

Chapter 9

The Dragonflies and Damselflies of Angola: An Updated Synthesis



Jens Kipping, Viola Clausnitzer, Sara R. F. Fernandes Elizalde,
and Klaas-Douwe B. Dijkstra

Abstract Prior to 2012, only 158 species of Odonata were known from Angola. Surveys in 2012 and 2013 added 76 species and further additions in 2016 brought the national total to 236 species. This was published earlier in 2017 as the checklist of the dragonflies and damselflies (Odonata) of Angola by the same authors (Kipping et al. *Afr Invertebr* 58 (I):65–91. <https://africaninvertebrates.pensoft.net/article/11382/>, 2017) on which this chapter is based. Records obtained in 2017 and 2018 and a survey by two of the authors in December 2017 led to the discovery of 25 additional species, of which several are undescribed. We provide a revised checklist here comprising 260 species and discuss the history of research, the biogeography of the fauna with endemism and the potential for further discoveries. The national total is likely to be above 300 species. This would make Angola one of the richest countries for Odonata in Africa.

Keywords Africa · Biogeography · Checklist · Conservation · Endemism

J. Kipping (✉)
BioCart Ökologische Gutachten, Taucha/Leipzig, Germany
e-mail: biocartkippling@email.de

V. Clausnitzer
Senckenberg Museum for Natural History, Görlitz, Görlitz, Germany
e-mail: Viola.Clausnitzer@senckenberg.de

S. R. F. Fernandes Elizalde
SASSCAL – BID GBIF, Instituto de Investigação Agronómica, Huambo, Angola
e-mail: kikas.sara@gmail.com

K.-D. B. Dijkstra
Naturalis Biodiversity Center, Leiden, The Netherlands
e-mail: kd.dijkstra@naturalis.nl

Introduction

Given the country's size, diverse landscapes, climatic regimes and habitats Angola is likely to be one of the richest in Odonata species in Africa. However, Angola's biodiversity is very poorly known, with comparatively limited research before independence in 1975 halting altogether in the three decades of civil war and unrest that followed. Research coverage is also limited for Odonata, with much of the north and east never surveyed at all (Clausnitzer et al. 2012). The potentially very species-rich highland catchments of the Congo, Cuanza, Cubango (Okavango) and Zambezi rivers are almost unknown and may hold many undescribed species. The whole Angolan part of the extensively marshy Cuando River and almost the entire Cuito River system are also largely unsurveyed.

History of Odonata Research in Angola

Research on Odonata began in July 1928, when the Swiss zoologist Albert Monard embarked on the first of his two expeditions to Angola, which lasted until February 1929. Monard was a curator at the Natural Museum of La-Chaux-de-Fonds in Switzerland with a broad interest in nature who mainly collected vertebrates and plants. Ris (1931) identified 27 and described four species from Monard's first expedition.

With the death of Ris, Monard submitted the Odonata from his second expedition (April 1932 to October 1933) to Cynthia Longfield at the British Museum (now the Natural History Museum) in London, who had published several records obtained by Karl Jordan from Mount Moco in 1934 (Longfield 1936). Longfield (1947) identified 77 species from Monard's new material and described 13 new species and two new genera. She also dealt with the Odonata held at the Dundo Museum in northern Angola, first revising the genus *Orthetrum* based on the long series available (Longfield 1955) and later listing 61 species from the collection, including three new species (Longfield 1959).

Elliott CG Pinhey (1961a, b) described five new species of Gomphidae from northern Angola received from António de Barros Machado of the Dundo Museum. While Longfield (1959) stated that the Dundo collection "shows the usual scarcity of the genera Gomphidae", Pinhey (1961a) noted it "was particularly notable for the number of Gomphids." Possibly Machado split the material between the two authors. It is uncertain whether the material was collected in Dundo or only held there, as most records lack details on collector, date and precise locality. However, Pinhey (1961b) did detail collecting in localities around Dundo, suggesting that all material came from this part of Lunda-Norte Province. The collector was probably Machado himself. No-one has worked on this collection since and its state is thus unknown.

Elliot Pinhey was curator at the National Museum of Zimbabwe from 1955 until 1975 and while he collected intensively in adjacent countries, he only visited Angola twice (Vick et al. 2001). In April and May 1963 Pinhey participated in an expedition to northwestern Zambia, also visiting an area east of Caianda and the Lutchigena River in Angola directly adjacent to the Ikelenge Pedicle of Zambia, where he recorded 26 species (Pinhey 1964, 1974, 1984). His second excursion into Angola went to an area between Luanda and the Duque de Bragança Falls on the Lucala River (now known as Calandula Falls) in October 1964 with records of 32 species (Pinhey 1965).

Pinhey further treated the material of three collectors, describing a species in honour of each of them. Edward S Ross of the California Academy of Sciences collected between Cuchi and Dondo in 1957 and 1958 (Pinhey 1966), the American expert of mammal behaviour Richard Estes in central Angola in 1970 (Pinhey 1971a), and Ivan Bampton around the Serra da Chela and Tundavala in 1973 (Pinhey 1975). In the 1975 paper he also repeated records from Pinhey (1964, 1965) and Longfield (1947), and provided a gazetteer, causing confusion about the precise locality of some sites. The correct historic collecting sites could be verified with the gazetteer of Mendes et al. (2013).

Various collectors gathered about 1000 specimens in the collection of the *Instituto de Investigação Agronómica* in Huambo between 1950 and 1974. These records were never published but this will be done shortly by Sara F Elizalde and David Elizalde as a GBIF dataset.

After Angola’s independence in 1975 there was a long break in field research, with only a few records by various collectors. Namely in the two decades between 1980 and 2000 not a single record of Odonata is available. Some years after the end of the civil war a renaissance of research began, resulting in a growing number of records (Fig. 9.1). All localities with available Odonata records distinguished in the three periods (a) pre-independence 1928–1974, (b) after independence 1975–2001 and (c) after the end of civil war 2002–today are shown in Fig. 9.2.

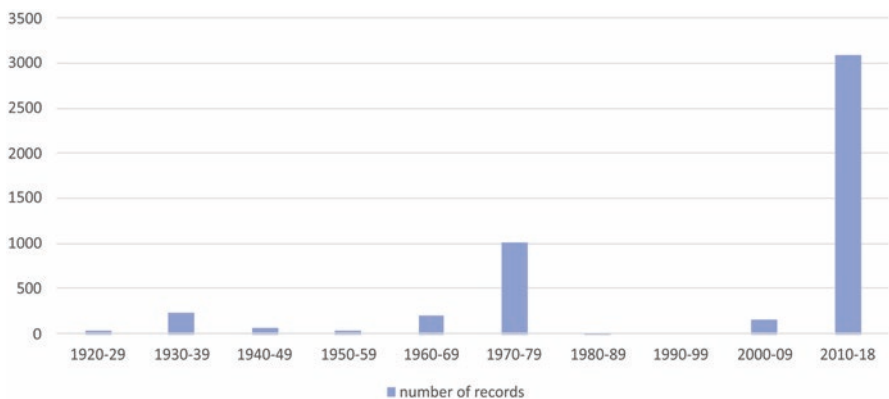


Fig. 9.1 Number of Odonata records from Angola over past decades

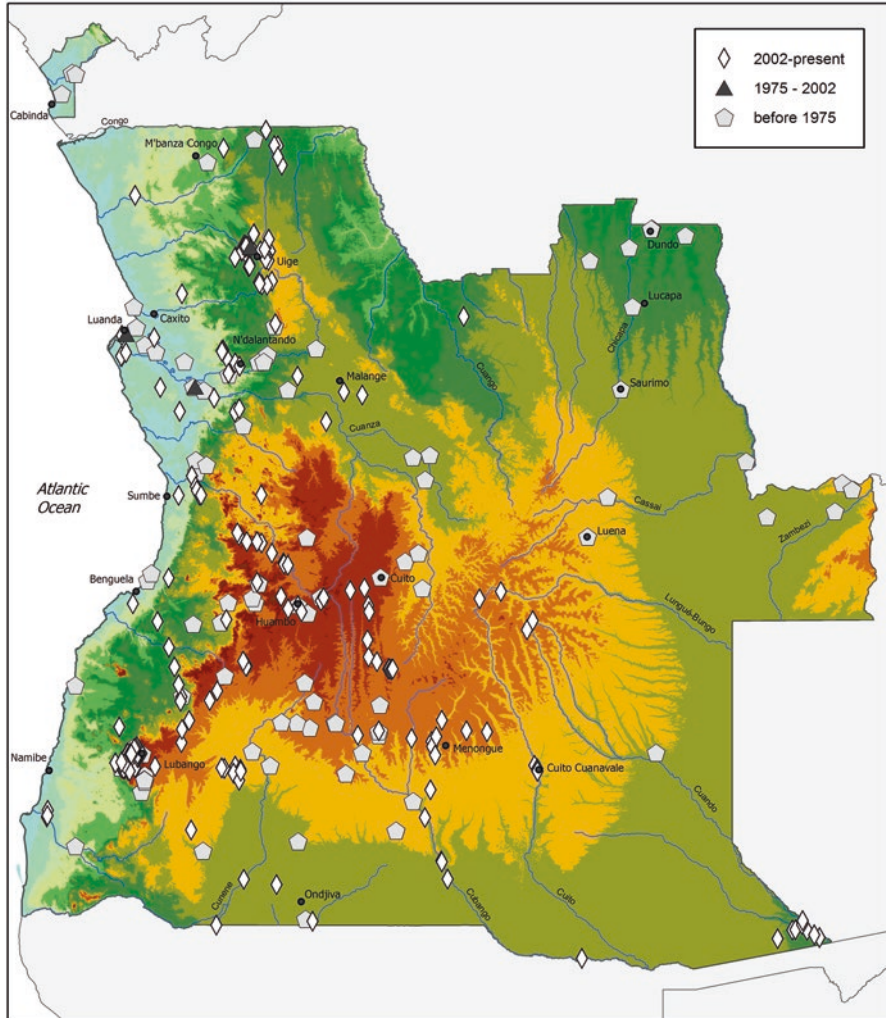


Fig. 9.2 Records of Odonata from Angola before 1975, before 2002 and up to 2018

Origin of Recent Data

In January 2009, an expedition led by Brian Huntley visited the Serra da Chela in southwestern Angola and the Namib Desert to the south. During that survey Warwick Tarboton collected and photographed Odonata around Humpata (7 field days).

