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Butterflies (Lepidoptera) of the Can Gio Mangrove Biosphere Reserve, Vietnam

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Abstract

Background

The Can Gio Mangrove Biosphere Reserve is a unique transitional ecosystem between land and sea and represents a significant wetland area in southern Vietnam. Despite being recognized as a biodiversity hotspot, its butterfly fauna remains poorly documented.

New information

In this study, the Pollard Walk method was used on 72 sampling events in 12 fixed transects to present the first comprehensive checklist and diversity assessment of butterflies (Lepidoptera: Rhopalocera) from this region. A total of 46 species, belonging to 37 genera and 5 families, were recorded through systematic field surveys conducted across 12 sites during both dry and rainy seasons from 2024 to 2025. The family Nymphalidae exhibited the highest species richness (19 species), followed by Lycaenidae (9 species), Pieridae (7 species), and Hesperidae (7 species). Two species of most abundance were identified: *Catopsilia pomona* and *Ixias pyrene*. Our findings reveal that the butterfly community in Can Gio is moderately diverse ($H' = 1.66 \pm 0.52$) and exhibits seasonal variation in species composition and abundance. The study provides baseline data for future biodiversity monitoring and highlights the importance of preserving the mosaic of habitats within this mangrove biosphere reserve.

Keywords

butterfly diversity, Can Gio, Lepidoptera, mangrove forest, Vietnam

Introduction

Butterflies (Lepidoptera: Rhopalocera) are widely recognized as important bioindicators of ecosystem health and are among the most studied insect groups due to their ecological roles, aesthetic appeal, and sensitivity to environmental changes (McMullen 1965). Their diversity and distribution patterns are closely linked to vegetation structure, climate, and habitat quality, making them valuable indicators in biodiversity monitoring and conservation planning (Swaay CA et al. 2008).

Vietnam is considered one of the most biologically diverse countries in Southeast Asia and harbors a rich butterfly fauna, with over 1,200 species recorded to date (Monastyrskii and Devyatkin 2016). However, many regions, particularly lowland wetlands and mangrove ecosystems, remain underexplored in terms of their diversity.

The Can Gio Mangrove Biosphere Reserve, located in southern Vietnam, was designated as the country's first UNESCO Biosphere Reserve in 2000 (The International Co-ordinating Council of the Programme on Man and the Biosphere 2000). Spanning more than 75,000 ha of restored and natural mangrove forests, it represents a critical transition zone between freshwater and marine ecosystems. The reserve is well known for its ecological services and biodiversity, including birds, reptiles, and aquatic invertebrates (Nguyen et al. 2013, Le 2021). However, its butterfly fauna has received little scientific attention, with no comprehensive checklist or systematic diversity assessments published prior to this study.

This study aims to address that gap by documenting the species composition, and variation in butterfly diversity across different habitat types within the Can Gio Mangrove Biosphere Reserve. We also highlight species of conservation concern and discuss the implications for wetland biodiversity management. The data generated from this study contribute to national biodiversity inventories and can support long-term ecological monitoring programs in southern Vietnam.

Materials and methods

Study area

The study was conducted in the Can Gio Mangrove Biosphere Reserve, located approximately 40 km southeast of central Ho Chi Minh City, Vietnam. The reserve spans over 75,000 hectares and includes a mosaic of habitats such as mangrove forests, plantations, tidal flats, salt pans, and canals. Twelve transect surveys were selected based on habitat heterogeneity and accessibility, including areas of natural mangroves (L5, L7, L8), monoculture mangrove plantations (L1, L2, L3, and L6), and mixed vegetation and edge habitats (L4, L9, L10, L11, and L12) (Fig. 1)

Coordinates: N10°24'7.21" and N10°35'26.35" Latitude; E106°56'39.33" and E106°47'15.95" Longitude

Sampling effort

Six fieldwork Events were carried out between 2024 and 2025, covering both dry (November–April) and rainy (May–October) seasons at 12 transects (Fig. 1). Each study sites was surveyed once per season, resulting in a total of 72 sampling events.

Sampling description

The data on butterfly assemblages were collected using the transect method described by Pollard 1977 and modified by Spitzer et al. 1993. One full observation includes one pass. Observations will occur along each transect at a speed of approximately 20 m per min, and all observed butterflies will be recorded. Species that require further identification will be collected using a butterfly net.

