

A TOURISM CLASSIFICATION OF AUSTRALIAN WILDLIFE



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Status Assessment of Wildlife Tourism in Australia Series

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EXECUTIVE SUMMARY

Aims

This report aims to present information on different kinds of Australian wildlife that has a bearing on their suitability for use in tourism. This should assist in identifying suitable species for further development of wildlife tourism products, encourage sustainable practices in such development, and discourage inappropriate development.

Key Issues

There are many animal species in Australia that could be suitable for wildlife tourism. However, much of the relevant information is not available in a form that is readily accessible to the tourism industry and those responsible for its management. The potential of many lesser-known wildlife sites and species is being ignored, while a few are probably being used excessively. There also seems to be much scope for enhancing the quality of tourism experiences based on well-known species, especially in terms of providing improved interpretation. In an attempt to address this information shortage, this report presents information on Australian wildlife that may be useful in developing sustainable tourism based on these species.

Firstly, relevant information on major categories of Australian wildlife (terrestrial mammals, birds, reptiles, amphibians, terrestrial invertebrates, freshwater fauna and marine fauna) is presented, highlighting the kinds of opportunities and constraints on wildlife tourism development within each category.

The core of the report is a spreadsheet (available on floppy disk or CD) containing an extensive classification of Australian wildlife in relation to tourism. Information is presented on 190 categories of wildlife including: individual species (e.g. emu, bilby); taxonomic groups (e.g. kangaroos, tree frogs); categories based on features of interest or concern to tourists (e.g. edible fish, dangerous snakes); or remaining elements of a subdivided group (e.g. 'other insects'). The spreadsheet provides information on which species might be of particular interest

to tourists, where and how they might be found, as well as possible constraints on their use in tourism, such as difficulty of access and shyness of animals. In addition, the spreadsheet addresses conservation management issues by providing information on the vulnerability of wildlife and their habitats, and how this varies seasonally.

The spreadsheet makes use of published information where possible; however given the lack of such information for some variables, in such cases the authors have used their own judgement and experience. The spreadsheet herein is not intended to be a final product, but is a starting point to stimulate feedback. There is much yet to be learned about the habits and vulnerability of Australian animals and it is hoped that future inputs will be used to modify and expand the spreadsheet to make it increasingly useful.

There is a danger that providing information on attractions without first setting guidelines for their protection will contribute to their destruction rather than their sustainable development and management. As competition between operators increases over the coming decades, an increase in areas and species utilised appears inevitable, and it is better for such increase to occur in an informed way, utilising the kind of information presented in this spreadsheet. A lack of realisation of tourism potential will not necessarily prevent use of a natural area, and may even lead to its clearance for agriculture or other usage. Further, this spreadsheet does not include (and nor will future versions include) instructions for finding vulnerable wildlife or localities.

Conclusions

Informed decisions are necessary for the development and management of a sustainable wildlife tourism industry. The current spreadsheet, and future versions as the results of further research are added, will provide valuable information on which to base such decisions.

We ask all who would like to contribute suggestions or information for the spreadsheet to email Ronda Green at ronda.green@mailbox.gu.edu.au

or by post to Australian School of Environmental Studies, Griffith University, Nathan QLD 4111.

Recommendations

The spreadsheet is intended to provide information to both tourism operators and conservation managers, in a first-of-its kind compilation for such purpose. It is not designed to assist either tourists or operators to go directly to particular animals or places, and operators will need to do considerable additional reading and fieldwork to develop plans for quality tours. Operators will, however, find herein a wealth of basic information and an enhanced view of possibilities for wildlife tours. We recommend that they utilise the spreadsheet when planning a new tour or expanding an existing one, and when attempting to make their tours 'greener'. We also recommend that conservation managers use the spreadsheet both when planning interpretation programs and when compiling environmental advice for operators.

TABLE OF CONTENTS

ABSTRACT	1
1. INTRODUCTION	2
1.1 Rationale, Aims And Scope	2
1.2 The Need For Improved Tourism-Related Wildlife Information	3
2. OVERVIEW OF MAJOR GROUPINGS OF AUSTRALIAN WILDLIFE	7
2.1 Terrestrial Mammals	7
2.2 Birds	12
2.3 Reptiles	14
2.4 Amphibians	17
2.5 Terrestrial Invertebrates	18
2.6 Freshwater Fauna	19
2.7 Marine Fauna	20
3. THE SPREADSHEET	24
3.1 Overview	24
3.2 How To Use The Spreadsheet	28
4. FACTORS CONTRIBUTING TO THE POSITIVE APPEAL OF WILDLIFE TO TOURISTS	30
4.1 Introduction	30
4.2 Appearance	31
4.3 Behaviour And Other Features Of Special Interest	34
4.4 Perceived Danger (Positive Aspects)	35
4.5 Distinctiveness And Rarity	36
4.6 Fame	37
5. FACTORS CONTRIBUTING TO NEGATIVE REACTION OF TOURISTS TOWARDS WILDLIFE	38
5.1 Introduction	38
5.2 Perceived Danger (Negative Aspects)	39
5.3 Disgust	40
5.4 Nuisance Value	41
6. PRACTICAL ISSUES WITH USING WILDLIFE FOR TOURISM	42
6.1 Introduction	42
6.2 Distribution (Within Australia) And Habitat	43
6.3 Ease Of Finding And Observing	43
6.4 Approachability	44
7. ENVIRONMENTAL MANAGEMENT	46
7.1 Introduction	46
7.2 Conservation Status	46
7.3 Potential Tourist Impact On Animals And Habitats	47
7.4 Actual Danger To Humans	48
8. OTHER SOURCES OF INFORMATION	49
9. FUTURE EXPANSION OF THE SPREADSHEET	50
REFERENCES	51
APPENDICES	
A: Wildlife Groups Contained In The Tourism Classification Spreadsheet	58
B: Key Wildlife-Related References Recommended To Support Sustainable Wildlife Tourism	61
C: Key Websites With Wildlife Information Relevant To Wildlife Tourism	67
AUTHORS	70
ACKNOWLEDGEMENTS	71
BOX	
1: Key features of Australian Wildlife pertaining to tourism potential	2

ABSTRACT

There are many animal species in Australia that could be suitable for wildlife tourism. However, much of the relevant information is not available in a form that is readily accessible to the tourism industry and those responsible for its management. In an attempt to address this information shortage, this report presents information on Australian wildlife that may be useful in developing sustainable tourism based on these species. The core of this material is presented in spreadsheet format and contains an extensive classification of Australian wildlife in relation to tourism. It provides information on which species might be of particular interest to tourists, where and how they might be found, as well as possible constraints on their use in tourism, such as difficulty of access and shyness of animals. In addition, it addresses conservation management issues by providing information on the vulnerability of wildlife and their habitats, and how this varies seasonally. The spreadsheet is not intended to be a final product, but is a starting point to stimulate feedback. We recommend that it be utilised by tourism operators when planning a new tour or expanding an existing one, and when attempting to make tours 'greener'. We also recommend that conservation managers use the spreadsheet both when planning interpretation programs and when compiling environmental advice for operators.

1. INTRODUCTION

1.1 Rationale, Aims And Scope

This report is one of a series designed to provide a review and assessment of the status of wildlife tourism in Australia, and should preferably be read in conjunction with Higginbottom *et al.* (2001a), who present an overview of this topic. One of the key conclusions of the latter report is that Australia has potential as a major wildlife destination for international tourists, based on consideration of trends in international wildlife tourism, patterns of demand, and certain positive attributes of Australian wildlife. The authors also recognise, however, that a number of characteristics of Australian wildlife provide constraints on the extent of wildlife tourism development, and these need to be addressed through the appropriate design of experiences (see Box 1).

Box 1: Key Features of Australian Wildlife Pertaining to Tourism Potential

POSITIVE FEATURES

- High biodiversity
- High levels of endemism¹
- High conservation value (related in part to the above two points)
- Fauna with unusual features
- Fauna attracting high levels of scientific interest
- Relatively large areas of natural habitat
- Relatively large areas of natural habitat under legal protection
- Relatively low seasonality
- Ease of finding and observing some species which occur in high numbers and/or predictable concentrations
- Relatively few large and dangerous animals (see 3.1)

NEGATIVE FEATURES

- Many species (including many of our mammals) that are difficult to find and/or observe (because of nocturnal or cryptic habits or rarity) and/or occur in remote areas
- High proportion of threatened species
- Relatively few large and dangerous animals (see 3.1)

¹ endemic animals are those that occur naturally only within the region in question (e.g. 'endemic to Australia and New Guinea')

While these generalisations may be useful as part of a basis for marketing campaigns or broad strategy directions, they are insufficient for the establishment and design of new, high quality visitor-wildlife experiences that will not be unduly disruptive to the animals. Functional plans for such activities requires a knowledge of the potential of different animals for tourism development, including probable tourist response to the animal, interesting features to include in interpretation, various practicalities (e.g. infrastructure) and the vulnerability of the animal and its habitat.

This report provides information relevant to the development of sustainable tourism on different types of Australian wildlife. It begins by providing broad information on the major groupings of Australian animals, including both vertebrates and invertebrates. The bulk of the report is a spreadsheet describing key features of relevance to tourism for 190 different kinds (or groups) of animals. The rationale for the design of this spreadsheet is explained within this paper, but for the actual content the reader is referred to an accompanying Excel spreadsheet on floppy disk/CD.

While this report has a focus on non-consumptive tourism² based on free-ranging animals, elements of the content are equally applicable to captive or consumptive situations. As a result of the authors' areas of expertise, examples are drawn mainly from terrestrial vertebrate wildlife, but the issues discussed are relevant to other groups, and the spreadsheet spans the full spectrum of Australian fauna.

Future editions of the spreadsheet will incorporate more information. We ask all who would like to contribute suggestions or information to send this to Dr Ronda Green by post to Australian School of Environmental Studies, Griffith University, Nathan or email: ronda.green@mailbox.gu.edu.au

1.2 The Need For Improved Tourism-Related Wildlife Information

Much of the potential for wildlife tourism in Australia, especially in free-ranging situations, appears to be as yet untapped. Some animals

² as opposed to so-called consumptive forms: principally hunting and fishing

such as kangaroos and koalas are promoted widely, while others are largely ignored. There seem to be many species of native animals that are unknown to most international tourists and even to most Australians, including many tourism operators (pers. comm. with many tourists, tourist operators, tertiary students, adult education students and others). Some of these species might have high popularity if better known (witness the rise of 'bilby-consciousness' within Australia over the last few years). Others, such as small nocturnal mammals, cannot be easily viewed in the wild using conventional means, but a combination of creativity and new technology (for instance infra-red video cameras) might generate ways of doing so.

Some Australian habitats (especially rainforest and reefs) have been well promoted, but others have been largely ignored. It is a pity perhaps that animal sightings are often only that – a sighting with no interpretation, with groups perhaps viewing for less than a minute and then moving on to find something new. The behaviour of our mammals, birds, reptiles and other creatures is often interesting to watch if one knows what to look for and when, and there are many principles of ecology and conservation biology that can be demonstrated while looking at animals in the field. For instance an explanation of the importance of seed dispersal can add greatly to visitor appreciation while watching the brilliantly coloured wompoo fruit doves feasting in a fig tree.

Some wildlife-viewing sites, especially those close to capital cities or where well-promoted eco-lodges adjoin national parks, are heavily used while many potential sites rarely see a visitor. The relatively low level of use of our wildlife resources for tourism may be seen by some as a problem to be solved for economic reasons, and by others as a welcome protection for animals and ecosystems that might otherwise become over-exploited. But economic and ecological concerns are not necessarily in conflict. There are certainly many areas where unchecked tourism would lead to substantial damage, and places where tourism of any kind could be disastrous to the wildlife (see Green and Higginbottom 2000, 2001). On the other hand, well-managed wildlife tourism has the potential for positive impacts on biodiversity by:

- educating people about the existence, value and conservation problems of our lesser-known species and ecosystems;
- providing a source of revenue or labour for conservation; and
- providing an economic return from uncleared land, which may encourage landowners and decision-makers to retain or restore native habitat³.

Once a tourism operator develops an interest in wildlife beyond the more obvious species, the problems often remain of:

- whether it is a practical possibility to find particular species on a tour;
- if so, how to do so (what time of day or season, what habitat types, how quietly to approach etc);
- how to maximise the quality of the experience for the tourist in terms of both enjoyment and interpretation⁴; and
- how to do all this without scaring the animals off and diminishing the 'supply' for future tours.

Conservation managers and tourism operators alike need to be aware of the vulnerability of species and ecosystems so as to minimise the impacts of tourist activities, and also need to be aware of any potential dangers to the tourists. Although there is far more information available nowadays about Australian wildlife and ecosystems than there was a couple of decades ago, much of it exists in journals and unpublished reports seldom accessed by tourism operators or spread through a number of books which would collectively cost many hundreds of dollars. There is a wealth of popular books on Australian wildlife, some with very good compilations of general information and others with invaluable information for identification. However, none of these are simultaneously:

³ see Green and Higginbottom (2000), Higginbottom *et al.* (2001b)

⁴ a key factor that has been shown to influence visitor satisfaction with wildlife experiences is provision of good information by staff – this issue is reviewed by Moscardo *et al.* (2001)

- produced with the needs of wildlife tour operators in mind;
- comprehensive; and
- affordable.

There is also a lack of readily accessible and well-publicised information on the vulnerability of many species and habitats from the perspective of managing wildlife tourism.

Concern about negative effects of wildlife tourism on wildlife (reviewed by Green and Higginbottom 2001) may call into question the advisability of creating a spreadsheet accessible to operators on the wildlife tourism potential of Australian animals. However:

- the spreadsheet will also be accessible by conservation managers;
- information presented in the spreadsheet does not authorise its usage in any locality (operators must still seek permission from land-owners and government departments);
- the spreadsheet does not provide precise locations; and
- it is proposed that in the course of any future expansion of the spreadsheet care will be taken not to facilitate access to especially vulnerable species or fragile habitats.

Decisions relating to conservation and to the tourist industry are presumably best made when there is sufficient information available, both for an overview of the topic as a whole and for details relevant to particular aspects and situations.

2. OVERVIEW OF MAJOR GROUPINGS OF AUSTRALIAN WILDLIFE

2.1 Terrestrial Mammals

Out of a total of 276 species of native terrestrial⁵ mammals found in Australia (Strahan 1998), about 84% are endemic to Australia and New Guinea⁶ and neighbouring islands⁷. Further, this region is the only area in the world where all three sub-classes of mammal are found⁸. More than half of its mammal species (56%) are marsupials or monotremes, and all the families to which these belong are endemic to the region. The remaining species are placental mammals, and while 33% of the genera are endemic (Dyne and Walton 1987), no placental families are restricted to the region as defined above (Heatwole 1987).

Monotremes occur only in Australia and New Guinea, and are restricted to two species of echidna (one occurring only in New Guinea, the other in both Australia and New Guinea) and the platypus (Australia only). They are thought to represent an ancient group more closely related to the reptiles than are other mammals, and have become extinct elsewhere in the world. As the only animals that lay eggs as well as having fur and suckling their young, they are of great biological interest. The bizarre appearance of the platypus, with its mammalian body form and 'duck-bill' has aroused curiosity ever since European scientists expressed scepticism about its authenticity.

Some 69 species of marsupials also occur in North and South America, but nearly all of these are possums belonging to one family, the Didelphidae⁹. Nowhere else do marsupials reach the levels of diversity and abundance found in Australia. Marsupials are divided into four orders. In Australia the largest order is the Diprotodonta, comprising about 80 herbivorous species, including kangaroos and their smaller relatives, wombats, koalas, possums and gliders. The

⁵ land-dwelling

⁶ the landmass that now consists of Papua New Guinea and Irian Jaya

⁷ a very few reach as far west as Sulawesi but most are confined to Australia or to Australia and New Guinea; these figures are obtained from Burgman and Lindenmayer (1998)

⁸ the three sub-classes of mammals worldwide are the marsupials (Subclass Marsupialia), monotremes (Subclass Prototheria) and placentals (Subclass Eutheria)

⁹ the remainder belong to the families Caenolestidae and Microbiotheriidae (Eisenberg 1981)

Order Dasyuromorphia consists of about 52 species of carnivores (some of which feed predominantly on insects) ranging from mouse-sized animals to the quolls, numbat and Tasmanian devil. Members of the Order Peramelemorphia are omnivorous, consisting of 8 species of bandicoots and bilbies (Heatwole 1987). In addition, there is a single species of marsupial mole in the Order Notoryctemorphia – a species completely unrelated to the placental moles that occur elsewhere in the world¹⁰.

No extant marsupial is larger than 100 kg and no Australian marsupial species is fully aquatic. Otherwise, Australian marsupials have diverged to occupy most of the terrestrial niches filled by placental mammals elsewhere in the world, and interesting parallels can be seen with species with which international tourists may be familiar. For example, the kangaroos can be seen as ecologically equivalent to the antelopes of Africa or deer of Europe, Asia and the Americas; Tasmanian devils scavenge at night and in some ways parallel hyenas; and gliding possums adopt similar habits to flying squirrels.

Marsupials have a number of unusual features compared with other animals. Most conspicuous is the use of a pouch to carry the young by most species (in several species, this is reduced to only a fold of skin). Young are born at a very immature stage, and climb to the pouch where they attach to their mother's teats. However the habit of carrying the young in the pouch once it is fully furred is restricted to many of the diprotodonts, and this stage is particularly prolonged in members of the kangaroo family. A number of species carry their young on their backs at later stages (e.g. koalas, many possums, quolls), while others leave them in nests. Marsupials are also the only group of mammals other than primates (monkeys and apes) to have developed hands for climbing: bears, cats and other tree-climbers depend on strong claws and limb muscles. Particular groups of marsupials have additional unusual features of potential tourism interest – whether in terms of morphology, behaviour or physiology.

Australia is the only continent in which placentals are not the dominant group of mammals. Unlike the other mammalian subclasses, the young of placental mammals (which include most of the

world's mammals) grow inside the mother's uterus to a relatively advanced stage of development. Placental marine species such as whales and seals probably reached Australian coasts long ago, but the ancestors of most of our indigenous terrestrial placental mammals are thought to have arrived relatively recently in geological time (that is, over the past few million years) as Australia drifted closer to Southeast Asia. The only two terrestrial groups to successfully bring themselves here were the bats, which were able to fly over the intervening water, and the rats-and-mice subfamily of rodents. The latter would presumably travel more readily than many other mammals on driftwood, and the high level of adaptability and fecundity of this group probably predisposes them to enter the unfamiliar habitats such as temporary land bridges and establish themselves on the far side. Native terrestrial placental mammal species are almost evenly divided between rodents (22% of Australian mammal species) and bats (22%). Mammals that have been introduced by humans and subsequently become well established in the wild include dogs (including the dingo: see below), foxes, cats, rabbits, hares, horses, donkeys, cattle, buffalo, goats, camels, pigs, several species of deer and three species of rodent. Although levels of diversity are high, there is a marked lack of large native terrestrial mammals in Australia compared with other continents. The largest herbivores are the kangaroos, with the red kangaroo – weighing up to 85kg and standing up to 2m in height – being the largest species. The largest predator is the dingo,¹¹ which, at a similar size to the average domestic dog, weighs no more than 19kg.

A serious constraint on viewing of Australian native terrestrial mammals is that the majority are nocturnal. This means that viewing them in the wild requires tourists to be active at times they are typically not accustomed to, and requires the skilled use of spotlights, strong torches or infra-red equipment for satisfying viewing. These difficulties are accentuated by the fact that most species are small, and many are cryptic¹². Thus considerable skill may be needed to find and view animals, and a guided tour is often required. Numbats, musky rat-kangaroos and echidnas are exceptional amongst native

¹⁰ mammalian classification and numbers of extant (living) species are taken from Strahan (1998)

¹¹ it is controversial whether the dingo should be considered native to Australia, having been apparently brought to Australia by Asian seafarers around 3500 – 4000 years ago (Strahan 1998)

¹² adopting a secretive habit, in this case typically 'hiding' in vegetation even when feeding – this is related to hiding from potential predators or sheltering from exposure to the sun

terrestrial mammals in being most active during daylight hours. Koalas can often be seen during daylight hours, although usually asleep or resting. Other species that can be seen during daylight hours include most of the kangaroos and wallabies, wombats in some areas, and platypus, but usually only in the first hour or two after dawn or before dusk (unless the daytime resting areas of kangaroos and wallabies are sought). By contrast, the mammals introduced to Australia are often active by day and include some relatively large species. They are therefore more likely to be seen by independent travellers than are the native species in areas where both are equally abundant. This can create a distorted impression of the Australian mammal fauna. The nocturnal nature of Australian mammals is also a constraint for viewing them in captivity. Although some species readily adapt to a more diurnally active existence (particularly the kangaroos), most require construction of a nocturnal house if visitors are to see them while active. Such facilities are more expensive than normal zoo exhibits.

Several other common features of Australian native terrestrial mammals make them difficult to find or view, and/or potentially limit satisfaction associated with that viewing. Firstly, they rarely occur in large groups, such as those formed by the large ungulates found in North America, Africa and Europe (e.g. deer, antelope, buffalo, bison). Certain kangaroo species¹³, most notably red kangaroos and to a lesser extent western grey and eastern grey kangaroos, are the main exception. Secondly, most species do not occur predictably at the same location on multiple occasions¹⁴, unless they are hand-fed. This is largely because they do not use the same resource on a reliable basis. Waterholes or troughs can be good sites for viewing kangaroos (and feral species) in arid areas, but they are generally not as effective as waterholes in African wildlife-viewing sites (K. Higginbottom, pers. obs.). Further, there is often a reasonable level of predictability on successive days, so that on going monitoring of the animals' movements (combined with non-intrusive viewing methods) increases the likelihood of viewing them. Once again a suitable tour guide is often highly desirable in Australia, since a good knowledge of the

¹³ the kangaroo family (Macropodidae) in fact consists of some 41 species, six of which are commonly referred to as kangaroos on the basis of their large size (red kangaroo, eastern grey kangaroo, western grey kangaroo, euro or wallaroo, black wallaroo, antilopine wallaroo)

¹⁴ most species do have relatively fixed home ranges, but may still be difficult to find within those ranges

species' behaviour and ecology, combined with some local knowledge, enables many species to be found. A third problem is the cryptic habit referred to above, making them difficult to find. Also, like most mammals, native Australian mammals are generally relatively silent and therefore cannot be detected by their call¹⁵. Finally, as discussed above, most species are small, and can be observed at close quarters only through live trapping.

No Australian native mammal species poses a serious threat to humans, as long as sensible precautions are adopted. None of them habitually seek out humans, except in cases where they have become attracted by hand feeding. In such situations, kangaroos occasionally become sufficiently aggressive or playful to cause real injury (see Higginbottom *et al.* 2001c). Habituated dingoes have been known to attack humans (mainly children), with a fatal attack on a young boy on Fraser Island in early 2001. Other species may sometimes scratch or bite, but normally only when an attempt is made to handle them. An exception may be some brush tail possums, which will approach a human in the hope of finding food, and very occasionally give a nip if none is offered (pers. obs.). Dolphins have occasionally been known to act aggressively in situations where hand feeding occurs, or where people swim with dolphins, but we are not aware of any records of serious injury. Male platypus have venomous spurs on their hind limbs capable of inflicting a painful sting (making it the world's only poisonous mammal), but are shy animals, and tourists are very unlikely to have any opportunity to handle them. Feral pigs and buffalo can be dangerous, but unless a tourist is involved in hunting them (and in this case it may add to the attraction) they are unlikely to encounter threatening situations.

While introduced species of mammal are rarely exploited for tourism, several species have become the mainstay of recreational hunting, much of which technically involves tourists. Unlike most native mammals, introduced species are generally not protected and thus may be hunted without permit. Some of the main introduced species

¹⁵ three of the most notable exceptions, are: the common brushtail possum, considered a pest in some urban areas partly because of raucous social calls; the dingo, which like large predators found on other continents, utters loud calls (in this case howls) for social reasons; and the yellow-bellied glider, which displays loud and distinctive social calls

that are hunted by tourists are feral pigs, deer, goats, and water buffalo¹⁶.

Mammals are not only the group of animals of highest interest to international visitors to Australia (Fredline and Faulkner 2001) but are also the group with the greatest numbers of threatened species (cf Environment Australia 2001). In fact Australia has the highest recorded rate of recent mammal extinctions of any country (Burgman and Lindenmayer 1998). About 17 species have become extinct in the last 200 years, and 22 species are classified as threatened with extinction unless action is taken to reverse these threats. In addition, many species have very restricted ranges and are therefore vulnerable to disturbance; others, while more widespread, may be declining but not yet officially listed as worthy of special action plans for their conservation.

2.2 Birds

The 850 or so species of birds that occur in Australia (Jones and Buckley 2001) represent only a moderate level of diversity in global terms. Given their highly mobile nature, endemism levels for birds are expected to be lower than those of flightless vertebrates. However, at 46%, Australia has the highest proportion of endemic species of any country, as well as five entire families that are endemic (Jones and Buckley 2001). Another nine families are endemic to the region encompassing Australia, New Guinea and neighbouring islands (Biodiversity Unit 1994).

There are Australian representatives of 20 of the 29 orders of birds, and the number of species is approximately evenly divided between passerines (perching birds/songbirds) and non-passerines. Many groups of birds are particularly well represented in Australia, as illustrated by the following examples. Australia has an unusually high diversity of parrots (55 species), the world's highest number of seabird species (about 80), and supports very high densities of migratory waders that travel (mainly) from countries further north. Kookaburras and lyrebirds are examples of birds found nowhere else in the world. Twenty of the world's 26 species of fairy-wren and allies occur in Australia and all are endemic (Biodiversity Unit 1994).

¹⁶ native waterfowl are also legally hunted in some parts of Australia

Most of the passerines are not closely related to families from the northern hemisphere, despite misleading common names (our 'robins' and 'magpies' for instance belong to quite different families from their northern name-sakes; and fairy-wrens, cuckoo-shrikes and shrike-thrushes do not belong to the wren, shrike or thrush family). As with the mammals however, there are a number of groups that – while taxonomically very different – occupy similar ecological niches to groups in the Northern Hemisphere. For example, sittellas and tree-creepers in many ways parallel nuthatches and creepers, and thorn bills and other small insectivorous forest birds behave in similar ways to tits. There are parallels also with other southern continents (e.g. the honeyeaters and hummingbirds).

Birds are probably the easiest group of Australian animals for the independent traveller to find, identify, and observe. This is mainly because most species are diurnal and conspicuous either visually (by colour or behaviour) or by their calls. Many species are highly colourful (e.g. parrots, fairy-wrens, some honeyeaters), many adopt unusual behaviours (mimicry, cooperative breeding, bower-building, incubation by fermentation), and many have loud and distinctive calls (e.g. kookaburras, whip birds, magpies, catbirds). Unlike mammals, many species of Australian birds also occur in large flocks – such as some waterfowl, parrots and pigeons. Compared with other types of animals, birds are relatively easy to identify with the aid of a guidebook and a pair of binoculars, although binoculars are not needed for a tourist to identify many of the larger or bolder species.

A wide variety of birds can be seen without even venturing away from Australia's capital cities, most of which contain substantial native vegetation. The Greater Brisbane Region, for example, is home to more than 370 species of birds (Queensland Museum 1995). In one day of bird watching, it is possible to see over 100 bird species in Perth or Darwin, and more than 130 species in the mangroves and saltbush near the St Kilda Salt works just north of Adelaide (Wheatley 1998).

On the other hand, unlike other terrestrial vertebrates, the distributions of birds can change markedly throughout the year, or sometimes even from week to week. A swamp that is full of whistling ducks or pelicans one week may be barren the next, as many of our water birds are highly nomadic. So also are many nectarivorous and

frugivorous birds that may congregate in a group of food-trees for a few days or weeks and then move on. Other birds are more predictably migratory. For example, it is useless to look for the channel-billed cuckoo or the dollar bird in subtropical Australia during winter, but they are very easy to find in southeast Queensland and north-eastern New South Wales throughout the summer months.

There are no birds that are normally a serious threat to humans, although several species can cause injury. Cassowaries and emus are both capable of delivering strong kicks and thus causing serious injury, even (as reported for the cassowary) fatal ones. Attacks are not likely unless the bird feels threatened and cornered, but cassowaries appear to be the more aggressive of the two species. Habituated emus can be alarming in their behaviour when trying to search humans for food, but in this situation are more likely to peck with the bill (unpleasant, occasionally painful, but not life-threatening). Some magpies attack humans within their territories during nesting season, particularly in suburban areas: contrary to public opinion, individuals displaying serious aggression are very much in the minority (D. Jones, pers. comm.). Attacks can be frightening however, with the bird's strong bill sometimes drawing blood, and there have been occasional reports of eye damage, and of broken limbs when bicycle-riders have fallen while under attack (D. Jones, pers. comm.). Other large birds such as black swans are capable of inflicting injury (not life-threatening but at least one broken arm has been reported) if humans approach their nests or offspring. All of the above can generally be avoided by appropriate education of tourists and watchfulness of tour guides.

Further information on Australian birds that is relevant to tourism is presented by Jones and Buckley (2001) as part of the present series of reports.

2.3 Reptiles

Australia's relatively dry climate has favoured the proliferation of a high diversity of reptiles, with 838 species currently known (Cogger 2000). One family (Pygopodidae – the snake-lizards) is endemic to Australia and New Guinea (*ibid*), and 89% of the reptile species in Australia (including its external territories) are endemic (Biodiversity

Unit 1994). Australian reptiles are divided into four commonly recognised groups: lizards and snakes (each considered a Suborder of the Order Squamata), turtles (Order Testudines) and crocodiles (Order Crocodylia) (Cogger 2000). There are more species of lizard, python and blind snake in Australia than in any other country (Dyne and Walton 1987).

Reptiles are widely distributed through Australia, but are most diverse in northern Australia due to their need for relatively high ambient temperatures¹⁷. Unlike other Australian vertebrates, they remain at similar levels of diversity and abundance in the arid and semi-arid (mainly inland) areas as in wetter regions. However, in subtropical and temperate parts of Australia, many species are relatively inactive during the colder months, limiting the length of the viewing season.

Australia has probably the most diverse and distinctive lizard fauna in the world (Biodiversity Unit 1994). This is the most diverse group of Australian reptile, comprising 617 species and including 5 distinct families, commonly known as goannas, skinks, geckos, dragon lizards, and snake-like lizards (Cogger 2000). All these families display high levels of endemism. Goannas (in the same family as the monitors of Africa and the Komodo 'dragon' of Indonesia) are the largest lizards, reaching up to 2m in length (*ibid*). Skinks are the most diverse group, comprising 381 species (*ibid*). Geckos are small lizards with large snake-like eyes, often with large toe pads and complex patterns of different shading or colours. They are the only lizards that are predominantly nocturnal. Dragon lizards often have enlarged tubercles on their bodies that make them appear 'fierce', or in the case of the frilled lizard, spectacular. Legless lizards look superficially like small snakes.

Australia is also internationally recognised for its snakes. Altogether there are 188 species of snakes in Australia, divided into 7 families: the file snakes, blind snakes, pythons, colubrid (rear-fanged) snakes, elapid (fixed, front-fanged) snakes, sea kraits and sea snakes. Australia has the greatest diversity of elapid and blind snakes in the world (Biodiversity Unit 1994). It is, however, notable for the absence

¹⁷ like the amphibians, reptiles are ectotherms, whose body temperature is controlled primarily by environmental temperature

of snakes of the viper family. Australian snakes may reach up to 8.5m long and weigh up to 130kg¹⁸, and many have conspicuous patterns or colouring. Almost half of Australia's snake species are elapids, some of which, along with several species of sea snakes, have venom capable of killing humans (Covacevich *et al.* 1987, Cogger 2000). Members of the other families are mostly non-venomous or have very weak venom. The most dangerous snakes are the taipan (western and eastern species), tiger snakes (two species), death adders (three species), the rough-scaled snake and king brown snake. Several other elapids have caused occasional deaths and others could potentially do so. Most, however, are quite harmless to humans or promote uncomfortable symptoms such as headache or mild nausea.

Although consisting only of two species in Australia, the crocodile family has a high public profile. Saltwater crocodiles are the largest reptiles in the world today, and have caused several human deaths. They are mostly restricted to coastal rivers and swamps in northern and north-eastern Australian coastal regions. In areas likely to be inhabited by saltwater crocodiles, swimming in or staying adjacent to water bodies can be dangerous. Freshwater crocodiles will bite only in self-defence if molested: they do not attempt to capture or drown humans. Crocodiles feature in a large number of tourist attractions, particularly in the Northern Territory.

Most reptiles are diurnally active. However they are typically difficult for the inexperienced visitor to find, as they are generally small, solitary, cryptic in their habits, and silent. Finding them often requires specialised knowledge.

Snakes and crocodiles would normally be considered the major dangerous reptiles in Australia. However bites from goannas are potentially more problematical than bites from harmless snakes, as the goanna is more capable of tearing the skin, possibly with resultant profuse bleeding. Both goanna bites and non-venomous snake-bites can also become infected from bacteria in the decaying remains of past meals within their mouths. Avoidance of long grass, due care in looking at the ground while walking at night or near swamps, and avoidance of hand-feeding goannas or handling large reptiles of any

¹⁸ the Amethystine or rock python (Cogger 2000)

kind will render the chances of serious incident minimal, to the extent that they should not be a deterrent to tourists.

2.4 Amphibians

Australia has only one of the three orders of amphibia: the frogs (order Salientia). Frogs are unusually diverse here, with approximately 211 native species, all but one of which are endemic either to Australia alone or to Australia and New Guinea (Cogger 2000). Australian native frogs are currently classified as comprising four families: Hylidae (also known as Pelodyadidae), Myobatrachidae, Microhylidae (a family found throughout warm regions of the world) and Ranidae (one species only of a world-wide family) (*ibid*). The family Bufonidae (true toads, as distinct from a number of rough-skinned Australian frogs called 'toads' or 'toadlets') is represented only by one introduced species (*ibid*). Out of all Australian frogs, 91% of species belong to the families Hylidae and Myobatrachidae, families that are now thought to be endemic to Australia and New Guinea (*ibid*).

Most frogs occur in wet environments and are therefore most abundant along the eastern and northern coastal regions. They occur in and around a wide range of freshwater habitats, such as ponds, streams and dams, and are generally most abundant where the natural vegetation has been preserved. However one of the unusual features of Australia's frog fauna is that many have adapted to environments that are usually dry (Biodiversity Unit 1994), often burrowing into the ground to prevent dehydration. Australian frogs display a fascinating array of life history styles – including one genus (*Assa*) in which the tadpoles are brooded in a pouch-like structure on the male's flank and another (*Rheobatrachus*) where the complete development of the frog occurs in the mother's stomach¹⁹.

Like mammals, most Australian frogs are nocturnal and are therefore relatively difficult to view, and best detected using a head-torch. Also, most of them are active only for part of the year (when temperatures are warm), limiting the length of the viewing season (although a few species call mainly during winter). In contrast with mammals, frogs can often be detected by their loud calls. They also often occur in

¹⁹ Unfortunately, this species now appears to be extinct, but is an interesting case to tell tourists about

large groups (e.g. leks of calling males during the breeding season), making them even more easily detectable as well as probably raising levels of interest in viewing. However their small size usually makes them difficult to see and identify without some skill and patience.

2.5 Terrestrial Invertebrates

There are many more invertebrates than vertebrates in Australia and throughout the world. By far the largest group of terrestrial invertebrates is the arthropods, comprising insects, spiders, ticks, mites, scorpions, centipedes, and millipedes. By far the most abundant of these are the insects, and of the world's 29 orders of insects, 26 are found in Australia. Many new species of insect are being discovered every year, and it is estimated that there are well over 225,000 species in Australia (Lindenmayer and Burgman 1998). Thousands of invertebrate species and a number of families are endemic to Australia, and according to Main (1976) Australian spiders 'include some representatives as distinctive as are the marsupials among the mammals.'

Currently, there is little use of terrestrial invertebrates in tourism, although skilled guides may point out some species opportunistically. Large spiders and their webs, large praying mantids, large stick insects, and colourful dragonflies are amongst those that tend to attract attention. Specialised commercial tourism based on terrestrial invertebrates does exist for butterflies (Australia has many colourful species) and glow worms (a fly larva that glows in the dark).

Some terrestrial invertebrates can be dangerous to humans. Two species of spider (the funnel-web and the redback) have caused human deaths, although not since anti-venom has been available. Any spider known to feed on small vertebrates (which includes several relatives of the funnel-web) should be treated with caution (Main 1976). White-tailed spiders have been known to cause necrosis (a rotting of the skin around the bite) in some individuals. Other examples of invertebrates that can cause very painful, but not life-threatening stings are: scorpions, centipedes, large ants, wasps and the introduced honey-bee. There has been at least two deaths from a scorpion – a baby in Tasmania and an infant in Western Australia (Sutherland and Tibballs 2001), but this is exceptional; and scorpions

are seldom encountered unless actively sought by rock-turning, and are usually far more intent on hiding than attacking when so disturbed. Paralysis ticks have been responsible for at least 20 human deaths in Australia (*ibid*) but they usually feed on the host for several days before injecting the venom, and are almost always detected and removed long before this.

Such dangers can generally be avoided by not putting hands into dark crevices, and wearing gloves if fossicking in leaf litter. Some insects, particularly mosquitoes, march flies, midges and sandflies, can be a nuisance, and bites can become infected if scratching of the bite breaks the skin. Such problems can be avoided by covering the body or by use of insect repellent.

2.6 Freshwater Fauna

Although Australia has a relatively small number of species of native freshwater fish (194), 71% of these species and 32% of genera are endemic to Australia and New Guinea. Due to severe threats facing Australia's freshwater systems, 20.6% of native freshwater fish are considered rare (12 species), vulnerable (11 species) or endangered (17 species). One of these threats is the influence of the 12.4% (24 species) of Australian freshwater fish species that have been introduced, often as a fishing resource (Native Fish Australia 2001).

Recreational fishing in Australian inland waters involves both native species and species that have been deliberately introduced for angling purposes, the latter including most notably salmonids such as trout and salmon. Generally in the cooler areas of Tasmania, Victoria and New South Wales, these introduced species are the principal focus of recreational fishing, whereas in warmer areas native species predominate (N. Thorne, pers. comm.). In Queensland, for example, the most commonly sought after freshwater fish are native species (Queensland Department of Primary Industries 2001).

Other native freshwater vertebrates include mammals (platypus, water rat), turtles, crocodiles and frogs (see sections 2.1, 2.3 and 2.4 respectively) plus the many birds that forage in a variety of aquatic habitats. Freshwater invertebrates include molluscs, leeches, spiders, water mites and a range of insects such as stoneflies, mayflies, water

'scorpions', water beetles, water bugs, mosquitoes and midges. More widely known are the crustaceans such as freshwater crayfish, crabs and yabbies (also known as marron) (Williams 1980). There is a high level of endemism of freshwater invertebrates at the level of species and genus, and several whole families occur only in Australia (Biodiversity Unit 1994).

No freshwater animal species (other than saltwater crocodiles in the north) pose a significant danger to humans. However the bullroter (a fish) can cause painful wounds if stepped on with bare feet (Queensland Museum 1995). Freshwater eels and catfish guarding eggs occasionally inflict non-serious bites on swimmers, and a few quiet bodies of water harbour aquatic leeches, but the low risk of such events and the trivial consequences if bitten should not deter anyone from enjoying a swim. Freshwater catfish also have venomous dorsal and caudal spines that could cause injury if handled carelessly.

Tourists and tour operators should give some thought as to whether sunscreen is really necessary when swimming in shaded areas: some mountain streams well-visited by tour buses develop thin layers of oil by the end of the day, with unknown effects on aquatic life. Use of insect repellents may be even more damaging.

2.7 Marine Fauna

Australia's coastal waters are among the most species-rich on earth, with about 3400 species of fish alone (Wilson *et al.* 1987), most of which are endemic (Burgman and Lindenmayer 1998). This high diversity is related largely to the wide latitudinal range of marine habitats, and the presence of the world's largest intact coral reef (the Great Barrier Reef) (State of the Environment Advisory Council 1996). The vertebrates are represented by mammals (whales, dolphins, seals and sea lions, dugong), sea birds (many species), reptiles (saltwater crocodiles, sea turtles, sea snakes) and fishes (many species). The main groups of invertebrates found underwater and sometimes along the shore are sponges, coelenterates, worms, crustaceans, molluscs, bryozoans, echinoderms and urochordates.

Several families of fish are noted for their particularly high levels of diversity and endemism in Australia: the pipefishes and seahorses, the

leatherjackets and the anglerfishes. The chondrichthyan fish (sharks, rays etc.) are also unusually diverse, and more than half the species are endemic to Australia (Williams 1980). