

Management of threatened invertebrates of the Tasmanian Wilderness World Heritage Area

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The Tasmanian Wilderness World Heritage Area is one of the largest and least inhabited of the world heritage areas where natural processes and ecological systems can continue to occur in a relatively undisturbed state. It provides important habitat for 13 invertebrate species listed under the *Tasmanian Threatened Species Protection Act 1995*. Three are listed as endangered, three as vulnerable and seven as rare. The Tasmanian Parks and Wildlife Service, together with other organizations, continues to protect and manage these species. This paper details the threatened invertebrate species known to occur in the Tasmanian Wilderness World Heritage Area and provides a summary of the management issues and actions. Listing species is a useful tool for drawing attention to invertebrate conservation and threatening processes, however, maintaining habitats and minimizing threatening processes should be the primary focus for invertebrate conservation.

INTRODUCTION

The Tasmanian Wilderness World Heritage Area (TWWHA) encompasses over 1.38 million hectares of west and south-west Tasmania (Fig. 1). It is one of the largest and least inhabited of the world heritage areas, and one of the few listed for both natural and cultural values. One of the natural criteria for world heritage area listing is that it contains important and significant natural habitats where threatened species of animals and plants survive (Anon. 1987). At the time the TWWHA was inscribed on the world heritage list in 1982, little was known about its fauna and the original nomination document (Anon. 1981) mentioned only four threatened fauna species, all vertebrates. In 1989 a second nomination succeeded in expanding the boundaries of the TWWHA (Anon. 1989). By this time, 15 threatened species of invertebrates were recognized, largely a result of surveys organized by the Tasmanian Parks and Wildlife Service (TPWS). These assisted volunteer scientists from Australia and overseas to undertake survey work in the TWWHA.

In 1992 the TPWS established flora and fauna advisory committees to consider and review the current state of knowledge of native species and to assign a conservation status to those considered rare or threatened. These committees considered the status of flora and fauna in Tasmania, independent of their status elsewhere in Australia, hence a species may be rare on the mainland but common in Tasmania. The committees published lists of rare and threatened plants (Flora Advisory Committee 1994), vertebrates (Vertebrate Advisory Committee 1994) and invertebrates (Invertebrate Advisory Committee 1994), and

were subsequently incorporated into the *Tasmanian Threatened Species Protection Act 1995*. However, not all species listed as rare were included in the Act. Only those considered to be at risk were listed. A total of 110 species of invertebrates are currently (December 1997) listed on the Act and the TWWHA provides habitat for 13 species from six orders (Table 1). This paper details those threatened invertebrate species that occur in the TWWHA by providing a summary of the management issues and the actions undertaken.

ENDANGERED SPECIES

A species is listed as endangered if it is in danger of extinction because its long-term survival is unlikely while the factors causing it to be endangered continue to operate. The three endangered species are the Lake Pedder Earthworm *Diporochoeta pedderensis* (Annelida, Megascolecidae, Fig. 2), the Lake Pedder Caddis-fly *Taskiropsyche lacustris* (Trichoptera, Kokiriidae) and McCubbin's Caddis-fly *Taskiria mccubbini* (Trichoptera, Kokiriidae). All were recorded from the original Lake Pedder prior to flooding in 1972 for hydro-electric power generation. Since the flooding, none has been recorded, despite searching, and it is probable they are now extinct. *D. pedderensis* was first described in 1974 from a single specimen collected from the original shore of Lake Pedder. The TPWS commissioned two surveys to locate extant populations of this species (Dyne 1991; Blakemore 1996), neither could find any specimens. A small number of specimens of each of the two endangered caddis-flies were collected in 1965 and described by Neboiss (1977). Despite several surveys in the Lake Pedder area and other