Species identification

Butterflies were collected and identified in the field using standard field guides (McMullen 1965, Carter 1992, Bui 2007, Monastyrskii and Devyatkin 2016). Species-level identifications were verified by taxonomic specialists and cross-checked with GBIF database (<https://www.gbif.org/>). Nomenclature follows the most recent classification by GBIF database (GBIF - Global Biodiversity Information Facility 2025).

Diversity Analysis

Butterfly diversity were compiled and annotated with habitat association from L1-L12 (Suppl. material 1) then caculated for each transects using Excel, BioDiversity Professional Version 2.0 (McAleece et al. 1997), Statgraphics Version XIX Version (Nguyen 2009). Shannon-Wiener diversity index (H') (Shannon and Wiener 1963, Bibi and Ali 2013) and Simpson dominance index (D) (Simpson 1949, Okpiliya 2012) were calculated to assess diversity patterns.

Data resources

Our survey revealed a moderately high level of butterfly diversity in the Can Gio Mangrove Biosphere Reserve, with species composition of 46 species from 05 families. The number of butterfly species recorded in the study area during each survey ranged from 19 to 25 species. Through continuous survey efforts along the transects, it was observed that from the fourth survey onward, the number of newly encountered species was negligible. This indicates that the survey results are approaching the estimated species richness of butterflies in the study area (Fig. 2).

Biodiversity data on butterfly species were systematically collected in 12 transects of the Can Gio Mangrove Biosphere Reserve to support the analysis of biological indices. Field

surveys to record species composition with photos as evidences of records (Figs 3, 4, 5, 6, 7, 8) and abundance in each transects (Suppl. material 1). These data provide a foundation for calculating key biodiversity metrics, such as Shannon-Wiener diversity index and evenness. The results aim to contribute to the ecological assessment and conservation management of the Can Gio mangrove ecosystem.

Butterfly species recorded in the Can Gio Mangrove Biosphere Reserve in this study

Family Hesperiidae Latreille, 1809

Hasora badra Moore, 1857

Material

- a. genus: *Hasora*; specificEpithet: *badra*; scientificNameAuthorship: Moore, 1857; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 01/12/2025; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0163

Notes: Recorded in Monastyrskii and Devyatkin (2016), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024) and this study (Fig. 3A).

Hasora chromus (Cramer, 1780)

Material

- a. genus: *Hasora*; specificEpithet: *chromus*; scientificNameAuthorship: (Cramer, 1780); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 13/3/2025; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0222

Notes: Recorded in Bui (2007), Monastyrskii and Devyatkin (2016), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), and this study.

Hyarotis adrastus (Stoll, 1782)

Material

- a. genus: *Hyarotis*; specificEpithet: *adrastus*; scientificNameAuthorship: (Stoll, 1782); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 03/11/2025; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0194

Notes: Recorded in Bui (2007), India Biodiversity Portal (2024), GBIF - Global Biodiversity Information Facility (2025), and this study (Fig. 3B).

Iambrix salsala (Moore, 1865)

Material

- a. genus: *Iambrix*; specificEpithet: *salsala*; scientificNameAuthorship: (Moore, 1865); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 11/09/2024; individualCount: 2; sex: unknown; occurrenceID: CANGIOMB0105

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study.

Parnara apostata (Snellen, 1886)

Material

- a. genus: *Parnara*; specificEpithet: *apostata*; scientificNameAuthorship: (Snellen, 1886); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 09/05/2024; individualCount: 2; sex: unknown; occurrenceID: CANGIOMB0018

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), and this study (Fig. 3C).

Pelopidas mathias (Fabricius, 1798)

Material

- a. genus: *Pelopidas*; specificEpithet: *mathias*; scientificNameAuthorship: (Fabricius, 1798); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 17/10/2024; individualCount: 3; sex: unknown; occurrenceID: CANGIOMB0056

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 3E1,E2).

Potanthus ganda (Fruhstorfer, 1911)

Material

- a. genus: *Potanthus*; infraspecificEpithet: *ganda*; scientificNameAuthorship: (Fruhstorfer, 1911); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 19/10/2024; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0075

Notes: Recorded in GBIF - Global Biodiversity Information Facility (2025), Monastyrskii and Devyatkin (2016), and this study (Fig. 3D).

