Odonatologica 31(2): 151-170 *June 1, 2002*

RED-LISTED ODONATA OF AFRICA

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Received September 11, 2000 / Revised and Accepted February 6, 2001

The Red-Listed African Odon. spp. are re-assessed and are assigned or re-assigned to the IUCN *Categories of Threat*. It is important to distinguish between those species that are simply rare, those that are 'Data Deficient' and those that are genuinely threatened. It is also important to consider the 'Extinct' category very carefully as premature inclusion of a taxon in this category can preclude further searches for it. The IUCN *Categories of Threat* were found to be very workable for the African Odon. Problems are more to do with the practicalities of doing the field assessments, rather than with the categorisation itself. While the Red List is of enormous value when considering one species at a time, it should not be seen as a generalized data base amenable to comparative assemblage statistics, which are likely to reveal more on assessment efforts than on the organisms.

INTRODUCTION

With increasing anthropogenic pressure upon the landscape throughout much of Africa, it is timely to review the conservation status of Odonata. While there is much we do not know of the African fauna, particularly ecology and susceptibility to landscape disturbance, there is sufficient evidence to indicate that certain species are clearly threatened (PINHEY, 1982; SAMWAYS, 1999), and that this is an indication of adverse pressure on ecosystem integrity and health.

There are about 720 species of Odonata in Africa and the neighbouring islands (PINHEY, 1962a). To this list is being added one new species about every two or three years. With rapid land transformations, some species may never be scientifically described. While certain species are known to be in decline, or perhaps even extinct, others may be poorly represented in collections simply because they are from a relatively unexplored area.

The aim here is to recategorize the currently listed threatened species according to the latest IUCN Red List *Categories of Threat* and format (IUCN, 2000), and to highlight

certain species for which searches are needed. This paper updates and supercedes PINHEY (1982) and SAMWAYS (1996), but it is not meant to be a comprehensive list of all the rare or threatened species in Africa and the neighbouring islands. The taxonomic authorities used here are principally those of PINHEY (1962a, 1984a, 1985) and SAMWAYS (1999) and the references therein. The IUCN 'Assessor' throughout is M.J. S a m w a y s, and the 'Evaluator' is J. v a n T o l. Assessment date is date of this publication.

CATEGORISATION OF THREATENED SPECIES

Family: Synlestidae
Taxon Name: *Chlorolestes apricans* Wilmot, 1975
Common Name: Basking Malachite
Status: Endangered A3c, B2ab(i, ii, iii + iv)

Range	**Population**	**Habitat**	**Threats**
500 km^2	1000, declining	Rivers and streams	Habitat removal (replaced by livestock farming) and habitat change caused alien invasive trees

Rationale: Qualifies due to small number and small size of subpopulations, several of which have been lost between 1975 and 2000 through habitat loss and modification. Formerly listed as EN B1 + 2ab (IUCN, 1996).

Range & population: In 1975, this species was known from ten sites (WILMOT, 1975), whereas in 2000, it was known from only two, showing a decline in extent of occurrence, area of occupancy, as well as decline in extent and quality of suitable habitat. Currently, it is known only from the Kubusi (near Stutterheim) and Thorn Rivers, Eastern Cape, South Africa. Currently, it is estimated that no more than 1000 adults exist, and even this may be a generous estimate.

Habitat: Inhabits clear, shallow, rocky streams with riffles and glides and with an abundance of long grass, herbs and indigenous bushes overhanging streams.

Threats: Severely threatened by cattle trampling of the banks and the synergistic effects of shading of the habitat by the alien invasive tree *Acacia mearnsii*. Further adverse synergistic effects include detergent entering the streams from washing of clothes and possibly also the effect of predation from rainbow trout. This species is not known from any protected area.

Conservation measures: Searches for further localities are urgently required. Removal of *Acacia mearnsii* under the 'Working for Water' programme should continue. Liaison with local farmers is essential so that cattle may enter the streams at certain points only, fencing off other areas of the stream.

Family: Synlestidae

Taxon Name: *Ecchlorolestes peringueyi* (Ris, 1921)
Common Name: Marbled Malachite
Status: Vulnerable D2
Distribution: South Africa

Range	Population	Habitat	Threats
200 km²	1000, stable	Rivers and streams	Habitat removal (replaced by forestry plantations and livestock farming), alien invasive predatory trout and alien invasive trees shading habitat

Rationale: Earlier this century this species was known from many more localities. Although now known from only two localities, in protected areas, a relatively small increase in threats to the streams in which it lives could jeopardize its future. Formerly listed as EN B1 +2c (IUCN, 1996).

Range & population: Known only from the Hawequas Mountains in the Western Cape, this species could never have been abundant as it is such a habitat specialist. From early records (PINHEY, 1984a) it was nevertheless at many more localities than it is today, having disappeared in particular from the Rawsonville area. Today however, its population appears to have stabilized both in range and size.

Habitat: Moderate elevation (>100 m a.s.l.) with clear, shallow, streams with an abundance of large, lichen-covered boulders.

Threats: There are several threats, which are also synergistic. Alien invasive trees (pines and *Acacia longifolia*) shade the habitat, and alien invasive trout are predators. The former threat of habitat removal (for plantation forestry mostly) has largely subsided. However, its small total population size and minute area of occupancy (20 km²) make this species very vulnerable to any changing conditions.

Conservation measures: Population levels should be monitored regularly. There must be no further encroachment of plantation forestry or introduction of trout. The fish-farming enterprise in Du Toit's Kloof is of great concern. The 'Working for Water' programme, with removal of alien invasive trees is of great advantage to this species.

Family: Megapodagrionidae
Taxon Name: *Amanipodagrion gilliesi* Pinhey, 1962
Common Name: None
Status: Endangered A1c, B1ab (iv), B2ab (iii)

Range	Population	Habitat	Threats
<500 km² ?	<1000 ?	Swamps, marshes and bogs	Habitat removal (replaced by arable agriculture)

Rationale: Qualifies as its type locality and the only known locality has been converted

to agricultural land. This species was listed as Endangered on the 1996 Red List (IUCN, 1996). As we have no further information, and, as there is no reason to believe that the habitat has improved, it is reasonable to retain it as Endangered, although in reality the situation may be more severe than this. Formerly listed as EN A1c (IUCN, 1996).

Range & population: Only known from near AmAni, East Usambara mountains, Tanzania. Only known from two males collected in May 1959 (PINHEY, 1962b).

Habitat: Swamp associated with forest.

Threats: The type locality has been transformed for tea production.

Conservation measures: A first step is to undertake searches in the area to redetermine its conservation status.

Family: Platycnemididae
Taxon Name: *Metacnemis angusta* (Selys, 1863)
Common Name: Ceres Stream Damsel
Status: Critically Endangered A4, B1ab(iii), B2ab (i, ii + iii)
Distribution: South Africa

Range	Population	Habitat	Threats
100 km² ?	Unknown	Rivers and streams	Habitat removal (replaced by arable agriculture), alien invasive trees, excessive water extraction from streams and damming of streams)

Rationale: This species has not been seen since 1920, despite many searches over many years.

Range & population: Only two females of this species are known. One was caught in the middle of the 19th century and the other in 1920 (PINHEY, 1984a) in Ceres, Western Cape, South Africa. As this species is only known from two female specimens there is doubt as to whether it is a full species or, unlikely, a geographical variant of *Metacnemis valida*, which itself is threatened (see below). In view of this, SAMWAYS (1996) suggested it be removed from the Red List. However, it is likely at least to be an 'Evolutionarily Significant Unit' (MORITZ, 1994; VOGLER & DE SALLE, 1994; SAMWAYS, 1997), and so should be reinstated. However, very intensive searches between 1993 and 2000 have failed to refind it, and there is a strong likelihood that it is extinct. In view of the arguments put forward by HARRISON & STIASSNY (1999) it may be unwise and premature to declare it extinct as this may preclude further searches for it elsewhere in the Western Cape.

Habitat: Shallow, rocky steams.

Threats: The streams in the Ceres area have been radically transformed and indeed some no longer flow from overextraction of water for the fruit industry. Other threats are from shading of the habitat by alien invasive trees and damming of streams. Alien fishes, especially rainbow trout may also be a threat.

Conservation measures: Firstly, further searches are required to determine whether it is still extant. The 'Working for Water' removal of alien trees programme would be clearly beneficial for this species.

Family: Platycnemididae
Taxon Name: *Metacnemis valida* (Hagen in Selys, 1863)
Common Name: Kabusi Stream Damsel
Status: Endangered A4, B1ab (i, ii + iii), B2ab (i, ii + iii)
Distribution: South Africa

Range	Population	Habitat	Threats
200 km²	<1000, declining	Rivers and streams	Habitat removal (replaced by livestock removal) and alien invasive trees.

Rationale: This species was never widespread and now has disappeared from some of its former sites (PINHEY, 1984a) and is now known from only two sites which are not in reserves and are disturbed. To date has not been included on the Red List (IUCN, 1996).

Range & population: Formerly known from a few isolated localities in the Amatola-Winterberg region of the Eastern Cape, South Africa. Known today from only two sites on the Kabusi River in the vicinity of Stutterheim.

Habitat: Shallow, clear, rocky streams.

Threats: These are multiple and include loss of habitat principally to cattle farming, alien invasive trees (especially *Acacia mearnsii*) shading the habitat, pollution of the Kabusi river from domestic washing and siltation of stream from cattle trampling of the banks. Alien rainbow trout may also be a threat.

Conservation measures: Further searches are urgently required. Removal of alien invasive trees, particularly *Acacia mearnsii* through the 'Working for Water' programme should continue. Translocation to a protected area should be considered, as this species is highly threatened and does not occur in a protected area.

Family: Coenagrionidae
Taxon Name: *Teinobasis alluaudi* (Martin, 1896)
Common Name: Seychelles Fineliner
Status: Vulnerable B2ab (ii + iii), D2
Distribution: Seychelles

Range	Population	Habitat	Threats
<100 km²	500?	Rivers and streams	Habitat removal (replaced by arable agriculture)

Rationale: Described as found "fairly commonly on Mahé island" (BLACKMAN &

PINHEY, 1967), this species was recorded in 1909 (CAMPION, 1913) and then not again until 27 June 1997 by M.J. Samways in the southwest of Mahé. As huge land transformation that has taken place on Mahé and Silhouette, this species is highly threatened. To date has not been included on the Red List (IUCN, 1996).

Range & population: Known from the islands of Silhouette and Mahé, at both low and high elevations, this species is clearly very scarce. *T. berlandi* Schmidt, 1951 occurs in Madagascar. It was considered to be a subspecies of *T. alluaudi* by SCHMIDT (1951) but was raised to specific rank by LIEFTINCK (1965).

Habitat: Clear streams in forest. In 1997 it was recorded in *Terminalia* forest at sea level.

Threats: Habitat removal for agriculture is probably the biggest threat. It is not known from any reserve areas.

Conservation measures: It is vital that further searches be undertaken to ascertain the range of the species and to redetermine its threat status.

Family: Coenagrionidae
Taxon Name: *Pseudagrion inopinatum* Balinsky, 1971
Common Name: Balinsky's Sprite
Status: Vulnerable B2ab (ii + iii), D2
Distribution: South Africa

Range	Population	Habitat	Threats
6000 km^2	Unknown	Rivers and streams	Habitat removal (replaced by livestock farming)

Rationale: Known from only a few specimens from two localities, this species has not been rediscovered since 1968, despite very intensive searches. To date has not been included on the Red List (IUCN, 1996).

Range & population: The type series is from Baadplaas, Mpumalanga and another specimen from the 'Drakensberg', South Africa (BALINSKY, 1971; PINHEY, 1984a). This species clearly has a localized distribution and subpopulations are likely to be awaiting discovery. However, despite intensive searches between 1988 and 2001, this species has not been rediscovered, even at its type locality.

Habitat: Montane streams with an abundance of long grasses and herbs on the banks.

Threats: Uncertain, but livestock farming, and possibly damming of streams and impacts of alien trout, may have affected this species. These anthropogenic threats may be aggravated by periodic droughts and floods, the latter of which scoured the type locality in February 2000.

Conservation measures: None. It is essential to continue searches for this species.

Family: Coenagrionidae
Taxon Name: *Pseudagrion newtoni* Pinhey, 1962
Common Name: Harlequin Sprite

Status: Vulnerable B2ab (ii + iii), D2
Distribution: South Africa

Range	Population	Habitat	Threats
100,000 km²	2000	Rivers and streams	Habitat removal (replaced by livestock farming)

Rationale: Known from only a few specimens from scattered localities, this species is vulnerable, because in addition to its natural rarity, its specialized riparian habitat is under threat from increasing pressure from domestic livestock, especially cattle, visiting the water's edge. To date has not been included on the Red List (IUCN, 1996).

Range & population: The type series is from Nqutu, KwaZulu-Natal (PINHEY, 1962d) but the species has not been rediscovered in the area. This area is now heavily grazed by livestock. Prior to 1962, there are isolated records from the Western Cape, Eastern Cape and KwaZulu-Natal, although the Cape records are doubtful taxonomically. After intensive searches over many years the species was only rediscovered in January 2001, in Mpumalanga, by M.J. Samways.

Habitat: Fine grasses and reeds lining swift, clear, upland rivers.

Threats: With more extensive and intensive livestock pressure, the grasses on the banks of rivers become increasingly cropped and trampled. This may be synergistic with other impacts such as the growth of alien invasive riparian vegetation. This species is not known from any reserve.

Conservation measures: More searches are required to discover further populations, especially in reserves. Fencing off portions of the riverbank. Translocation to a reserve is also a consideration. Removal of alien invasive trees appears to have benefited this species, as the 2001 Mpumalanga site was formerly invaded by *Acacia mearnsii.*

Family: Coenagrionidae
Taxon Name: *Pseudagrion umsingaziense* Balinsky, 1963
Common Name: Umsingazi Sprite
Status: Vulnerable B2ab (ii + iii), D2
Distribution: South Africa

Range	Population	Habitat	Threats
2000 km²	3000	Swamps, marshes and bogs	Habitat removal (replaced by livestock farming, forestry plantations and industrial development.)

Rationale: Only described in 1963 (BALINSKY, 1963), this species appears always to have been highly localised. Much of its habitat has been transformed, especially the type locality where it was rediscovered. To date has not been included on the Red List (IUCN, 1996).

Range & population: Only known to persist at one locality in South Africa, this species was rediscovered at its type locality (Lake Umsingazi, and a neighbouring pan) in February 2001, by M.J. Samways.

Habitat: Marshes and dams

Threats: Probably multiple, including habitat replacement by industrial development, forestry plantations and livestock farming, and synergistic effects of drought.

Conservation measures: Although recently recorded in the protected areas of Cape Vidal and Sodwana (between 1990 and 1996), these populations have disappeared from natural drought. The strongest population is at Lake Umsingazi but it is threatened by urban encroachment. Constant monitoring is essential.

Family: Coenagrionidae

Taxon Name: *Enallagma (Africallagma) polychromaticum* Barnard, 1937

Common Name: Cape Bluet

Status: Critically Endangered A4, B1ab (i, ii + iii), B2ab (i, ii, iii + iv)

Distribution: South Africa

Range	Population	Habitat	Threats
1000 km^2	Unknown	Rivers and streams	Habitat removal (replaced by livestock farming and plantation forestry) and alien invasive trees shading habitat

Rationale: Despite very intensive searches this species has not been rediscovered, even at its type locality. To date has not been included on the Red List (IUCN, 1996).

Range & population: This species is only known from the type locality, Sevenweeks Poort, Western Cape, South Africa, where it was collected between 1932-1936, and from near Ceras and Franschoek (PINHEY, 1984a). Since then, the species has not been rediscovered, despite intensive searches throughout the Western Cape 1993-2000. A suggestion that it occurred in the Hermanas area was not confirmed, and indeed the streams in this area have undergone major disturbance in recent years.

Habitat: Not recorded, but probably among vegetation beside pools associated with small streams.

Threats: These appear to be multiple and include loss of habitat to cattle farming and plantation forestry, overgrowth of river banks by alien trees and possibly canalization of streams.

Conservation measures: Further searches are urgently required, but the chances of relocating it appear to be ever slimmer. The removal of alien invasive trees through the 'Working for Water' programme is likely to be very beneficial for this species.

Family: Gomphidae

Taxon Name: *Ceratogomphus triceraticus* Balinsky, 1963

Common Name: Cape Thorntail
Status: Vulnerable A1ac, B1ab (i, ii, iii + iv), B2ab (i, ii + iv)
Distribution: South Africa

Range	Population	Habitat	Threats
50000 km²	Unknown	Rivers and streams	Habitat removal (replaced by livestock farming and plantation afforestation), alien invasive trees and possibly pollution, over extraction of water and alien trout

Rationale: Known from very few specimens, this species was recorded in 1968 (PINHEY, 1985) and then in 1998 by D.R. Paulson. Despite very intensive searches between 1993 and 2000, this is the only recent record. Its habitat has deteriorated markedly, especially the type locality near Franschoek. To date has not been recorded on the Red List (IUCN, 1996).

Range & population: This species has a wide range throughout the Western Cape, South Africa (PINHEY, 1984a). Discovered in 1962 (BALINSKY, 1963), only six specimens are known. It is a large and conspicuous insect, and as it is not easily overlooked it must be extremely scarce. Despite many revisits to the type locality, near Franschoek, this species has not been rediscovered there. Its habitat has been radically altered.

Habitat: Swift and shallow streams and rivers, with pools.

Threats: These are many and probably synergistic, including a severe alien invasive tree problem and loss of habitat to the wine industry and to a lesser extent cattle farming and plantation forestry. Over-extraction of water from streams and possibly pollution from the wine industry are increasing threats. Alien invasive trout may also be a problem.

Conservation measures: Searches must continue to establish whether this species occurs in protected areas. Removal of alien trees through the 'Working for Water' programme is likely to be of great benefit to this species.

Family: Corduliidae
Taxon Name: *Syncordulia gracilis* (Burmeister, 1839)
Common Name: Yellow Presba
Status: Vulnerable B1ab (i, ii, iii + iv), B2 ab (i, iii + iv)
Distribution: South Africa

Range	Population	Habitat	Threats
40000 km²	2000, now stable	Rivers and streams	Habitat removal (replaced by livestock farming and plantation afforestation) alien invasive trees and possibly alien invasive trout

Rationale: This species appears never to have been common (PINHEY, 1984a). Its habitat is severely threatened by the growth of riparian alien trees, and by plantation forestry. To date this species has not been recorded on the Red List (IUCN, 1996).

Range & population: This species is very scarce, and appears to have disappeared from many of its earlier localities in the Western Cape. There is also one early record from the KwaZulu-Natal Drakensberg (PINHEY, 1984a). The last records were from the Palmiet River, Kogelberg, Western Cape, and Mooirivier, Prentjiesberg, Eastern Cape, in 2000 by M.J. Samways and R.G. Kinvig.

Habitat: Wide valleys with fynbos or grassland, and fast flowing rivers with solid rock bottoms.

Threats: Some former habitats have been overgrown with alien bankside vegetation, especially *Acacia longifolia*. This has been compounded by loss of habitat to cattle and plantation agroforestry. Alien rainbow trout may also pose a threat.

Conservation measures: Further searches are required to ascertain where it might have stronghold areas in protected areas. The strongest population appears to be in the Kogelberg Nature Reserve.

Family: Corduliidae
Taxon Name: *Syncordulia venator* (Barnard, 1933)
Common Name: Mahogany Presba
Status: Vulnerable B1ab (i, ii, iii + iv), B2ab (i, ii + iii), D2
Distribution: South Africa

Range	Population	Habitat	Threats
10000 km^2	4 000, declining	Rivers and streams	Habitat removal (replaced by plantation forestry), alien invasive trees and possibly alien rainbow trout

Rationale: Intensive searches between 1993 and 2000 have only confirmed this species at two localities, when formerly it was more widespread. To date has not been recorded on the Red List (1996).

Range & population: Formerly recorded from various scattered localities in the Western Cape, South Africa (PINHEY, 1984a), this species has only been rediscovered at two localities in the Hawequas Mountains. These localities are in reserve areas and its status has stabilized, although vulnerable owing to its very limited area of occupancy.

Habitat: High, montane streams and kloofs with bushy marginal vegetation.

Threats: Habitat removal for plantation forestry coupled with the shading of its habitat by alien invasive trees, especially *Acacia longifolia* and the impact of alien invasive trout pose synergistic threats.

Conservation measures: Avoidance of plantation trees close to streams, coupled with removal of alien, invasive trees (as is being done through the 'Working for Water' programme) will help this species. No further trout should be introduced and those

already present should be removed. Population monitoring is also required.

Family: Libellulidae
Taxon Name: *Orthetrum rubens* Barnard, 1937
Common Name: Waxy-winged Skimmer
Status: Endangered A4, B1ab (i, ii, iii + iv), B2ab (i, ii, iii + iv)
Distribution: South Africa

Range	Population	Habitat	Threats
5000 km²	500?, declining	Rivers and streams	Habitat removal (replaced by plantation forestry), alien invasive trees and alien rainbow trout

Rationale: This species appears always to have been rare, and was last seen in 1977 (PINHEY, 1979). Despite very intensive searches between 1993-2000, this species has not been rediscovered, while its habitat has been greatly modified. To date has not been recorded on the Red List (IUCN, 1996).

Range & population: Formerly this species was recorded from various localities in the Western Cape, South Africa, including Table Mountain. Clearly, it was never an abundant species (PINHEY, 1979, 1984a). A great deal of searching time was devoted to this species between 1993 and 2000 but it was never rediscovered, suggesting that it may be under severe threat.

Habitat: High, montane streams and kloofs.

Threats: It is not clear why this species has not been rediscovered, as its upland habitat is largely in protected areas. However, it may breed at lower elevations where threats are from plantation forestry, alien invasive trees, alien trout, and, in Du Toit's Kloof, from fish farming.

Conservation measures: Searches must continue, especially for the larval habitat. Continued removal of alien trees must also continue. Trout should no longer be released, and those present should be removed.

Family: Libellulidae
Taxon Name: *Sympetrum dilatatum* (Calvert, 1892)
Common Name: St Helena Darter
Status: CR A4, B1ab (i, ii, iii + iv), B2ab (i, ii, iii +iv)
Distribution: St Helena island

Range	Population	Habitat	Threats
150 km²	Unknown	Rivers and streams	Alien frog predation, pollution and lack of rainfall

Rationale: Last seen in 1977 (unpublished hand-written annotation by E. Pinhey on

a copy of his PINHEY (1982) paper), this species now appears to be extinct (PINHEY, 1982). To date has not been recorded on the Red List (IUCN, 1996). In view of the points made by HARRISON & STIASSNY (1999) and the necessity for 50 years to pass without being recorded despite searches, this species must be listed as Critically Endangered rather than Extinct.

Range & population: Only known from St Helena, with no information on its population density (PINHEY, 1964). Sight records in the 1960s became fewer and fewer and the last ever captured was a female in October 1963 (PINHEY, 1982).

Habitat: Streams.

Threats: Several combined threats include introduction of an alien frog to one of the few streams, pollution from use of New Zealand flax in waters and partial desiccation through inadequate rainfall (PINHEY, 1982).

Conservation measures: None.

SPECIES NOT TO BE INCLUDED ON THE RED LIST

Family: Synlestidae
Taxon Name: *Chlorolestes draconicus* Balinsky, 1956
Common Name: Drakensberg Malachite
Status: Not to be included on the Red List
Distribution: South Africa, Lesotho

Range	Population	Habitat	Threats
20000 km^2	>12 000, stable	Rivers and streams	Minimal

Rationale: SAMWAYS (1996) tentatively concluded this species should be on the Red List. Since then, further subpopulations have been found, all in a large protected area of the Drakensberg. Also, the habitat is being improved through removal of alien pine trees through the 'Working for Water' programme.

Range & population: Now known to be widespread throughout the high elevation (>1700 m a.s.l.) Lesotho/South Africa Drakensberg Mountains. Its population is probably at least 10 000 individuals.

Habitat: Clear, high, montane streams (>1700 m a.s.l.) with an abundance of fringing grasses, herbs and bushes.

Threats: With proclamation of the transfrontier Drakensberg Park, a huge area is now protected which adequately conserves this species. Invasive pine trees were formerly a threat but these are now being removed.

Conservation measures: No further measures currently required.

Family: Synlestidae
Taxon Name: *Ecchlorolestes nylephtha* (Barnard, 1937)
Common Name: Queen Malachite

Status: Not to be included on the Red List.
Distribution: South Africa

Range	Population	Habitat	Threats
400 km²	6000, now stable	Rivers and streams	Formerly habitat removal (replaced by livestock farming and forestry plantations)

Rationale: Further searches have been conducted since SAMWAYS (1996). With the virtual cessation of natural forest removal, more subpopulations have been found, all within protected areas. With continued forest protection, this species appears to be currently safe.

Range & population: The original geographical range of this species has probably been reduced through removal of the Cape forests. Today, with protection of the Tsitsikamma Forest, the species' range and population size appear to have stabilized.

Habitat: An unusual Odonata species for South Africa in that it inhabits small streams in the deep shade of the forest at relatively southerly latitudes (ca 34°S).

Threats: Renewed natural forest removal would be a severe threat, but currently this threat is minimal.

Conservation measures: Cessation of all natural forest removal is critical. Restoration of natural forest edges may enable it to expand its area of occupancy.

Family: Libellulidae
Taxon Name: *Trithemis hartwigi* Pinhey, 1970
Common Name: None
Status: Not to be included on the Red List
Distribution: Bioko island (Gulf of Guinea, Central Africa), Cameroon

Range	Population	Habitat	Threats
Unknown	Unknown	Swamps, marshes and bogs	Habitat removal (replaced by arable farming)?

Rationale: This species was formerly known from two specimens from Bioko captured prior to 1970. Despite collecting trips to the island, the species has not been rediscovered and yet there has been little habitat change on the island. Recently however, the species was discovered in Cameroon (VICK, 1999), suggesting that this species might be much more widespread than formerly thought. Formerly listed as ENA1c (IUCN, 1996).

Range & population: Further searches are needed to confirm its geographical range.

Habitat: Marsh (VICK, 1999).

Threats: Not confirmed, but habitat loss to arable farming appears to be a likely candidate.

Conservation measures: None at present. Further searches and assessments required.

'DATA DEFICIENT' SPECIES

Apart from South Africa, Seychelles and Mascarenes, most African countries, including Madagascar, have rare species for which there is no or little indication of their current conservation status. For other species, even some South African ones, there are still some taxonomic problems. Below are the species on the 1996 Red List (IUCN, 1996) for which there are insufficient data to recategorize them and therefore they should receive 'Data Deficient' status. Excluded from the list below is *Enallagma camerunense* Karsch, 1899, which is probably synonymous with a non-threatened *Pseudagrion* sp. (K.-D. Dijkstra, personal communication) and *Paragomphus sinaiticus* (Morton, 1929) which is now known to be a widespread species (DUMONT, 1991). This list is far from comprehensive and serves only to revise current Red listings into the 'Data Deficient' category than to provide firm categorisation. It is also a preliminary basis for further field searches.

Platycnemididae

- *Platycnemis mauriciana* Selys, 1863. Former listing: CR B1+2c. Known only from the incomplete male type (PINHEY, 1962c, 1982). The locality Mauritius as well as the species status are doubtful (SELYS, 1863; FRASER, 1949). To remain tentatively on the Red List.

Coenagrionidae

- *Argiagrion leoninum* Selys, 1876. Former listing: EN B1 + 2c (IUCN, 1996). Only the type is known, which is labelled as from Sierra Leone (PINHEY, 1962a), but this origin is questionable (K.-D. Dijkstra, personal communication). To remain tentatively on the Red List.
- *Argiocnemis solitaria* (Selys, 1872). Former listing: CR B1+2c. Only known from the female type from Rodriguez (PINHEY, 1982). As well as taxonomic verification, further searches are required. Rodriguez has been substantially agriculturally developed in recent years, making an assessment urgent. To remain tentatively on the Red List.
- *Argiocnemis umbargae* Pinhey, 1970. Former listing: EN B1 + 2c. Only known from the male type from Cameroon (PINHEY, 1982). Further searches required. To remain on the Red List.

Gomphidae

- *Isomma hieroglyphicum* Selys, 1892. Former listing: VU A1c (IUCN, 1996). Recently rediscovered by A. Davies, S. Butler and M. Parr at Andapa, NE Madagascar, April 1999 (G.S. Vick, personal communication). Further searches required. To remain on the Red List.
- *Cornigomphus guineensis* Martin, 1907. Former listing: EN A1c (IUCN, 1996). "Only known from type male, believed to be in Madrid Museum. The status and

description are not very clear. It might even represent an aberrant member of another genus." (PINHEY, 1982). To remain tentatively on the Red List.

Aeshnidae

- *Aeshna meruensis* Sjöstedt, 1909. Former listing: EN B1 + 2c (IUCN, 1996). Only known for certain from the male type from Mt Meru, northern Tanzania (PINHEY, 1982). Taxonomic verification and further searches required. To remain tentatively on the Red List.

Corduliidae

- *Libellulosoma minuta* Martin, 1907. Former listing: VU B1 + 2c (IUCN, 1996). Only known from two males from Madagascar. Further searches required. To remain on the Red List pending verification of threats.

Libellulidae

- *Monardithemis flava* Longfield, 1947. Former listing: VU B1 + 2c (IUCN, 1996). Only known from a few specimens from Angola and the Mwinilunga Province, Zambia (PINHEY, 1982). There is no evidence that this species is threatened at present. Further searches required. To be removed from the Red List.
- *Allorrhizucha campioni* Ris, 1915. Former listing: EN A1c (IUCN, 1996). For many years only known from the types from Sierra Leone (PINHEY, 1982), this species was rediscovered by Lempert (1988) in upland wooded streams in Liberia, where it appears currently not to be threatened. To be removed from the Red List.
- *Palpopleura albifrons* Legrand, 1980. Former listing: CR A1c (IUCN, 1996). Only the male type is known from Gabon (PINHEY, 1982). Further searches required. To remain on the Red List pending verification of threats.
- *Brachythemis liberiensis* Fraser, 1949. Former listing: CR A1c (IUCN, 1996). Only known from the type male from Guinea Bissau. Further searches required. To remain on the Red List pending verification of threats.
- *Trithemis nigra* Longfield, 1936. Former listing: CR B1 + 2c (IUCN, 1996). Only known from two specimens from Principe island (PINHEY, 1982). Further searches required. To remain on the Red List pending verification of threats.

DISCUSSION

ADVANTAGES OF THE RED LIST

An important spin-off from the Red List and listings of suspected threatened species is that they stimulate renewed searches for already-listed species or those that might be suspected as being threatened. This does not always result in more negative listings. Indeed, *Chlorolestes draconicus, Ecchlorolestes nylephtha, Monardithemis flava* and *Trithemis hartwigi* are now known to be less threatened than formerly thought. Others

that were thought possibly to be extinct have now been rediscovered, although their future is precarious (e.g. *Metacnemis valida* and *Ecchlorolestes peringueyi*). Others, despite eight years of intensive searching, have still not been rediscovered, and these appear to be genuinely severely threatened (e.g. *Orthetrum rubens* and *Enallagma polychromaticum*). Still others are probably at reduced overall population levels but currently stable (e.g. *E. peringueyi*). Some are probably, in reality, extinct (e.g. *Metacnemis angusta, Sympetrum dilatatum*). However, for the reasons outlined by HARRISON & STIASSNY (1999), listing as Extinct is a major decision, as this may preclude further searches. *S. dilatatum* has been well searched for on a small island (St Helena) and is likely to be extinct, but it still requires a 50-year waiting period. In contrast, although *M. angusta* and *E. polychromaticum* have not been seen for decades, there is still a chance that they will be located in a remote location in the rugged Cape Fold Mountains.

DISTINGUISHING RARE OR LITTLE-KNOWN SPECIES FROM THREATENED SPECIES

Intensive searches in South Africa in recent years have emphasized that rarity (whether because of a small extent of occurrence, small areas of occupancy and/or general rarity) is not the same as 'Data Deficient' or threatened. Many species fall into the various rarity categories (SAMWAYS, 1999), yet they are not, as far as we know, threatened. *Urothemis luciana* Balinsky, 1961 was formerly known from only a few specimens, captured prior to 1960, from northern, coastal KwaZulu-Natal (SAMWAYS, 1999). However, this species was rediscovered at Kosi Bay, northern KwaZulu-Natal in December 2000 (M.J. Samways, pers. observation). This species is probably not threatened, with its stronghold in coastal Mozambique, expanding its geographical range south in wet years.

A very clear distinction must be drawn between those species that are nationally rare and are included on national red lists and those that are globally threatened. For example, included on the 'Liste Rouge des odonates du Maroc' (JACQUEMIN & BOUDOT, 1999) are species such as *Pseudagrion sublacteum* (Karsch, 1893), *Anax ephippiger* (Burmeister, 1839), *Diplacodes lefebvrii* (Rambur, 1842), *Trithemis arteriosa* (Burmeister, 1839), *Zygonyx torridus* (Kirby, 1889) and *Pantala flavescens* (Fabricius, 1798) which are very common species elsewhere in Africa.

Some species have benefited enormously from certain anthropogenic disturbances, and were it not for these, they almost certainly would be much rarer and even possibly threatened. *Enallagma sapphirinum* Pinhey, 1950 and *E. rotundipenne* Ris, 1921 are two very rare South African endemics that have both increased their extent of occurrence and area of occupancy through the construction of large dams (e.g. Chelmsford) and smaller trout dams in the KwaZulu-Natal Midlands.

THE SPECIAL CASE OF POORLY KNOWN YET THREATENED GEOGRAPHICAL AREAS

LIEFTINCK (1965) provided a valuable initial checklist (there have been subsequent

revisions and additions) of Odonata from Madagascar and the Comores. Of the 163 species listed, 23.5% of genera and 62% of species and subspecies are endemic to the islands. LIEFTINCK (1965) also pointed out that this relatively poor species richness figure is probably the result of insufficient collecting and the adverse impacts of deforestation.

It has been estimated that rainforest covered 11.2 million ha at the time of human colonisation of Madagascar. By 1950, only 7.6 million ha remained, and by 1985 only 34% of the original forest was still standing (SUSSMAN et al., 1996). This yields an average rate of clearance of 111,000 ha (1.5%) per year between 1950 and 1985.

This has almost certainly resulted in Centinelan extinctions (those of which we have no knowledge). Using the estimates from island biogeography theory, this figure is possibly around 15% of species. However, from our knowledge elsewhere in Africa, especially the Eastern and Western Cape (SAMWAYS, 1999), anthropogenic impacts are often synergistic. As deliberate fires are a common feature in Madagascar, with subsequent and often severe silting of water courses (PRESTON-MAFHAM, 1991), it is likely that many Odonata species geographically remote downstream from the impacts have also suffered. This concern is further emphasized by the fact that the deforestation is continuing at a high rate, with estimates that only 38% of the rainforest remaining in 1985 will exist in the year 2020, which is only 12.5% of the original extent (1.4 million ha)(SUSSMAN et al., 1996). A further consideration is that this remaining forest will be highly fragmented, which, through the process of ecological relaxation, may reduce the Madagascan rainforest odonate species richness by 50%. A further point raised by SUSSMAN et al., (1996) is that some types of forest are preferentially destroyed, and the prediction is that none of the lowland flat-lying forests will remain by 2020, without factoring in the impact of AIDS.

There are other geographical areas, especially Mauritius and Rodriguez, that are facing similar threats to those in Madagascar. In addition there are many little explored areas and poorly known species that urgently require further investigation and assessment. It is timely now that these areas and species be prioritized for attention. Currently such species stand as 'Not Evaluated'.

PROBLEMS OF ACCESSIBILITY TO HABITATS AND BIASES IN NATIONAL DATA

Truly meaningful searches can only be undertaken by taxonomic and ecological experts on the group who know exactly what to look for. This has now been shown time and again in our searches in South Africa, although occasionally there are important serendipitous finds by non-experts. But for the purposes of Red List categorisation, experts must do the primary searching.

The main problem with Red Listing in an area such as Africa is the inaccessibility of areas. This may be from purely practical and logistic problems, or because of political upheavals. Indeed, for one taxon, even a moderately-sized one such as the Odonata, it would be difficult for one expert to cover the whole African region. For this reason, in Red Listing species, it is essential to specify the effort on the ground that has gone into

the categorisation. The importance of exploring new geographical areas and new habitats has been emphasized by CLAUSNITZER (1999) in Kenya, who has added 12 new species to the national list, ten of which are rainforest species.

The bias in this study towards South Africa is partly apparent and partly real. South Africa has been much more extensively and intensively surveyed for Odonata than any other continental African country. This would constitute a genuine bias. However, South Africa has by far the highest level of national endemism on the southern African mainland (22%) and even when corrected for area (i.e. national density) the figure is still high (18%). A further factor is that the areas that are rich in localized endemics, especially the southwestern Western Cape, have also been subject to intense landscape disturbance. These three factors, (intense surveying, high and very localized endemism, coupled with intense landscape change) inevitably lead to inclusion of many species on the Red List. When other areas are finally intensively surveyed, especially megadiverse areas facing threats, a similar picture might emerge. This is borne out by VICK's (1999) Cameroon study, which records *Trithemis hartwigi* on the African mainland (when formerly it was only known from Bioko) and a new species of *Phyllogomphus*.

ARE THERE ANY SNAGS WITH THE CURRENT LISTING APPROACH?

Current categories (IUCN, 2000) were found here to be highly workable for African Odonata. Limitations were lack of basic information on the species rather than limitations in the categorisation process. The category Vulnerable D2 was found to be particularly useful for the Cape endemic species, which naturally are very localized, but now have reduced ranges (extent of occurrence and area of occupancy) and are stable but vulnerable to a new and sudden impact.

Although for some invertebrates it is difficult to have an estimate of total population size, this is not the case for most of the threatened dragonflies. Much research has gone into estimating dragonfly population densities (STEYTLER & SAMWAYS, 1995, OSBORN & SAMWAYS, 1996, SAMWAYS & STEYTLER, 1996, CLARK & SAMWAYS, 1998, STEWART & SAMWAYS, 1998) and, given the area of occupancy of the threatened species, it is not difficult to obtain an approximate total population estimate. In many cases, the figure is nevertheless likely to be an underestimate as more subpopulations may exist and are not accounted for.

The biggest concern is that the field assessments are very expensive to undertake. While an earlier study (SAMWAYS, 1996) considered that it cost around US$ 1000 to assess each odonate species in South Africa, this figure was found here to escalate when the species could not be rediscovered (e.g. *Enallagma polychromaticum* and *Orthetrum rubens*). On the positive side, it is likely that several species are being searched for at the same time, and other data on other species are also being gathered. But rediscovering a suspected threatened species is very time-consuming and expensive. In contrast, reassessment of known, resident populations of threatened species is not expensive and, at least for Odonata, can be done for a few hundred dollars per species.

THE RED LIST AS A DATA BASE

The value of the Red List for single species information is unquestionable. However, this study has shown that the Red List should not be seen as a comprehensive data base amendable to generalized statistical analysis. Different taxonomic groups and different geographical areas receive disparate levels of attention and assessment, and generalized analyses will reveal more on the assessment effort than on assemblage trends among the organisms.

ACKNOWLEDGEMENTS

Valuable background information on certain species was kindly supplied by KLAAS-DOUWE DIJKSTRA, ANDREAS MARTENS, DENNIS PAULSON and GRAHAM VICK. K.-D. Dijkstra, CRAIG HILTON-TAYLOR and JAN VAN TOL critically reviewed the manuscript. Ms CATHERINE MURRAY kindly processed it. Financial support was from the National Science Foundation.

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