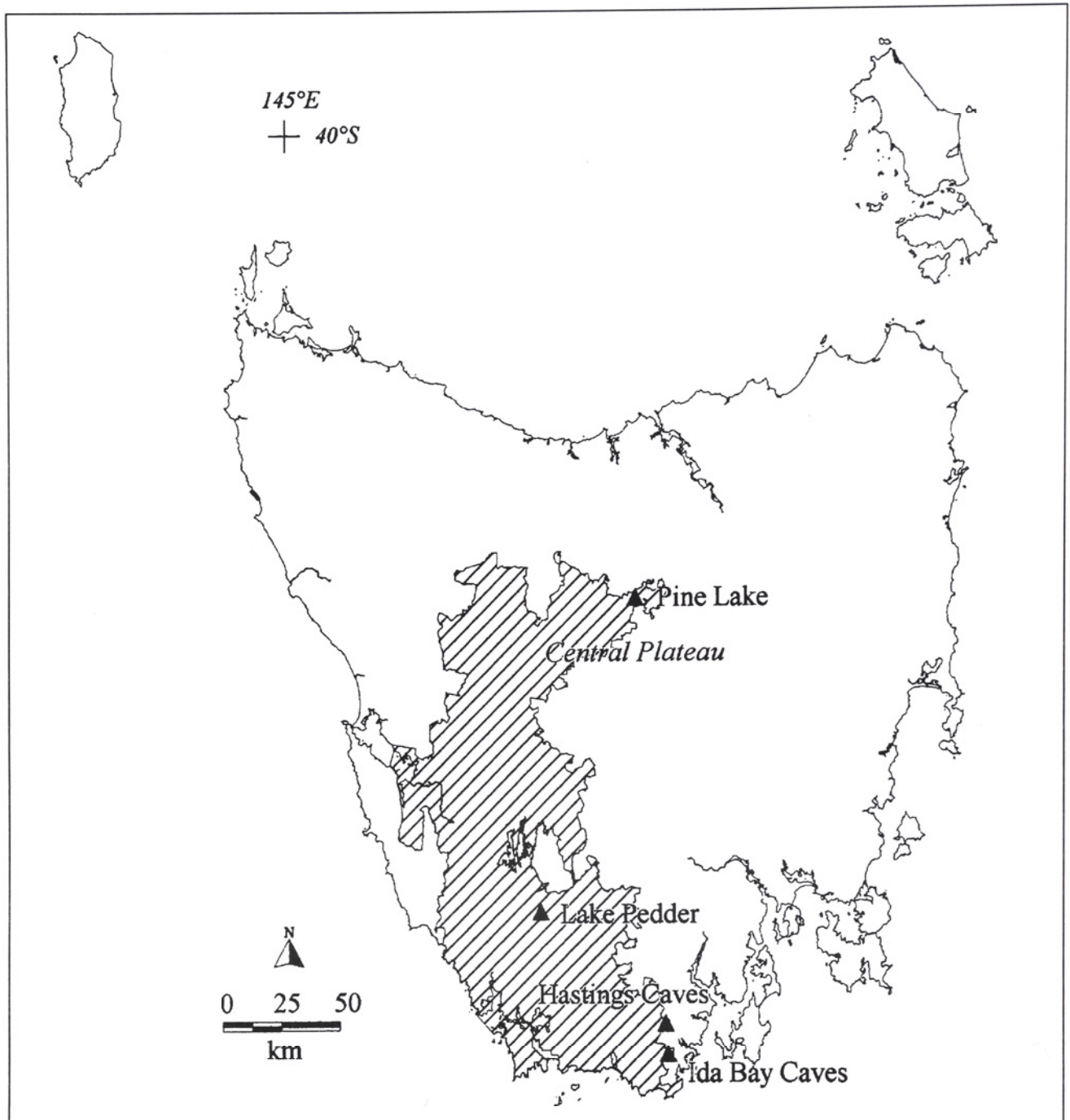


Figure 1. Location of Tasmanian Wilderness World Heritage Area (shaded) and place names mentioned in text.

parts of south-west Tasmania since the flooding, no further specimens have been collected (Neboiss 1977; Chilcott 1987, 1988; Neboiss *et al.* 1988). The possibility of finding extant populations of these three species is considered unlikely.