Jens Kipping surveyed the upper catchment of the Okavango (Cubango) River on the SAREP (Southern African Regional Environmental Program) Expedition from 5 to 22 May 2012 (18 field days). A second SAREP survey visited southeastern Angola with the Cubango and Cuando River floodplains in April 2013.

Viola Clausnitzer and K-D B Dijkstra in collaboration with the Universidade Kimpa Vita (Uíge) and the Technical University of Dresden (Germany) surveyed around Uíge, Negage and Ndalatando in northern Angola in the wet season from 13 November to 1 December 2012 (19 days). Dijkstra revisited this area in the dry season, from 26 September to 5 October 2013 (10 days).

From 27 November to 10 December 2016 (14 field days), Manfred Haacks and colleagues of SASSCAL (Southern African Science Service Centre for Climate Change and Adaptive Land Management) visited Bicuar NP and a few other places in southern Angola.

Sara F Elizalde and David Elizalde, Chris Hines, André Günther, Raik Moritz and Jens Kipping surveyed the Serra da Chela around Lubango and the mountain range stretching from Huambo northwards to Gabela from 30 November to 19 December 2017 (20 field days).

Sara F Elizalde, Chris Hines, Rogério Ferreira and other experts provided many photographic records from 2016 to 2018.

The National Geographic Okavango Wilderness Project (NGOWP 2018) gathered scattered data on Odonata which has not yet been fully considered, except for some field photographs and exceptional records provided by John Mendelsohn.

Apart from the field surveys the authors also examined the Angolan collections and type material in the Natural History Museum in London, the National History Museum of Zimbabwe in Bulawayo (Dijkstra 2007a, b), the Royal Museum for Central Africa in Tervuren, Belgium and the *Instituto de Investigação Agronómica* in Huambo, Angola. All records are kept in the Odonata Database of Africa – ODA (Kipping et al. 2009) and mapped per species on African Dragonflies and Damselflies Online – ADDO (visit <http://addo.adu.org.za/> also for further information about all mentioned species).

Odonata Species Recorded in Angola

From all the historic sources mentioned above, 152 species of Odonata were known to occur in Angola until 2009. Some of the formerly published species had to be deleted from the country list in the light of new taxonomic knowledge and after careful validation of all records (see Kipping et al. 2017).

In 2009 Warwick Tarboton recorded 47 species of Odonata at the Serra da Chela of which five were recorded in Angola for the first time and one was new to science (Tarboton 2009, Dijkstra et al. 2015). The first SAREP Expedition in 2012 yielded 87 species, 17 of them new to the country list and two new to science (Kipping 2012, Dijkstra et al. 2015). One additional species new for the country came from a second SAREP Expedition in April 2013 of which all collected specimens were examined. The first expedition to Uíge, Negage and Ndalatando resulted in 138 species, of which 43 were recorded for the first time in Angola and five were new to science. The second visit produced 86 species, adding another 15 to the national list. With the surveys from 2009 to 2013 and a careful review of the historic data, the

known odonate fauna of Angola had increased from 152 species in the year 2009 to 234 species in 2013: an increase of about one-third with only 54 days in the field. Two species were added in 2016 by photographs made by Chris Hines and specimens from the collection of the *Instituto de Investigação Agronómica* in Huambo provided by Sara F Elizalde. The state of knowledge at the end of 2016 was published as the checklist of the dragonflies and damselflies of Angola by Kipping et al. in early 2017 (free download: <https://africaninvertebrates.pensoft.net/article/11382/>).

The SASSCAL expedition in November–December 2016 recorded 44 species, amongst them one new species for Angola. The latest survey in December 2017 yielded 88 species of which 10 were new for the country list, amongst them probably three species new to science. A further 14 species new for Angola were recorded only in 2017 and early 2018 by Chris Hines and colleagues mostly in northern Angola.

The updated checklist of the Odonata of Angola, now of 260 species, is provided in [Appendix 1](#). The ODA database now holds about 4900 Angolan records from more than 400 localities. All species of [Appendix 1](#) are reliably recorded from Angolan territory. Footnotes will give further information about the 25 additional species to the updated country list and one species that was deleted from it.

There are 15 more species listed in [Appendix 2](#) that are known to occur at rivers bordering the country with Namibia and Zambia. The Namibian bank of the Okavango River is very well surveyed (Suhling and Martens 2007, 2014) and most of the mentioned species derive from this river. These species were technically not found on the Angolan riverbank and therefore not included in the checklist. But naturally they belong to the country's fauna.

Composition

Angola's rich dragonfly fauna expresses its geographic position, size and diversity. Its territory, especially in the north, falls within a region with an estimated highly diverse fauna (Fig. 9.3). Dijkstra et al. (2011) observed that roughly half of tropical African species occur predominantly within the extensive lowland forests of western and central Africa, a quarter is associated with the eastern and southern part dominated by highlands, while the remaining quarter occurs in open habitats throughout much of the Afrotropics. Indeed, about half of Angola's species are widespread across the continent and its exceptional diversity can be attributed to two major sources. Almost 30% are confined to forest habitats in the north, mostly below 1000 m altitude. Nine species confined to the Lower Guinea, the forest area that stretches between the Congo Basin and Atlantic Ocean from Cameroon to Gabon and western Congo, reaching their southern limit in northwestern Angola. Nearly 20% favour the swamps, grasslands, miombo woodlands and gallery forests that stretch eastwards, mostly above 1000 m asl. This fauna is concentrated in Katanga and northern Zambia but has now been proven to extend across to the

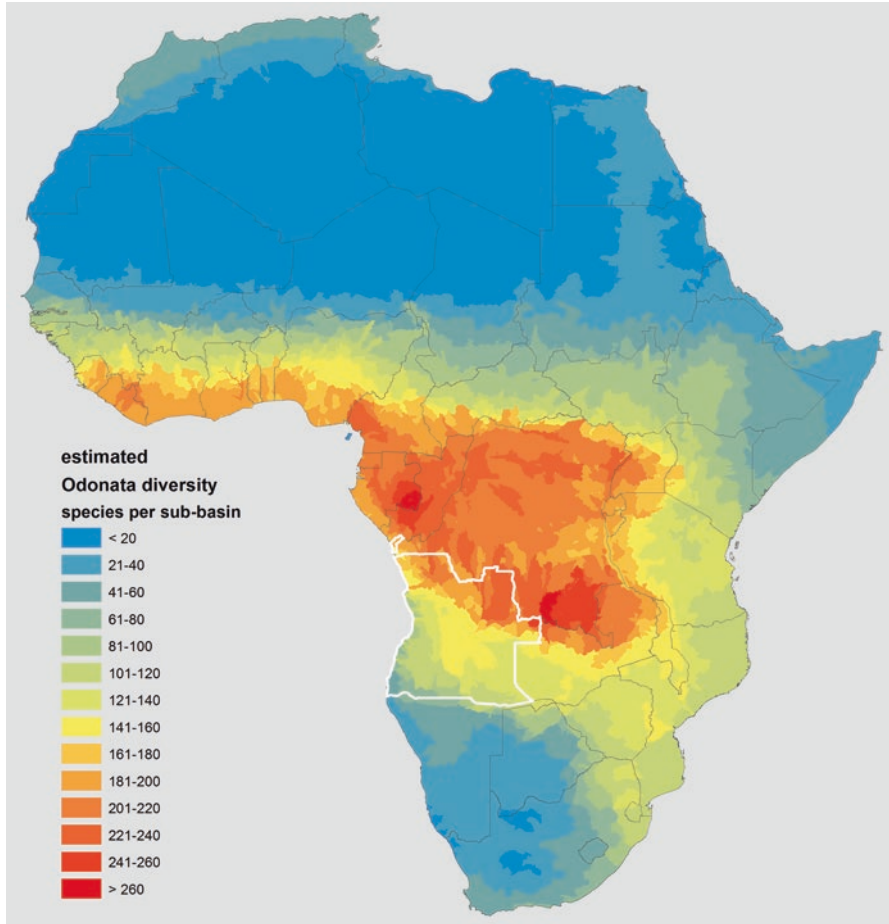


Fig. 9.3 Spatial estimation of Odonata diversity in continental Africa, based on the summation of the inferred ranges of all 770 species known; mapped as the number of species per Hydro1K basin. (Adapted from Clausnitzer et al. 2012). Angola is outlined in white

Angolan upland. This was confirmed by the discovery of *Orthetrum kafwi* at two localities in Cuanza-Sul in December 2017. The species was until then only known from Upemba NP in southern DRC. A number of palustrine species, e.g. *Anax bangweuluensis*, *Pinheyagrion angolicum*, *Pseudagrion deningi* and *P. rufostigma*, prefer larger marsh areas and swamps as in the Okavango Delta of Botswana (see Kipping 2010) and spreading north into Bié highlands with the headwaters of that river system. The discovery of *Trithemis integra* near Uíge is also of special interest, as it had seemed to be endemic to the Albertine Rift, being known previously only from western Tanzania and Uganda and eastern DRC.

Endemism

Seventeen valid species and several recently discovered undescribed species have so far only been found in Angola (Figs. 10.4, 10.5 and 10.6 for examples). With the exception of two known only from their alleged type localities in far northeastern Angola, all are limited to the central plateau: the type locality for *Platycypha rubriventris* is questionable as it may be that of *Pseudagrion dundoense*, which could also be a river species from the very poorly sampled southern Congo Basin. No endemics have been found below 1200 m asl in the east, although some drop down to about 500 m west of the escarpment. While the proportion of endemics (7%) is lower than for Ethiopia (12 endemics; 11%) and South Africa (30 endemics; 18%), countries that also enclose distinct highland areas, this still ranks Angola as one of Africa's greatest centres of endemism for Odonata, rivalling the highlands of Cameroon (13 endemics) and the Albertine Rift, Eastern Arc and Katanga. Moreover, the number is expected to increase, as almost two-fifths were described since exploration was reinitiated and undescribed species of *Platycypha*, *Paragomphus* and *Tetrathemis* are already known to us.

