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## Odonata survey on some of the outer islands of Belitung Regency, Belitung island, Indonesia

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### Abstract

Another survey of Odonata on the Indonesian island of Belitung is reported. This survey was the second survey conducted in the Belitung area with International Dragonfly Fund support and was focused to Belitung Regency's outer islands. Seventy two species were recorded during the survey. Significant records from the surveyed islands include *Amphicnemis kuiperi*, *Mortonagrion arthuri*, *Mortonagrion appendiculatum*, *Teinobasis ruficollis*, *Platylestes heterostylus*, *Pornothemis serrata*, *Pornothemis starrei* and *Tramea phaeoneura*. Almost all the records are new to the small islands surveyed, except for Mendanau Island for which there were already records of four species. A checklist of the odonate fauna of the outer islands is given in an appendix.

**Key words:** species diversity, Mendanau, Seliu, Rengit, Betangan, Kampak, Burung, Lengkuas, Kepayang, mangrove forest

### Introduction

Belitung or Billiton, is an Indonesian island (area ca 4,800 km<sup>2</sup>), located at the northern extremity of the Java Sea, between Sumatra and Borneo (see Fig. 1). See Alfarisyi (2017a, 2017b) and Dow et al. (2017) for more background information on Belitung. Belitung has a number of satellite islands, the largest of which is Pulau Mendanau. The only published records of Odonata from these outer islands are of *Prodasineura collaris*, *Amphicnemis kuiperi*, *Archibasis viola* and *Teinobasis ruficollis*. These records are all from Mendanau (Liefstinck 1937, 1949, 1954; Dow 2010). Several of the outer islands face environmental problems from activities such as Bauxite mining, deforestation, illegal logging and plantations. Therefore surveys of the outer islands are important and urgent.

Starting in May 2017 members of the Belitung Biodiversity Observer Foundation made surveys on several of the outer islands: Mendanau, Burung, Kampak, Kepayang, Betangan, Seliu, Rengit, and Lengkuas. Three of these island; Kepayang, Lengkuas, and Burung are included in a special region for marine tourism called Hooping Islands located on Sijuk District. All of these islands are administratively located within Belitung Regency.

### Sampling sites

Odonata were searched for at sites covering a wide variety of habitat types on a number of the outer islands. The locations of the islands are indicated in Fig. 2. The

dates on which each site was visited are indicated after the code for the location. Coordinates at a representative point or access point are also given.

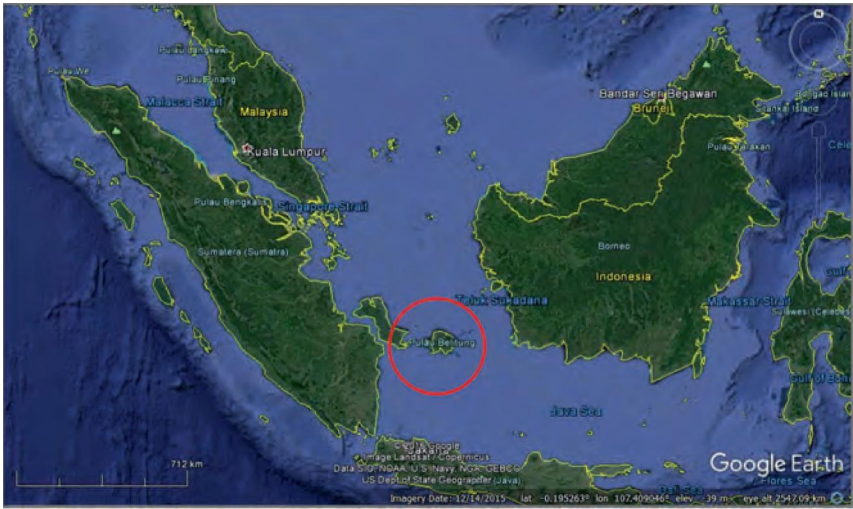


Figure 1. Belitung Island and small surrounding islands (Source: Google Earth).

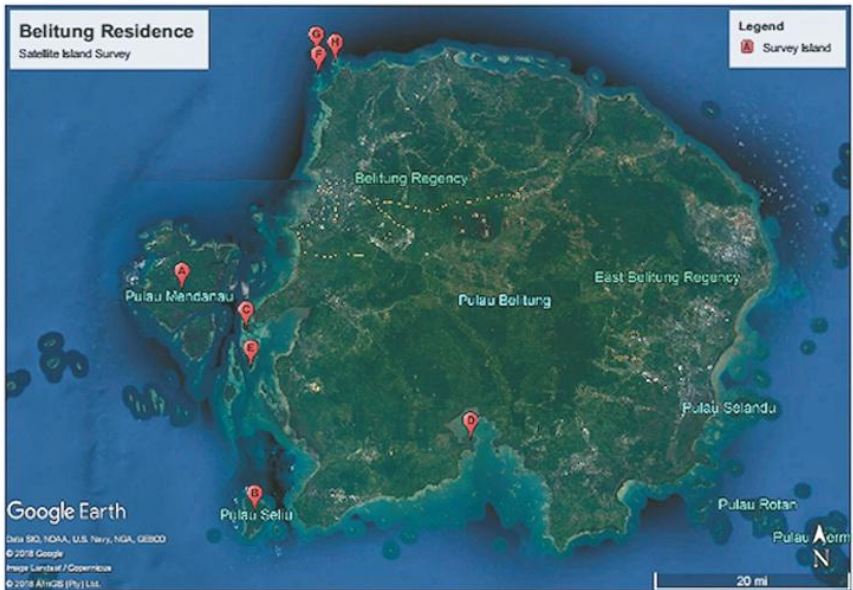


Figure 2. Belitung regency's satellite outer islands locations (source: Google Earth).

