

**BASSLINK INTEGRATED IMPACT ASSESSMENT
STATEMENT**

**POTENTIAL EFFECTS OF CHANGES TO HYDRO POWER
GENERATION**

APPENDIX 9:

GORDON RIVER TERRESTRIAL FAUNA ASSESSMENT

J. Griggs¹

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1. Environmental Consultant – Environmental Services, Hydro Tasmania, GPO Box 355D, Hobart, 7001.

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1 INTRODUCTION

This report details the environmental issues associated with terrestrial fauna adjacent to the Gordon River downstream of the Gordon Dam and Gordon Power Station to the confluence with the Franklin River (the “study area”), as related to Basslink. It describes, from a desktop study, what is currently known about the terrestrial fauna in this zone and details the threatened fauna recorded in this area, as given by the Department of Primary Industries, Water and Environment’s threatened species database (GTSPOT). It evaluates potential impacts on the terrestrial fauna from hydro-electric operations under Basslink, and describes potential mitigation measures and suggested monitoring requirements.

This is part of a suite of studies being carried out by Hydro Tasmania to identify issues resulting from possible changes to the Tasmanian non-marine aquatic environment arising from the changed operation of the hydro-electric system with the introduction of Basslink. Basslink is a proposed development to connect the Tasmanian electricity grid to Victoria and the National Electricity Market via an undersea cable across Bass Strait.

The Gordon Hydro-catchment is made up of the catchment of the Gordon River, which feeds into Lake Gordon, and the catchments of the Serpentine and upper Huon Rivers, which are impounded by Lake Pedder. The area has a cool temperate climate, and experiences high annual rainfall, particularly in winter and in the mountainous regions in the upper catchment. The geology in the region is generally characterised by large areas of Precambrian quartzites and phyllites, overlain by Ordovician Devonian limestones and sand/siltstones. The vegetation is generally wet sclerophyll forest, rainforest, buttongrass moor and wet scrub. The catchment is almost entirely within the South West National Park, with small areas of State Forest in the east of the catchment, upstream of the study area. The primary land uses throughout the catchment are conservation, recreation and tourism associated with wilderness appreciation.

2 METHODS

Faunal species lists were obtained from the Department of Primary Industries, Water and Environment’s threatened species database (GTSPOT). Due to the limited amount of research that has been undertaken in this area, the list is incomplete. The only other major source of information was obtained from survey work undertaken as part of the Lower Gordon River Scientific Survey, which occurred in the mid 1970’s. Other literature sources provided additional information. Observations from researchers during field work for the Basslink studies performed in 1999-2000 were also added where appropriate.

The Tasmanian Wilderness was inscribed on the World Heritage List in 1989 via a number of natural and cultural criteria for the World Heritage values of this area. Throughout the text, it is indicated where those terrestrial animals found in the Gordon River Valley fit these criteria. See Appendix 14 of this report series – Gordon River World Heritage Area Values Assessment (Kriwoken 2001) for specific wording of these criteria.

3 CURRENT CONDITIONS

3.1 Background

The Gordon catchment is located in the south-west of Tasmania, covering an area of approximately 7,220 km². Of this area, approximately 2,000 km² drains into the Gordon Power Scheme, with the remainder downstream of Hydro structures. The main rivers in the catchment include the Gordon, Franklin, Denison and Olga rivers and a small section of the Serpentine River. A location plan of the

catchment showing the study area downstream of the Gordon Dam and Gordon Power Station tributaries is presented in Figure 3.1.

