

Chapter 14

Dragonflies and Damselflies (Odonata) of Príncipe, São Tomé, and Annobón



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Abstract The dragonfly and damselfly (Odonata) fauna of the oceanic islands of the Gulf of Guinea is impoverished, even compared to other Afrotropical archipelagoes, with a combined total of 22 species recorded with certainty on São Tomé, Príncipe, and Annobón. *Trithemis nigra* Longfield, 1936 from Príncipe is the only known endemic, although two reported but unidentified species may still prove to be endemic too. Most recorded species occur widely across and beyond Africa, and 27 equally widespread species are listed as potential additions. Several hypotheses for the fauna's impoverishment are briefly discussed.

Keywords Biogeography · Diversity · Gulf of Guinea · Oceanic islands · Odonata

Research History

The Odonata of the Gulf of Guinea have been poorly studied, even if the first records were provided a century ago (Martin 1908; Campion 1923). The first endemic taxon was described almost as long ago but remains the only one (Longfield 1936). Pinhey (1974) was the only specialist ever to visit, being on São Tomé for 2 weeks in April and May 1971. His review remains the main resource on all the islands' faunas, only overlooking the material from Annobón treated by Compte Sart (1962). Just four species were added to the list for the three islands combined since Pinhey's visit half a century ago, all very recently.

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Species Diversity

Twenty-two species are known from the islands, of which 19 were recorded from São Tomé, 9 from Príncipe, and 7 from Annobón (Table 14.1). The specific identity of two species, however, is uncertain. These and two other species of interest are discussed below.

***Gynacantha* sp.** — Pinhey (1974) saw a species of this genus or the similar *Heliaeschna* on São Tomé on four occasions, but these eluded capture. Two observers made sightings there since (see Table 14.1), suggesting the taxon is not rare. Both genera breed in shaded temporary pools. Adults are active at dusk, lurking in dense vegetation at daytime, making them challenging to find and catch. Pinhey (1974) remarked that “forest species of these genera on an isolated island might be expected to be distinctive.” While the Comoros, Seychelles and Mascarene archipelagos indeed have endemic *Gynacantha* species, these belong to the *bispina*-group that is absent on the western side of Africa (Dijkstra 2005). Twelve species occur on the continent nearest to São Tomé, any of which might be present on the Gulf of Guinea islands (Dijkstra 2016). Indeed, a female caught there by Gérard Filippi in March 2022 probably pertains to *G. cylindrata* Karsch, 1891. That species is widespread in western and central Africa. Females are hard to separate from those of *G. vesiculata* Karsch, 1891 (ranges are similar), so confirmation is desirable.

Orthetrum brachiale (Palisot de Beauvois, 1817) — This species and *O. stemmale* (Burmeister, 1839) were confused for 140 years (Pinhey 1979). Both occur widely on the tropical African mainland, while *O. stemmale* also extends to the nearby islands of Madagascar, the Mascarenes, and Seychelles in a variety of potential but unresolved taxa (see Table 14.2). While the latter’s presence in the Gulf of Guinea may thus seem likelier, both the material of Pinhey (1974, 1979) and Papazian et al. (2020) included *O. brachiale* only. Specimens in the Natural History Museum (London) and photographic records seen by the first author also agree with that species. Loureiro and Pontes (2013) reported *O. stemmale* from Príncipe without further comment, and Papazian et al. (2022) from São Tomé based on female specimens not assignable to other *Orthetrum* species found. Thus, while its presence seems very likely, confirmation with male specimens is required given the long history of taxonomic confusion.

Trithemis nigra Longfield, 1936 (Fig. 14.1) — Longfield (1936) described this as a subspecies of the Denim Dropwing *T. donaldsoni* (Calvert, 1899) based on two males, collected on Príncipe on 7 December 1932 and 1 January 1933. Pinhey (1970) raised the taxon to species level, which by morphology is nearest the Halfshade Dropwing *T. aconita* Lieftinck, 1969 and Congo Dropwing *T. congolica* Pinhey, 1970 (Damm et al. 2010). Alain Gauthier (pers. comm.) found *T. nigra* to be common in 1990. Indeed, it was found at 6 of 15 sites surveyed on the island’s eastern half in 2011 (Loureiro and Pontes 2013): all streams that were partly sunny and partly shaded by forest or shrubs. The species was not seen at fully shaded or seasonal streams, nor at standing or brackish water. While the limited distribution is below thresholds for Critically Endangered on the IUCN Red List of