Family Lycaenidae Leach, 1815

Arhopala centaurus (Fabricius, 1775)

Material

- a. genus: *Arhopala*; specificEpithet: *centaurus*; scientificNameAuthorship: (Fabricius, 1775); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 13/1/2025; individualCount: 3; sex: unknown; occurrenceID: CANGIOMB0174

Notes: Recorded in GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 3 F1,F2).

Arhopala elopura Druce, 1894

Material

- a. genus: *Arhopala*; specificEpithet: *elopura*; scientificNameAuthorship: Druce, 1894; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 11/09/2024; individualCount: 2; sex: unknown; occurrenceID: CANGIOMB0106

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study.

Castalius rosimon (Fabricius, 1775)

Material

- a. genus: *Castalius*; specificEpithet: *rosimon*; scientificNameAuthorship: (Fabricius, 1775); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 11/10/2024; individualCount: 2; sex: unknown; occurrenceID: CANGIOMB0118

Notes: Recorded in Carter (1992), Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 4A1,A2).

Curetis saronis Moore, 1877

Material

- a. genus: *Curetis*; specificEpithet: *saronis*; scientificNameAuthorship: Moore, 1877; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 17/10/2024; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0052

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study.

Hypolycaena erylus (Godart, 1823)

Material

- a. genus: *Hypolycaena* ; specificEpithet: *erylus*; scientificNameAuthorship: (Godart, 1823); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 09/04/2024; individualCount: 3; sex: unknown; occurrenceID: CANGIOMB0010

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 4B).

Jamides bochus Stoll 1782

Material

- a. genus: *Jamides* ; specificEpithet: *bochus* ; scientificNameAuthorship: Stoll, 1782; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 03/11/2025; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0201

Notes: Recorded in GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 4 D1,D2).

Rapala pheretima (Hewitson, 1863)

Material

- a. genus: *Rapala* ; specificEpithet: *phetima* ; scientificNameAuthorship: (Hewitson, 1863); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 11/07/2024; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0085

Notes: Recorded in GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 4 C).

Spindasis lohita (Horsfield, 1829)

Material

- a. genus: *Spindasis* ; specificEpithet: *lohita* ; scientificNameAuthorship: (Horsfield, 1829); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 01/11/2025; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0146

Notes: Recorded in Bui (2007), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 4E).

Zizina otis (Fabricius, 1787)

Material

- a. genus: *Zizina* ; specificEpithet: *otis*; scientificNameAuthorship: (Fabricius, 1787); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 09/04/2024; individualCount: 50; sex: unknown; occurrenceID: CANGIOMB0007

Notes: Recorded in Bui (2007), Carter (1992), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 4F).

Family Nymphalidae Rafinesque, 1815

Acraea violae Fabricius, 1775

Material

- a. genus: *Acraea* ; specificEpithet: *violae* ; scientificNameAuthorship: Fabricius, 1775; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 01/11/2025; individualCount: 2; sex: unknown; occurrenceID: CANGIOMB0154

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), and this study (Fig. 5A).

Amathusia phidippus Linnaeus, 1763

Material

- a. genus: *Amathusia* ; specificEpithet: *phidippus* ; scientificNameAuthorship: Linnaeus, 1763; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 11/09/2024; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0099

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 5B).

Cethosia cyane Drury, 1773

Materials

- a. genus: *Cethosia* ; specificEpithet: *cyane*; scientificNameAuthorship: Drury, 1773; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 11/08/2024; individualCount: 4; sex: male; occurrenceID: CANGIOMB0094
- b. genus: *Cethosia* ; specificEpithet: *cyane*; scientificNameAuthorship: Drury, 1773; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 01/11/2025; individualCount: 2; sex: female; occurrenceID: CANGIOMB0151

Notes: Recorded in Bui (2007), India Biodiversity Portal (2024), and this study (Fig. 5 C).

Danaus chrysippus (Linnaeus, 1758)

Material

- a. genus: *Danaus*; specificEpithet: *chrysippus*; scientificNameAuthorship: ((Linnaeus, 1758); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 23/05/2025; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0233

Notes: Recorded in Bui (2007), Carter (1992), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 5F).

