving herb species such as *Sesuvium portulacastrum* were found scattered around the Mandaitivu mangrove ecosystem (Rajkumar *et al.*, 2019).

The present study was planned to explore the existence of lepidopteran fauna in the mangrove ecosystem of Mandaitivu.

2. MATERIALS AND METHODS

Two different locations at the west and south border of Mandaitivu Island, were selected for insect survey. Each site was visited weekly from 0800h to 1200h during August 2019 to March 2020. Two hours were spent on each site. Altogether, 24 sampling visits were made. Adult butterflies and moths were collected through sweep netting and hand-picking methods. Larval stages were also collected to rear to get the adult.

Collected specimen was taken from field to the laboratory, Department of Zoology, University of Jaffna, for identification. Species were identified using published taxonomic keys and standard field guides (Triplehorn *et al.*, 2005; Banks & Banks, 1985) and checking the butterfly nomenclature and national conservation status. National Red list (MOE, 2012). Identified insects were preserved with complete label.

3. RESULTS

Thirteen butterfly species, belonging to four families, and six moth species, belonging to three families, were recorded. Out of all butterflies, the plain tiger (*Danaus chrysippus*) was the most common and abundant butterfly. On the basis of frequency of sightings, the Mottled Emigrant (*Catopsilia pyranthe*) and the Small Salmon Arab (*Colotis amata*) were other common butterflies recorded throughout the study period. The Yellow Pansy (*Junonia hierta*) species is listed as a critically endangered (CR) species nationally and is also found in Mandaitivu. The other twelve species are listed as least concerned (LC) nationally. All moth species are listed as not assessed for the IUCN red list. (Table 1, Plate 1 and 2)

4. DISCUSSION

The present study confirms Mandaitivu mangrove ecosystem harbored at least 13 species of butterflies and 6 moth species. Butterflies and moths are good pollinators in the meantime their larval stages are voracious

