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THE CONSERVATION STATUS OF DRAGONFLIES (ODONATA) FROM SOUTH-EASTERN AUSTRALIA

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Abstract

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The conservation status of the dragonflies from south-eastern Australia is documented and the species with limited distributions and/or larval habitats which are vulnerable are discussed. One hundred and seven species are recorded from South Australia, Victoria, Tasmania and southern New South Wales. No species is considered endangered, but nine species have high conservation priority. These species are endemic to Australia and all have restricted distributions. The vulnerability of the larval habitats is discussed and suggestions for their conservation and management are made.

Introduction

At present, 305 species of Odonata (damselflies and dragonflies) are known from Australia (Watson et al., 1991, Theischinger, pers. comm.). Of these, approximately 40% are endemic, and many can be considered as southern species, possibly Gondwanan relicts (Watson and O'Farrell, 1991). Most of the endemic species are uncommon, and restricted in distribution. These two factors suggest vulnerability to change and therefore their conservation status should be evaluated. In contrast, the non-endemics are generally common and have much wider distributions. For this reason the conservation of these species should not be ignored, but given a lower status.

The IUCN Invertebrate Red Data Book (Wells et al., 1983) listed the damselfly *Hemiphlebia mirabilis* Selys as endangered, the only Australian odonate so listed. Hill and Michaelis (1988) listed *Archipetalia auriculata* Tillyard and *Hemiphlebia mirabilis* as threatened and another 14 species (of which only *Austroaeschna hardyi* Tillyard and *Synthemiopsis gomphomacromioides* Tillyard occur in south-eastern Australia), which the late Dr J.A.L. Watson suggested were of significant conservation value.

Only limited attention has been given to the conservation of Australian Odonata, except for *Hemiphlebia mirabilis*. This paper attempts to evaluate the conservation status of the Odonata from south-eastern Australia, list the threatened species, identify the species habitats, list the threats to each species and suggest conservation measures to be implemented. Conservation status of the odonate species is evaluated on the basis of the categories adopted from the IUCN Red Data Book by Hill and Michaelis (1988). The categories are:

(a) Endangered species are in serious risk of disappearing within two decades if present causal factors continue;
(b) Vulnerable species are endangered over a longer time or extremely localised and or patchy in distribution;
(c) Rare species are not currently threatened but are extremely localised or patchy in distribution;
(d) Indeterminate species are suspected of being threatened but too poorly known to assign to one of the preceding categories.

Species considered of conservation significance

Watson et al. (1991) recorded 107 odonate species from south-eastern Australia and from these nine (Table 1) have been identified as worthy of conservation evaluation based on the rarity and restricted distribution.

Hemiphlebiidae *Hemiphlebia mirabilis* Selys

Hemiphlebia mirabilis was first positively recorded in the early 1900s from Alexandra, Victora and has been recorded sporadically from this location since (Trueman et al., 1992). A population was discovered on Wilsons Promontory (Davies, 1985), and its ecology has been studied in considerable detail (Sant and New, 1988; New, 1993). The recorded distribution of this species has greatly expanded with subsequent discoveries in Tasmania (Trueman et

Table 1. Collection sites, collection localities , habitats, habits and conservation threats of the nine species identified as of high conservation significance

Species	Sites	Distribution	Habitat	Habit	Conservation threats
Hemiphlebiidae					
Hemiphlebia mirabilis	6	Vic., NE Tas.	swamps	clasper	cattle grazing, draining of swamps, burning of vegetation
Megapodagrionidae					
Austroargiolestes isabellae	8	SE NSW	bogs	unknown	urban and rural development
Gomphidae					
Austrogomphus angeli	4	SA, Vic.	unknown	unknown	unknown
Austropetaliidae					
Archipetalia auriculata	9	Tas.	montane streams/bogs	unknown	water pollution, burning of button grass
Austropetalia patricia/A. tonyana	7?	Vic., NSW	waterfalls	hider	forestry activities
Petaluridae					
Petalura gigantea	3	NSW, SE Qld	marshes	deep burrower	peat mining, rural development
Corduliidae					
Archaeophya adamsi	2	NSW	stream	hider	urban development
S. gomphomacromioides	22	Tas.	bogs	shallow burrower	water pollution, fire

al., 1992) and King Island (Endersby, 1993). During the preceeding two decades this species was believed to be extinct and subsequently placed on the endangered list in the IUCN Invertebrate Red Data Book. The recent papers of Trueman et al. (1992) and Watson (1995) suggested that since *H. mirabilis* is now known to have a more extensive distribution, it can no longer be regarded as endangered. Although this species has a wider distribution than previously thought, it is uncommon at the known sites (Hawking unpublished data) and is appraised as rare.

Megapodagrionidae *Austroargiolestes isabellae* Theischinger and O'Farrell

Austroargiolestes isabellae has only recently been recognised as a discrete species (Theischinger and O'Farrell, 1986). It appears to be restricted to the Sydney area and the Blue Mountains, where it is never common and should be considered rare. Watson et al., (1991) listed its habitat as streams and boggy seepages. The larva has not been recognised, and judging from the rarity of the adult, the larva will, most probably, also be rare, and its habitat will probably be unusual. This species is classified as rare, based on the restricted distribution and rarity of the adult, and that the identity and habitat of the larva is unknown.