## A - MENDANAU ISLAND

Administratively, Selat Nasik District of Belitung Regency is on this island. Three villages are on this island, there are Selat Nasik, Petaling, and Suak Gual. The government of Selat Nasik District is located in the village of Selat Nasik. The survey reported here was focused on Selat Nasik and Petaling villages. In general, the freshwater habitats that can be found on this island are a river with black water, a small river with clear water, mangrove forests, swamp lakes, bauxite excavated lakes, secondary and primary forest, also Kerangas forest and the highest hill are on Mount Petaling located in Petaling village. Locations on Mendanau are shown in Fig. 3.

### Selat Nasik Village Sites

- A1.** 14-V-2017 (-2.847304N 107.404274E) Selat Nasik freshwater reservoir, since 1980 this has been used by locals for their daily activities. Additionally the local people wash their pepper crops harvest at this location. As a result the water has become significantly more acidic.
- A2.** 16-V-2017 (-2.850744N 107.401350E) Kerangas Swamp Lake. This location is a lake complex created by bauxite excavation in 1981. But the mining stopped shortly thereafter because of the impact on the surrounding environment. The dominant habitat at this location is swamp with Water Chestnut (*Eleocharis* sp.) and Paperbarks (*Melaleuca* sp.) as the dominant vegetation.
- A3.** 17-V-2017 (-2.856076N 107.430117E) Lowland Swamp Forests at Village Border. This location has black water, pandanus species surround the high canopy forest.



**Figure 3.** Survey sites on Mendanau Island (source: Google Earth).

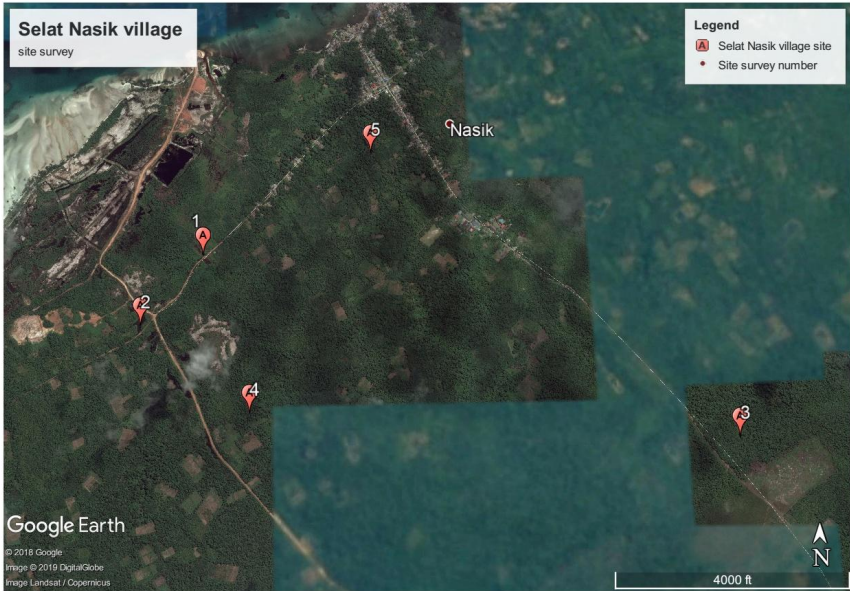


Figure 4: Selat Nasik survey sites. (source: Google Earth).

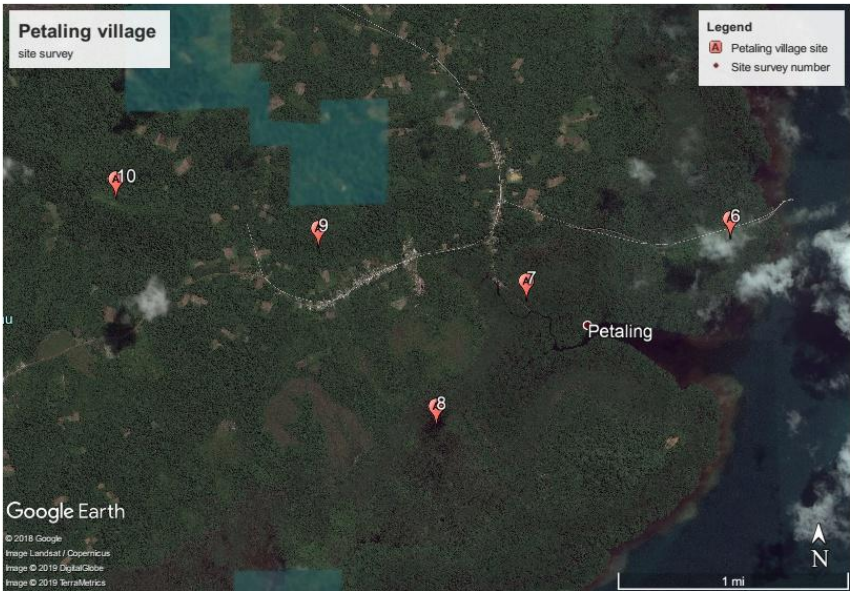


Figure 5: Petaling village survey sites (source: Google Earth).

Located near to the main road, there are four spots used for the daily activities of local people. As a result, much rubbish is present at this location and unfor-

unately the water has become contaminated by detergents. Hopefully, the contamination does not have a significant impact on Odonata life cycles.

- A4.** 18-V-2017 (-2.854951N 107.406721E) Lowland Swamp Forests. This location is the upstream of locations of A1 and A2. In contrast to the downstream habitat, this location has black water, a small stream, *Pandanus* sp. and lowland swamp forest with thick leaf litter as substrate.
- A5.** 19-V-2017 (-2.842203N 107.412438E) Small Stream village. This black water stream is located near a pepper plantation. Surrounded by high trees, thick leaf litter.

