The Dragonflies of the Southern Islands of Singapore

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ABSTRACT. Of the historically recorded 136 species of Odonata (dragonflies and damselflies) from Singapore, 42 species (31%) were found during recent surveys of the Southern Islands. Most are dragonflies of the family Libellulidae and there was only a low representation of forest-preferring damselflies. The results give a greatly expanded geographical coverage of the Southern Islands but demonstrate that there is still under-recording, shown by locality gaps in recording some of the common, highly mobile sea-crossing species that must be ubiquitous. Vegetation, habitat diversity and island size are identified as important determinants of community composition.

Keywords. Island fauna, Odonata, species richness

Introduction

The Southern Islands of Singapore, historically about 70 in number, have been reduced to 28 today through reclamation and joining of small clusters into larger entities, and erosion that has reduced several to subsurface reefs (Tan et al., 2025; Muzaini et al., 2025). They range in size from 0.5 ha (Pulau Biola) to 480 ha (Sentosa), in elevation from those merely exposed at low tide to 92 m, and in land cover from denuded to well wooded (Tan et al., 2025; Lua et al., 2025). Although the vegetation is varied in type (grassland, mangroves, beach forest, hill forest) there are few natural freshwater bodies. Distances between islands range from little over 0.1 km to 3.3 km (Ng et al., 2025). Such conditions pose challenges for the dispersal and survival of various taxonomic groups including Odonata (dragonflies and damselflies).

Odonata can make excellent biological indicators for aquatic and terrestrial environments (Bried & Samways, 2015), if there is sufficiently detailed information about the various species' sensitivity to environmental conditions (Furtado, 2024). Species representation in Singapore has been well studied, with several recently published checklists (Ngiam & Cheong, 2015; Cai et al., 2018; Cai et al., 2019). However, there is virtually no published information on Odonata in the Southern Islands.

As part of the Southern Islands Biodiversity Survey, SIBS (Tan et al., 2025), dragonflies and damselflies were surveyed on various islands. The aims were to present a species checklist of Odonata observed in the Southern Islands of Singapore and their species richness on individual islands. We indicate the conservation status of the species, in accordance with the Singapore Red Data Book (3rd edition) (Davison et al., 2024) and discuss the conservation value of the islands considering their historical and present use.

Materials and Methods

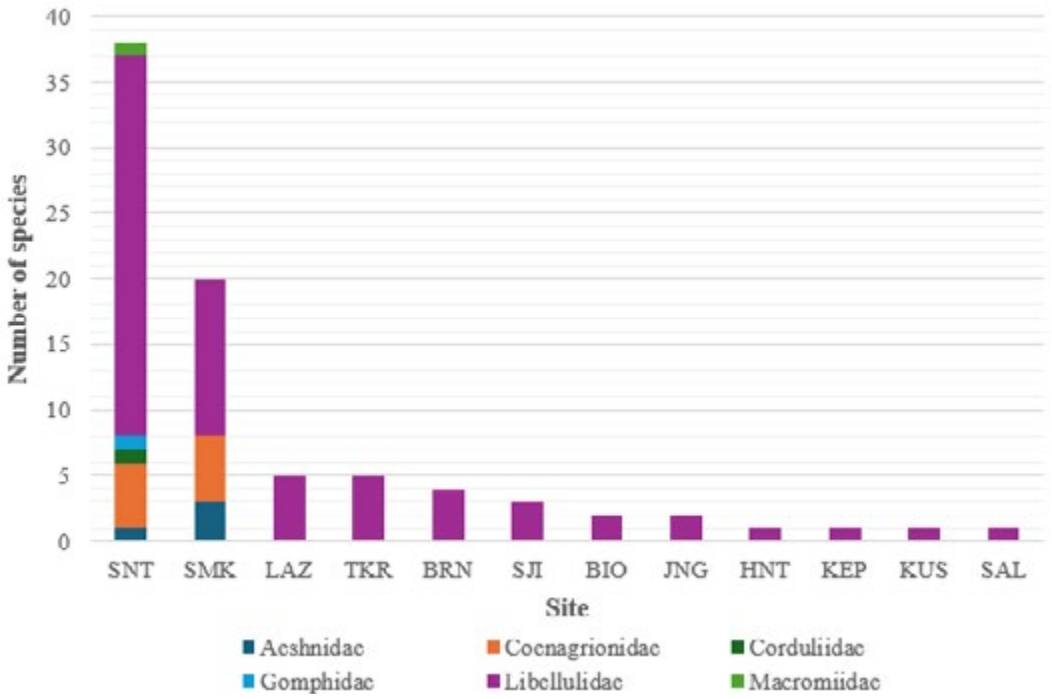
The Southern Islands Biodiversity Survey (SIBS) was conducted between 2019 and 2022, involving 33 terrestrial surveys across 18 sites. Insects were surveyed using visual surveys and sweep nets. Data from the insect surveys, along with the species observations from published and unpublished literature and other stored records were compiled into a SIBS fauna database (Tan et al., 2025). Only observations that were identified to at least the species

level were included; nomenclature follows Schorr & Paulson (2017). The odonate species were tabulated using Excel PivotTable function alongside their Singapore Red Data Book and International Union for Conservation of Nature (IUCN) Red List conservation statuses, the site of observation, the year of publication of literature containing species observations, and observations during SIBS. Species richness by site was plotted in a bar chart.