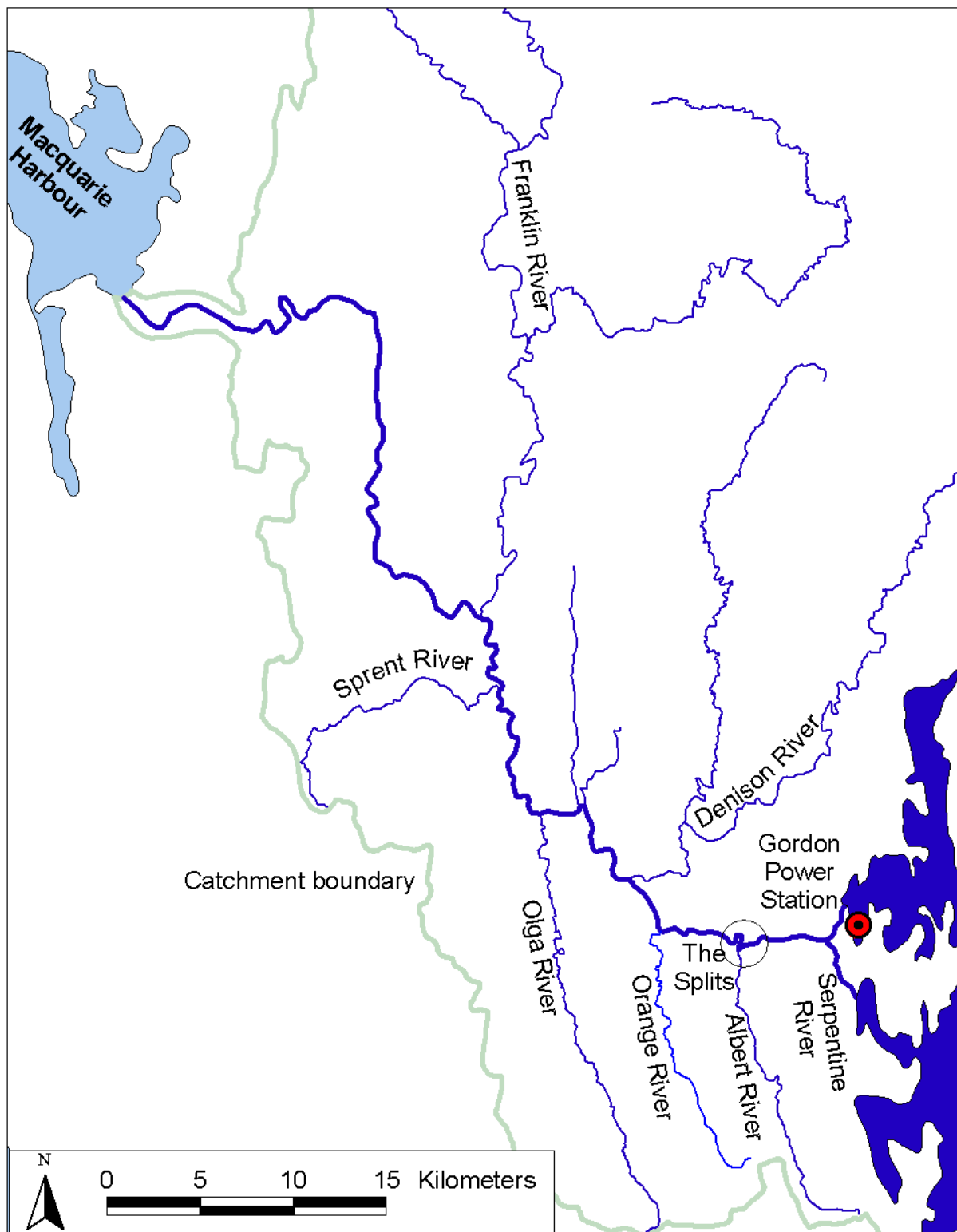


Figure 3.1: Catchment map of Gordon River downstream of Gordon Power Station.

The region of Tasmania in which the Gordon catchment is located experiences annual rainfall ranging from 1,600 mm along the western coastline, to over 3,200 mm at some points along the mountain ranges of the west coast. Highest rainfall is recorded in winter. Annual average evaporation at

Strathgordon is 869 mm, with the summer and winter averages being 621 mm and 248 mm, respectively (Pemberton 1989).

A seasonal pattern of minimum and maximum temperatures is also evident in the region. Mean temperatures at Strathgordon range from 3.0° C to 9.7° C in winter, and from 8.3° C to 19.5° C in summer (http://www.bom.gov.au/climate/averages/tables/cw_097053.shtml 2000). Frosts are experienced in most months of the year, with heavy frosts during the period May to October. Snow and hail can be experienced in higher areas at any time of year and can occasionally descend to sea level. There is no permanent snow line or accumulation of snow, although patches may remain on the higher peaks until December (Watson 1978).

Eucalyptus simmondsii and *Eucalyptus obliqua* wet forest, rainforest, buttongrass moor, and wet scrub are the dominant vegetation types in the Gordon and Pedder regions. Smaller areas of Western alpine complex, rainforest-wet scrub mosaic, *Eucalyptus delegantensis* forest and *Eucalyptus obliqua* forest, *Eucalyptus coccifera* forest and Labyrinth subalpine complex also occur in the catchment. Rainforest and wet scrub occur mainly in the western part of the catchment, while buttongrass moors are located throughout the region (Kirkpatrick and Dickinson 1984). Within the study area rainforest covers large areas of the Gordon, Maxwell, Franklin, Orange and Olga valleys while heath/sedgeland buttongrass plains are found extensively in the Olga and Hardwood valleys.