Danaus genutia (Cramer, 1779)

Material

- a. genus: *Danaus*; specificEpithet: *genutia*; scientificNameAuthorship: (Cramer, 1779); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 16/10/2024; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0034

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 5G).

Danaus melanippus Cramer, 1777

Materials

- a. genus: *Danaus*; specificEpithet: *melanippus*; scientificNameAuthorship: Cramer, 1777; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 09/04/2024; individualCount: 5; sex: male; occurrenceID: CANGIOMB0008
- b. genus: *Danaus*; specificEpithet: *melanippus*; scientificNameAuthorship: Cramer, 1777; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 25/5/2025; individualCount: 1; sex: female; occurrenceID: CANGIOMB0012

Notes: Recorded in Bui 2007, GBIF - Global Biodiversity Information Facility 2025, India Biodiversity Portal 2024, Monastyrskii and Devyatkin 2016, and this study (Fig. 5 D).

Elymnias hypermnestra Linnaeus, 1763

Materials

- a. genus: *Elymnias*; specificEpithet: *hypermnestra*; scientificNameAuthorship: Linnaeus, 1763; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 11/07/2024; individualCount: 1; sex: male; occurrenceID: CANGIOMB0089

- b. genus: *Elymnias* ; specificEpithet: *hypermnestra*; scientificNameAuthorship: Linnaeus, 1763; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 03/11/2025; individualCount: 1; sex: female; occurrenceID: CANGIOMB0197

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 6F).

Euploea core Cramer, 1780

Material

- a. genus: *Euploea*; specificEpithet: *core*; scientificNameAuthorship: Cramer, 1780; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 01/11/2025; individualCount: 21; sex: unknown; occurrenceID: CANGIOMB0142

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 6A).

Euploea mulciber (Cramer, 1777)

Material

- a. genus: *Euploea* ; specificEpithet: *mulciber*; scientificNameAuthorship: (Cramer, 1777); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 01/11/2025; individualCount: 2; sex: unknown; occurrenceID: CANGIOMB0157

Notes: Recorded in Bui (2007), Carter (1992), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 6B).

Hypolimnas bolina (Linnaeus, 1758)

Material

- a. genus: *Hypolimnas* ; specificEpithet: *bolina*; scientificNameAuthorship: (Linnaeus, 1758); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 03/11/2025; individualCount: 4; sex: unknown; occurrenceID: CANGIOMB0192

Notes: Recorded in Bui (2007), Carter (1992), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study.

Ideopsis similis (Linnaeus, 1758)

Material

- a. genus: *Ideopsis* ; specificEpithet: *similis* ; scientificNameAuthorship: (Linnaeus, 1758);
country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 03/12/2025;
individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0216

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 6D).

Junonia almana Linnaeus, 1758

Material

- a. genus: *Junonia* ; specificEpithet: *almana*; scientificNameAuthorship: Linnaeus, 1758;
country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 17/10/2024;
individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0053

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 6G).

Junonia lemonias Linnaeus, 1758

Material

- a. genus: *Junonia* ; specificEpithet: *lemonias*; scientificNameAuthorship: Linnaeus, 1758;
country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 17/10/2024;
individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0049

Notes: Recorded in Bui (2007), Carter (1992), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 6H).

Melanitis leda Linnaeus, 1758

Material

- a. genus: *Melanitis* ; specificEpithet: *leda* ; scientificNameAuthorship: Linnaeus, 1758;
country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 01/10/2025;
individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0128

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 5H).

Neptis hylas Linnaeus, 1758

Material

- a. genus: *Melanitis* ; specificEpithet: *leda* ; scientificNameAuthorship: Linnaeus, 1758;
country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 11/07/2024;
individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0086

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), and this study (Fig. 5I).

Phalanta phalantha (Drury, 1773)

Material

- a. genus: *Phalanta* ; specificEpithet: *phalantha*; scientificNameAuthorship: (Drury, 1773);
country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 17/10/2024;
individualCount: 14; sex: unknown; occurrenceID: CANGIOMB0043

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 7B).

Polyura schreiberi (Godart, 1824)

Material

- a. genus: *Polyura* ; specificEpithet: *schreiberi*; scientificNameAuthorship: (Godart, 1824);
country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 09/04/2024;
individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0014

Notes: Recorded in GBIF - Global Biodiversity Information Facility (2025) and this study (Fig. 7A).