Results

There were 42 species of odonates recorded from 12 islands (Appendix 1), 31% out of the 136 odonate species that have been observed in Singapore (National Parks Board, 2023). The island with the highest odonate species richness was Pulau Blakang Mati (Sentosa) with 37 species in six families, followed by Pulau Semakau with 20 species in three families. On each of the other islands surveyed, there were five or fewer species (Fig. 1), consisting only of Libellulidae, and no odonates were recorded from Sisters Islands, Raffles Lighthouse, or the periodically exposed reefs such as Pulau Berkas, Terumbu Pempang or Cyrene Reef.

Of the total, 35 species were dragonflies in the suborder Anisoptera (84%) and seven were damselflies in the suborder Zygoptera (16%), all the latter being within the family Coenagrionidae. The most speciose family of dragonflies in the Southern Islands was Libellulidae (darters, skimmers, perchers) with 29 species recorded (or 31 species if Corduliidae and Macromiidae are included as subfamilies within Libellulidae). Libellulidae were recorded across 12 islands.



Pulau Biola, BRN = Pulau Brani, HNT = Pulau Hantu, JNG = Pulau Jong, KEP = Keppel Island, KUS = Pulau Tembakul (Kusu Island), LAZ = Pulau Sekijang Pelepah (Lazarus Island), SAL = Pulau Salu, SJI = Pulau Sekijang Benderah (St John's Island), SMK = Pulau Semakau, SNT = Pulau Blakang Mati (Sentosa Island), TKR = Pulau Tekukor

Discussion

The 42 odonates recorded include two species (*Pantala flavescens*, *Tramea transmarina*) that are capable of very large marine crossings. *Pantala flavescens* in particular is a long-distance migrant that can be encountered far out at sea in the world's oceans, and it is abundant throughout Singapore. Therefore, the lack of records of this species from Pulau Brani and Kusu, and lack of records of any odonates from Sisters Islands must reflect incomplete surveying. The totals found per island under the SIBS programme should consequently not be taken as absolutes but still illustrate the broad outlines of odonate diversity. In particular, the odonate fauna of Sentosa and Pulau Semakau are respectively seven times and four times greater than the next most diverse islands (Lazarus and Tekukor), diversity that is also evident at family level and subordinal level through the presence of damselflies (Zygoptera) only on Sentosa.

The relative richness of Sentosa and Semakau is presumably a consequence of island size (Tan et al., 2025), habitat diversity and the history of disturbance (Muzaini et al., 2025). The two islands are also developed but in strikingly different ways. Sentosa has a resident human population, condominiums, resorts, roads, water supply and drainage infrastructure. Semakau has an incineration plant, limited roads, a system of shallow 'lagoons' separated into cells by earth and rock bunds to contain incinerated waste, and flat ground liable to ponding after rain. By analogy, the odonate fauna has possibly been under-recorded on other islands with significant habitat diversity and manmade infrastructure, such as St. Johns Island and various military islands.

The Appendix illustrates the importance of compiling both current and past records from varied sources. The list of 37 species from Sentosa includes only two species found there by SIBS alone, 22 species recorded only from other sources, and 14 species recorded both by SIBS and by others. The list of 20 species from Semakau includes four species recorded both by SIBS and by others, and 16 species recorded only from other, non-SIBS sources. Out of all 42 odonates found, only one, *Potamarcha congener*, was newly added to the Southern Islands fauna by SIBS. However, SIBS alone was responsible for more than a quarter of all island records and was responsible for all odonate records for eight out of 12 islands: Pulau Biola, Hantu, Jong, Keppel, Kusu, Lazarus, Salu and Tekukor. Continuing work is therefore likely to add a range of records across the Southern Islands, including more species as yet only known from mainland Singapore.

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Appendix 1. Locations of recorded odonate species from published and unpublished literature and Southern Islands Biodiversity Survey (SIBS) data. SIBS indicates species was observed during Southern Islands Biodiversity Survey 2019-2022. Year corresponds to most recent publication or NParks internal record with dragonfly species observation. RDB3 = Singapore Red Data Book 3rd edition. Status, IUCN = International Union for Conservation of Nature Status, BIO = Pulau Biola, BRN = Pulau Brani, HNT = Pulau Hantu, JNG = Pulau Jong, KEP = Keppel Island, KUS = Pulau Tembakul (Kusu Island), LAZ = Pulau Sekijang Pelepah (Lazarus Island), SAL = Pulau Salu, SJI = Pulau Sekijang Bendera (St John's Island), SMK = Pulau Semakau, SNT = Pulau Blakang Mati (Sentosa Island), TKR = Pulau Tekukor, Acronyms for RDB3/IUCN: EX = Globally Extinct, NE = Presumed Nationally Extinct, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern, DD = Data Deficient, NE = Not Evaluated, NA = Not Applicable, NL = Not Listed.