Only *Platycypha* presents an endemic radiation. While *Chlorocypha* (the family's other large Afrotropical genus) has diversified with almost 30 species largely in the forested lowlands of west and central Africa, *Platycypha* is ecologically more diverse, with species adapted to open, submontane and lake habitats as well. The Angolan endemics are found mainly between 1300 and 1800 m altitude in open habitats. The widespread *P. angolensis* replaces the common *P. caligata*, which extends from South Africa to Ethiopia but only peripherally into Angola. *Platycypha bamptoni* is probably confined to Serra da Chela; a similar undescribed species appears more widespread. *Platycypha crocea* is typical of very small streams in the Bié highlands and escarpment mountains whereas the other two inhabit larger streams and rivers. A local radiation of a group that has otherwise diversified in the highlands to the east, and forests to the north, fits the overall affinities of Angola's endemic Odonata both geographically and ecologically (Kipping et al. 2017) (Fig. 9.4).

The four endemic *Pseudagrion* species have separate origins but similar links: the nearest relatives of *P. angolense* and *P. estesi* appear to be the rainforest species *P. grilloti* Legrand, 1987 and *P. kibalense* respectively. The former is limited to Congo and Gabon, but the latter extends to Cameroon and Uganda. *P. sarepi* is closely related to *P. fisheri* and *P. greeni*, both of which extend from Angola into Zambia. While these species belong to the genus's A-group, the B-group species *P. dundoense* is known only from Dundo and may not be endemic at all (see above).

Notogomphus kimpavita is the sister-species of *N. praetorius* found in highlands across southern Africa (including Angola), while *Eleuthemis eogaster* is nearest to an unnamed species from Gabon (Dijkstra et al. 2015).

Molecular data for *Umma femina* and *Onychogomphus rossii* are not available yet. By its unusual habitus and colouration *Umma femina* (see Fig. 9.5) is a very distinct member of the genus. It is definitely the odonate flagship species of the



Fig. 9.4 Photographs of some of Angola’s (near) endemic dragonflies and damselflies. (a) Sarep Sprite (*Pseudagrion sarepi*), (b) Blue Wisp (*Agriocnemis angolensis*) that just extends into Namibia and Zambia, (c) Angola Claspertail (*Onychogomphus rossii*), (d) Angola Longleg (*Notogomphus kimpavita*), (e) Sunrise Firebelly (*Eleuthemis eogaster*), (f) Angola Micmac (*Micromacromia flava*). (All males, photographs a–d by J Kipping, e–f by K-DB Dijkstra)

Angolan highlands and probably also most threatened. The morphology of *O. rossii* is close to other pale *Onychogomphus* species from the open plateaus stretching from Angola to Zambia and Katanga.

Thus, like the majority of Angola’s Odonata, most endemics probably originated quite recently and proximally from the forests to the north and open habitats to the east. However, some affinities are unresolved and potentially more distant: *Agriocnemis toto* and especially *A. canuango* have no obvious close relatives (Dijkstra et al. 2015), while the near-endemic *A. angolensis* and *A. bumhilli* are probably related to each other but even more distinct overall (Kipping et al. 2017).



Fig. 9.5 Photographs of some of Angola's endemic damselflies. (a) Angola Blue Jewel (*Platycypha crocea*), (b) Highland Blue Jewel (*Platycypha bamptoni*), (c) undescribed Blue Jewel (*Platycypha* sp. nov.), (d) Angola Dancing Jewel (*Platycypha angolensis*), (e) Angola Sparklewing (*Umma femina*), (f) Stout Threadtail (*Elatoneura tarbotonorum*), (g) Angola Sprite (*Pseudagrion angolense*), (h) Estes's Sprite (*Pseudagrion estesi*). (All males, photographs by J Kipping)

These data suggest that Angola may be the centre of diversification of this genus, which includes Africa's smallest damselflies. The morphologically very distinct *Aciagrion rarum* is only known from very few specimens from Lunda Sul Province in the northeast and molecular data is not available yet.

Micromacromia flava is morphologically nearest *M. miraculosa* (Förster 1906), known only from the East Usambara Mountains of north-eastern Tanzania and the only one of four *Micromacromia* species adapted to non-forest habitats, being strongly pruinose with maturity. *Elatoneura tarbotonorum* may be closest to *E. frenulata* of southwestern South Africa (Dijkstra et al. 2015): after its discovery at the Serra da Chela in 2009 it was found more widespread in December 2017 along the mountain range stretching north into Cuanza-Sul.

Potential for Discovery

If we compare the tallies for the well-studied neighbouring countries of Zambia and Namibia, the total number of species in Angola should lie somewhat above 300, meaning that less than 80% of the fauna is currently known. All Odonata expeditions in modern times surveyed areas that are easily accessible.

Additions can be expected throughout the country, but especially in the remote regions on the eastern and particularly northern border, as species diversity is expected to be extraordinarily high in the transition to the Congolian rainforest (Fig. 9.3). The province of Lunda-Norte with only 92 recorded species and 162 records should be the richest area for discovery, around Dundo where exploration began in the 1950s. Generally, all the northern and eastern provinces are largely unsurveyed and the discrepancy between the amount of available data, the number of known species and the expected diversity is extremely high. This applies also to the provinces of Lunda-Sul (10 species, 11 records), Zaire (17 species, 21 records), Malanje (35 species, 152 records) and Moxico (46 species, 51 records). An exception is Uíge where recent surveys increased the number of known species to 145 from 820 records gathered.

The central highlands can also yield more surprises, like the discovery of additional endemic species, with three areas being especially notable. Firstly, despite having most records, the north-south directed mountain range that lies entirely above 1600 m asl and includes the Serra do Chilengue, Serra da Chela and Angola's highest peak at Mount Moco (2620 m asl) is poorly sampled as the large gaps in Fig. 9.2 illustrates.

Secondly, except for its extreme northern and southern ends, the western escarpment has only been surveyed recently, which already led to the discovery of an undescribed *Paragomphus* species from Cumbira Forest. Even more easily accessible provinces such as Bengo and Cuanza-Sul will prove to be much richer in species than currently known. The potential of these mountains is illustrated by the discovery of a spectacular and unique but unknown species by Chris Hines and Rogério Ferreira in May 2018 (Fig. 9.6). Two males at a stream that flows off the



Fig. 9.6 An undescribed species that probably belongs to *Trithemis*, although the extensive markings and dense veins in the wings are unusual even for that highly diverse genus. Two males were observed at a stream running off Namba Mountains in Cuanza-Sul. (Photograph by R Ferreira)

Namba Mountains in Cuanza-Sul were photographed but not collected. These mountains reach over 2000 m in altitude and harbour larger pockets of Afrotropical forest than Mt. Moco (Mills et al. 2013). They are known for their plant endemism and fieldwork there will definitely lead to the discovery of more endemic Odonata.

Thirdly, an extensive plateau at 1200–1600 m altitude stretches east from the Bié Highlands. Except for its southern edge, this area shared between Bié and Moxico Provinces, which is almost as large as Uganda (or the United Kingdom), has almost no records. A few collections from the NGS Okavango Wilderness Project suggest that more new species for the country and for science can be expected here. These deep Kalahari sands are the ‘watertower’ of Angola and its neighbours, incorporating the headwaters of the Cuito, Cuando, Chicapa, Cuango, Cuanza and large tributaries of the Congo and Zambezi such as the Cassai and Lungué-Bungo. The sources of the vast catchments of the Congo, Cuanza, Okavango and Zambezi meet in a small area between Munhango and Cangonga. Watersheds are prone to endemism (Dijkstra et al. 2011) and this region is the top priority for further research.

Studying insect collections of Angola’s museums will be also a valuable source of more records and possibly even to get insight into past conditions in the light of the recent landscape change. Of special interest is the Dundo Museum that holds many interesting specimens of Odonata, some of which have been published. This remarkable collection has not been studied since independence but survived the civil war. There is also material dispersed over several museums in Europe and probably also in private collections, mainly in Portugal.

New species are most likely to be found among genera prone to narrow (highland) ranges, i.e. with known Angolan endemics like *Platycypha* and *Pseudagrion*, but also *Agriocnemis*, *Elatoneura*, *Notogomphus* and *Paragomphus*. Also possible

is the discovery of endemics in genera that are well represented across the country and continent, and that have highland endemics elsewhere but not in Angola, such as *Africallagma*, *Neodythemis* and *Orthetrum*. However, given the biogeographic diversity of Angola's fauna and endemics, we could expect greater surprises. Among forest genera with no known Angolan endemic, *Allocnemis* seems most likely to reveal one, e.g. on the escarpment. The presence (or local endemism) of distinctly Lower Guinean genera like *Neurolestes*, *Africocypha*, *Pentaphlebia* and *Stenocnemis* seems less likely, but the Lower Guinean *Stenocypha gracilis* (Karsch 1899) has four endemic relatives in the Albertine Rift and the sister-taxon of the Upper and Lower Guinean *Tragomphus* is *Nepogomphoides stuhlmanni* (Karsch 1899) in the Eastern Arc, suggesting an Angolan taxon is possible.

Some typical African highland genera are notably absent from Angola. *Atoconeura* is most likely to be present above 1400 m asl, being found in Zambia, Katanga, the Lower Guinea and Albertine Rift. However, its absence also from South Africa suggests historical factors may have been limiting, e.g. that the highlands were too harsh in cooler periods and too isolated when habitats were suitable (Dijkstra 2006).

This might not apply to *Proischnura*, present in South Africa as well as Cameroon and the Albertine Rift. However, that genus is absent from Katanga and northern Zambia, which lies lower and thus possibly provided no stepping-stone to the mountains of Angola. Kipping et al. (2017) also noted the absence of *Zosteraeschna* and *Pinheyschna*, which have a similar range (although the latter does occur in Katanga and northern Zambia), but isolated populations of *Z. minuscula* (McLachlan 1895) and *P. subpupillata* (McLachlan 1896) were discovered in the Serra da Chela in southern Angola in December 2017.

Conservation

Our findings show that Angola's wealth of aquatic habitats harbours a rich freshwater fauna. Although large areas are relatively untouched, Angola's rapid economic and population growth will have a tremendous impact on the environment and thus human well-being in the future. In the light of this, Angola's development should consider (1) the establishment of sewage works in cities and larger villages; (2) a stop to deforestation, especially along stream courses; (3) restoration of deforested water catchments; (4) village-level awareness campaigns for sustainable use of freshwater sources, e.g. no detergents and waste dumping in rivers; (5) biodiversity surveys and monitoring to feed into a national conservation plan.

With the exception of four species, all endemics are currently considered Data Deficient for the IUCN Red List of Threatened Species. *Platycypha angolensis*, *Pseudagrion angolense* and *Micromacromia flava* are Near Threatened because, while they seem fairly widespread, their dependence on relatively natural habitats may put them at risk as human development progresses. Only *Umma femina* is now listed as threatened. It is currently known from only a few sites in the fairly densely

populated highlands around Lubango and seems to inhabit exclusively the smaller and cooler highland streams. There is much development in this densely settled region and increasing pressure on those habitats by grazing, deforestation and urbanisation. As it seems to prefer cool mountain streams we can assume additional risks from climate change and it is therefore thought to be Vulnerable to extinction. More research on all endemic species' statuses and ecology is urgently required.

Angola has an exceptional fauna of dragonflies and damselflies, as well as many valuable rivers and wetlands. Odonata are excellent indicators of the health and biodiversity of both the freshwater and terrestrial realm. As the biological survey of Angola advances, they should be a priority taxon.

Acknowledgements We are grateful to Her Excellency Madame Minister of Environment Dr. Paula C Francisco Coelho (MINAMB) for making the SAREP survey in southern Angola possible, to Dr. Chris Brooks of SAREP for the preparation and organization of the 2012 survey, to Marta Alexandre Zumbo (MINAMB), Maria Helena Loa (MINAMB), Julius Bravo (MINAMB), Francisco de Almeida (INIP), Manuel Domingos (INIP) and Gabriel Cabinda (Agriculture and Rural Development and Fisheries) for their help in organization and management on the 2012 tour, and to Vince Shacks and Werner Conradie for collecting specimens on the second SAREP survey in 2013. We thank Alvaro Bruno Toto Nianguesso, the driving force behind biodiversity research in Uíge Province, Angola, Prof Dr. Neinhuis and Dr. Thea Lautenschlaeger from TU Dresden for inviting us to the field survey in Uíge province. Part of the fieldwork in Angola was supported by a travel fund from the German Academic Exchange Service (DAAD). We thank Dr. Aristófanes Pontes, director of the *Instituto Nacional da Biodiversidade e Áreas de Conservação* (INBAC) for the support during the December 2017 expedition, by providing the necessary permits. Chris Hines provided many valuable photographic records. Further records were provided by Warwick Tarboton, Dr. Manfred Haacks (SASSCAL), John Mendelsohn (RAISON) and Rogério Ferreira. The latter also gave permission to use his wonderful photograph.

Appendices

Appendix 1

Checklist of Odonata recorded from Angola.

– see Taxonomic comments in Kipping et al. (2017); ## – see footnotes following this table;

(V) Validation of species: “1!” new national record made by the authors; “1!!” new national record made by the authors and addendum to Kipping et al. (2017); “1” records obtained by authors and confirming existing records; “2” specimens kept in collections (identification confirmed or primary types); “3” literature records, regarded as reliable because specimens were described well or location agrees with known biogeographic pattern; “4!!” new national record made by other persons and addendum to Kipping et al. (2017); ** – range restricted to Angola; * – range restricted to Angola with very few exceptions (see Endemism in the discussion).

(RL) Global conservation status according to the IUCN Red List of Threatened Species (2016): CR (Critically Endangered), DD (Data-Deficient), EN (Endangered), NT (Near-Threatened), VU (Vulnerable), LC (Least Concern), NE (Not Evaluated)

| Scientific name | English name | V | RL |
|---|----------------------------|-------|----|
| Lestidae | | | |
| <i>Lestes amicus</i> (Martin, 1910) | Yellow-winged Spreadwing | 1 | LC |
| <i>Lestes dissimulans</i> (Fraser, 1955) | Cryptic Spreadwing | 1 | LC |
| <i>Lestes pallidus</i> (Rambur, 1842) | Pallid Spreadwing | 1 | LC |
| <i>Lestes pinheyi</i> (Fraser, 1955) | Pinhey's Spreadwing | 1 | LC |
| <i>Lestes plagiatus</i> (Burmeister, 1839) | Highland Spreadwing | 1 | LC |
| <i>Lestes tridens</i> (McLachlan, 1895) | Spotted Spreadwing | 1 | LC |
| <i>Lestes virgatus</i> (Burmeister, 1839) | Smoky Spreadwing | 3 | LC |
| Calopterygidae | | | |
| <i>Phaon camerunensis</i> (Sjöstedt, 1900) | Emerald Demoiselle | 1! | LC |
| <i>Phaon iridipennis</i> (Burmeister, 1839) | Glistening Demoiselle | 1 | LC |
| <i>Sapho orichalcea</i> (McLachlan, 1869) [#] | Mountain Bluewing | 1! | LC |
| <i>Umma electa</i> (Longfield, 1933) | Metallic Sparklewing | 1 | LC |
| <i>Umma femina</i> (Longfield, 1947) | Angola Sparklewing | 1** | VU |
| <i>Umma longistigma</i> (Selys, 1869) | Bare-bellied Sparklewing | 1 | LC |
| <i>Umma mesostigma</i> (Selys, 1879) | Hairy-bellied Sparklewing | 1! | LC |
| Chlorocyphidae | | | |
| <i>Chlorocypha aphrodite</i> (Le Roi, 1915) ^{##} | Blue Jewel | 4!! | LC |
| <i>Chlorocypha cancellata</i> (Selys, 1879) | Exquisite Jewel | 1! | LC |
| <i>Chlorocypha curta</i> (Hagen in Selys, 1853) | Blue-tipped Jewel | 1! | LC |
| <i>Chlorocypha cyanifrons</i> (Selys, 1873) | Blue-fronted Jewel | 1! | LC |
| <i>Chlorocypha fabamacula</i> (Pinhey, 1961) | Spotted Jewel | 1 | LC |
| <i>Chlorocypha victoriae</i> (Förster, 1914) | Victoria's Jewel | 1 | LC |
| <i>Platycypha angolensis</i> (Longfield, 1959) | Angola Dancing Jewel | 1** | NT |
| <i>Platycypha bamptoni</i> (Pinhey, 1975) [#] | Highland Blue Jewel | 1** | NE |
| <i>Platycypha</i> cf. <i>bamptoni</i> (Pinhey, 1975) [#] | (near Highland Blue Jewel) | 1!*** | NE |
| <i>Platycypha caligata</i> (Selys, 1853) [#] | Common Dancing Jewel | 2 | LC |
| <i>Platycypha crocea</i> (Longfield, 1947) [#] | Angola Blue Jewel | 1** | LC |
| <i>Platycypha rubriventris</i> (Pinhey, 1975) [#] | Red-bellied Blue Jewel | 2** | DD |
| <i>Platycypha rufitibia</i> (Pinhey, 1961) | Beautiful Jewel | 1 | LC |
| Platycnemididae | | | |
| <i>Allocnemis nigripes</i> (Selys, 1886) | Rainbow Yellowwing | 1 | LC |
| <i>Allocnemis pauli</i> (Longfield, 1936) | Orange-tipped Yellowwing | 1! | LC |
| <i>Copera congolensis</i> (Martin, 1908) | Congo Featherleg | 1! | LC |
| <i>Elatoneura acuta</i> (Kimmins, 1938) | Red Threadtail | 1! | LC |
| <i>Elatoneura cellularis</i> (Grünberg, 1902) [#] | Zambezi Threadtail | 3 | LC |
| <i>Elatoneura</i> cf. <i>glauca</i> (Selys, 1860) [#] | (near Common Threadtail) | 1 | LC |
| <i>Elatoneura lliba</i> (Legrand, 1985) | Eastern Stream Threadtail | 1! | LC |
| <i>Elatoneura tarbotonorum</i> (Dijkstra, 2015) [#] | Stout Threadtail | 1** | DD |
| <i>Mesocnemis singularis</i> (Karsch, 1891) ^{##} | Common Riverjack | 1!! | LC |
| <i>Mesocnemis</i> cf. <i>singularis</i> (Karsch, 1891) [#] | (near Common Riverjack) | 1! | NE |
| Coenagrionidae | | | |
| <i>Aciagrion africanum</i> (Martin, 1908) | Blue Slim | 1 | LC |
| <i>Aciagrion macrootithenae</i> (Pinhey, 1972) | Awl-tipped Slim | 3 | DD |

(continued)

| Scientific name | English name | V | RL |
|--|----------------------------|-------|----|
| <i>Aciagrion nodosum</i> (Pinhey, 1964) | Cryptic Slim | 1! | LC |
| <i>Aciagrion rarum</i> (Longfield, 1947) | Tiny Slim | 2** | DD |
| <i>Aciagrion steeleae</i> (Kimmins, 1955) | Swamp Slim | 3 | LC |
| <i>Aciagrion zambiense</i> (Pinhey, 1972) | Zambia Slim | 3 | DD |
| <i>Africallagma fractum</i> (Ris, 1921) | Slender Bluet | 1 | LC |
| <i>Africallagma glaucum</i> (Burmeister, 1839) | Swamp Bluet | 1 | LC |
| <i>Africallagma sinuatum</i> (Ris, 1921) ^{##} | Peak Bluet | 4!! | LC |
| <i>Africallagma subtile</i> (Ris, 1921) ^{##} | Fragile Bluet | 1!! | LC |
| <i>Africallagma vaginale</i> (Sjöstedt, 1917) | Forest Bluet | 1! | LC |
| <i>Agriocnemis angolensis</i> (Longfield, 1947) | Blue Wisp | 1* | LC |
| <i>Agriocnemis bumhilli</i> (Kipping, Suhling & Martens, 2012) | Bumhill Wisp | 1!* | LC |
| <i>Agriocnemis canuango</i> (Dijkstra, 2015) | Bog Wisp | 1!*** | DD |
| <i>Agriocnemis exilis</i> (Selys, 1872) | Little Wisp | 1 | LC |
| <i>Agriocnemis forcipata</i> (Le Roi, 1915) | Greater Pincer-tailed Wisp | 1 | LC |
| <i>Agriocnemis gratiosa</i> (Gerstäcker, 1891) ^{##} | Gracious Wisp | 4!! | LC |
| <i>Agriocnemis cf. maclachlani</i> (Selys, 1877) [#] | (near Forest Wisp) | 1! | LC |
| <i>Agriocnemis pinheyi</i> (Balinsky, 1963) ^{##} | Pinhey's Wisp | 1!! | LC |
| <i>Agriocnemis ruberrima</i> (Balinsky, 1961) | Orange Wisp | 1! | LC |
| <i>Agriocnemis toto</i> (Dijkstra, 2015) | Bruno's Wisp | 1!*** | DD |
| <i>Agriocnemis victoria</i> (Fraser, 1928) | Lesser Pincer-tailed Wisp | 1 | LC |
| <i>Azuragrion nigradorsum</i> (Selys, 1876) | Sailing Bluet | 1 | LC |
| <i>Ceriagrion annulatum</i> (Fraser, 1955) | Green-eyed Citril | 1! | LC |
| <i>Ceriagrion bakeri</i> (Fraser, 1941) | Blue-fronted Citril | 3 | LC |
| <i>Ceriagrion corallinum</i> (Campion, 1914) | Green-fronted Citril | 1 | LC |
| <i>Ceriagrion glabrum</i> (Burmeister, 1839) | Common Citril | 1 | LC |
| <i>Ceriagrion junceum</i> (Dijkstra & Kipping, 2015) | Spikerush Citril | 1! | LC |
| <i>Ceriagrion platystigma</i> (Fraser, 1941) | Variable Citril | 1 | LC |
| <i>Ceriagrion sakejii</i> (Pinhey, 1963) | Cream-sided Citril | 1! | LC |
| <i>Ceriagrion suave</i> (Ris, 1921) | Plain Citril | 1 | LC |
| <i>Ceriagrion whellani</i> (Longfield, 1952) | Yellow-faced Citril | 1! | LC |
| <i>Ischnura senegalensis</i> (Rambur, 1842) | Tropical Bluetail | 1 | LC |
| <i>Pinheyagrion angolicum</i> (Pinhey, 1966) | Pinhey's Bluet | 1 | LC |
| <i>Pseudagrion</i> (A) <i>angolense</i> (Selys, 1876) | Angola Sprite | 1** | NT |
| <i>Pseudagrion</i> (A) <i>coeruleipunctum</i> (Pinhey, 1964) | Pretty Sprite | 3 | LC |
| <i>Pseudagrion</i> (A) <i>estesi</i> (Pinhey, 1971) | Estes's Sprite | 1** | LC |
| <i>Pseudagrion</i> (A) <i>fisheri</i> (Pinhey, 1961) | Dark-tailed Sprite | 3 | LC |
| <i>Pseudagrion</i> (A) <i>greeni</i> (Pinhey, 1961) | Clasper-tailed Sprite | 1 | LC |
| <i>Pseudagrion</i> (A) <i>inconspicuum</i> (Ris, 1931) | Little Sprite | 1 | LC |
| <i>Pseudagrion</i> (A) <i>kersteni</i> (Gerstäcker, 1869) | Powder-faced Sprite | 1 | LC |
| <i>Pseudagrion</i> (A) <i>kibalense</i> (Longfield, 1959) | Forest Sprite | 1 | LC |
| <i>Pseudagrion</i> (A) <i>makabusiense</i> (Pinhey, 1950) | Green-striped Sprite | 3 | LC |
| <i>Pseudagrion</i> (A) <i>melanicterum</i> (Selys, 1876) | Farmbush Sprite | 1 | LC |
| <i>Pseudagrion</i> (A) <i>salisburyense</i> (Ris, 1921) | Slate Sprite | 1 | LC |

(continued)

| Scientific name | English name | V | RL |
|--|---------------------------|------|----|
| <i>Pseudagrion</i> (A) <i>sarepi</i> (Kipping & Dijkstra, 2015) | Sarep Sprite | 1!** | DD |
| <i>Pseudagrion</i> (A) <i>serrulatum</i> (Karsch, 1894) | Superb Sprite | 1! | LC |
| <i>Pseudagrion</i> (A) <i>simonae</i> (Legrand, 1987) | Wide-striped Sprite | 1! | LC |
| <i>Pseudagrion</i> (A) <i>simplicilaminatum</i> (Carletti & Terzani, 1997) ^{##} | Blue Slim Sprite | 4!! | LC |
| <i>Pseudagrion</i> (B) <i>acaciae</i> (Förster, 1906) | Acacia Sprite | 1 | LC |
| <i>Pseudagrion</i> (B) <i>camerunense</i> (Karsch, 1899) ^{##} | Yellow-fronted Sprite | 4!! | LC |
| <i>Pseudagrion</i> (B) <i>coeleste</i> (Longfield, 1947) | Cathead Sprite | 1 | LC |
| <i>Pseudagrion</i> (B) <i>deningi</i> (Pinhey, 1961) | Dark Sprite | 1! | LC |
| <i>Pseudagrion</i> (B) <i>dundoense</i> (Longfield, 1959) | Dundo Sprite | 2** | DD |
| <i>Pseudagrion</i> (B) <i>glaucescens</i> (Selys, 1876) | Blue-green Sprite | 1 | LC |
| <i>Pseudagrion</i> (B) <i>hamoni</i> (Fraser, 1955) | Swarthy Sprite | 1! | LC |
| <i>Pseudagrion</i> (B) <i>helenae</i> (Balinsky, 1964) | Little Blue Sprite | 1! | LC |
| <i>Pseudagrion</i> (B) <i>isidromorai</i> (Compte Sart, 1967) | Large Blue Sprite | 1! | LC |
| <i>Pseudagrion</i> (B) <i>massaicum</i> (Sjöstedt, 1909) | Masai Sprite | 1 | LC |
| <i>Pseudagrion</i> (B) <i>rufostigma</i> (Longfield, 1947) | Ruby Sprite | 1 | LC |
| <i>Pseudagrion</i> (B) <i>sjoestedti</i> (Förster, 1906) | Variable Sprite | 1 | LC |
| <i>Pseudagrion</i> (B) <i>sublacteum</i> (Karsch, 1893) | Cherry-eye Sprite | 1 | LC |
| Aeshnidae | | | |
| <i>Afroaeschna scotias</i> (Pinhey, 1952) | Shadow Hawker | 1! | LC |
| <i>Anaciaeschna triangulifera</i> (McLachlan, 1896) ^{##} | Evening Hawker | 4!! | LC |
| <i>Anax bangweuluensis</i> (Kimmins, 1955) ^{##} | Swamp Emperor | 4!! | NT |
| <i>Anax congoliath</i> (Fraser, 1953) | Dark Emperor | 1! | LC |
| <i>Anax ephippiger</i> (Burmeister, 1839) | Vagrant Emperor | 1 | LC |
| <i>Anax imperator</i> (Leach, 1815) | Blue Emperor | 1 | LC |
| <i>Anax speratus</i> (Hagen, 1867) | Eastern Orange Emperor | 1 | LC |
| <i>Anax tristis</i> (Hagen, 1867) | Black Emperor | 1 | LC |
| <i>Gynacantha</i> (A) <i>sextans</i> (McLachlan, 1896) | Dark-rayed Duskhawker | 3 | LC |
| <i>Gynacantha</i> (A) <i>vesiculata</i> (Karsch, 1891) | Lesser Girdled Duskhawker | 3 | LC |
| <i>Gynacantha</i> (B) <i>bullata</i> (Karsch, 1891) | Black-kneed Duskhawker | 1 | LC |
| <i>Gynacantha</i> (B) <i>manderica</i> (Grünberg, 1902) | Little Duskhawker | 3 | LC |
| <i>Heliaeschna cynthiae</i> (Fraser, 1939) ^{##} | Blade-tipped Duskhawker | 4!! | LC |
| <i>Heliaeschna fuliginosa</i> (Karsch, 1893) | Black-banded Duskhawker | 1 | LC |
| <i>Heliaeschna ugandica</i> (McLachlan, 1896) | Uganda Duskhawker | 3 | LC |
| <i>Pinheyschna subpupillata</i> (McLachlan, 1896) ^{##} | Stream Hawker | 1!! | LC |
| <i>Zosteraeschna minuscula</i> (McLachlan, 1895) ^{##} | Friendly Hawker | 1!! | LC |
| Gomphidae | | | |
| <i>Crenigomphus</i> cf. <i>cornutus</i> (Pinhey, 1956) [#] | (near Horned Talontail) | 1! | LC |
| <i>Diastatomma selysi</i> (Schouteden, 1934) | Common Hoetail | 3 | LC |
| <i>Diastatomma soror</i> (Schouteden, 1934) | Painted Hoetail | 3 | LC |
| <i>Gomphidia quarrei</i> (Schouteden, 1934) | Southern Fingertail | 3 | LC |
| <i>Ictinogomphus dundoensis</i> (Pinhey, 1961) | Swamp Tigertail | 1 | LC |
| <i>Ictinogomphus ferox</i> (Rambur, 1842) | Common Tigertail | 1 | LC |
| <i>Ictinogomphus regisalberti</i> (Schouteden, 1934) | Congo Tigertail | 3 | LC |

(continued)

| Scientific name | English name | V | RL |
|--|----------------------------------|------|----|
| <i>Lestinigomphus calcaratus</i> (Dijkstra, 2015) | Spurred Fairytail | 1! | LC |
| <i>Libyogomphus tenaculatus</i> (Fraser, 1926) | Large Horntail | 1! | LC |
| <i>Mastigomphus chapini</i> (Klots, 1944) [#] | Western Snorkeltail | 2 | LC |
| <i>Mastigomphus dissimilis</i> (Cammaerts, 2004) ^{##} | Southern Snorkeltail | 2 | LC |
| <i>Microgomphus</i> cf. <i>nyassicus</i> (Grünberg, 1902) [#] | (near Eastern Scissortail) | 1! | LC |
| <i>Neurogomphus alius</i> (Cammaerts, 2004) | Large Siphontail | 1! | LC |
| <i>Notogomphus kimpavita</i> (Dijkstra & Clausnitzer, 2015) | Angola Longleg | 1!** | DD |
| <i>Notogomphus praetorius</i> (Selys, 1878) | Yellowjack Longleg | 2 | LC |
| <i>Notogomphus spinosus</i> (Karsch, 1890) | Jungle Longleg | 1! | LC |
| <i>Onychogomphus rossii</i> (Pinhey, 1966) | Angola Claspertail | 1** | DD |
| <i>Onychogomphus</i> cf. <i>styx</i> (Pinhey, 1961) [#] | (near Northern Dark Claspertail) | 1! | LC |
| <i>Paragomphus abnormis</i> (Karsch, 1890) | Humdrum Hooktail | 1! | LC |
| <i>Paragomphus cognatus</i> (Rambur, 1842) | Rock Hooktail | 1!! | LC |
| <i>Paragomphus</i> cf. <i>darwalli</i> (Dijkstra, Mézière & Papazian, 2015) [#] | (near Darwall's Hooktail) | 1! | DD |
| <i>Paragomphus genei</i> (Selys, 1841) | Common Hooktail | 1 | LC |
| <i>Paragomphus machadoi</i> (Pinhey, 1961) | Forest Hooktail | 2 | LC |
| <i>Paragomphus</i> cf. <i>nigroviridis</i> (Cammaerts, 1969) [#] | (near Black-and-green Hooktail) | 1! | LC |
| <i>Paragomphus sabicus</i> (Pinhey, 1950) ^{##} | Flapper Hooktail | 1!! | LC |
| <i>Paragomphus</i> sp. nov. ^{##} | (Hooktail, undescribed species) | 1!** | NE |
| <i>Phyllogomphus annulus</i> (Klots, 1944) | Crested Leaf-tail | 1 | LC |
| <i>Phyllogomphus selysi</i> (Schouteden, 1933) | Bold Leaf-tail | 3 | LC |
| Macromiidae | | | |
| <i>Phyllomacromia aureozona</i> (Pinhey, 1966) | Golden-banded Cruiser | 1! | LC |
| <i>Phyllomacromia contumax</i> (Selys, 1879) | Two-banded Cruiser | 1! | LC |
| <i>Phyllomacromia hervei</i> (Legrand, 1980) | River Cruiser | 1! | LC |
| <i>Phyllomacromia melania</i> (Selys, 1871) | Sombre Cruiser | 1 | LC |
| <i>Phyllomacromia overlaeti</i> (Schouteden, 1934) | Clubbed Cruiser | 3 | LC |
| <i>Phyllomacromia paula</i> (Karsch, 1892) | Greater Double-spined Cruiser | 3 | LC |
| <i>Phyllomacromia picta</i> (Hagen in Selys, 1871) | Darting Cruiser | 3 | LC |
| <i>Phyllomacromia unifasciata</i> (Fraser, 1954) | Golden-eyed Cruiser | 3 | LC |
| Libellulidae | | | |
| <i>Acisoma inflatum</i> (Selys, 1882) | Stout Pintail | 1 | LC |
| <i>Acisoma trifidum</i> (Kirby, 1889) | Pied Pintail | 1 | LC |
| <i>Aethiothemis bequaerti</i> (Ris, 1919) | Skimmer-like Flasher | 1 | LC |
| <i>Aethiothemis ellioti</i> (Lieftinck, 1969) | Plump Flasher | 1! | LC |
| <i>Aethiothemis mediofasciata</i> (Ris, 1931) [#] | Orange Flasher | 2 | LC |
| <i>Aethiothemis solitaria</i> (Martin, 1908) | Pearly Flasher | 1 | LC |
| <i>Aethriamanta rezia</i> (Kirby, 1889) | Pygmy Basker | 1 | LC |
| <i>Brachythemis lacustris</i> (Kirby, 1889) | Red Groundling | 1 | LC |

(continued)

| Scientific name | English name | V | RL |
|---|----------------------------|-------|----|
| <i>Brachythemis leucosticta</i> (Burmeister, 1839) | Southern Banded Groundling | 1 | LC |
| <i>Bradinopyga strachani</i> (Kirby, 1900) ^{##} | Red Rockdweller | 1!! | LC |
| <i>Chalcostephia flavifrons</i> (Kirby, 1889) | Inspector | 1! | LC |
| <i>Crocothemis brevistigma</i> (Pinhey, 1961) | Spotted Scarlet | 1! | LC |
| <i>Crocothemis divisa</i> (Baumann, 1898) | Rock Scarlet | 1 | LC |
| <i>Crocothemis erythraea</i> (Brullé, 1832) | Broad Scarlet | 1 | LC |
| <i>Crocothemis sanguinolenta</i> (Burmeister, 1839) | Little Scarlet | 1 | LC |
| <i>Cyanothemis simpsoni</i> (Ris, 1915) | Bluebolt | 1! | LC |
| <i>Diplacodes deminuta</i> (Lieftinck, 1969) | Little Percher | 1 | LC |
| <i>Diplacodes lefebvrii</i> (Rambur, 1842) | Black Percher | 1 | LC |
| <i>Diplacodes luminans</i> (Karsch, 1893) | Barbet Percher | 1 | LC |
| <i>Diplacodes pumila</i> (Dijkstra, 2006) | Dwarf Percher | 1! | LC |
| <i>Eleuthemis eogaster</i> (Dijkstra, 2015) | Sunrise Firebelly | 1!*** | DD |
| <i>Eleuthemis libera</i> (Dijkstra & Kipping, 2015) | Free Firebelly | 1! | DD |
| <i>Hadrothemis camarensis</i> (Kirby, 1889) | Saddled Jungleskimmer | 3 | LC |
| <i>Hadrothemis coacta</i> (Karsch, 1891) | Robust Jungleskimmer | 1! | LC |
| <i>Hadrothemis defecta</i> (Karsch, 1891) | Scarlet Jungleskimmer | 3 | LC |
| <i>Hemistigma albipunctum</i> (Rambur, 1842) | African Piedspot | 1 | LC |
| <i>Malgassophlebia bispina</i> (Fraser, 1958) | Ringed Leaf-tipper | 1! | LC |
| <i>Micromacromia camerunica</i> (Karsch, 1890) | Stream Micmac | 1! | LC |
| <i>Micromacromia flava</i> (Longfield, 1947) | Angola Micmac | 1** | NT |
| <i>Neodythemis afra</i> (Ris, 1909) | Seepage Junglewatcher | 1! | LC |
| <i>Neodythemis klingi</i> (Karsch, 1890) | Stream Junglewatcher | 1! | LC |
| <i>Nesciothemis cf. farinosa</i> (Förster, 1898) [#] | (near Eastern Blacktail) | 1 | LC |
| <i>Nesciothemis fitzgeraldi</i> (Longfield, 1955) | Lesser Peppertail | 1! | LC |
| <i>Notiothemis jonesi</i> (Ris, 1919) ^{##} | Eastern Forestwatcher | 1!! | LC |
| <i>Notiothemis robertsi</i> (Fraser, 1944) | Western Forestwatcher | 1! | LC |
| <i>Olpogastra lugubris</i> (Karsch, 1895) | Bottletail | 1 | LC |
| <i>Orthetrum abbotti</i> (Calvert, 1892) | Little Skimmer | 1 | LC |
| <i>Orthetrum austeni</i> (Kirby, 1900) | Giant Skimmer | 1 | LC |
| <i>Orthetrum brachiale</i> (Palisot de Beauvois, 1817) | Banded Skimmer | 1 | LC |
| <i>Orthetrum caffrum</i> (Burmeister, 1839) | Two-striped Skimmer | 1 | LC |
| <i>Orthetrum chrysostigma</i> (Burmeister, 1839) | Epaulet Skimmer | 1 | LC |
| <i>Orthetrum guineense</i> (Ris, 1910) | Guinea Skimmer | 1 | LC |
| <i>Orthetrum hintzi</i> (Schmidt, 1951) | Dark-shouldered Skimmer | 1 | LC |
| <i>Orthetrum icteromelas</i> (Ris, 1910) | Spectacled Skimmer | 1 | LC |
| <i>Orthetrum julia</i> (Kirby, 1900) | Julia Skimmer | 1 | LC |
| <i>Orthetrum kafwi</i> (Dijkstra, 2015) ^{##} | Bog Skimmer | 1!! | DD |
| <i>Orthetrum machadoi</i> (Longfield, 1955) | Highland Skimmer | 1 | LC |
| <i>Orthetrum macrostigma</i> (Longfield, 1947) | Sharkfin Skimmer | 1 | LC |
| <i>Orthetrum microstigma</i> (Ris, 1911) | Farmbush Skimmer | 1 | LC |
| <i>Orthetrum monardi</i> (Schmidt, 1951) | Woodland Skimmer | 1 | LC |
| <i>Orthetrum robustum</i> (Balinsky, 1965) | Robust Skimmer | 1! | LC |