### **Petaling Village Sites**

- A6.** 20-V-2017 (-2.891117N 107.472727E) The Harbour. This location is the main harbour for accessing Selat Nasik Residence and Tanjung Pandan Residence. Mangrove forest and brackish water is the main habitat at this location.
- A7.** 21-V-2017 (-2.895175N 107.459436E) The Fisherman's Harbour. This location is the main harbour used by Petaling's fisherman. Mangrove forest and brackish water is the main habitat at this location. This location is similar with A6 but the mangrove forest is more dense.
- A8.** 22-V-2017 (-2.903180N 107.453615E) Marsh.
- A9.** 23-V-2017 (-2.891752N 107.445984E) Small stream surrounded by *Pandanus* vegetation and highly disturbed forest near Petaling village.
- A10.** 25-V-2017 (-2.888749N 107.433113E) Mountain of Petaling. Small forest stream running from a small cave, and a tributary at 190 m. a.s.l.

## **B - SELIU ISLAND**

Seliu Island is located on the west coast of Membalong District. Administratively, this island has one village called Seliu and is divided into three sub-villages (kampong). The habitats that can be found on this island are quite diverse: mangrove forests, peat swamp forest, primary forest, small kerangas forest, grassland, small rivers, and marshy lakes. Unlike the other islands, there is a fairly large marshy lake with an estimated area of 100 ha located at B1 on Seliu.

### **Seliu Village**

- B1.** 29-V-2017 (-3.242810N 107.525960E) Stream and marshy lake with black water.
- B2.** 30-V-2017 (-3.245710N 107.516050E) A coastal forest which contains small black water streams.
- B3.** 31-V-2017 (-3.202780N 107.530440E) This location has black water stream used by the people of Padang Bola's Kampong at Seliu village. The streams are contaminated with detergents and much rubbish.
- B4.** 1-V-2017 (-3.209030N 107.539440E) This location has a black water stream surrounded by palm trees and *Pandanus*.
- B5.** 2-VI-2017 (-3.219109N 107.531201E) Forest swamp surrounded with palm trees and a black water stream.

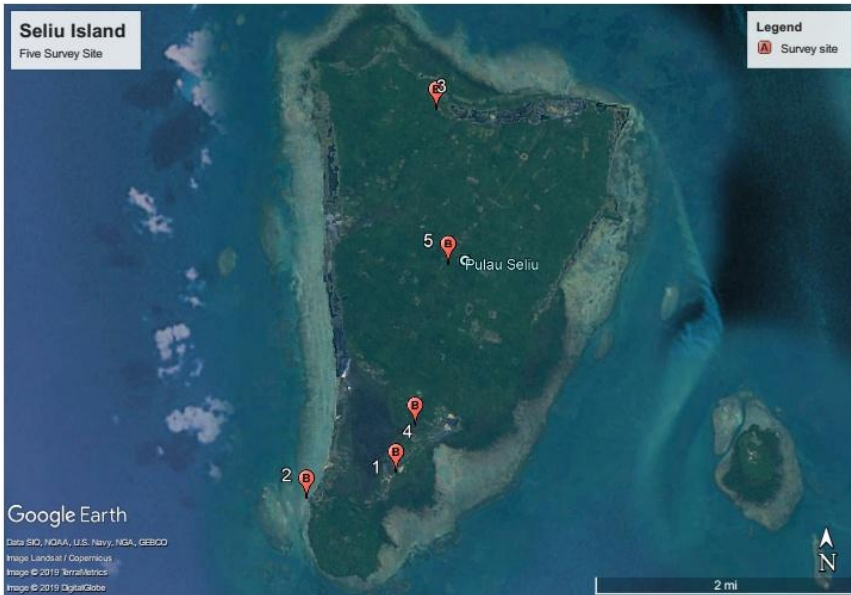


Figure 6: Survey sites on Seliu Island (source: Google Earth).

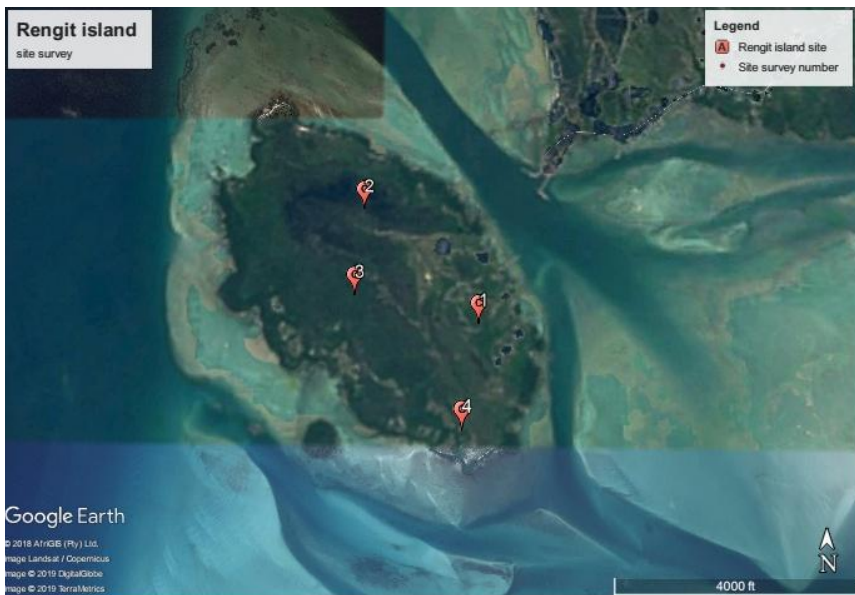


Figure 7: Survey sites on Rengit Island (source: Google Earth).



### **C - RENGIT ISLAND**

Rengit Island has one sub-district as part of Pegantung village, Badau District. Habitat on this island are kerangas forest, coastal forest, marshy lake, primary forest, and grassland.

#### **Rengit Island sites**

- C1.** 5-VI-2017 (-2.944740N 107.527026E) Small river running through grassland.
- C2.** 6-VI-2017 (-2.938678N 107.521299E) Marshy lake.
- C3.** 7-VI-2017 (-2.943274N 107.520904E) Primary forest with a small stream.
- C4.** 8-VI-2017 (-2.949991N 107.526154E) A coastal forest.

### **D - BETANGAN ISLAND**

This island is located in the west of Dudat village, Membalang District. There is one sub-village as part of Dudat village, called Kampong Betangan. Only 21 people live in this village. Kerangas forest are the largest habitat which almost covers the entire island. Other habitats that can be found are; fragmented primary forest, mangrove forest, grassland, small ponds, coastal forest and small stream.