Family	Scientific name	RDB3	IUCN	BIO	BRN	HNT	JNG	KEP	KUS	LAZ	SAL	SJI	SMK	SNT	TKR
Aeshnidae	*Gynacantha bayadera*	LC	LC										2012		
Aeshnidae	*Gynacantha dohrni*	LC	NE										2012		
Aeshnidae	*Gynacantha subinterrupta*	LC	LC										2012		
Coenagrionidae	*Agriocnemis femina*	LC	LC										2012	SIBS; 2020	
Coenagrionidae	*Ceriagrion cerinorubellum*	LC	LC										2012	2020	
Coenagrionidae	*Ischnura senegalensis*	LC	LC										SIBS; 2012	SIBS; 2020	
Coenagrionidae	*Mortonagrion arthuri*	VU	NT										2012		
Coenagrionidae	*Pseudagrion australasiae*	VU	LC											2018	
Coenagrionidae	*Pseudagrion microcephalum*	LC	LC											SIBS; 2020	
Coenagrionidae	*Teinobasis ruficollis*	NT	NT										2012		
Corduliidae	*Hemicordulia tenera*	VU	LC											2020	
Gomphidae	*Ictinogomphus decoratus*	LC	LC											2020	
Libellulidae	*Aethriamanta brevipennis*	LC	LC											2020	
Libellulidae	*Aethriamanta gracilis*	LC	LC											2020	
Libellulidae	*Agrionoptera insignis*	LC	LC							SIBS			2012	2020	

Appendix 1 continued. Locations of recorded odonate species from published and unpublished literature and Southern Islands Biodiversity Survey (SIBS) data. SIBS indicates species was observed during Southern Islands Biodiversity Survey 2019-2022. Year corresponds to most recent publication or NParks internal record with dragonfly species observation.

Family	Scientific name	RDB3	IUCN	BIO	BRN	HNT	JNG	KEP	KUS	LAZ	SAL	SJI	SMK	SNT	TKR
Libellulidae	*Brachydiplax chalybea*	LC	LC											2020	
Libellulidae	*Brachythemis contaminata*	LC	LC											SIBS; 2020	
Libellulidae	*Camacinia gigantea*	LC	LC											2020	
Libellulidae	*Crocothemis servilia*	LC	LC							SIBS			2012	SIBS; 2020	
Libellulidae	*Diplacodes nebulosa*	LC	LC										2012	2020	
Libellulidae	*Diplacodes trivialis*	LC	LC										SIBS; 2012	SIBS; 2020	SIBS
Libellulidae	*Hydrobasileus croceus*	LC	LC											SIBS; 2020	
Libellulidae	*Lathrecista asiatica*	LC	LC											SIBS; 2020	SIBS
Libellulidae	*Macrodiplax cora*	LC	LC										2012	2020	
Libellulidae	*Neurothemis fluctuans*	LC	LC										2012	SIBS; 2020	
Libellulidae	*Orthetrum chrysis*	LC	LC											SIBS; 2020	
Libellulidae	*Orthetrum glaucum*	LC	LC											2020	
Libellulidae	*Orthetrum sabina*	LC	LC						SIBS	SIBS			SIBS; 2012	2020	SIBS
Libellulidae	*Orthetrum testaceum*	LC	LC											2020	
Libellulidae	*Pantala flavescens*	LC	LC	SIBS		SIBS	SIBS	SIBS		SIBS	SIBS	SIBS	SIBS; 2012	SIBS; 2020	SIBS
Libellulidae	*Potamarcha congener*	LC	LC											SIBS	
Libellulidae	*Pseudothemis jorina*	LC	LC											2020	

Appendix 1 continued. Locations of recorded odonate species from published and unpublished literature and Southern Islands Biodiversity Survey (SIBS) data. SIBS indicates species was observed during Southern Islands Biodiversity Survey 2019-2022. Year corresponds to most recent publication or NParks internal record with dragonfly species observation.

Family	Scientific name	RDB3	IUCN	BIO	BRN	HNT	JNG	KEP	KUS	LAZ	SAL	SJI	SMK	SNT	TKR
Libellulidae	*Raphismia bispina*	NT	LC												
Libellulidae	*Rhodothemis rufa*	LC	LC										2012		
Libellulidae	*Rhyothemis obsolescens*	LC	LC											2020	
Libellulidae	*Rhyothemis phyllis*	LC	LC										2012	SIBS; 2020	
Libellulidae	*Rhyothemis triangularis*	LC	LC											SIBS; 2020	
Libellulidae	*Tholymis tillarga*	LC	LC											SIBS; 2020	
Libellulidae	*Tramea transmarina euryale*	LC	LC	SIBS									2012	2020	
Libellulidae	*Trithemis aurora*	LC	LC											2020	
Libellulidae	*Trithemis pallidinervis*	LC	LC										2012	SIBS	
Libellulidae	*Urothemis signata*	LC	LC											2020	
Macromiidae	*Macromia cincta*	EN	LC											2020	