Tirumala limniace (Cramer, 1775)

Material

- a. genus: *Tirumala* ; specificEpithet: *limniace* ; scientificNameAuthorship: (Cramer, 1775);
country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 18/10/2024;
individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0068

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 6C).

Parantica agleoides (Felder & Felder, 1860)

Material

- a. genus: *Parantica* ; specificEpithet: *agleoides* ; scientificNameAuthorship: (Felder & Felder, 1860); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 01/11/2025; individualCount: 3; sex: unknown; occurrenceID: CANGIOMB0269

Notes: Recorded in GBIF - Global Biodiversity Information Facility (2025), Monastyrskii and Devyatkin (2016), and this study (Fig. 6E).

Family Papilionida Latreille, 1802

Graphium arycles (Boisduval, 1836)

Material

- a. genus: *Graphium* ; specificEpithet: *arycles*; scientificNameAuthorship: (Boisduval, 1836); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 09/03/2024; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0005

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), Monastyrskii and Devyatkin (2016), and this study.

Graphium doson (Felder & Felder, 1864)

Material

- a. genus: *Graphium* ; specificEpithet: *doson*; scientificNameAuthorship: (Felder & Felder, 1864); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 23/5/2025; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0238

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 7E1,E2).

Papilio demoleus Linnaeus, 1758

Material

- a. genus: *Papilio* ; specificEpithet: *demoleus* ; scientificNameAuthorship: Linnaeus, 1758; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 03/11/2025; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0191

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 7D).

Papilio polytes Linnaeus, 1758

Materials

- a. genus: *Papilio* ; specificEpithet: *polytes* ; scientificNameAuthorship: Linnaeus, 1758; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 18/10/2024; individualCount: 1; sex: male; occurrenceID: CANGIOMB0059
- b. genus: *Papilio* ; specificEpithet: *polytes* ; scientificNameAuthorship: Linnaeus, 1758; country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 25/5/2025; individualCount: 1; sex: female; occurrenceID: CANGIOMB0259

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), Carter (1992), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 7C).

Family Pieridae Swainson, 1820

Appias libythea (Fabricius, 1775)

Materials

- a. genus: *Appias* ; specificEpithet: *libythea*; scientificNameAuthorship: (Fabricius, 1775); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 09/05/2024; individualCount: 15; sex: female; occurrenceID: CANGIOMB0019
- b. genus: *Appias* ; specificEpithet: *libythea*; scientificNameAuthorship: (Fabricius, 1775); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 24/5/2025; individualCount: 26; sex: male; occurrenceID: CANGIOMB0247

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), and this study (Fig. 8A1,A2).

Catopsilia pomona (Fabricius, 1775)

Materials

- a. genus: *Catopsilia*; specificEpithet: *pomona*; scientificNameAuthorship: (Fabricius, 1775); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 03/10/2025; individualCount: 143; sex: male; occurrenceID: CANGIOMB0176
- b. genus: *Catopsilia*; specificEpithet: *pomona*; scientificNameAuthorship: (Fabricius, 1775); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 03/10/2025; individualCount: 52; sex: female; occurrenceID: CANGIOMB0177

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 8B1,B2).

Catopsilia pyranthe (Linnaeus, 1758)

Material

- a. genus: *Catopsilia* ; specificEpithet: *pyranthe* ; scientificNameAuthorship: (Linnaeus, 1758); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 11/10/2024; individualCount: 1; sex: unknown; occurrenceID: CANGIOMB0111

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study.

Delias hyparete (Linnaeus, 1758)

Material

- a. genus: *Delias* ; specificEpithet: *hyparete*; scientificNameAuthorship: (Linnaeus, 1758); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 11/07/2024; individualCount: 2; sex: unknown; occurrenceID: CANGIOMB0087

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 8C).

Eurema hecabe (Linnaeus, 1758)

Material

- a. genus: *Eurema* ; specificEpithet: *hecabe*; scientificNameAuthorship: (Linnaeus, 1758); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 23/5/2025; individualCount: 9; sex: unknown; occurrenceID: CANGIOMB0230

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 8D).

Ixias pyrene (Linnaeus, 1764)

Material

- a. genus: *Ixias* ; specificEpithet: *pyrene*; scientificNameAuthorship: (Linnaeus, 1764); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 03/11/2025; individualCount: 40; sex: unknown; occurrenceID: CANGIOMB0195

Notes: Recorded in GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 8 E).