VULNERABLE SPECIES

A species is listed as vulnerable if it is likely to become endangered if the factors causing it to be vulnerable continue to operate. Two species of moth and one beetle listed as vulnerable occur in the TWWHA. The Blind Cave Beetle *Goedtrechus mendumae*

(Coleoptera, Carabidae, Fig. 3) is an obligate cave dweller with an extremely limited distribution. It is known only from a small section (<150 m²) of Exit Cave (part of the Ida Bay cave system) in the southeastern part of the TWWHA. It is found on moist substrates near water in the deep cave zone. Originally it was under threat from a limestone quarry operation, located adjacent to Exit Cave (and outside the TWWHA), which was affecting water quality. The quarry has been closed to protect the cave and cave fauna and is now being rehabilitated. Trampling of beetles and their habitat by visitors, as well as illegal collecting, are now the most

Table 1. Threatened invertebrates currently known from the Tasmanian Wilderness World Heritage Area. E = endangered, V = vulnerable, R = rare.

Taxon	Common Name	Status
Annelida		
<i>Diporochaeta pedderensis</i> (Jamieson 1974)	Lake Pedder Earthworm	E
Arachnida		
<i>Olgania excavata</i> Hickman 1979	Little Six-eyed Spider	R
<i>Hickmanoxyomma cavaticum</i> Hickman 1958	Ida Bay Cave Harvestman	R
Syncarida		
<i>Allanaspides hickmani</i> Swain, Wilson and Ong 1971	Hickman's Pygmy Mountain Shrimp	R
Coleoptera		
<i>Goedetrechus mendumae</i> Moore 1972	Blind Cave Beetle	V
<i>Idacarus troglodytes</i> Lea 1910	Ida Bay Cave Beetle	R
Lepidoptera		
<i>Dirce aesiodora</i> Turner 1926	Pencil Pine Moth	V
<i>Oreixenica ptunarra</i> Couchman 1953	Ptunarra Brown Butterfly	V
<i>Fraus latistria</i> Nielsen and Kristensen 1989	Broad-striped Ghost Moth	R
Trichoptera		
<i>Taskiropsyche lacustris</i> Neboiss 1977	Lake Pedder Caddis-fly	E
<i>Taskira mccubbini</i> Neboiss 1977	McCubbin's Caddis-fly	E
<i>Orphninostrichia maculata</i> Mosely 1934	Spotted Microcaddis-fly	R
<i>Oxyethira mienica</i> Wells 1981	Miena Microcaddis-fly	R

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Figure 2. Lake Pedder Earthworm *Diporochaeta pedderensis*.

significant threats to this species. Although access to Exit Cave has temporarily been restricted to visits for management purposes, it is expected that the cave will eventually be re-opened to recreational users under controlled conditions. At the time of writing, surveys are being undertaken by the TPWS to identify other locations in the Exit Cave system where the species occurs.

The Pencil Pine Moth *Dirce aesiodora* (Lepidoptera, Geometridae, Fig. 4) belongs to the most primitive group of the cosmopolitan geometrid moths, the Archiearineae (McQuillan 1987). The Archiearineae are day-flying, alpine moths that are believed to be relicts from the Gondwana land mass. *D. aesiodora* is only known from a few locations in Tasmania despite several surveys for it in recent years (McQuillan 1987, 1988; McQuillan and Nielsen 1989, 1990). All known locations are associated with a Tasmanian endemic conifer, Pencil Pine *Athrotaxis cupressoides*. The major threat is the loss of pencil pines, its only known food source and habitat, from fire and disease. Pencil pines are very fire sensitive and there are no known

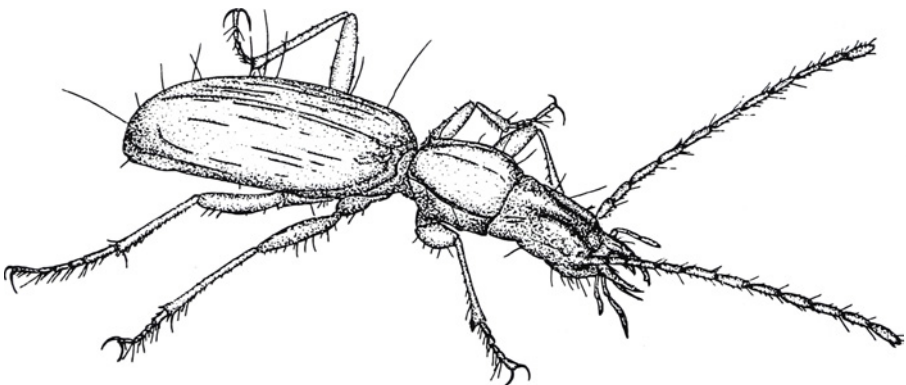
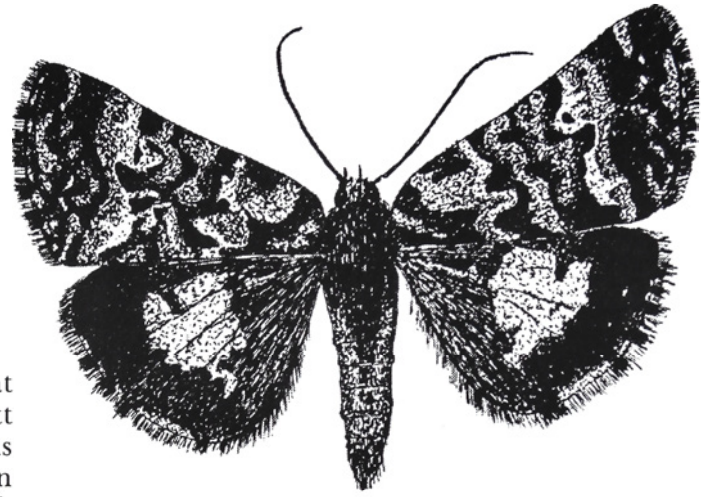


Figure 3. Blind Cave Beetle *Goedetrechus mendumae*.

Figure 4. Pencil Pine Moth *Dirce aesiodora*.



instances of trees recovering after fires that have occurred over the last century (Corbett 1996). About 40% of pencil pine rainforest has been destroyed by recent fires, particularly in the Central Plateau region (Kirkpatrick *et al.* 1995). In the World Heritage Area Management Plan (Anon. 1997) Pencil Pines are identified as fire sensitive and fire will be, as far as practical, prevented in alpine and subalpine vegetation. In addition to fire, the discovery of *Phytophthora* in alpine areas (Rudman and Whinam 1995) represents a serious threat to pencil pines and hence to pencil pine moths. The disease was discovered in the Pine Lake area of the Central Plateau and has not been previously recorded in Australia but it is known from North and South America. Pencil Pines show no immunity and many trees have died in the Pine Lake area (Rudman and Whinam 1995). The sites (totalling almost 1 ha) infected by alpine *Phytophthora* have been quarantined (2 020 ha) and a management plan has been written (Rudman and Whinam 1995). The aim of the management plan is to contain the disease

and to reduce its impact on the vegetation in the area. At the time of writing surveys are being undertaken by the TPWS to identify other locations where *D. aesiodora* occurs in Tasmania and several new locations have been found.

The Ptunarra Brown Butterfly *Oreixenica ptunarra* (Lepidoptera, Nymphalidae, Fig. 5) is a small brown and orange butterfly found in parts of central northern Tasmania, at altitudes greater than 400 m above sea level and containing a dense cover of tussock grass, *Poa* spp. A small (650 ha) but important part of its range is protected in the TWWHA. Outside the TWWHA, large areas of habitat have been lost to conversion to pasture and tree plantations (Neyland 1991). A recovery plan for *O. ptunarra* (Neyland 1991), funded by Environment Australia, has improved its conservation status and a large number of previously unknown colonies have been found. Colonies likely to be affected by commercial forestry operations are now identified in timber harvest plans and protected from logging while some land owners employ farm management practices that are sympathetic to their conservation. One forestry company has established a private reserve system which includes almost 1 000 ha of butterfly habitat (Tasmanian Parks and Wildlife Service, unpubl. records). The species is being considered for downlisting.

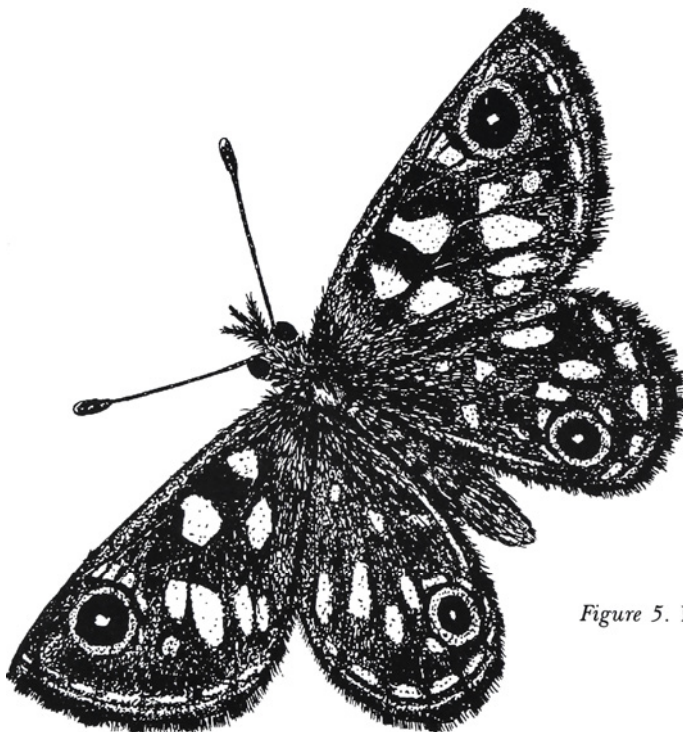


Figure 5. Ptunarra Brown Butterfly *Oreixenica ptunarra*.

RARE SPECIES

A species is listed as rare if it has a small population in Tasmania that is neither endangered nor vulnerable, but is at risk. Seven rare species are recognized for the TWWHA. These either have a very restricted range or are only known from a small number (<5) of widely distributed locations. The rare invertebrates with a restricted range are Hickman's Pygmy Mountain Shrimp *Allanaspides hickmani* (Syncarida, Anaspididae, Fig. 6) and two cave species: the Cave Harvestmen *Hickmanoxyomma cavaticum* (Opilionida, Triaenonychidae, Fig. 7) and the Ida Bay Cave Beetle *Idacarabus troglodytes* (Coleoptera, Caradibae, Fig. 8). *H. cavaticum* is restricted to three neighbouring cave systems — Ida Bay, Hastings and North Lune — in south-east Tasmania, whereas *I. troglodytes* is known only from the Ida Bay cave system. As was the case for *G. mendumae* (see above), these two cave species were under threat from a limestone quarry operation, which has now been closed. Trampling of habitat and the animals themselves by cave visitors remains the main threat to these

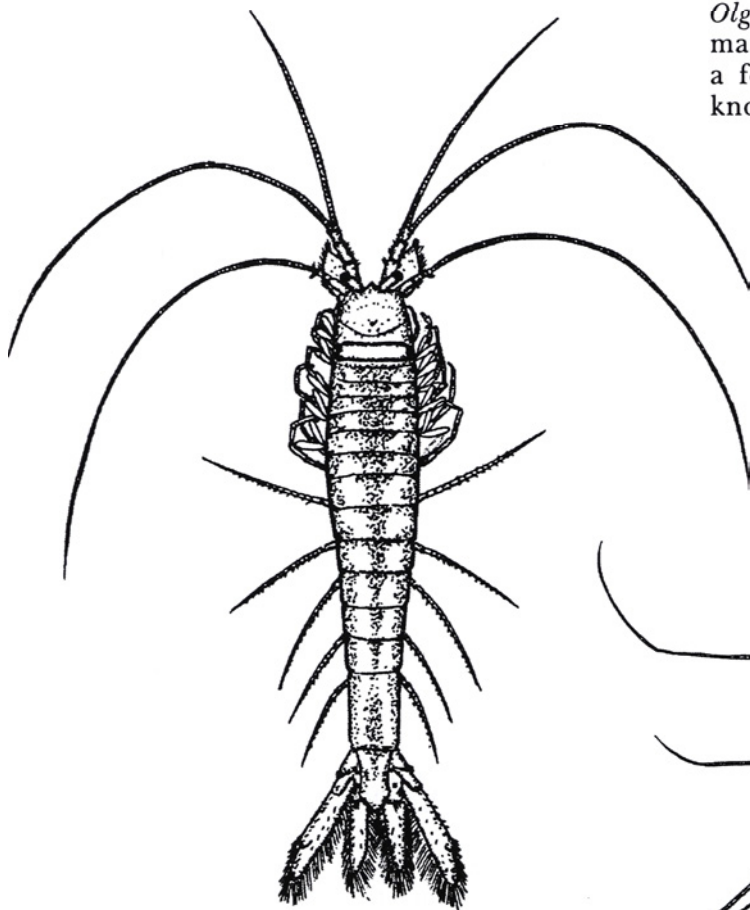


Figure 6. Hickman's Pygmy Mountain Shrimp *Allanaspides hickmani*.