#### **Betangan survey sites**

- D1.** 12-VI-2017 (-2.989193N 107.521730E) A marshy lake.
- D2.** 13-VI-2017 (-3.000236N 107.525410E) Mangrove forests.
- D3.** 14-VI-2017 (-2.987131N 107.527114E) Kerangas field with black water stream surrounded by *Pandanus*.
- D4.** 15-VI-2017 (-2.972833N 107.528873E) Marsh near coastal forests
- D5.** 16-VI-2017 (-2.979175N 107.519776E) Primary forest with fresh water surrounded by *Pandanus*.

### **E - KAMPAK ISLAND**

This island is inhabited by local communities, and administratively is part of Tanjung Rusa village, Membalang district. The middle of the island has a wide range of forest habitats with black water streams. Sadly in 2016, almost half of the island's forest was burned. The habitats on this island are grassland, marshy lake, Kerangas forest, primary forest, mangrove, coastal forest, and small stream.

- E1.** 20-VI-2017 (-3.106920N 107.858220E) Grassland.
- E2.** 21-VI-2017 (-3.108404N 107.852896E) Marshy lake with fresh water surrounded by Palm trees.
- E3.** 22-VI-2017 (-3.103595N 107.856777E) A Mangrove forest.
- E4.** 23-VI-2017 (-3.107874N 107.845101E) Marshy lake with black water, surrounded by *Pandanus*.
- E5.** 24-VI-2017 (-3.109491N 107.855030E) A primary forest with black water.

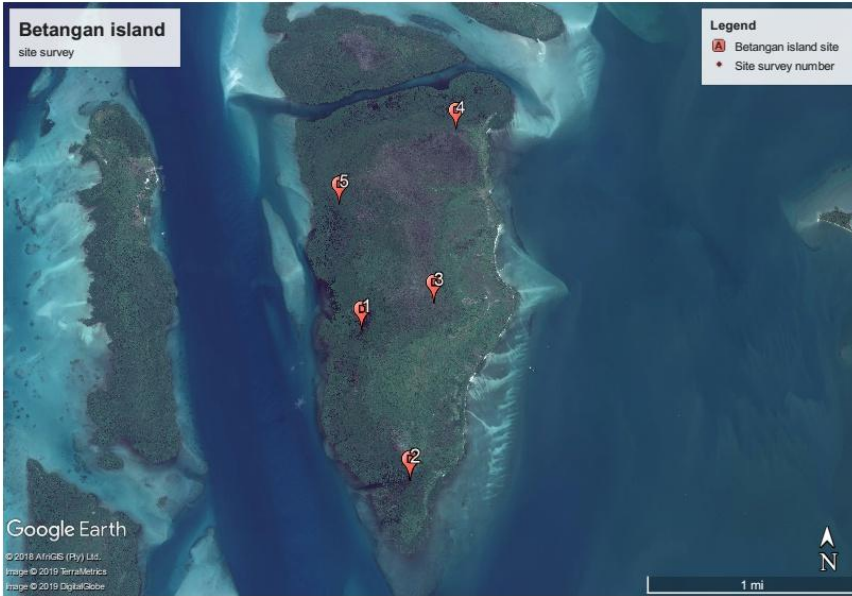


Figure 8: Betangan Island survey sites (source: Google Earth).

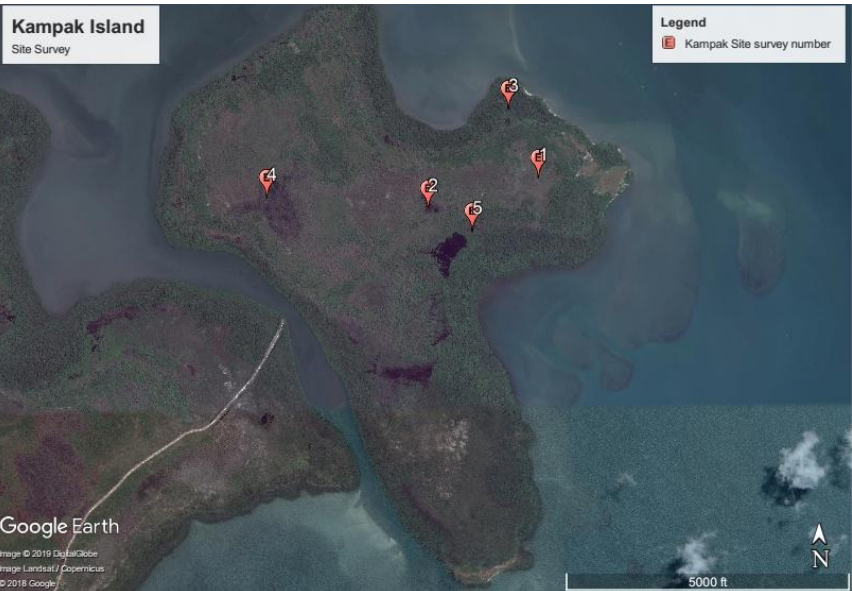


Figure 9: Kampak Island survey sites (source: Google Earth).

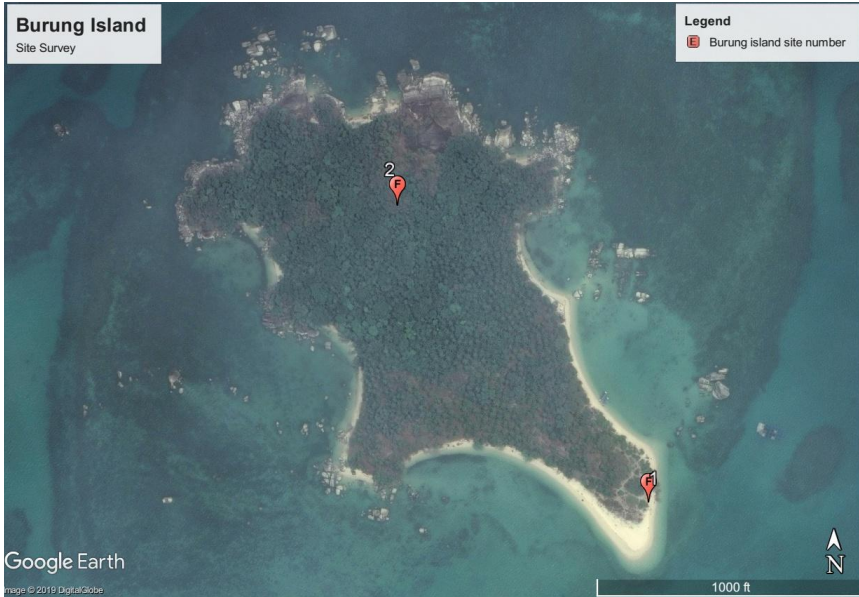


Figure 10: Burung Island survey sites (source: Google Earth).



Figure 11: Lengkuas Island survey sites (source: Google Earth).

## F, G, H. Hopping Islands Region

Hopping island is a term for special marine tourism islands. This marine tourism area is located on the west coast of Tanjung Kelayang Village, Sijuk District. Hopping islands now are included as one of Indonesian Geopark destinations. This area consists of exotic island destinations, offshore granite rock formations, and coral reefs. During the migration season from September to November, several animal species such as dolphins, hawksbill turtles, green turtles and groups of migratory bird can be easily found in this region. Islands that are included are Burung, Kepayang, and Lengkuas Islands. Habitats that can be found on the three islands include: primary forest, coastal forest, grassland, and small area of mangrove forest on the island of Lengkuas.

### F - BURUNG ISLAND

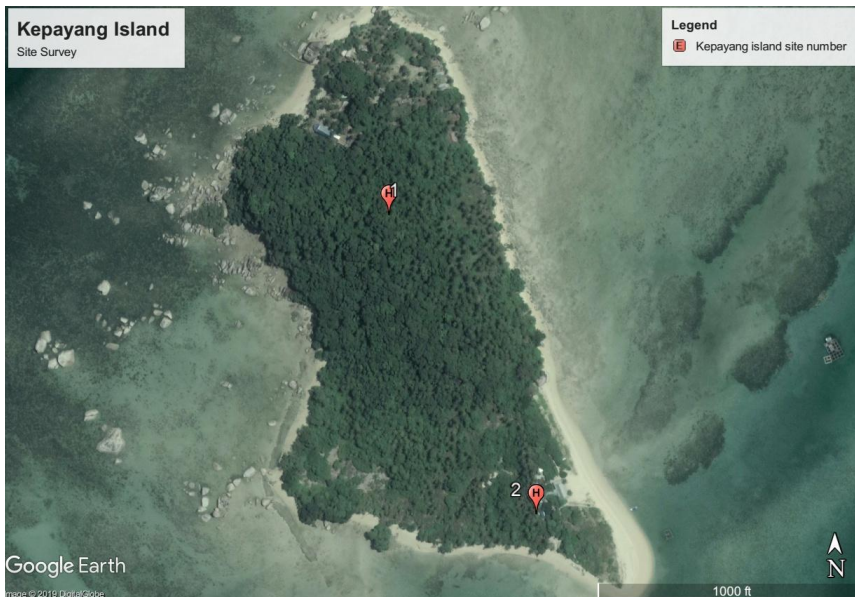
**F1.** 28-VI-2017 (-2.569984N 107.628172E) Coastal grassland.

**F2.** 28-VI-2017 (-2.566965N 107.625604E) Primary forest with black water small stream.

### G - LENGKUAS ISLAND

**G1.** 29-VI-2017 (-2.536751N 107.619738E) Primary forest.

**G2.** 29-VI-2017 (-2.537545N 107.619063E) A small area of Mangrove forest.



**Figure 12: Kepayang Island survey sites (source: Google Earth).**

## H - KEPAYANG ISLAND

H1. 30-VI-2017 (-2.547708N 107.650718E) Primary forest.

H2. 30-VI-2017 (-2.550742N 107.652215E) Coastal forest.

### List of species recorded

#### Zygoptera

##### Lestidae

1. *Lestes praemorsus decipiens* Kirby, 1894

Found on three of the outer islands.

2. *Platylestes heterostylus* (Rambur, 1842)

Recorded from Mendanau for the first time here, as well as on two of the other outer islands.

##### Calopterygidae

3. *Vestalis amoena* Hagen in Selys, 1853

Common on forested streams on Mendanau and six other islands. On Mendanau, this species was found on kerangas forest streams with black water on the coastal side of Selat Nasik village and in the primary forest of Petaling village.

##### Chlorocyphidae

4. *Heliocypha biforata* (Selys, 1859)

Common on rocky forest streams on Mendanau island at Selat Nasik and Petaling.

5. *Libellago aurantiaca* Selys, 1859

Now found on small streams on Mendanau.

6. *Libellago hyalina* Selys, 1859

Commonly found at streams with a high canopy. Found on all surveyed islands.

##### Platycnemididae

7. *Copera vittata* (Selys, 1863)

Common in swamp forests on the outer islands.

8. "*Elatoneura*" *aurantiaca* (Selys, 1886)

Common in lowland swamp forest.

9. *Prodasineura collaris* (Selys, 1860)

Found on small streams with black water in swamp forest and also found at 190m a.s.l. at Petaling village. Also found in swamp forest of Betangan and Seliu.

10. *Prodasineura interrupta* (Selys, 1860)

This is a common species at forest streams on the islands of Mendanau, Kampak, and Seliu. Also found in mangrove forests on Betangan and Rengit.

11. *Prodasineura verticalis* (Selys, 1860)

Common on many primary forest and forest streams on all the surveyed islands, except Lengkuas, Betangan and Kepayang.

12. *Pseudocopera ciliata* (Selys, 1863)

Found on all the surveyed islands except Burung, Lengkuas and Kepayang.