Leptosia nina (Fabricius, 1793)

Material

- a. genus: *Leptosia* ; specificEpithet: *nina*; scientificNameAuthorship: (Fabricius, 1793); country: Vietnam; stateProvince: Ho Chi Minh City; eventDate: 13/1/2025; individualCount: 14; sex: unknown; occurrenceID: CANGIOMB0170

Notes: Recorded in Bui (2007), GBIF - Global Biodiversity Information Facility (2025), India Biodiversity Portal (2024), Monastyrskii and Devyatkin (2016), and this study (Fig. 8F).

Analysis

The average Simpson index (D) in the total survey was 0.29 ± 0.05 close to 0, demonstrating that there was dominance of some species among the butterflies in the surveyed transects (Table 1). Of which, L2 had the highest dominance, followed by L1, L7 and L12 with D index values of 0.74, 0.44, 0.36 and 0.35, respectively. This shows that the butterfly community has dominated by some species including the *C. pomona*, *I. pyrene*, *A. libythea*, etc. In which, *C. pomona* appeared in and was dominant in most of the surveyed transects with 711 encountered individuals.

Butterfly diversity varied among transects, with the highest (1.93–2.53) at mixed vegetation and edge habitats (transect L4, L9, L10, and L11) Table 1. In contrast, sites dominated by monoculture mangrove plantations (L1, L2, and L6) was lowest diversity (0.07–1.13). The areas of natural mangroves (L7, L8) is average in diversity (1.68–1.73). In Overall, butterfly diversity was moderately high, with a mean Shannon-Wiener index (H') of 1.66 ± 0.15 .

The average Simpson index (D) in the total survey was 0.29 ± 0.05 close to 0, demonstrating that there was dominance of some species among the butterflies in the surveyed transects Table 1. Of which, L2 had the highest dominance, followed by L1, L7 and L12 with D index values of 0.74, 0.44, 0.36 and 0.35, respectively. This shows that the butterfly community has dominated by some species including the *C. pomona*, *I. pyrene*, *A. libythea*, etc. In which, *C. pomona* appeared in and was dominant in most of the surveyed transects with 711 encountered individuals.

Our survey revealed a moderately high level of butterfly diversity in the Can Gio Mangrove Biosphere Reserve, with species composition of 46 species from 05 families. This finding is notable given the dominance of mangrove and brackish-water habitats, which are often considered less diverse for butterflies compared to inland forests or mountainous regions (Bui 2007, Figueroa-Fernández et al. 2014). The highest diversity in mixed vegetation and edge habitats here in supports the idea that mangrove ecosystems, especially when interspersed with mixed vegetation and edge habitats, can harbor substantial butterfly assemblages (Kunte 2008).

The dominance of the family Nymphalidae is consistent with patterns observed in other Southeast Asian tropical lowland forests (Monastyrskii 2011). Their ecological versatility, broader host plant range, and adaptability to a variety of microhabitats likely contribute to their high representation. Conversely, the relatively lower species diversity in monoculture mangrove plantations may reflect habitat simplification and the absence of larval host plants or nectar sources.

Although the present study provides the first comprehensive checklist for Can Gio Mangrove Biosphere Reserve, we acknowledge that butterfly diversity may still be underrepresented due to methodological limitations (e.g., reliance on visual surveys and daytime sampling). Future studies incorporating traps, longer survey durations, and larval host plant assessments would help provide a more complete picture.

Discussion

This study presents the first comprehensive assessment of butterfly diversity in the Can Gio Mangrove Biosphere Reserve, highlighting a moderately high level of species abundance across five families. The baseline data generated herein can support future biodiversity monitoring, ecological restoration, and conservation planning in mangrove and lowland wetland systems in Vietnam. We recommend ongoing monitoring, integration of additional sampling methods, and targeted habitat management to maintain and enhance butterfly diversity in the reserve.

In conclusion, the Can Gio Mangrove Biosphere Reserve supports a diverse assemblage of butterflies. Protecting the mosaic of habitats—particularly transitional and edge areas—is essential for sustaining *Rhopalocera* diversity in this important wetland landscape.