species. At the time of writing, surveys are being undertaken to identify important habitat areas in the caves for these and other more common species, with the intention of restricting access to such areas, and establishing fauna sanctuaries.

A. hickmani is a small shrimp-like crustacean belonging to the family Anaspididae. It appears to be naturally restricted to a small area (<2 km²) of buttongrass moorland near Lake Pedder where it occurs in pools and the burrows of crayfish (*Parastacoides* sp.). Some habitat was lost when the original Lake Pedder was flooded in 1972. The main threat to the species is a stochastic event such as fire or flood. Fire in the peat beds could devastate the population by removal of the entire habitat (Horwitz 1990), but the species has survived fire that does not remove peat (author, pers. obs.).

The remaining four rare species are the Broad-striped Ghost Moth *Fraus latistria*, (Lepidoptera, Hepialidae, Fig. 9) the Spotted Microcaddis-fly *Orphninostrichia maculata* (Trichoptera, Hydroptilidae), the Miena Microcaddis-fly *Oxyethira mienica* (Trichoptera, Hydroptilidae) and the Little Six-eyed Spider *Olgania excavata* (Araneae, Micropholcommatidae). Although they are known only from a few locations, their wide distribution and known habitat preferences suggest that they

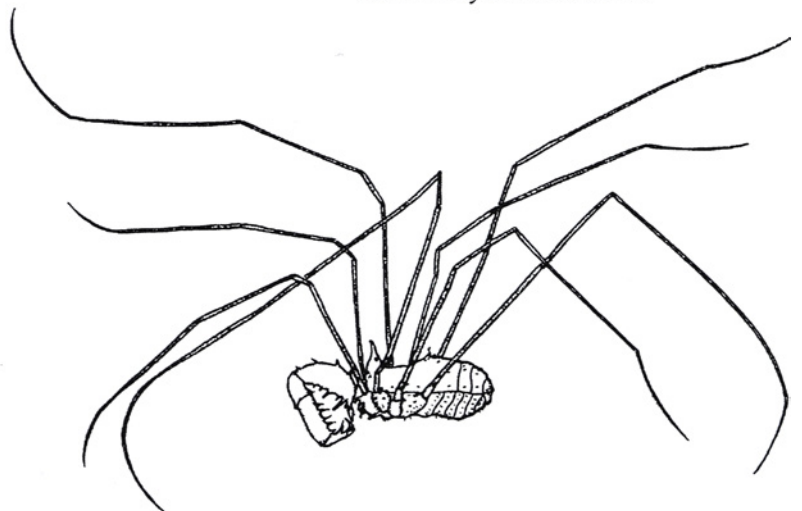


Figure 7. Ida Bay Cave Harvestman *Hickmanoxyomma cavaticum*.

Figure 8. Ida Bay Cave Beetle
Idacrabus troglodytes.

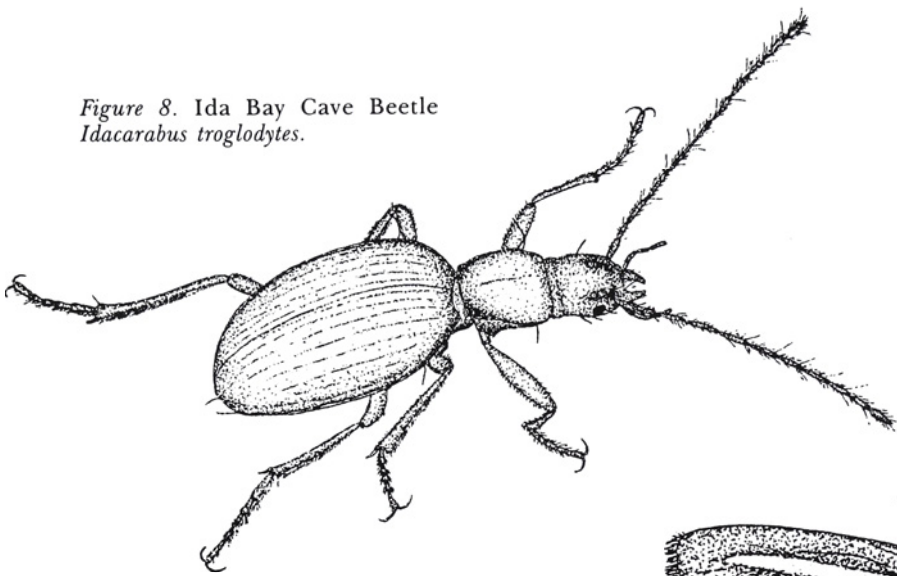
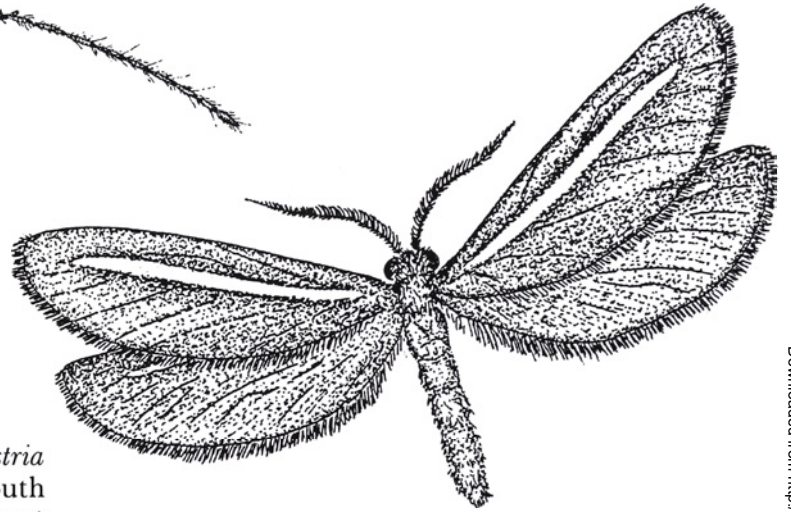


Figure 9. Broad-striped Ghost Moth
Fraus latistria.



may be more common. For example, *F. latistria* is known from locations in the north, south and south-west of Tasmania in quite different habitats. *Orphninostrichia maculata* is known to be quite common on the Australian mainland yet is known from only two widely distributed locations in Tasmania. Although there have been surveys for these rare species, it is possible that they are difficult to locate, especially as some species are very small. *O. excavata*, for example, is a minute spider (body size less than 1 mm) which favours moist conditions in cryptic locations. The primary management strategy for these species is to continue to protect existing known locations and to identify new locations where the species occur so that they may be down-listed.

DISCUSSION

The TWWHA remains one of the few places in the world where natural processes and ecological systems continue to occur over a relatively large (~20% of Tasmania) and undisturbed landscape (Anon. 1989). It contains a diverse range of plant and animal species with high levels of endemism, particularly among invertebrates (Smith and Banks 1991). The land tenure of the TWWHA consists of State reserves (92.7%) and conservation areas (7.2%) with the remainder being Aboriginal land or freehold (Anon. 1997). Consequently, fauna in the great majority of the TWWHA receives the highest level of legal protection possible under the Tasmanian *National Parks and Wildlife Act 1971*. Thus, the TWWHA plays a significant role in the conservation of Tasmania's fauna.

As the TWWHA is relatively undisturbed and has a high level of protection, the priority

for invertebrate conservation management within Tasmania is on unreserved land where there is a far greater level of disturbance of native fauna and their habitats, and where management issues are more complex. Nevertheless, there are processes that occur within the TWWHA that have or might impact on the conservation of invertebrate species or communities, particularly those with restricted distributions. These include management activities (e.g., scientific surveys, habitat and fuel reduction burns, track construction), recreational activities (e.g., caving, horse-riding, four-wheel driving, bushwalking), tourism developments (e.g., toilets and sewage systems, huts, visitor centres), exotic species (e.g., wasps, bees, trout and diseases), illegal collecting, wildfire and global climate change. For most listed species currently known from the TWWHA little active management is required other than drawing the attention of land managers to the location of the species and their habitats to ensure that they are not inadvertently harmed. For some listed species, further survey work is required to confirm the existence of populations or to find other populations so that a species' listing may be changed. Other listed species, such as *G. mendumae* and *D. aesiodora*, have required and may continue to require more active management to ameliorate threatening processes.

The TWWHA is known to contain 13 invertebrate species listed as threatened. Seven of these species are only known to occur in the TWWHA, the remaining six also occur

in locations outside the TWWHA. Given the large size of the world heritage area, the diverse range of habitats and access difficulties, together with a high proportion of endemic invertebrates and a limited amount of invertebrate research, there are likely to be more threatened invertebrates remaining to be identified. The 13 listed species represent a diverse group of invertebrates with different habitats and life histories that provide limited insight into predicting where to look for additional threatened species. Four of the species occur in caves, five in freshwater and the remainder are associated with different terrestrial habitats (pine trees, grasslands, heathlands and beach sediments). Most appear to have naturally limited distributions. Habitats with limited distributions (such as caves, grasslands, alpine areas, some plant species) and that are under threat have potential for containing threatened invertebrates.

Assessing the conservation status of invertebrates depends on further inventory survey work over the whole TWWHA. This must be linked with more taxonomic work, as many TWWHA invertebrates remain undescribed. However, this process requires significant amounts of time and resources and there is unlikely to be any significant progress in the foreseeable future. The priority for invertebrate conservation is to maintain representative habitats and to minimize threatening processes to protect a wide range of species. Habitats in the TWWHA are generally well protected, although we need to know more about the natural processes operating within habitats, for example, the role of fire in maintaining invertebrate biodiversity in buttongrass moorlands. Thus, identifying threatening processes and assessing their impacts is the key focus area for protecting invertebrates in the TWWHA. Threatening or potentially threatening processes of concern in the TWWHA that are currently being investigated or controlled include: honey bees, goats, rabbits *Phytophthora*, recreational cave users and fire.

Greater time and funds are directed towards management of habitat and threatening processes in the TWWHA than on single species management. However, listing species is a helpful tool for conservation management as it can focus public and government attention on invertebrate conservation and threatening processes and can result in funding for management research. Listed species often have benefits over non-listed species as they are normally considered a higher priority for management, research and interpretation. However, listing often

leads to conservation benefits for non-listed species and can increase our knowledge of invertebrate biodiversity, ecology and evolutionary history. For example, the closure of a quarry at Exit Cave to protect *G. mendumae* and *I. troglodytes* resulted in protection for all invertebrate species occurring in the cave. The survey for extant populations of *D. pedderensis* resulted in the collection of many oligochaete taxa most of which were previously undescribed (Dyne 1991; Blakemore 1996). The survey and study currently undertaken on *D. aesiadora*, which belongs to a primitive family of geometrid moths, will provide further insight into the evolutionary history of this worldwide group (P. McQuillan, University of Tasmania, pers. comm.).

Listing and management of threatened invertebrates is a new process in Australia and there is much to learn about assessing their conservation status. Some of the species listed for the TWWHA are likely to be de-listed in the near future, such as *O. maculata*. Conversely, there will be other species that require listing. Although listing species is a useful tool to focus attention on threatening processes, we shall never be able to assess the conservation status of all invertebrate species. Species, whether flora or fauna, require habitat free of human-induced threatening processes if they are to survive in a relatively natural system. The conservation focus should therefore be on maintaining representative habitats and minimizing the impacts of threatening processes. The challenge is to manage the requirements of species with the increasing demands of human society. Although the TWWHA is a large area of relatively undisturbed protected habitat there are processes, such as exotic species, global warming and fire, which may have significant impacts on invertebrates. The TPWS continues to investigate these and other threatening processes to assess and reduce their impact.

ACKNOWLEDGEMENTS

All illustrations by Karen Richards, except the Lake Pedder Earthworm which is by Craig Williams. Angus Sinclair prepared the map.

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