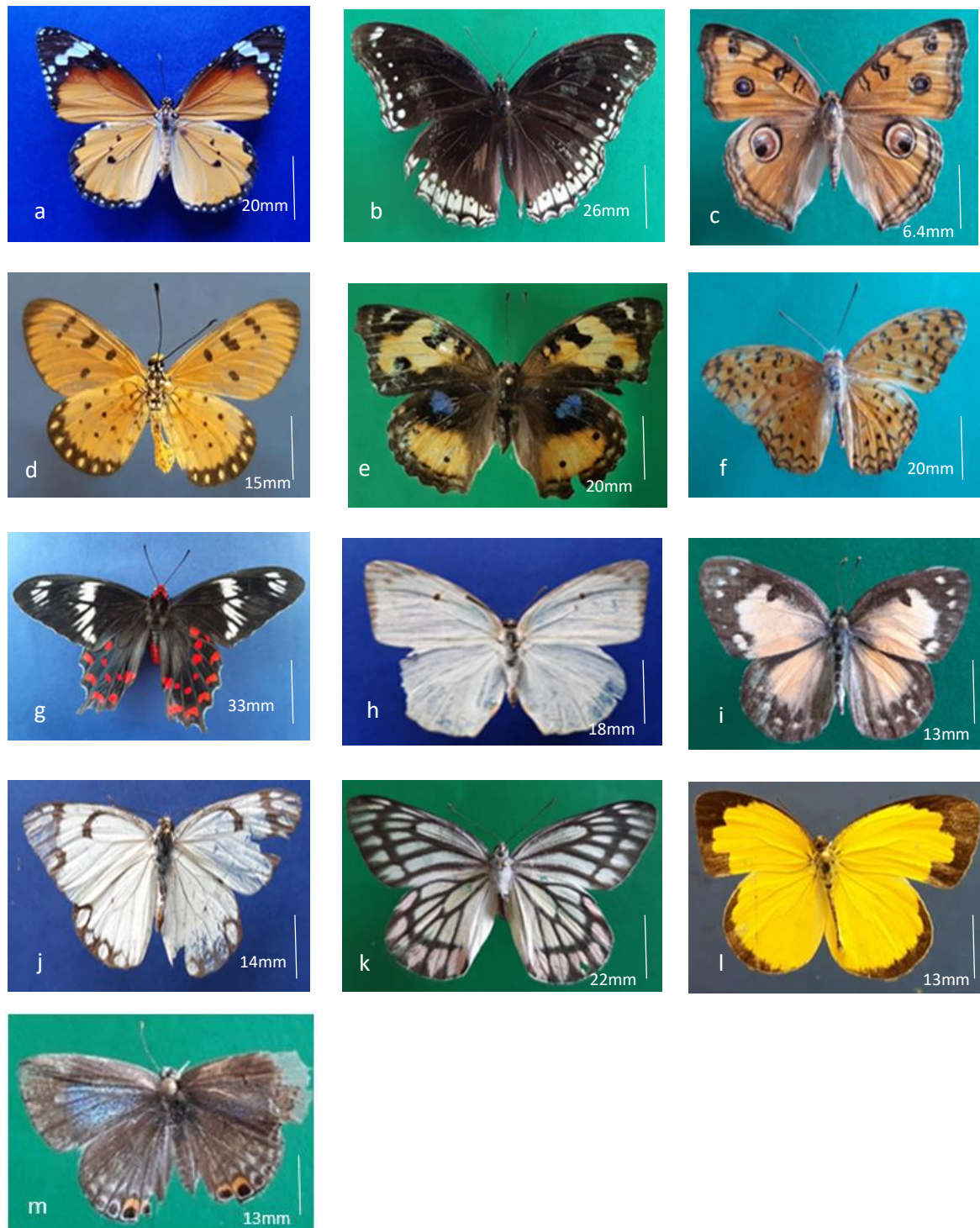


Plate 1: Butterfly species collected from Mandathivu mangrove ecosystem (August 2019 to March 2020) FAMILY: NYMPHALIDAE (a) *Danaus chrysippus* (b) *Hypolimnas bolina* (c) *Junonia almana* (d) *Acraea violae* (e) *Junonia hierta* (f) *Phalanta phalantha* FAMILY PAPILIONIDAE (g) *Pachliopta hector* FAMILY : PIERIDAE (h) *Catopsilia pyranthe* (i) *Colotis amata* (j) *Belenois aurota* (k) *Delias eucharis* (l) *Eurema hecabae* FAMILY: LYCAENIDAE (l) *Euchrysops cnejus*

Table 1: Checklist of lepidopteran fauna found in Mandaitivu mangrove ecosystem (August 2019 – March 2020)

Superfamily	Family	Name	Common Name	IUCN Category
Papilionoidea	Nymphalidae	<i>Danaus chrysippus</i> (Linnaeus, 1758)	Plain Tiger	LC
	Nymphalidae	<i>Hypolimnas bolina</i> (Linnaeus, 1758)	Great Eggfly	LC
	Nymphalidae	<i>Junonia almanac</i> (Linnaeus, 1758)	Peacock Pansy	LC
	Nymphalidae	<i>Junonia hierta</i> (Fabricius, 1798)	Yellow Pansy	CR
	Nymphalidae	<i>Acraea violae</i> (Fabricius, 1775)	Tawny Coster	LC
	Nymphalidae	<i>Phalanta Phalantha</i> (Drury, 1773)	Common Leopard	LC
	Pieridae	<i>Catopsilia pyranthe</i> (Linnaeus, 1758)	Mottled Emigrant	LC
	Pieridae	<i>Colotis amata</i> (Fabricius, 1775)	Small Salmon Arab	LC
	Pieridae	<i>Belenois aurota</i> (Fabricius, 1793)	Pioneer	LC
	Pieridae	<i>Delias eucharis</i> (Drury, 1773)	Common jezebel	LC
	Pieridae	<i>Eurema hecabe</i> (Linnaeus, 1758)	Common Grass Yellow	LC
	Lycanidae	<i>Euchrysops cnejus</i> (Fabricius, 1798)	Gram blue	LC
	Papilionidae	<i>Pachliopta hecta</i> (Linnaeus, 1758)	Crimson Rose	LC
Noctuoidea	Erebidae	<i>Trigonodes hyppasia</i> (Cramer, 1779)	Semi-looper	Not assessed
	Erebidae	<i>Eudocima maternal</i> (Linnaeus, 1767)	Dot-underwing	Not assessed
	Erebidae	<i>Utetheisa pulchella</i> (Linnaeus, 1758)	crimson-speckled flunkey	Not assessed
	Erebidae	<i>Digama hearseyana</i> (Moore, 1859)		Not assessed
	Noctuidae	<i>Brithys crini</i> (Fabricius, 1775)	Amaryllis Borer	Not assessed
Geometroidea	Geometridae	<i>Scopula sp.</i>	White moth	Not assessed