Acknowledgements

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Author contributions

Dang Ngoc Hiep developed the research idea. Dang Ngoc Hiep, Bui Nguyen The Kiet, and Luong Thi Thu Thao collected the data. Dang Ngoc Hiep and Phan Van Trung analysed the data and wrote the first draft. Huynh Duc Hoan, Dang Ngoc Hiep and

Nguyen Dang Hoang Vu edited the final draft. Nguyen Dang Hoang Vu submitted the manuscript to the journal.

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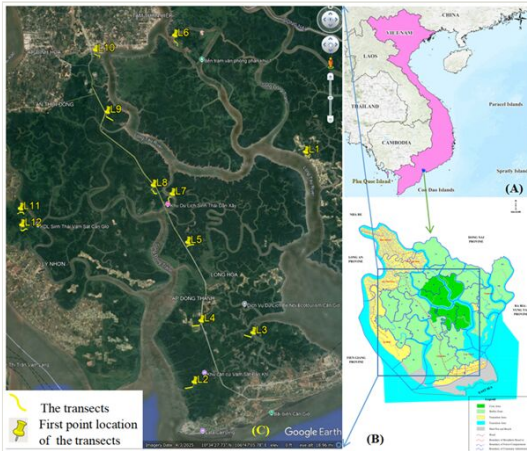


Figure 1.

Map of the study sites. **A** Location of Can Gio Mangrove Biosphere Reserve on a map of Vietnam; **B** The study area on the Can Gio Mangrove Biosphere Reserve; **C** Ecosystems and survey areas within Can Gio Mangrove Biosphere Reserve. The map was created with QGIS software version 3.34.11. The ecosystem layer data for Google Earth Pro version 7.3.6.10201. The base map of Vietnam was sourced from GADM (Global Administrative Areas) at https://gadm.org/download_country.html

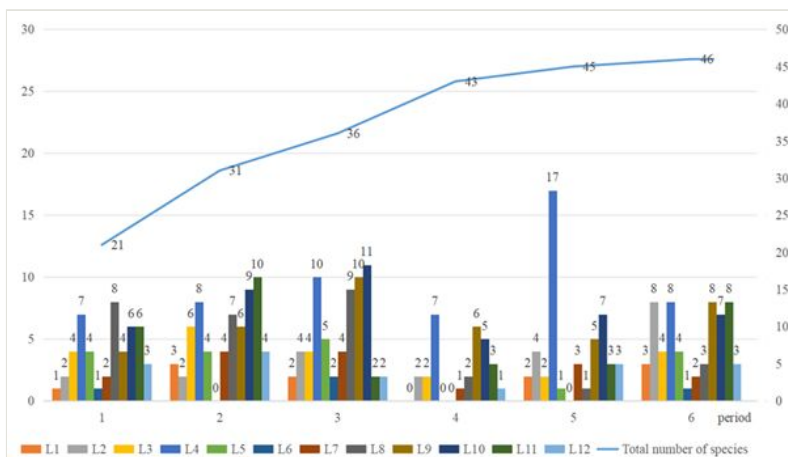


Figure 2.

Species accumulation curve of the recorded species across six field surveys



Figure 3.

Family Hesperidae: **A** *Hasora badra*; **B** *Hyarotis adrastus*; **C** *Parnara apostata*; **D** *Potanthus ganda*; **E1**, **E2** *Pelopidas mathias*; Family Lycaenidae: **F1**, **F2** *Arhopala centaurus*. Photos by Dang H.N.

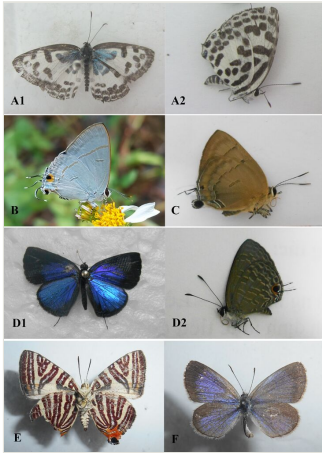


Figure 4.

Family Lycaenidae: **A1, A2** *Castalius rosimon*; **B** *Hypolychna erylus*; **C** *Rapala pheretima*; **D1, D2** *Jamides bochus*; **E** *Spindasis lohita*; **F** *Zizina otis*. Photos by Dang H.N.