## Coenagrionidae

13. *Aciagrion hisopa* (Selys, 1876)

Found in small ponds and marshy lakes on Mendanau, Betangan, Rengit and Seliu.

14. *Agriocnemis minima* Selys, 1877

Found in small ponds and marshy lakes on all the surveyed islands, except Lengkuas, Burung, and Kepayang.

15. *Amphicnemis kuiperi* Lieftinck, 1937

During this survey, *A. kuiperi* was only found on Betangan, Seliu and Mendanau. This species was common at many locations on Mendanau and occurs both in swamps and streams in primary forest. *Amphicnemis billitonis* is also supposed to be found on the island, but was not found during this survey.

16. *Archibasis tenella* Lieftinck, 1949

Found on Kampak, Betangan, Mendanau, and Seliu.

18. *Archibasis viola* Lieftinck, 1949

This species is a common species found in small ponds and streams on Mendanau, and rarely on Seliu, Kampak, Kepayang and Betangan.

19. *Ceriagrion cerinorubellum* (Brauer, 1865)

This very common species was found in marshy lake and stream on all the surveyed islands, except Lengkuas, Burung, and Kepayang.

20. *Ischnura senegalensis* (Rambur, 1842)

A very common species in marshland but not found on Burung, Lengkuas and Kepayang.

21. *Mortonagrion aborensis* (Laidlaw, 1914)

This species was only found on Mendanau at Petaling village. A single female was found on the top of Petaling Mountain. Note that we do not yet know if the taxon found in Belitung is the true *M. aborensis* or the allied form reported in Dow (2016: 7).

22. *Mortonagrion appendiculatum* Lieftinck, 1937

During this survey only a single female and two individual males were found in swamp forest at Selat Nasik village and a single female at Petaling village.

23. *Mortonagrion arthuri* Fraser, 1942

This species is quite rare on Belitung where it has only been recorded at Juru Seberang village (Alfarisyi 2018), with an old specimen from Tanjung Pandan listed in Dow (2011). During the outer islands survey it was common in mangrove forests



Figure 13. *Lestes prae-morsus decipiens*.



Figure 14. *Lestes prae-morsus decipiens* in a mangrove forest.

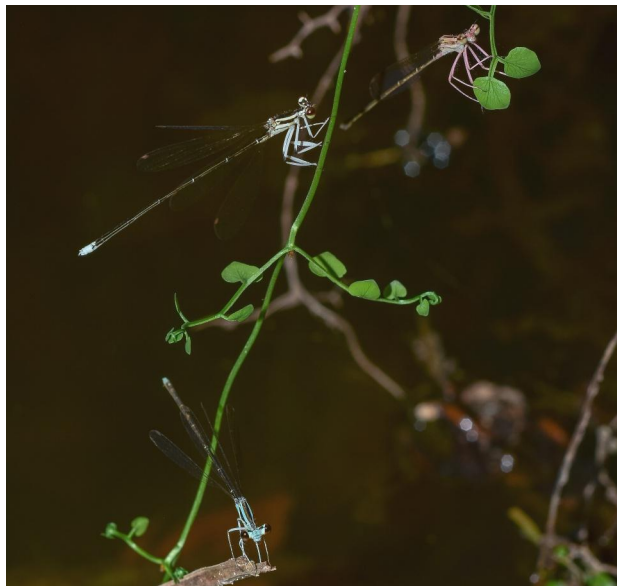


Figure 15. *Pseudocoperia ciliata*.



Figure 16. *Platylestes heterostylus*.

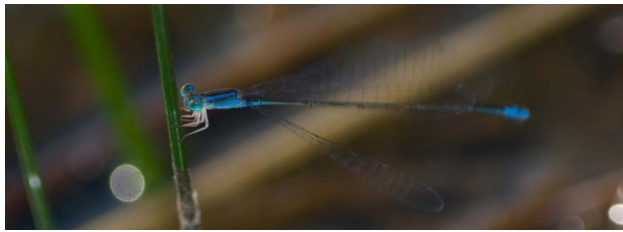


Figure 17. *Aciagrion hisopa*.



Figure 18. *Agriocnemis minima*.



Figure 19. *Amphicnemis kuiperi*, male.





Figure 20. *Mortonagrion appendiculatum*, female.



Figure 21. *Mortonagrion appendiculatum*, male.

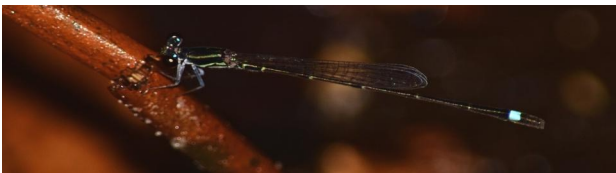


Figure 22. *Mortonagrion arthuri*.



Figure 23. *Mortonagrion falcatum*.

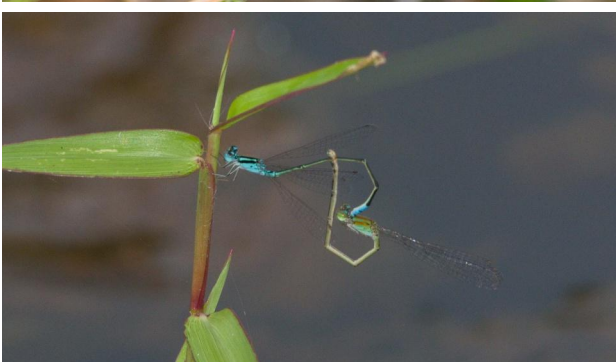


Figure 24. *Pseudagrion coomansi*.



Figure 25. *Teinobasis ruficollis*.

at Petaling village on Mendanau and on Betangan. So far in Belitung this species has only been found in mangrove forest.

24. *Mortonagrion falcatum* Lieftinck, 1934

During our survey this species was found at ponds on Betangan, Seliu, Rengit, Kampak and Mendanau

25. *Pseudagrion coomansi* Lieftinck, 1937

This is a common species on all the islands surveyed except Burung, Lengkuas and Kepayang.

26. *Pseudagrion microcephalum* (Rambur, 1842)

During our survey we found this much less common than the preceding species and only on Mendanau, Betangan and Seliu.

27. *Teinobasis ruficollis* (Selys, 1877)

During our survey this species was only found at small streams at Selat Nasik village on Mendanau.

## **Anisoptera**

### Aeshnidae

28. *Anax guttatus* (Burmeister, 1839)

This species was found at open marshy habitats on Mendanau, Kampak and Seliu, as well as some other islands.

29. *Gynacantha bayadera* Selys, 1891

A single male was found durin the survey on base camp at night at Betangan, and also found Mendanau (Selat Nasik village).

30. *Gynacantha maclachlani* Förster, 1899

Found on Mendanau atSelat Nasik village.

31. *Heliaeschna crassa* Krüger, 1899

Common on all islands surveyed.

32. *Heliaeschna idae* (Brauer, 1865)

Quite common on Mendanau and Seliu.

### Gomphidae

33. *Gomphidia maclachlani* Selys, 1873

During this survey, this species was only be found on Petaling mountain on Mendanau.

34. *Ictinogomphus decoratus melaenops* (Selys, 1857)

This species can be found at marshy lake at Betangan, Kampak, Seliu, Rengit and Mendanau.

35. *Macrogomphus parallelogramma albardae* (Selys, 1878)

This species only be found at marshy field at Seliu, Betangan and Petaling mountain on Mendanau.

Macromiidae

36. *Epophthalmia vittigera* (Rambur, 1842)

Only found on Mendanau and Seliu, especially at dusk time at open fields.

37. *Macromia cincta* Rambur, 1842

This species seems quite rare on the outer island, and was only found at Betangan and Petaling mountain on Mendanau.

Libellulidae

38. *Acisoma panorpoides* Rambur, 1842

Found in open marshy fields on Seliu, Betangan, Mendanau, Kampak and Rengit.

39. *Aethriamanta brevipennis* (Rambur, 1842)

Found in open marshy fields on Betangan, Mendanau, and Seliu.

40. *Aethriamanta gracilis* (Brauer, 1878)

Found in open marshy fields on Betangan, Mendanau, and Kampak.

41. *Agrionoptera insignis* (Rambur, 1842)

Common in primary forest on all island except Lengkuas.

42. *Agrionoptera sexlineata* Selys, 1879

During our survey we found it this species in swamp forest habitats and mangrove forest, on three islands.

43. *Brachydiplax chalybea* Brauer, 1868

Common at marshes, ponds, and coastal forest on all of the surveyed islands.

44. *Brachygonia oculata* (Brauer, 1878)

Common at swamps and swampy stream habitats. Found on the Mendanau, Seliu, Rengit, Kampak and Betangan.

45. *Camacinia gigantea* (Brauer, 1867)

A very rare species on the outer islands, only be found on Seliu.

46. *Chalybeothemis fluviatilis* Lieftinck, 1933

A common species at marshes, lakes and ponds on Mendanau, Seliu, and Betangan.

47. *Crocothemis servilia* (Drury, 1773)

Found on most islands during the surveys.

48. *Diplacodes nebulosa* (Fabricius, 1793)

This species was found on most islands surveyed, and was quite rare on several of them, but more common on Betangan and Mendanau.

49. *Diplacodes trivialis* (Rambur, 1842)

A Common species and found on most of the islands surveyed.

50. *Hydrobasileus croceus* (Brauer, 1867)

Common in marshy areas on Mendanau, Betangan, Rengit, Kampak, and Seliu. But not be found on Kepayang, Lengkuas, and Burung.



Figure 26. *Epophtalmia vittigera*.



Figure 27. *Acisoma panorpoides*.



Figure 28. *Aethriamanta gracilis*.



Figure 29. *Camacinia gigantea*.



Figure 30. *Hydrobasi-leus croceus*.



Figure 31. *Pornothemis starrei*.



Figure 32. *Risiphlebia dohrni*.



Figure 33. *Tetrathemis flavescens*.



Figure 34. *Tamea phaeoneura*, female.



Figure 35. *Tramea phaeoneura*, male.



Figure 36. *Tramea transmarina euryale*.



Figure 37. *Urothemis signata*, example of the most common coloration form found on all surveyed islands.



**Figure 38. *Urothemis signata* on Kampak island.**

51. *Macrodiplax cora* (Kaup in Brauer, 1867)  
An coastal species specialist, common in coastal areas of on Mendanau, Betangan, Kampak, and Seliu.
52. *Nannophya pygmaea* Rambur, 1842  
Common on many islands.
53. *Nesoxenia lineata* (Selys, 1879)  
Common species in swamp forest at Petaling village on Mendanau.
54. *Neurothemis fluctuans* (Fabricius, 1793)  
Found on all islands surveyed.
55. *Orchithemis pruinans* (Selys, 1878)  
Found on most islands surveyed and moderately common at several locations.
56. *Orchithemis pulcherrima* Brauer, 1878  
Found on most islands surveyed.
57. *Orthetrum chrysis* (Selys, 1891)  
Found on most islands surveyed.
58. *Orthetrum glaucum* (Brauer, 1865)  
Only found on Mendanau at Petaling mountain during the surveys.
59. *Orthetrum sabina* (Drury, 1773)  
Found on all islands surveyed.
60. *Pantala flavescens* (Fabricius, 1798)  
Common on all islands surveyed.
61. *Pornothemis serrata* Krüger, 1902  
This species is a new recorded for Mendanau where it was found at Selat Nasik village.
62. *Pornothemis starrei* Lieftinck, 1948  
This species is a new recorded for Seliu and Mendanau where it was found at Selat Nasik and Petaling villages.



63. *Raphismia bispina* (Hagen, 1867)

Found in mangrove forest on the surveyed islands except Rengit, Burung and Kepayang.