Gomphidae *Austrogomphus angeli* Tillyard

Austrogomphus angeli is a little known species for which only about five adult specimens have been recorded. These were collected over a substantial length of the River Murray (900 km from Morgan, SA to Corowa, NSW) (Watson, 1991). They were recorded over a long time period: 58 years — Morgan (1909), Renmark (1948), Wentworth (1967) and Corowa (1967) (Watson, 1991). Watson (1991) recorded its adult habitat as mature, slow-flowing parts of the river, suggesting that the larva may in fact not be a stream-dweller. Hawking (1986) recorded the larva and its habitat as unknown.

This species must be given high conservation status, due to the limited numbers of adults having been collected and the larva not being collected. There is uncertainty with this species' existence and it is listed as indeterminate until a detailed survey can be undertaken. The distribution of this species corresponds to a section of River Murray that is under severe pressure from urban development (mainly building of holiday villages) and many agricultural activities (especially salination from irrigation practices).

Austropetaliidae *Archipetalia auriculata* Tillyard

Tillyard (1917) collected the first specimens of *Archipetalia auriculata* from Cradle Mountain, north-west Tasmania, at an elevation between 1100 and 1500 m, and considered it very rare. Allbrook (1979) listed *A. auriculata* from nine sites in the highlands of Tasmania, considering its distribution restricted and rare. The larvae are also rare. They occur in shallow streams, under exposed rocks and crevices in fallen timber (Allbrook 1979). This species is regarded as rare. Conservation appears plausible as these collection sites are all in either the Southwest National Park or Cradle Mountain Park. Hill and Michaelis (1988) listed the major threats as water pollution and fire.

Austropetaliidae *Austropetalia patricia* and *A. tonyana*

Tillyard (1909) described the adult and larvae of *Austropetalia patricia* from Leura, Blue Mountains and considered it an extremely rare species. Theischinger (1995) has re-examined the known specimens of *A. patricia* and from them described a new species, *A. tonyana*. Collectively these species occur along the Great Dividing Range in Victoria and New South Wales, with *A. tonyana* occurring from Canberra south, and *A. patricia* north from the Blue Mountains. The larvae occupy an unusual habitat, being found on logs or amongst moss in the splash zones of waterfalls. Many of the collection sites are protected as they occur in conservation areas, but sites outside these areas could be affected by forestry activities. These two archaic species are seldom collected, either as an adult or larva, and are considered uncommon. These species are listed as rare.

Petaluridae *Petalura gigantea* Leach

Petalura gigantea is Australia's largest dragonfly and its larvae live in burrows opening above water level (Tillyard, 1909). At present this species is only known from three locations: Katoomba (Blue Mountains National Park), Audley (Royal National Park) and Wingecarribee Swamp, Robertson. Specimens have been collected from near Tillyard's original site at Leura in the Blue Mountains and exuviae have been found in the Royal National Park, almost two years after the January 1994 bush fires destroyed 95% of the vegetation in the park (Theischinger, pers. comm.). The population at Wingecarribee Swamp may have become extinct, as neither adult nor larval stages have

been found recently. Wingecarribee Swamp is under threat from 'peat mining' operations which is destroying the larval habitat, through machinery removing the peat from the swamp and by the machinery clearing vegetation from the perimeter of the swamp. This species is listed as rare.

Corduliidae *Archaeophya adamsi* Fraser

Archaeophya adamsi is possibly the rarest dragonfly in south-eastern Australia. Only five adults of *A. adamsi* have been recorded; the holotype from Edungalba, Queensland, three specimens from Berowra Creek, near Hornsby and one male from Somersby Falls near Gosford, both sites in New South Wales (Theischinger and Watson, 1978). This species appears to have disappeared from the Edungalba and Berowra Creek sites and possibly only exists at Somerby Falls (Theischinger, pers. comm.). Fortunately the Somersby Falls site lies within the Brisbane Water National Park. Thus the natural habitat is being preserved, furthering the populations survival. However the site is under increasing pressure from agricultural activities, dairying and fruit growing, which are increasing in the upper catchment immediately upstream of the park. This species is listed as vulnerable.

Corduliidae *Austrocordulia leonardi* Theischinger

Austrocordulia leonardi is a recent discovery. It was found in 1968 in low numbers from the Woronora River and Kangaroo Creek, south of Sydney (Theischinger, 1973). It seems to have disappeared from the Woronora River as the result of the Army demolishing a small weir on the river. Further investigations have revealed populations on the Nepean River at Maldon and at Audley in the Royal National Park (Theischinger, pers. comm. 1995). The discovery of the population in the Royal National Park will aid the conservation of this species which has a very restricted distribution and is listed as rare. In contrast, its congener *A. refracta* has a wide distribution and is extremely common.