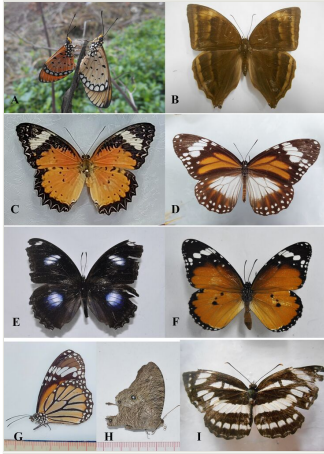


Figure 5.

Family Nymphalidae: **A** *Acraea violae*; **B** *Amathusia phidippus*; **C** *Cethosia cyane*; **D** *Danaus melanippus*; **E** *Hypolimnas bolina*; **F** *Danaus chrysippus*; **G** *Danaus genutia*; **H** *Melanitis leda*; **I** *Neptis hylas*. Photos by Dang H.N.



Figure 6.

Family Nymphalidae: **A** *Euploea core*; **B** *Euploea mulciber*; **C** *Tirumala limniace*; **D** *Ideopsis similis*; **E** *Parantica agleoides*; **F** *Elymnias hypermnestra*; **G** *Junonia almana*; **H** *Junonia lemonias*. Photos by Dang H.N.

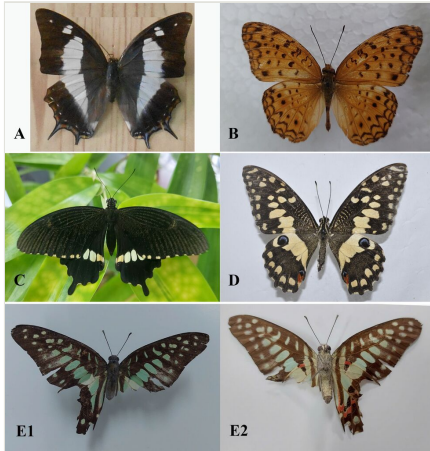


Figure 7.

Family Nymphalidae: **A** *Polyura schreiberi*; **B** *Phalanta phalantha*. Family Papilionidae: **C** *Papilio polytes*; **D** *Papilio demoleus*; **E1, E2** *Graphium doson*. Photos by Dang H.N.

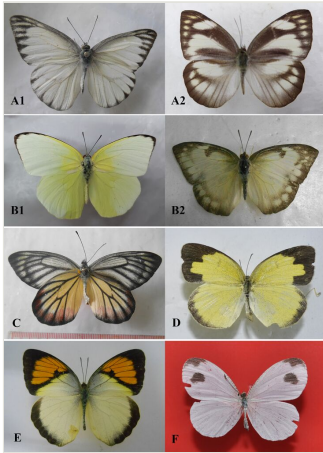


Figure 8.

Family Pieridae: **A1, A2** *Appias libythea*; **B1, B2** *Catopsilia pomona*; **C** *Delias hyparete*; **D** *Eurema hecabe*; **E** *Ixias pyrene*; **F** *Leptosia nina*. Photos by Dang H.N.

Table 1.

Biological index by survey transects from L1 to L12. Note: areas of natural mangroves (L5, L7, L8), monoculture mangrove plantations (L1, L2, L3, and L6), and mixed vegetation and edge habitats (L4, L9, L10, L11, and L12)

Index	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	AVG	SE	SD
H'	1.13	0.70	1.79	2.53	2.06	1.04	1.68	1.73	1.93	1.98	2.03	1.35	1.66	0.15	0.52
D	0.44	0.74	0.22	0.11	0.12	0.17	0.36	0.30	0.22	0.25	0.18	0.35	0.29	0.05	0.17
H'dry season	1.16	0.30	1.61	2.08	2.01	0.69	1.50	1.61	1.79	1.99	2.09	1.61	1.54	0.16	0.56
H'drainy season	0.82	1.81	1.65	2.37	1.03	0.69	1.30	1.73	1.79	1.83	1.64	0.77	1.45	0.15	0.52

Supplementary material

Suppl. material 1: The number of individuals of the recorded species along the survey transects

Authors: Dang Ngoc Hiep

Data type: occurrences

Brief description: The number of individuals of the recorded species along 12 survey transects. The data is the input of Butterfly diversity analysis.

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