Table 14.1 Review of Odonata species recorded from the Gulf of Guinea Islands

Scientific name	English name	Príncipe	São Tomé	Annobón
<i>Agriocnemis zerafica</i> Le Roi, 1915	Sahel Wisp	Series collected 28–29 October 2019 near Santo António (Papazian et al. 2020).	Both sexes photographed on 3 January 2022 near Neves by Ernst Klimsa. A female photographed on 23 August 2005 in São Tomé town by Phil Benstead was probably this species too.	
<i>Ceriatrigon glabrum</i> (Burmeister, 1839)	Common Citril	First reported by Martin (1908); confirmed by Loureiro and Pontes (2013), Papazian et al. (2020) and photographic records.	First reported by Campion (1923); confirmed by Pinhey (1974).	
<i>Ischnura senegalensis</i> (Rambur, 1842)	Tropical Bluetail	Surprisingly no records yet.	Found at several sites in October 2021 (Papazian et al. 2022) and photographed on 1 January 2022 near Neves by Ernst Klimsa.	First reported by Martin (1908); confirmed by Compte Sart (1962).
<i>Anax ephippiger</i> (Burmeister, 1839)	Vagrant Emperor	Surprisingly no records yet.	Not recorded since Pinhey (1974).	
<i>Anax imperator</i> Leach in Brewster, 1815	Blue Emperor	Surprisingly no records yet.	First recorded by Pinhey (1974); confirmed by Papazian and Filippi (2019).	First reported by Martin (1908); confirmed by Compte Sart (1962).
<i>Gynacantha</i> sp.	Duskhawker species		Seen by Pinhey (1974) in 1971, by Alain Gauthier in 1991, and by Russell Tate in 2020. See main text on female caught in March 2022.	
<i>Chalcostephia flavifrons</i> Kirby, 1889	Inspector		Both sexes photographed on 13–15 January 2022 at Praja Inhame by Ernst Klimsa.	

(continued)

Table 14.1 (continued)

Scientific name	English name	Príncipe	São Tomé	Annobón
<i>Crocothemis erythraea</i> (Brullé, 1832)	Broad Scarlet	Surprisingly no records yet.	First reported by Longfield (1936); confirmed by Pinhey (1974) and photographic records.	
<i>Crocothemis sanguinolenta</i> (Burmeister, 1839)	Little Scarlet		Not recorded since Pinhey (1974).	
<i>Diplacodes lefebvrii</i> (Rambur, 1842)	Black Percher	Surprisingly no records yet.	First reported by Campion (1923); confirmed by Pinhey (1974).	
<i>Orithetrum africanum</i> (Selys, 1887)	Elongate Skimmer	First reported by Longfield (1936); confirmed by Loureiro and Pontes (2013) and photographic records.	First recorded by Pinhey (1974); confirmed by photographic records.	
<i>Orithetrum brachiale</i> (Palisot de Beauvois, 1817)	Banded Skimmer	Pinhey (1974) reported <i>O. brachiale kalai</i> ; confirmed as <i>O. brachiale</i> by Pinhey (1979), Loureiro and Pontes (2013), and Papazian et al. (2020).	First reported by Longfield (1936); confirmed by Pinhey (1974, 1979), Papazian et al. (2020), and photographic records.	First reported and illustrated quite accurately by Compte Sart (1962); additional record provided by Pinhey (1974).
<i>Orithetrum julia</i> Kirby, 1900	Julia Skimmer	First reported as <i>O. stemmale capense</i> by Longfield (1936); confirmed by Pinhey (1974) and Papazian et al. (2020).	First reported by Campion (1923) and as <i>O. stemmale capense</i> , by Longfield (1936); confirmed by Pinhey (1974), Papazian et al. (2020), and photographic records.	
<i>Palpopleura lucia</i> (Drury, 1773)	Lucia Widow	First reported by Longfield (1936); confirmed by Pinhey (1974), Loureiro and Pontes (2013), Papazian et al. (2020), and photographic records.	First reported by Martin (1908), Campion (1923) and Longfield (1936); confirmed by Pinhey (1974), Papazian et al. (2020), and photographic records.	Only reported by Martin (1908).
<i>Pantala flavescens</i> (Fabricius, 1798)	Wandering Glider	First reported by Martin (1908); confirmed by Loureiro and Pontes (2013) and Papazian et al. (2020).	First reported by Campion (1923); confirmed by Pinhey (1974) and Papazian et al. (2020).	