Corduliidae *Synthemiopsis gomphomacromioides* Tillyard

Tillyard (1917) originally collected *Synthemiopsis gomphomacromioides* from Cradle Mountain, north-west Tasmania, at an elevation of 1500 m. He gave details to distinguish the larva, but since then no larvae have been positively identified. Allbrook (1979) listed 19 collection sites and suggested that this species was restricted to the swampy buttongrass plains at all altitudes, where it is locally common. Sant and Hayes (1990) agreed with Allbrook, reporting adults locally abundant in the Pelion area, Cradle Mountain and in the Mount Melaleuca area. Many of the collection sites of this species are in the Southwest National Park or Cradle Mountain Park. This species is listed as rare.

Discussion

The nine species investigated are all worthy of concern, having met the criteria to be given a conservation status ranking. Hill and Michaelis (1988) listed four species (*H. mirabilis*, *A. auriculata*, *S. gomphomacromioides* and *Austroaeschna hardyi*) from south-eastern Australia as of conservation concern and the first three species are listed as noteworthy species in this paper. However the last species, *A. hardyi*, has a wide distribution and is not given conservation status. A further seven species (*Austroargiolestes isabellae*, *Austrogomphus angeli*, *Austrocordulia leonardi*, *Austropetalia patricia*, *A. tonyana* and *Archaeophya adamsi*), not listed by Hill and Michaelis (1988), have been selected in this paper, for recommendation of conservation status. *Archaeophya adamsi* is classified as vulnerable, *Austrogomphus angeli* as indeterminate and the other seven species as rare (Table 2).

Much of the Australian odonate fauna is endemic and unique. All the species selected are endemic and have strong Gondwanan links. These relict dragonflies have very restricted distributions, their larvae are relict forms, and are found in unusual and different habitats (splash-zones of waterfalls, burrows etc.) (Table 1).

Archaeophya adamsi is probably the rarest dragonfly in south-eastern Australia and should receive prompt conservation attention to establish its distribution and habitat, and only then can preservation measures be implemented. *Austrogomphus angeli* has been listed as indeterminate, due to only a few specimens being collected, and these occurred over a wide range. The status can be established formally only after intensive collecting has been conducted and the species distribution, and larval identity and habitat are determined.

Habitat conservation is hampered in the cases of *Austroargiolestes isabellae* and *Austrogomphus angeli* because their larvae are not known and their ecology can not be characterised. Without this information recommendations to conserve their habitats cannot be suggested.

Table 2. The suggested conservation status of each species and conservation priorities for their habitats.

Species	Status	Conservation priorities
Hemiphlebia mirabilis	rare	preserve the known habitats
Austroargiolestes isabellae	rare	identify the larva and its habitat
Austrogomphus angeli	indeterminate	identify the larva and its habitat, determine its distribution
Archipetalia auriculata	rare	preserve the known habitats
Austropetalia patricia	rare	preserve the known habitats
A. tonyana	rare	preserve the known habitats
Petalura gigantea	rare	preserve the known habitats
Archaeophya adamsi	vulnerable	establish the distribution and habitat
S. gomphomacromioides	rare	identify the larva and its habitat

All the species suggested, except *A. angeli*, are found in montane areas, generally within National Parks or in State Parks (*H. mirabilis*), and with continued preservation and monitoring, these populations should remain viable. In contrast *A. angeli* occurs along the lower reaches of the River Murray, an area which has been heavily effected by salination from intensive irrigation and with very little chance of the degraded land being rehabilitated.

Much of the distributional data on Australian dragonflies on which this paper is based, has not been derived from commissioned surveys, but from naturalist collectors, post-graduate research students or scientists like Dr J.A.L. Watson. This type of collecting helps to build up databases of distributional information over a period of time, but cannot provide the detailed information of well designed commissioned surveys, such as the survey of the dragonflies of the Kakadu National Park conducted by CSIRO staff (Watson and Abbey, 1980). Detailed surveys should therefore be undertaken initially to establish the true status of these species. Once the status is known, conservation procedures can be implemented.

Currently there is no conservation strategy to preserve our unique Australia dragonflies. In the past the major conservation emphasis has been directed to the preservation of *H. mirabilis* (New 1993) and only recently Sydney Water has had Wingecarribee Swamp (a known habitat of *P. gigantea*) listed on the Australian Heritage Council's Register of the National Estate.

Conclusions and recommendations

The conservation of Australia Odonata has not developed at the same rate as urban expansion, economic activity and the natural habitats of many dragonflies being destroyed. Preservation of habitats is urgent, but in the specific cases treated here, sites cannot be recommended until the distributions and ecology of the rare species are known. This can be achieved through initial surveys which should initiated immediately to determine the identity and ecology of the unknown larvae; and the distribution and population size of rare species.

From larval and ecological information, the following conservation recommendations can be suggested:

1. Conservation of natural aquatic and terrestrial habitat by including the sites in National Parks or as nature reserves, by purchasing the site if it is on private land;
2. Control pollution discharges to aquatic habitats through co-operatinon with the relevant private land owners and the states Environmental Protection Agency;
3. Transfer of conservation knowledge through education of non-specialists and children;
4. Monitor the success, or failures, of the above conservation measures and modify when necessary.

Conservation of Odonata depends on the protection of the adult and larval habitats which in many cases are very susceptible to destruction from urban and rural development.

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