(continued)

| Scientific name | English name | V | RL |
|---|------------------------------|-------|----|
| <i>Orthetrum saegeri</i> (Pinhey, 1966) | Eastern Mushroom Skimmer | 1! | LC |
| <i>Orthetrum stemmale</i> (Burmeister, 1839) | Bold Skimmer | 1 | LC |
| <i>Orthetrum trinacria</i> (Selys, 1841) | Long Skimmer | 1 | LC |
| <i>Oxythemis phoenicosceles</i> (Ris, 1910) | Pepperpants | 1! | LC |
| <i>Palpopleura albifrons</i> (Legrand, 1979) | Pale-faced Widow | 1! | LC |
| <i>Palpopleura deceptor</i> (Calvert, 1899) | Deceptive Widow | 3 | LC |
| <i>Palpopleura jucunda</i> (Rambur, 1842) | Yellow-veined Widow | 1 | LC |
| <i>Palpopleura lucia</i> (Drury, 1773) | Lucia Widow | 1 | LC |
| <i>Palpopleura portia</i> (Drury, 1773) | Portia Widow | 1 | LC |
| <i>Pantala flavescens</i> (Fabricius, 1798) | Wandering Glider | 1 | LC |
| <i>Porpax asperipes</i> (Karsch, 1896) | Powdered Pricklyleg | 1 | LC |
| <i>Porpax risi</i> (Pinhey, 1958) | Highland Pricklyleg | 1 | LC |
| <i>Rhyothemis fenestrina</i> (Rambur, 1842) | Skylight Flutterer | 1 | LC |
| <i>Rhyothemis mariposa</i> (Ris, 1913) | Butterfly Flutterer | 2 | LC |
| <i>Rhyothemis</i> cf. <i>notata</i> (Fabricius, 1781) ^{##} | (near Veiled Flutterer) | 4!! | LC |
| <i>Rhyothemis semihyalina</i> (Desjardins, 1832) | Phantom Flutterer | 1! | LC |
| <i>Sympetrum fonscolombii</i> (Selys, 1840) | Nomad | 1 | LC |
| <i>Tetrathemis camerunensis</i> (Sjöstedt, 1900) | Forest Elf | 2 | LC |
| <i>Tetrathemis fraseri</i> (Legrand, 1977) | Treefall Elf | 1! | LC |
| <i>Tetrathemis polleni</i> (Selys, 1869) | Black-splashed Elf | 2 | LC |
| <i>Tetrathemis</i> sp. nov. ^{##} | (Elf, undescribed species) | 4!!** | NE |
| <i>Thermochoria equivocata</i> (Kirby, 1889) | Dash-winged Piedface | 1! | LC |
| <i>Tholymis tillarga</i> (Fabricius, 1798) | Twister | 1 | LC |
| <i>Tramea basilaris</i> (Palisot de Beauvois, 1817) | Keyhole Glider | 1 | LC |
| <i>Trithemis aconita</i> (Lieftinck, 1969) | Halfshade Dropwing | 1! | LC |
| <i>Trithemis aenea</i> (Pinhey, 1961) ^{##} | Bronze Dropwing | 4!! | LC |
| <i>Trithemis annulata</i> (Palisot de Beauvois, 1807) | Violet Dropwing | 1 | LC |
| <i>Trithemis anomala</i> (Pinhey, 1956) | Striped Dropwing | 1! | LC |
| <i>Trithemis apicalis</i> (Fraser, 1954) | Furtive Dropwing | 1! | LC |
| <i>Trithemis arteriosa</i> (Burmeister, 1839) | Red-veined Dropwing | 1 | LC |
| <i>Trithemis basitincta</i> (Ris, 1912) | Jungle Dropwing | 1! | LC |
| <i>Trithemis dichroa</i> (Karsch, 1893) | Black Dropwing | 1 | LC |
| <i>Trithemis dorsalis</i> (Rambur, 1842) | Highland Dropwing | 1 | LC |
| <i>Trithemis</i> cf. <i>dubia</i> (Fraser, 1954) [#] | (near Sleek Dropwing) | 1! | DD |
| <i>Trithemis furva</i> (Karsch, 1899) | Navy Dropwing | 1 | LC |
| <i>Trithemis imitata</i> (Pinhey, 1961) [#] | Northern Fluttering Dropwing | 1! | LC |
| <i>Trithemis integra</i> (Dijkstra, 2007) | Albertine Dropwing | 1! | LC |
| <i>Trithemis kirbyi</i> (Selys, 1891) | Orange-winged Dropwing | 1 | LC |
| <i>Trithemis leakeyi</i> (Pinhey, 1956) | Mealy Dropwing | 1! | LC |
| <i>Trithemis monardi</i> (Ris, 1931) [#] | Southern Fluttering Dropwing | 1 | LC |
| <i>Trithemis nuptialis</i> (Karsch, 1894) | Hairy-legged Dropwing | 1 | LC |
| <i>Trithemis palustris</i> (Damm & Hadrys, 2009) [#] | Marsh Dropwing | 1! | LC |

(continued)

| Scientific name | English name | V | RL |
|--|---------------------------------|-------|----|
| <i>Trithemis pluvialis</i> (Förster, 1906) | Russet Dropwing | 1 | LC |
| <i>Trithemis pruinata</i> (Karsch, 1899) | Cobalt Dropwing | 1! | LC |
| <i>Trithemis stictica</i> (Burmeister, 1839) | Jaunty Dropwing | 1 | LC |
| <i>Trithemis werneri</i> (Ris, 1912) | Elegant Dropwing | 3 | LC |
| <i>Trithemis</i> sp. nov. (Fig 9.6) ^{##} | (Dropwing, undescribed species) | 4!!** | NE |
| <i>Urothemis assignata</i> (Selys, 1872) | Red Basker | 1 | LC |
| <i>Urothemis edwardsii</i> (Selys, 1849) | Blue Basker | 1 | LC |
| <i>Urothemis venata</i> (Dijkstra & Mézière, 2015) ^{##} | Red-veined Basker | 4 !! | LC |
| <i>Zygonoides fuelleborni</i> (Grünberg, 1902) | Southern Riverking | 3 | LC |
| <i>Zygonyx denticulatus</i> (Dijkstra & Kipping, 2015) | Pale Cascader | 1! | LC |
| <i>Zygonyx eusebia</i> (Ris, 1912) | Imperial Cascader | 3 | LC |
| <i>Zygonyx flavicosta</i> (Sjöstedt, 1900) ^{##} | Ensign Cascader | 1 | LC |
| <i>Zygonyx natalensis</i> (Martin, 1900) | Blue Cascader | 1 | LC |
| <i>Zygonyx regisalberti</i> (Schouteden, 1934) | Regal Cascader | 1 | LC |
| <i>Zygonyx torridus</i> (Kirby, 1889) | Ringed Cascader | 1 | LC |

Notes on new country records (by J Kipping and S F Elizalde unless stated otherwise)

Chlorocypha aphrodite – male photographed by C Hines near Lucala north of Uíge in June 2017.

Mesocnemis singularis – first record of true *M. singularis* (see Kipping et al. 2017) from the Angolan bank of the Cunene River in December 2017.

Africallagma sinuatum – single male photographed by C Hines near Cambondo, Cuanza-Norte Province in February 2017.

Africallagma subtile – several collected at marshy floodplains of the Yevedula River, 20 km northwest of Caconda, Benguela Province in December 2017.

Agriocnemis gratiosa – several collected by M Haacks from Bicuar NP, Huíla Province in December 2016.

Agriocnemis pinheyi – several collected at a marsh northwest of Caconda, Benguela Province in December 2017.

Pseudagrion (A) *simplicilaminatum* – male photographed by C Hines near Lucala north of Uíge in June 2017.

Pseudagrion (B) *camerunense* – male photographed by C Hines in Cuanza River floodplains south of Luanda in January 2018.

Anaciaeschna triangulifera – female photographed by C Hines in Cuanza River floodplains south of Luanda in June 2017. Westernmost record; nearest locality is Ikelenge in northwestern Zambia, about 1200 km to the east.

Anax bangweuluensis – teneral male photographed by J Mendelsohn at Lake Saliakembo, Moxico Province in October 2017. The Cuito River links to the nearest known population in the Okavango Delta, Botswana, about 750 km away.

Heliaeschna cynthiae – female and two males recorded by C Hines at the Rio Nzadi and near Quicunga in Uíge Province in June 2017.

Pinheyschna subpupillata – many observed and collected at Tchiamena River near Lubango and Neve River near Humpata on Serra da Chela, Huíla Province in

December 2017. Presumably isolated population; widespread in South Africa, with another isolated population on border of Mozambique and Zimbabwe. With the new finding of this species a former record of a female *P. rileyi* (Calvert, 1892) from Tundavala (Pinhey 1975) became more doubtful and the species is therefore deleted from the country list.

Zosteraeschna minuscula – male collected at the Tchiamena River near Lubango on Serra da Chela, Huíla Province in December 2017. Northernmost record; widespread in South Africa but with scattered records in Namibia and eastern Botswana.

Mastigogomphus dissimilis – the *Instituto de Investigação Agronómica* in Huambo has one male from Nova Sintra (Catabola), Bié Province from October 1973, coll. L Amorim.

Paragomphus cognatus – presence in Angola was uncertain due to lack of reliable material (Kipping et al. 2017), but several males collected at Tchiamena, Leba and Neve Rivers in the Serra da Chela in December 2017.

Paragomphus sabicus – common at the Rio Coporolo, north of Chongoroi, Benguela Province in December 2017.

Paragomphus sp. nov. – two males collected at the Uiri River near Conda, Cuanza-Sul Province in December 2017 belong to an undescribed species similar to *P. cognatus* but darker and with stouter paraprocts and more curved cerci.

Bradinyoga strachani – the *Instituto de Investigação Agronómica* in Huambo has three males from Ndalatando, Cuanza-Norte Province from March 1973, coll. U Passos. Several also collected at Rio Mussenju, south of Quilengues, Benguela Province in December 2017 and photographed by R Ferreira at Calandula Falls, Lunda-Norte Province in June 2018.

Notiothemis jonesi – male was collected in Lubango, Huíla Province in December 2017.

Orthetrum kafwi – several males and females collected at boggy streams and bogs in the highlands around Cassongue, Cuanza-Sul Province in December 2017. Previously known only from the type locality in the Upemba National Park in Katanga, which lies 1400 km to the east.

Rhyothemis cf. *notata* – male photographed by J Mendelsohn at Sacangombe near the Cuito River source in Moxico Province in November 2011. The black markings in the forewings reach only to the nodus and in the hindwings halfway the nodus and pterostigma, which is much less than even the palest variation of *R. notata* illustrated by Dijkstra & Clausnitzer (2014). The habitat is open, while true *R. notata* favour rainforest conditions. This species therefore needs to be verified with specimens.

Tetrathemis sp. nov. – several males photographed by C Hines in dry forest near Cambondo, Cuanza-Norte Province in March 2017. Differs from *T. fraseri* by the smoky wings and shape of the very hairy cerci.

Trithemis aenea – photographed by C Hines near Lucala north of Uíge in June 2017.

Trithemis sp. nov. – see Fig. 9.6 and main text.

Urothemis venata – photographed by Carel van der Merwe in the Cuango area, Cuanza-Norte Province in May 2017.

Appendix 2

Odonata recorded from rivers bordering Angola that most likely also occur in Angola.

| Scientific name | English name | Nearest occurrence |
|---|---------------------|---|
| Coenagrionidae | | |
| <i>Pseudagrion</i> (A) <i>spernatum</i> (Selys, 1881) | Upland Sprite | At Jimbe and other rivers in Ikelenge Pedicle of north-western Zambia. |
| <i>Pseudagrion</i> (B) <i>assegaii</i> (Pinhey, 1950) | Assegai Sprite | Cuando River in Namibian Caprivi Strip. |
| <i>Pseudagrion</i> (B) <i>sudanicum</i> (Le Roi, 1915) | Blue-sided Sprite | Okavango and Cuando Rivers in Namibian Caprivi Strip. |
| Gomphidae | | |
| <i>Crenigomphus kavangoensis</i> (Suhling & Marais, 2010) | Kavango Talontail | Okavango River in Namibia. |
| <i>Lestinogomphus angustus</i> (Martin, 1911) | Common Fairytail | Cunene, Okavango and Cuando Rivers in northern Namibia. |
| <i>Lestinogomphus silkeae</i> (Kipping, 2010) | Silke's Fairytail | One locality on the southern bank of the Okavango River near Rundu, Namibia. |
| <i>Paragomphus cataractae</i> (Pinhey, 1963) | Cataract Hooktail | Waterfalls and rapids of the Cunene and Okavango Rivers in northern Namibia. |
| <i>Paragomphus elpidius</i> (Ris, 1921) | Corkscrew Hooktail | Cunene, Okavango and Cuando River in northern Namibia and the Ikelenge Pedicle of Zambia. |
| <i>Neurogomphus cocytius</i> Cammaerts, 2004 | Kokyotos Siphontail | Okavango River in northern Namibia. |
| Libellulidae | | |
| <i>Parazyxomma flavicans</i> (Martin, 1908) | Banded Duskdarter | Okavango and Cuando Rivers in northern Namibia. |
| <i>Trithemis aequalis</i> (Lieftinck, 1969) | Swamp Dropwing | Okavango and Cuando Rivers in the Namibian Caprivi. |
| <i>Trithemis donaldsoni</i> (Calvert, 1899) | Denim Dropwing | Okavango and Cunene Rivers in northern Namibia. |
| <i>Trithemis hecate</i> (Ris, 1912) | Silhouette Dropwing | Common along the Cunene, Okavango and Cuando Rivers in northern Namibia. |
| <i>Trithemis morrisoni</i> (Damm & Hadrys, 2009) | Rapids Dropwing | Okavango and Cuando Rivers in the Namibian Caprivi. |
| <i>Trithetrum navasi</i> (Lacroix, 1921) | Fiery Darter | Cunene, Okavango and Cuando Rivers in northern Namibia. |

References

- Clausnitzer V, Koch R, Dijkstra K-DB et al (2012) Focus on African freshwaters: hotspots of dragonfly diversity and conservation concern. *Front Ecol Environ* 10:129–134
- Damm S, Hadrys H (2009) *Trithemis morrisoni* sp. nov. and *Trithemis palustris* sp. nov. from the Okavango and Upper Zambezi Floodplains previously hidden under *T. stictica* (Odonata: Libellulidae). *Int J Odonatol* 12(1):131–145
- Dijkstra K-DB (2006) The *Atoconeura* problem revisited: taxonomy, phylogeny and biogeography of a dragonfly genus in the highlands of Africa (Odonata, Libellulidae). *Tijdschrift voor Entomologie* 149:121–144
- Dijkstra K-DB (2007a) The name-bearing types of Odonata held in the Natural History Museum of Zimbabwe, with systematic notes on Afrotropical taxa. Part 1: introduction and Anisoptera. *Int J Odonatol* 10(1):1–29
- Dijkstra K-DB (2007b) The name-bearing types of Odonata held in the Natural History Museum of Zimbabwe, with systematic notes on Afrotropical taxa. Part 2: Zygoptera and description of new species. *Int J Odonatol* 10(2):137–170
- Dijkstra K-DB, Clausnitzer V (2014) The dragonflies and damselflies of Eastern Africa: handbook for all Odonata from Sudan to Zimbabwe. . *Studies in afrotropical zoology* 298. Royal Museums for Central Africa, Tervuren, 263 pp
- Dijkstra K-DB, Kipping J, Mézière N (2015) Sixty new dragonfly and damselfly species from Africa (Odonata). *Odonatologica* 44(4):447–678
- Dijkstra K-DB, Boudot J-P, Clausnitzer V et al (2011) Chapter 5. Dragonflies and damselflies of Africa (Odonata): history, diversity, distribution, and conservation. In: Darwall WRT, Smith KG, Allen DJ et al (eds) *The diversity of life in African freshwaters: under water, under threat. An analysis of the status and distribution of freshwater species throughout mainland Africa*. IUCN, Cambridge and Gland, 347 pp
- Kipping J (2010) The dragonflies and damselflies of Botswana – an annotated checklist with notes on distribution, phenology, habitats and Red List status of the species (Insecta: Odonata). *Mauritiana (Altenburg)* 21:126–204
- Kipping J (2012) Southern African Regional Environmental Program (SAREP) – first biodiversity field survey upper Cubango (Okavango) catchment, Angola, May 2012 – Dragonflies & Damselflies (Insecta: Odonata). *Expert Report*:1–108
- Kipping J, Clausnitzer V, Fernandes Elizalde SRF et al (2017) The dragonflies and damselflies (Odonata) of Angola. *Afr Invertebr* 58(1):65–91 <https://africaninvertebrates.pensoft.net/article/11382/>
- Kipping J, Dijkstra K-DB, Clausnitzer V et al (2009) Odonata Database of Africa (ODA). *Agrion* 13:20–23
- Longfield C (1936) Studies on African Odonata, with synonymy and descriptions of new species and subspecies. *Trans R Entomol Soc Lond* 85:467–499
- Longfield C (1947) The Odonata of South Angola: results of the Mission Scientifiques Suisses 1928–29, 1932–33. *Arquivos do Museu Bocage* 16:1–31
- Longfield C (1955) The Odonata of North Angola, part 1. *Publicações Culturais, Companhia de Diamantes de Angola* 27:11–64
- Longfield C (1959) The Odonata of North Angola, part 2. *Publicações Culturais, Companhia de Diamantes de Angola* 45:16–42
- Mendes LF, Bivar-de-Sousa A, Figueira R et al (2013) Gazetteer of the Angolan localities known for beetles (Coleoptera) and butterflies (Lepidoptera: Papilionoidea). *Boletim da Sociedade Portuguesa de Entomologia* 228(VIII–14):257–292
- Mills MSL, Melo M, Vaz A (2013) The Namba mountains: new hope for Afromontane forest birds in Angola. *Bird Conserv Int* 23:159–167
- NGOWP – National Geographic Okavango Wilderness Project (2018) Initial Findings from Exploration of the Upper Catchments of the Cuito, Cuanavale and Cuando Rivers in Central and South-Eastern Angola (May 2015 to December 2016). *National Geographic Okavango Wilderness Project*, 352 pp

- Pinhey ECG (1961a) A collection of Odonata from Dundo, Angola with the descriptions of two new species of Gomphids. *Publicações Culturais, Companhia de Diamantes de Angola* 56:71–78
- Pinhey ECG (1961b) Some dragonflies (Odonata) from Angola and descriptions of three new species of the family Gomphidae. *Publicações Culturais, Companhia de Diamantes de Angola* 56:79–86
- Pinhey ECG (1964) Dragonflies (Odonata) of the Angola-Congo borders of Rhodesia. *Publicações Culturais, Companhia de Diamantes de Angola* 63:97–130
- Pinhey ECG (1965) Odonata from Luanda and the Lucala River, Angola. *Revista de Biologia* 5:159–164
- Pinhey ECG (1966) New distributional records for African Odonata and notes on a few larvae. *Arnoldia Rhodesia* 2(26):1–5
- Pinhey ECG (1971a) Notes on the genus *Pseudagrion* Selys (Odonata: Coenagrionidae). *Arnoldia Rhodesia* 5(6):1–4
- Pinhey ECG (1971b) Odonata collected in Republique Centre-Africaine by R. Pujol. *Arnoldia Rhodesia* 5(18):1–16
- Pinhey ECG (1974) A revision of the African *Agriocnemis* Selys and *Mortonagrion* Fraser (Odonata: Coenagrionidae). *Occasional Papers of the National Monuments of Rhodesia B* 5/4:171–278
- Pinhey ECG (1975) A collection of Odonata from Angola. *Arnoldia Rhodesia* 7(23):1–16
- Pinhey ECG (1984) A check-list of the Odonata of Zimbabwe and Zambia. *Smithersia* 3:1–64
- Ris F (1931) Odonata aus Süid-Angola. *Revue Suisse Zoologie* 38(7):97–112
- Suhling F, Martens A (2007) Dragonflies and damselflies of Namibia. Gamsberg Macmillan, Windhoek, 280 pp
- Suhling F, Martens A (2014) Distribution maps and checklist of Namibian Odonata. *Libellula Suppl* 13:107–175
- Tarboton W (2009) A dragonfly survey of the Humpata District. In: Huntley BJ (ed) *Projecto de estudo da biodiversidade de Angola. (Biodiversity Rapid Assessment – Huíla /Namibe) Report on Pilot project.* SANBI, Cape Town, 3 pp
- Vick GS, Chelmick DG, Martens A (2001) In memory of Elliot Charles Gordon Pinhey (10 July 1910 – 7 May 1999). *Odonatologica* 30:1–11

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