<i>Rhyothemis notata</i> (Fabricius, 1787)	Veiled Flutterer		Male photographed on 24 January 2019 near Praia Jalé close to the island's southern tip by Anja Cervenc. Also photographed on 29 December 2021 at Praia Vanha (Papazian et al. 2022).	
<i>Tholymis tillarga</i> (Fabricius, 1798)	Twister	Surprisingly no records yet.	Not recorded since Pimhey (1974).	
<i>Tramea basilaris</i> (Palisot de Beauvois, 1817)	Keyhole Glider	Surprisingly no records yet.	Not recorded since Pimhey (1974).	Only reported by Martin (1908).
<i>Tramea limbata</i> (Desjardins, 1835)	Ferruginous Glider	Found at two sites in October 2021 (Papazian et al. 2022).	Surprisingly no records yet.	Only reported by Compte Sart (1962).
<i>Trithemis nigra</i> Longfield, 1936	Príncipe Dropwing	Described by Longfield (1936). Status studied by Loureiro and Pontes (2013).		
<i>Zygonyx</i> sp. near <i>flavicosta</i> (Sjöstedt, 1900)	Near Ensign Cascader			Female reported as <i>Pseudomacromia</i> sp. by Longfield (1936) was identified by Pimhey (1975) as this species.
<i>Zygonyx torridus</i> (Kirby, 1889)	Ringed Cascader		Female collected on 6 February 2019 at Monte Café (Papazian and Filippi 2019).	

Photographic records were taken from [iNaturalist.org](https://www.inaturalist.org) and [Observation.org](https://www.observation.org), and received directly from Ernst Klimsa

Table 14.2 Occurrence of Odonata species, that are widespread in western and central Africa, in Atlantic and Indian Ocean islands but that so far have not been recorded from the Gulf of Guinea islands (Martens et al. 2013; Van Damme et al. 2020; Dijkstra and Cohen 2021)

Scientific name	English name	CV	Com	Mad	Mas	S&A	Soc
<i>Lestes ochraceus</i> Selys, 1862	Ochre Spreadwing			*		*	
<i>Lestes pallidus</i> Rambur, 1842	Pallid Spreadwing	•					
<i>Agriocnemis exilis</i> Selys, 1872	Little Wisp			•	•		
<i>Pseudagrion glaucescens</i> Selys, 1876	Blue-green Sprite	•					
<i>Pseudagrion sublacteum</i> (Karsch, 1893)	Cherry-eye Sprite		•				
<i>Anax rutherfordi</i> McLachlan, 1883	Western Orange Emperor	•					
<i>Anax tristis</i> Hagen, 1867	Black Emperor	•	•	•	•		
<i>Paragomphus genei</i> (Selys, 1841)	Common Hooktail		•	*			•
<i>Aethriamanta rezia</i> Kirby, 1889	Pygmy Basker			•			
<i>Brachythemis leucosticta</i> (Burmeister, 1839)	Southern Banded Groundling	•		•			
<i>Crocothemis divisa</i> Karsch, 1898	Rock Scarlet			•			
<i>Diplacodes luminans</i> (Karsch, 1893)	Barbet Percher		•			•	
<i>Olpogastra lugubris</i> (Karsch, 1895)	Bottletail			•			
<i>Orthetrum chrysostigma</i> (Burmeister, 1839)	Epaulet Skimmer						•
<i>Orthetrum icteromelas</i> Ris, 1910	Spectacled Skimmer			*			
<i>Orthetrum stemmale</i> (Burmeister, 1839)	Bold Skimmer		•	•	•	*	
<i>Orthetrum trinacria</i> (Selys, 1841)	Long Skimmer	•	•	•		•	
<i>Parazyxomma flavicans</i> (Martin, 1908)	Banded Duskdarter			•			
<i>Rhyothemis semihyalina</i> (Desjardins, 1835)	Phantom Flutterer		•	•	•	•	•
<i>Sympetrum fonscolombii</i> (Selys, 1840)	Red-veined Darter	•			•		•
<i>Tetrathemis polleni</i> (Selys, 1869)	Black-splashed Elf			•			
<i>Trithemis annulata</i> (Palisot de Beauvois, 1807)	Violet Dropwing	•		*		*	
<i>Trithemis arteriosa</i> (Burmeister, 1839)	Red-veined Dropwing	•	•	•			•
<i>Trithemis hecate</i> Ris, 1912	Silhouette Dropwing		•	•			
<i>Trithemis kirbyi</i> Selys, 1891	Orange-winged Dropwing		•	*			
<i>Urothemis assignata</i> (Selys, 1872)	Red Basker		•	•			
<i>Urothemis edwardsii</i> (Selys in Lucas, 1849)	Blue Basker		•	•	•		