64. *Rhodothemis rufa* (Rambur, 1842)

Found at marshes and ponds on Mendanau, Seliu, Kampak and Betangan.

65. *Rhyothemis obsolescens* Kirby, 1889

Found in primary forest, marshes and ponds on Mendanau, Seliu, Kampak and Betangan.

66. *Rhyothemis phyllis* (Sulzer, 1776)

Found on all islands surveyed.

67. *Risiphlebia dohrni* (Krüger, 1902)

Only be found on Mendanau at Petaling mountain during the surveys.

68. *Tetrathemis flavescens* Kirby, 1889

Two males were found at sites in swamp forest at Petaling village on Mendanau.

69. *Tholymis tillarga* (Fabricius, 1798)

Found on almost all surveyed islands.

70. *Tramea phaeoneura* Lieftinck, 1953

Found at Petaling Mountain on Mendanau.

71. *Tramea transmarna euryale* (Selys, 1878)

Common on Mendanau, Seliu, Kampak and Betangan.

72. *Tyriobapta torrida* Kirby, 1889

Found on Betangan, Kampak, and Mendanau in peat swamp forest habitats.

73. *Urothemis signata insignata* (Selys, 1872)

Moderately common on most of the surveyed islands.

74. *Zyomma petiolatum* Rambur, 1842

This is a common species on most of the surveyed island.

## Discussion and conclusions

Seventy three species were recorded during our survey. The island of Mendanau was one of Kuiper's collecting locations, and four of the species found there by Kuiper were found again during this survey: *Prodasineura collaris*, *Amphicnemis kuiperi*, *Archibasis viola* and *Teinobasis ruficolis*. However almost all of the species we recorded were new records for the surveyed islands. Mendanau island had the highest number of odonate species (73) from the 10 sites surveyed at two villages, with five sites surveyed at each village. Selat Nasik had the highest number of species found during the survey and Petaling the second highest number of species. By these two villages, all 10 families recorded during the survey were present on Mendanau. The island with the lowest diversity was Lengkuas with only 12 species from two families. Lengkuas island is the smallest island included in this survey and only has two dominant habitats: primary forest and

grassland. But a small area of mangrove can be found on the west side of the island, the highest altitude on this island is only 30m a.s.l. Almost all species recorded from Lengkuas are common species from the Libellulidae. The exception is one member of the Chlorocyphidae: *Libellago hyalina*. During the survey on this island, we found 5 males and 2 females in primary forest. The only freshwater source on the island is "the rain drop pool" created by the lighthouse keeper so it is surprising that this species was found on the island.

During the survey we found new sites for *Platylestes heterostylus* on Mendanau, Betangan and Kampak islands. This species is quite rare on Belitung, where we only known one location for this species at a tin excavated site at Air Seru village (Alfarisyi 2017). Another uncommon species in Belitung is *Pornothemis starei*, our only possible sighting of this species are from Membalong Distrik, in mangrove habitat with a high canopy. This species is rare on the outer islands; we only found it on Mendanau and Seliu. There are two location on Mendanau (sites A6 and A7), both are Mangrove habitats. The only location on Seliu was B1, and so this habitat located near the mangrove forest. It appears that this species is a mangrove specialist.

On Mendanau island, the highest number of species was found at site A1 at Selat Nasik with total 43 species (16 Zygoptera and 27 Anisoptera). This site is a water reservoir with lowland primary forest (Site A4) upstream. At the upstream site A4, we only found 23 species (14 Zygoptera and 9 Anisoptera). But we found one male and two females of the rare *Mortonagrion appendiculatum* in a small peat swamp area at this site. At the Petaling village, we also found one female on a small stream at A9 inside the primary forest of Mount Petaling. These two location are new locations for *M. appendiculatum*. Discovering this species on Mendanau, suggests that it may reach the island of Bangka and also on Aur island (one of Kuiper's collecting sites).

During the survey on Petaling village, *Gomphidia maclachlani* were found at site A10 on Mount Petaling. This site is an extension to the distribution for the species in Belitung island where it had only been found at Air Begantung village near Mount Tajam (Lieftinck 1948), which is also a Kuiper collecting site. Site A10 was an interesting collecting location on where we also found was one female of *Mortonagrion aborense* and one male of *Tramea phaeoneura*. So far, *M. aborense* on Mount Petaling is the only *Mortonagrion* species we found at such a high altitude (190m. a.s.l.).

Another interesting zygopteran species that we found at Selat Nasik on Mendanau was *Teinobasis ruficollis*, at two locations (A3 and A4). Both of these site is on Selat Nasik. Kuiper collected *T. ruficollis* at an unspecified location on Mendanau in 1936 (Dow 2010).

Of the 73 species recorded during the survey, 61 species are included in the IUCN Red List of Threatened with Least Concern status. *Mortonagrion arthuri* Fraser, 1942 is included in the IUCN Red List of Threatened Species in Status Near Threatened. In Singapore *M. arthuri* is regarded as locally Vulnerable (Ngiam & Cheong 2016). *Pseudagrion coomansi* is listed as Data Deficient on the IUCN Red List but is now known to be abundant in the Belitung area. Other species with currently listed as Data Deficient include *Amphicnemis kuiperi*, *Gynacantha maclachlani*, *Mortonagrion appendiculatum*, *Platylestes heterostylus*, *Tetrathemis flavescens*, *Pornothemis serrata*, *Pornothemis*

*starrei*, and *Tramea phaeoneura*; however all of these species are currently being re-assessed (R.A. Dow personal communication April 2019). All of these species listed were found to be rare during the survey reported here and are rare species on Belitung itself, except *A. kuiperi*. Taking into consideration the ongoing disturbance to the habitat on Belitung and its satellite islands, some sensitive species may be in danger of local extinction. Therefore, to improve knowledge on the conservation status of all of these species, it necessary to conduct further studies of dragonflies in the territory of Belitung Regency's and Bangka-Belitung Province, as well as adjacent parts of mainland Sumatra.

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### **Appendix: Checklist of species recorded from outer islands of Belitung Residence**



















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