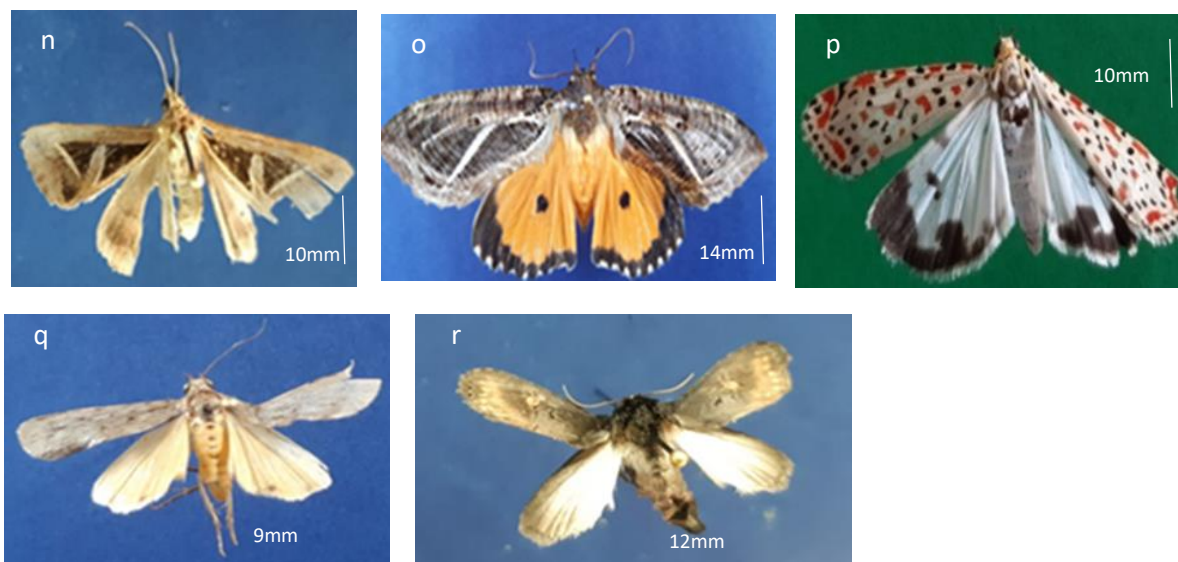


Plate 2: Moth species collected from Mandathivu mangrove ecosystem (August 2019 to March 2020)
 FAMILY: ERABIDAE (n) *Trigonodes hyppasia* (o) *Eudocima maternal* (p) *Utetheisa pulchella* (q) *Digama hearseyana* FAMILY: NOCTUIDAE (r) *Brithys crini* FAMILY: GEOMETRIDAE (s) *Scopula sp.*

feeders, they feed on leaves and buds of mangroves, mangrove associates and salt marsh species.

Species composition and abundance of butterflies and moths can be influenced by various factors such as environmental parameters like temperature, wind speed and rainfall, availability of food like host plant varieties, and their flowering season (Bambaradeniya, 2006). There are conspicuous differences noted between species composition of butterflies and Moths. There must be a quite large composition of nocturnal butterfly and moth species in this area. But the present data was collected only in the morning. Further, this mangrove ecosystem is very close to Jaffna mainland and connected with two main roads. Therefore, anthropogenic activities such as fishing and transport may influence on the presence of lepidopteran fauna. The critically endangered species *Junonia hierta* (Yellow pansy) was found in this ecosystem.

These results confirm that further extensive surveys in the Mandaitivu mangrove ecosystem will expose more diverse assemblages of lepidopteran that can be utilized in threat assessment and conservation strategy planning.

A preliminary checklist of lepidopterans was prepared after random day sampling surveys done in Mandaitivu mangrove ecosystem, during the period of eight months. Thirteen butterfly species were identified. They are belonging to four different families. Five moth species were identified; they are belonging to two different families. IUCN red list status is important to conservation of lepidopteran species and their habitats.

5. REFERENCES

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