Taxa that differ somewhat morphologically on these islands are marked with an asterisk. CV Cape Verde, Com Comoros, Mad Madagascar, Mas Mascarenes, S&A Seychelles and Aldabra, Soc Socotra



Fig. 14.1 *Trithemis nigra* or Príncipe Dropwing, the only endemic odonate known from the islands. Photo credits: Nuno de Santos Loureiro

Threatened Species, the survey identified no threats and therefore *T. nigra* is now listed as Near Threatened (IUCN 2021).

***Zygonyx* sp.** — Species of this genus favour water with a strong current. Pinhey (1974) did not see “any *Zygonyx* near any of the waterfalls and swift-flowing streams” on São Tomé, although the well-dispersing *Z. torridus* (Kirby, 1889) was recently recorded (Papazian and Filippi 2019). Pinhey (1975) examined the unidentified female reported from Annobón by Longfield (1936), stating that “it appears to be *flavicosta*.” The species *Z. flavicosta* (Sjöstedt, 1900) is widespread in western and central Africa and cannot be confused with *Z. torridus*, although other continental species are similar. The Seychelles, Comoros and Madagascar all have endemic *Zygonyx* species; thus, the presence of an endemic species on such a distant island as Annobón cannot be ruled out.

A Poor Fauna?

Considering how much suitable freshwater is present (Fig. 14.2), the 22 species known from all islands combined, and 19 from the largest and best-known island of São Tomé, seem exceptionally few. The Comoros, which geographically and ecologically are perhaps the most comparable island group, harbour 39 species in total,



Fig. 14.2 Tributary of the Rio Capitango, one of many forested streams on São Tomé. These seem perfect for endemic odonates, but none are known. Photo credits: Russell B. Tate

with 36 on the oldest and best-studied island of Mayotte. The Mascarenes and Seychelles (excluding Aldabra) are twice as far from the mainland, but have 29 and 19 confirmed species, respectively, while Mauritius and La Réunion each harbour 23 species (Dijkstra and Cohen 2021). Sixteen species have been reported from the Cape Verde islands, the only other major Afrotropical archipelago in the Atlantic Ocean (Martens et al. 2013). Although that is even fewer than in the Gulf of Guinea, those islands are also more isolated and substantially drier.

Comparing the species tallies of just a few archipelagos with very different sizes, histories, habitats, and degrees of isolation is problematic, however. Looking at the species themselves may therefore be more informative: 16 of the 22 recorded in the Gulf of Guinea are widespread across Africa, with most species' ranges including the other archipelagos mentioned (and parts of Eurasia) as well. Twenty-seven additional species are found both on the adjacent continent and on these other islands, but have yet to be found on São Tomé, Príncipe, or Annobón (Table 14.2): probably at least ten of the more widespread ones are likely present in the Gulf of Guinea islands, pushing the total species diversity over 30.

Range-restricted species, too, are unexpectedly scarce. Pinhey (1974) noted that “compared to other orders, particularly Lepidoptera, rich in species or subspecies only known from these islands, the few endemics are remarkable for their paucity.” While a quarter of the Comoro, Mascarene, and Seychelles species are confined to

their archipelagos (Dijkstra and Cohen 2021), *Trithemis nigra* from Príncipe is the only known endemic (Fig. 14.1). São Tomé is six times larger and twice as high but has no endemic Odonata. Socotra is larger but lies in a very dry corner of Africa (isolation is similar) and yet has similar numbers: 22 species including a single endemic (Van Damme et al. 2020). Furthermore, the mainland nearest Socotra has less than 50 species, whereas the Gulf of Guinea lies at the heart of the Afrotropics' foremost centre of odonate diversity: well over 200 species are present in the hotspot centred on the Cameroon highlands (Clausnitzer et al. 2012).

While the islands have been poorly researched, their low species numbers can probably not be ascribed only to that. The wet climate with often rainy and cloudy weather may certainly impede the activity of adult odonates and indeed of odonatologists: Pinhey (1974) found that the hot humidity made it "almost unbearable in April to scramble up the mountain after about 9 a.m." However, most widespread species are conspicuous provided it is warm enough. Sampling of five permanent forest streams in the south of São Tomé by the second author in September 2020, moreover, produced larvae of Ephemeroptera and Trichoptera, but no Odonata (Fig. 14.2) suggesting very low densities.

Perhaps the impoverishment on the islands in the Gulf of Guinea can be attributed to the same factors as the diversity on the continent around it. Odonate diversity and endemism is greatest at streams and other permanent waters, especially in areas with forest and varied relief such as in Lower Guinea (Clausnitzer et al. 2012). This is because species in stable habitats do not have to be good dispersers and can thus more easily become isolated and highly adapted to their specific environment. Species in seasonal habitats, by contrast, must be relatively tolerant and dispersive to survive (Dijkstra et al. 2014).

While very few of over 200 species found across from São Tomé, Príncipe, and Annobón may be capable of crossing over and colonising the islands, all of the less than 50 across from Socotra have to be. *Orthetrum africanum* (Selys, 1887), *Rhyothemis notata* (Fabricius, 1787), and *Gynacantha cylindrata/vesiculata* (see above) are the only species on São Tomé and Príncipe that are confined to Africa's wetter and more forested west and centre, but favour rather open or temporary habitats and thus occur widely across equatorial Africa. *Agriocnemis zerafica* Le Roi, 1915 has a similar but more northerly range, being common at seasonal habitats across the Sahel but patchy in the rainforest to the south.

The islands' only endemic fits the same pattern as those three species: the ancestors of the *basitincta*-group of species, to which *T. nigra* belongs, were inferred to prefer open standing water (Damm et al. 2010). The group first invaded flowing waters and then those with shade. The continental sister-species of *T. nigra* take an intermediate position in this transition, favouring more open and temporary sites in forests, such as flood pools near rivers. This capacity to penetrate the rainforest matrix and adapt to peripheral habitats likely allowed for the colonisation of Príncipe. This dispersal event was estimated to have occurred less than 3 million years ago (Damm et al. 2010).

Other factors may also have contributed to the poor odonate fauna in the Gulf of Guinea, such as habitat alteration by humans or volcanism, but these would seem

unlikely to have impacted these insects specifically to the exclusion of other groups. The composition of the freshwater communities, however, may also be especially unsuited to Odonata. The second author noted unusually high densities of crustaceans and *Sicydium* gobies in his samples, likely caused by the absence of large fish predators. Although this is highly speculative, their abundance might in turn have led to rates of predation and/or competition that affect odonate larvae disproportionately.

Conclusions

We consider it unlikely (but not impossible) that prolonged fieldwork by a specialist may upend the current impression of a poor and unexceptional odonate fauna on São Tomé, Príncipe, and Annobón. Nonetheless, additional widespread Afrotropical species are expected, especially on Annobón, while the identities of the *Gynacantha* species on São Tomé and *Zygonyx* on Annobón remain to be clarified. Future work should focus on larvae, as sampling this life stage is less affected by wet weather, but also because their ecology might hold the key to the islands' impoverished fauna.

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