3.2 Birds

The number of birds found in the south-west of Tasmania is half that found in the drier areas of the state (Rose and King 1983). The first survey of the Lower Gordon area by ornithologists occurred in the 1970's over three years as part of the Lower Gordon River Scientific Survey (Rose 1978). In this survey only eight species of bird were observed on or near the river, although there had been reports of a further three species lower down the river near Sir John Falls Camp (the Black Duck, Black Swan and White-breasted Sea Eagle). These species were the Grey Fantail, Welcome Swallow, Black Cormorant, White-faced Heron, Tree Martin, Azure Kingfisher, Common Sandpiper and Great Egret (see Table 3.1). The low diversity of species found near the river was thought to be due to a number of factors including the following (Christian and Sharp-Paul 1979):

- the banks of the Gordon River are extremely steep in most places and usually covered in rainforest down to the water's edge; and
- there are few flat open banks suitable as a habitat for wading birds and where these are, the sudden changes in river depth after heavy rainfall limit their availability and render any aquatic plant life and its associated aquatic fauna an irregular food source for water fowl.

Additional bird species not found in the Rose (1978) survey but recorded by GTSPOT for the study area are the Chestnut Teal, Grey Teal, Pacific Black Duck, Musk Duck, Great Cormorant, Little Pied Cormorant and the Hoary-headed Grebe. The location of these species in the GTSPOT database is given on the Gordon River near Abel Gorge, however the accuracy of this location is given as within 18,500 m, so they could have been observed anywhere within a radius of 18,500 m of this location. The number of bird species that are reported for, on or near the river is most probably an underestimate, as there are several common bird species recorded in the surrounding area that are also likely to be found on the banks of the river that have not been recorded for this category (eg. thornbills, crescent honeyeaters and green rosellas) (pers. comm. DPIWE Basslink working group).

Table 3.1: Bird Species Abundance and Habitat for the Gordon River Valley downstream of the Gordon Dam to Warners Landing (TABLE 4 Christian & Sharp-Paul (1979))

MAJOR VEGETATION TYPES	RAINFOREST	WET SCLEROPHYLL		Scrub	Heath / Sedge	
Structural Classification	Closed forest	open forest	woodland	Scrub	Heath / Sedge	River
VERY COMMON (100 counts)						
Green Rosella	X	X	X	X	X	
Grey Fantail	X	X	X	X	X	X
Olive Whistler	X	X	X	X	X	
Tasmanian Thornbill	X	X	X	X	X	
White-browed Scrub Wren	X	X	X	X	X	
Crescent Honeyeater	X	X	X	X	X	
COMMON (20-100 counts)						
Yellow-tailed Black Cockatoo	X	X	X	X	X	
Welcome Swallow			X	X		X
Golden Whistler	X	X	X	X	X	
Grey Shrike Thrush	X	X	X	X	X	
Scrub Tit	X	X	X	X	X	
Striated Field Wren				X	X	
Southern Emu Wren				X	X	
Silvereeye	X	X	X	X	X	
Eastern Spinebill	X	X	X	X		
Yellow-throated Honeyeater	X	X	X	X	X	
Black Currawong	X	X	X	X	X	
Spine Tailed Swift			X	X	X	
Black Cormorant						X
Pink Robin	X	X	X	X		
UNCOMMON (2-19 counts)						
Brush Bronzewing Pigeon	X					
Wedge-tailed Eagle					X	
Masked Owl	X			X		
Southern Boobook	X			X		
Brown Falcon				X	X	
Sulphur-crested Cockatoo	X	X	X	X	X	
Ground Parrot					X	
Shining Bronze Cuckoo	X	X	X	X		
Flame Robin	X		X		X	
Dusky Robin		X		X	X	
White's Thrush	X	X	X	X		
Superb Blue Wren				X		
New Holland Honeyeater		X	X	X		
Strong-billed Honeyeater	X	X	X	X		
Beautiful Firetail			X	X		
Forest Raven	X	X		X		
Fantailed Cuckoo	X	X		X		
Black-faced CuckooShrike		X	X	X		
Striated Pardalote	X	X	X			
Grey Goshawk	X	X		X	X	
White-faced Heron						X
Tree Martin		X		X	X	X
RARE (1-2 counts)						
Swift Parrot			X			
Azure Kingfisher						X
Common Sandpiper						X
Latham's Snipe				X		
Yellow Wattle Bird				X		
Accipiter sp.*				X		
Great Egret						X
TOTAL:	49	27	27	38	24	8

*Probably a Collared Sparrowhawk

Three of the species of birds recorded for the Gordon catchment are listed as threatened species. These are the Wedge-tailed Eagle (*Aquila audax fleayi*), the Swift Parrot (*Lathamus discolor*) and the Grey Goshawk (*Accipiter novaehollandiae*). Listed threatened species are considered World Heritage values under natural criterion (iv), however suitable habitat for these species is not restricted to this area.

Of these species, only the Grey Goshawk is possibly affected by Hydro water management regimes. The Grey Goshawk is a small hawk dependent on old-growth wet forests, such as rainforest, mixed forest and blackwood swamps, with dense mature blackwood swamps the preferred habitat for breeding and foraging. It preys primarily on other birds, but small mammals, reptiles and insects are also included in its diet. It has habitat requirements (habitat and prey species) which are dependent on a wetland ecosystem, which could be affected by Hydro waterway operations. Swamp forests are largely concentrated in north-west and north-east Tasmania on areas of low lying, seasonally inundated recent sands, clays and alluviums (Wells 1991) however how changes in water regimes may affect these forests this has never been assessed. Blackwood swamp habitat has not been identified as occurring in the middle Gordon River thus far. This species is listed as rare in the Threatened Species Act 1995, and as such is also considered a World Heritage value under natural criterion (iii), however its distribution is not restricted to the Gordon catchment and this area is not considered part of its core breeding and foraging habitat.

All species of bird except the Ground Parrot and the Azure Kingfisher are well distributed in the rest of the state of Tasmania where suitable habitat exists. The Ground Parrot is a species which shows links to ancient Gondwanan biota, has habitat elsewhere which is under threat and is of conservation significance, thus is considered a World Heritage value under natural criteria (i), (ii) and (iv) while the Azure Kingfisher is a sub-species of the mainland species and as such is considered a World Heritage value under natural criterion (ii).

The Azure Kingfisher is restricted mainly to the west of the state (but is also found in New Guinea, northern and eastern Australia) and its preferred habitats are small rivers and creeks with tree-lined banks (Watts 1999). It feeds on fish and nests in a burrow dug into a riverside bank. It has been sighted on the Gordon, Franklin, Pieman and Arthurs Rivers in western Tasmania. The species in Tasmania is a sub-species of the mainland species. The Azure Kingfisher is dependent on aquatic ecosystems for food (small fish) and has a restricted distribution, with rare sightings in the Gordon River recorded by the Lower Gordon Scientific Studies. The action plan for Australian Birds 2000 (Garnett and Crowley 2000) lists the Azure Kingfisher as critically endangered (this species is not listed in state or federal legislation as yet) due to declines in range and number, and gives the most likely reason for decline being competition with Brown Trout for galaxiids and other small fish.

The Ground Parrot is found in south-west and south-eastern Australia; in Tasmania it too is restricted to the west coast of the state. Its preferred habitats are densely vegetated coastal heaths, swamps and buttongrass plains where it nests in shallow depressions under grassy tussocks (Watts 1999). It is uncommon in the survey area, where most vegetation adjacent to the river is mixed forest or rainforest, and more commonly found in areas closer to the coast (Christian and Sharp-Paul 1979).

Mixed forest of an eucalypt overstorey with a rainforest understorey supports the greatest diversity of birds, while rivers and associated fringing vegetation supports the least diversity (Rose and King 1983). How much of the composition of the local waterbird population is due to Hydro operations or to natural conditions is unknown. In general, Hydro waterway operations have not been assessed for impacts on Tasmanian bird species.

3.3 Mammals

The results of a survey of mammal species (except bats) carried out over three summers in the mid-1970's as part of the Lower Gordon River Scientific Survey were summarised in Christian and Sharp-Paul (1979), and are presented below (Table 3.2). The occurrence of terrestrial mammal fauna

investigated as part of the survey was related to vegetational structures (Hocking and Guiler 1983). Broad habitat preferences can be derived for individual species from this table, however abundance comparisons between different species cannot be made due to different forms of sampling in the survey. Nineteen mammal species were found in the course of the survey, seventeen of which were terrestrial and one of which was introduced. The two aquatic species of mammal (Platypus and Water Rat) are discussed in Appendix 7 of this report series – Gordon River Macroinvertebrate and Aquatic Mammal Assessment (Davies and Cook 2001). There was a marked difference in the composition of fauna in forested habitats compared to sedgeland/shrubland habitats. This suggests that there are two main terrestrial macrohabitats, differentiated by life form, height and cover – forest and sedgeland/scrub. Nevertheless, a number of species, although characteristic of one macrohabitat type, were also well represented in the other macrohabitat type. Only 3 species were found to occur in all habitat types: the Swamp Rat (*Rattus lutreolus*), the Common Wombat (*Vombatus ursinus*), and the Pademelon (*Thylogale billardieri*). The Tasmanian Devil (*Sarcophilus harrisi*) was only found close to the major waterways and was probably using the river banks for access, but is normally found in a wide range of habitats from rainforest to sand dunes. The macrohabitats of the study area are characteristic of western Tasmania as a whole, and within these habitats a variety of microhabitats exist for the animals found in this area.

Table 3.2: Relative abundance of Mammals in each habitat in Lower Gordon Basin (adapted from Christian and Sharp-Paul (1979))

Common name	Latin name	Rainforest and Wet Sclerophyll			Scrub	Heath / Sedge
		Closed Forest	Open Forest	Woodland		
Swamp Antechinus	<i>Antechinus minimus</i>	x	x	x	C	C
Dusky Antechinus	<i>Antechinus swainsonii</i>	A	A	A	x	x
Eastern Pygmy Possum	<i>Cercartetus nanus</i>	x	R	R	x	x
Spotted-tail Quoll	<i>Dasyurus maculatus</i>	R	R	R	C	C
Eastern Quoll	<i>Dasyurus viverrinus</i>	x	R	x	R	C
Southern Brown Bandicoot	<i>Isoodon obesulus</i>	x	x	x	C	x
Bennetts Wallaby	<i>Macropus rufogriseus</i>	x	x	x	x	C
Ringtail Possum	<i>Pseudocheirus peregrinus</i>	A	A	A	x	x
Broad-toothed Mouse	<i>Pseudomys</i> (formerly <i>Mastacomys</i>) <i>fuscus</i>	x	x	x	x	C
Long-tailed Mouse	<i>Pseudomys higginsii</i>	A	C	A	C	R
Swamp Rat	<i>Rattus lutreolus</i>	A	A	A	C	C
Tasmanian Devil	<i>Sarcophilus harrisi</i>	A	R	C	R	x
White-footed Dunnart	<i>Sminthopsis leucopus</i>	R	x	x	x	R
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>	R	x	R	x	R
Pademelon	<i>Thylogale billardieri</i>	A	A	A	R	C
Common Wombat	<i>Vombatus ursinus</i>	R	R	R	C	A

R = rare; C = common; A = abundant; x = absent

GTSPOT records the native Spotted-tail Quoll (*Dasyurus maculatus*), Ringtail Possum (*Pseudocheirus peregrinus*), Long-tailed Mouse (*Pseudomys higginsii*), Pademelon (*Thylogale billardieri*), Brushtail Possum (*Trichosurus vulpecula*) and the introduced Cat (*Felis catus*) and Black Rat (*Rattus rattus*) as occurring adjacent to the Gordon River near Sir Johns Falls and downstream of this area; and the native Tasmanian Devil and introduced cat recorded near the Gordon Dam. During field work for other projects associated with Basslink assessment for the Gordon River a feral cat was seen just upstream of Second Splits in the Gordon River, and Tasmanian devils were observed on a

number of occasions from boats and helicopters, foraging in the river when the water level was low, or using the river banks to access other areas.

Monotremes (Echidna) and dasyurid species (Swamp Antechinus, Dusky Antechinus, Spotted-tailed Quoll, Eastern Quoll, White-footed Dunnart and Tasmanian Devil) are considered as relict biota which show links to ancient Gondwanan biota and as such are considered World Heritage values under the natural criterion (i). Animals which are sub species of mainland mammals (eg. Swamp Antechinus, Southern Brown Bandicoot, Common Wombat, Common Ringtail Possum, Eastern Pygmy Possum, Swamp Rat) and those whose habitat elsewhere is under threat (eg. Spotted-tail Quoll, Swamp Antechinus, Broad Toothed Rat) are considered World Heritage values under natural criterion (iii). Animal species of conservation significance such as Spotted-tail Quoll, Swamp Antechinus, and Broad Toothed Rat are also considered World Heritage values under natural criterion (iv).

The almost complete absence of exotic mammals is important, as this is not common in modern Tasmania. It appears that minimal disruption of the habitat, rather than isolation from potential colonising species, has been a major factor in the exclusion of most exotic mammal species in the region (Hocking and Guiler 1983).

3.4 Reptiles

The south west of Tasmania is not a particularly hospitable area for reptiles, due to cool summers, abundant rainfall, numerous waterways and high levels of rainforest cover. The reptiles present in the area are found within cleared areas such as rock platforms and river valleys where direct sunlight can penetrate for basking. The only reptile recorded by GTSPOT for the Gordon River is the Tasmanian Tree Skink (*Niveoscincus pretiosus*), which has three locations in the database, one near the Gordon Dam and the other two some distance below the Franklin River confluence. Although a Tasmanian endemic, this species is widely distributed across the State, and its offshore islands. The darker body colour of this skink enables it to absorb the sun's warmth more readily and thus maintain a higher body temperature. It is most active during the summer months when insect life is abundant and the weather is warmer. The long limbs of this skink gives the species excellent climbing abilities, allowing it to exploit a number of different habitats. It is found from tall forests to rocky shorelines, and in forested areas is found in trees old enough to develop hollows, often at considerable heights, or under bark and within crevices in logs (<http://www.parks.tas.gov.au/wildlife/reptile/Nivpre.html> November 2000).

3.5 Invertebrates

Thirty-nine orders of terrestrial invertebrates were recognised from sampling of transects as part of the Lower Gordon River Scientific Survey (Christian and Sharp-Paul 1979). Specimens were obtained through intensive sampling of moss, litter, hand sweepings over vegetation, logs and under stones. The report identified 269 species, a list of which are given in the back of Christian and Sharp-Paul (1979). Species identification was incomplete at the time of reporting, but the number of species was estimated to be 4,000-5,000, with many new species discovered. Many of these species were Gondwanan, primitive or relict fauna. A habitat analysis was performed but there was no constant pattern of association that could be related to macrohabitat characteristics. Collections from river banks of the Lower Gordon River by Dyne (1991), although comparatively superficial, have revealed a great diversity in earthworm species within a small area. Specific groups of interest are further discussed below.

There are many species of arachnid that have been identified from the area, some of which are associated with cave environments, and are discussed further in Appendix 10 of this report series – Gordon River Cave Flora and Fauna Assessment (Doran *et al.* 2001). Interestingly, the Little Six-eyed Spider (*Olgania excavata*) is considered to primarily inhabit caves (ie. it is a troglophile), but was collected from moss found adjacent to the banks of the Gordon River not in a cave during the Lower

Gordon River Scientific Survey along a transect near the Denison River (Hickman 1979). It is also found in Exit and Bubs Hill caves which are outside the Gordon catchment. It is listed as rare in the *Threatened Species Protection Act* 1995. This species was not observed or collected by Doran *et al.* (2001) in Bill Neilson Cave. It is considered rare, and as such is a World Heritage value under the natural criteria (iii) and (iv) which addresses rare or unusual flora and fauna.

Euperipatoides leukarti has a single record in GTSPOT for the Gordon River valley. This invertebrate belongs to the phylum Onychophora, commonly called peripatus or velvet worms. Members of this group have great evolutionary significance because they are thought to be members of two exclusive categories - living fossils and missing links. They have a fossil record extending back to the Cambrian period, over 500 million years ago, and display features in common with both the annelids (segmented worms, such as earthworms) and arthropods (such as insects, crustaceans and spiders). Present day peripatus are found on land masses derived from the fragmentation of the super-continent Gondwana. Here they are restricted to moist terrestrial microhabitats such as rotting logs, leaf litter and soil (Dept. Biological Sciences Macquarie University 1998). Terrestrial invertebrate species which show links to ancient Gondwanan biota such as the velvet worms are considered World Heritage values under natural criteria (i) and (ii).

3.6 Terrestrial fauna distribution in relation to current Gordon Power Station operation.

The Gordon River valley downstream of the Gordon Dam is dominated by rainforest, or emergent eucalypts with a rainforest understorey, particularly adjacent to the river. Further away from the river buttongrass plains are found. In general, rainforest and vegetation immediately adjacent to the river support the least diversity of species, with the greatest diversity found in areas disturbed by fire, this includes mixed forest, scrub and heath/sedgeland.

The only terrestrial fauna directly affected by hydro-electric generation water regimes are those individuals that inhabit the banks of the Gordon River. As the regulated flow conditions in the Gordon River have been in place for the past 25 years, the terrestrial fauna in the immediate vicinity of the Gordon River have most likely long since adapted to these conditions. The maximum discharge of the Gordon Power Station changed after the first 11 years when a third turbine was added. The operational regime depends on the conditions in the rest of the hydro-electric generation system, with the power station typically being operated on “base load” during the dry summer months, and at other times of the year on step load, with one turbine running almost constantly and the other two turbines switched on and off as demand requires. For more details on hydrology see Appendix 2 of this report series – Gordon River Hydrology Assessment (Palmer *et al.*, 2001). The terrestrial fauna in the study area that may utilise the river have had to tolerate the changes in river height and water volume, and have most likely adjusted their distribution to compensate for these flow fluctuations.

The Azure Kingfisher utilises river banks for nesting sites, and its food source is small native fish. The current flow regime has resulted in bank erosion and associated localised vegetation loss and a reduction in native fish due to repeated dewatering of the river bed. The presence of trout has also impacted on the composition and distribution of native fish populations in the Gordon River (see Appendix 8 of this report series - Gordon River Fish Assessment – Howland *et al.* 2001). The fish communities present in both the Gordon River and its tributaries upstream of Ewerts Gorge are dominated by trout, with few small native fish present, the latter in the main found in tributaries. Even though there has been no survey of the population size of the Azure kingfisher, or its utilisation of the Gordon River, it is likely that the above factors have had a negative impact on the availability of good habitat for this species under the current operational regime.

4 POTENTIAL BASSLINK CHANGES

Changes to the hydrological regime downstream of the Gordon Power Station under Basslink are unlikely to greatly affect the terrestrial fauna living in the area adjacent to the Gordon River. The maximum discharge from the power station will not change, so there will be no change to the area of inundation downstream. Terrestrial fauna have had over 20 years to adjust their patterns of distribution in relation to the maximum inundation area of the riparian zone. This would include *Olgania excavata* (a rare surface and cave dwelling spider), which is one of the few species occurring in the Gordon River valley that is listed (as rare) by the *Threatened Species Protection Act 1995*. Individuals of this species would only be affected by changes in flow patterns in the Gordon River if it were inhabiting moss located directly on the bank of the river within the zone of inundation. This is unlikely to be preferred habitat for this species.

The frequency of river level changes will increase, however the rate of river level rise from the activity of the power station will not change greatly as this is dictated by the physical constraints of the topology of the river. Hence, the terrestrial fauna will still have sufficient time to exit the river and avoid the rising water levels for most zones of the river except those immediately downstream of the power station, before the river gets to Abel Gorge. There is no specific data on the amount of use of the river by Tasmanian Devils and other animals as a corridor to access other areas, but there is the potential with an increase in the frequency of river level changes that this may affect the ability of these animals to utilise exposed cobble beds for this purpose. This may have some influence on the dispersal of species within the river corridor.

The increasing amount of on-off events will mean that off river pools and side channels will be flushed more frequently, thus the water in these pools will be fresher, and will have less time to evaporate and/or drain, hence the animals utilising the off river pools for drinking water will have access to fresher water.

None of the terrestrial mammals or birds are likely to be directly affected by Basslink. The food source (small native fish) of the Azure Kingfisher may be affected –see Howland *et al.* (2001). Basslink has the potential to decrease the habitat availability for small fish in the main river channel, but improve conditions in tributary streams. There is also the potential for increased migration opportunities of native fish through migration barriers such as the Splits under a Basslink water regime. Geomorphological investigations in the middle Gordon indicate (L. Koehnken pers. comm. and see Appendix 4 of this report series – Gordon River Fluvial Geomorphology Assessment (Koehnken *et al.* 2001)) that under Basslink initiation and enhancement of bank erosion at sites downstream of Denison River is unlikely; and that acceleration of bank erosion upstream of the Denison River may occur but only over very long time scales.

Basslink-induced flow changes are therefore not likely to reduce the availability or stability of nesting sites within the banks. Therefore, there will be no substantial difference in the suitability of conditions for nesting sites for the Azure kingfisher in the middle Gordon between Basslink and current operations. Those conditions will continue to remain degraded.

Some invertebrates such as velvet worms may inhabit the banks of the Gordon River, but these species are well represented in the surrounding area.

5 MANAGEMENT ISSUES

Current power station operations have little impact on terrestrial fauna in the Gordon River Valley beyond the high water level of the Gordon River. The Azure Kingfisher may be affected as a secondary impact through the effects of the power station operation on the composition and abundance of fish in the Gordon River – which is its primary food source. This food source is already being impacted by power station operations, and it is unlikely that this secondary impact will change enough to greatly affect the Azure Kingfisher under Basslink – see Howland *et al.* (2001) for more details. Changes in the frequency of fluctuating flows are unlikely to affect the location of this species' nesting sites as it has to accommodate fluctuating flows under current conditions.

There are very few listed terrestrial threatened species of fauna in the Gordon River Valley, with three bird species and one spider currently being recorded as present in the study area. Mature Blackwood swamps, which are the preferred habitat for the Grey Goshawk, are potentially affected by water management regimes, however this habitat type has not been recorded for the middle Gordon River thus far. Gordon Power Station operations are unlikely to greatly affect these species as there is sufficient suitable habitat in the surrounding catchment area.

6 MITIGATION OPTIONS

No direct mitigation options have been considered for terrestrial fauna in the Gordon River valley below the Gordon Power Station because of the small likelihood of direct Basslink impacts. Other mitigation measures which address bank erosion, such as bank protection works or modification of flows will also benefit any terrestrial organisms present in these areas of the riparian zone. An environmental flow release is primarily directed towards providing water for habitat protection of the instream biota, however it would be of some benefit to the riparian vegetation by limiting the time the rivers would be at lowest flows. This may also have a flow-on effect on associated terrestrial fauna.

7 MONITORING CONSIDERATIONS

There are no plans to conduct monitoring of terrestrial fauna in the Gordon River Valley below the Gordon Power station as the impact of Basslink is considered minimal to this ecotype. Terrestrial fauna monitoring could be conducted alongside other ongoing monitoring programs, noting any unusual sightings of animals, alteration to habitat, and general health and condition of species observed. Monitoring of erosion and fish populations will provide an indication of any further impacts on the habitat requirements of the Azure kingfisher.

8 REFERENCES

- Christian, C.S. & Sharp-Paul, A. (1979) *Lower Gordon River Scientific Survey - Description of the Biophysical Environment*, The Hydro-Electric Commission, Hobart. 139.
- Davies, P.E. & Cook, L.S.J. (2001) Appendix 7: Gordon river Macroinvertebrate and Aquatic Mammal Assessment. Basslink Integrated Impact Assessment Statement - Potential Effects of Changes to Hydro Power Generation. Hydro Tasmania, Hobart.
- Dept. Biological Sciences Macquarie University (1998) "Peripatus, modern tools reveal secrets of ancient animals." In: *Biology Bytes*, Vol. 2000.
- Doran, N., Richardson, A. & Wood, S. (2001) Appendix 10: Gordon River Cave Flora and Fauna Assessment. Basslink Integrated Impact Assessment Statement - Potential Effects of Changes to Hydro Power Generation. Hydro Tasmania, Hobart.
- Dyne, G.R. (1991) "The status of the Lake Pedder earthworm, *Perionychella pedderensis* and Investigations into New or Little-known Earthworms from the Western Tasmania World Heritage Area." In. Department of Parks, Wildlife and Heritage - Tasmania, Hobart.
- Garnett, S.T. & Crowley, G.M. (2000) *The Action Plan for Australian Birds*, Environment Australia - Commonwealth of Australia, Canberra. 673 pp.
- Hickman, V.V. (1979) "On some Tasmanian spiders of the families Oonopidae, Anapidae and Mysmenidae." *Papers and Proceedings of the Royal Society of Tasmania*, **113**, 53-79.
- Hocking, G.J. & Guiler, E.R. (1983) "The mammals of the Lower Gordon River region, south-west Tasmania." *Australian Wildlife Research*, **10**, 1-23.
- Howland, M., Davies, P., Bluhdorn, D. & Andrews, D. (2001) Appendix 8: Gordon River Fish Assessment. Basslink Integrated Impact Assessment Statement - Potential Effects of Changes to Hydro Power Generation. Hydro Tasmania, Hobart.
- Koehnken, L., Locher, H. & Rutherford, I. (2001) Appendix 4: Gordon River Fluvial Geomorphology Assessment. Basslink Integrated Impact Assessment Statement - Potential Effects of Changes to Hydro Power Generation. Hydro Tasmania, Hobart.
- Kirkpatrick, J.B. & Dickinson, K.J.M. (1984) *Vegetation of Tasmania 1:500,000.*, Forestry Commission of Tasmania., Hobart.
- Kriwoken, L. (2001) Appendix 14: Gordon River World Heritage Area Values Assessment . Basslink Integrated Impact Assessment Statement - Potential Effects of Changes to Hydro Power Generation. Hydro Tasmania, Hobart.
- Palmer, P., McConachy, F. & Peterson, J. (2001) Appendix 2: Gordon River Hydrology Assessment. Basslink Integrated Impact Assessment Statement - Potential Effects of Changes to Hydro Power Generation. Hydro Tasmania, Hobart.
- Pemberton, M. (1989) *Land Systems of Tasmania Region 7: South West.*, Department of Agriculture, Hobart.
- Rose, R. (1978). *The Birds Lower Gordon River Scientific Survey.*, The Hydro-Electric Commission, Hobart, Tasmania. 29pp.

- Rose, R.W. & King, C.D. (1983) Birds of the South-West. In: *The South West Book - A Tasmanian Wilderness.*, (Foundation., A.C. ed.), pp. 113-119. William Collins Pty Ltd, Sydney.
- Watson, B. (1978). Climate. *Lower Gordon River Scientific Survey*, Hydro-Electric Commission, Hobart.
- Watts, D. (1999) *Field Guide to Tasmanian Birds*, New Holland Publishers, (Australia) Pty Ltd, Sydney. 192.
- Wells, P. (1991) Chapter 4: Wet Forests. In: *Tasmanina Native Bush: A management handbook*, (Kirkpatrick, J.B. ed.). Tasmanian Environment Centre, Hobart.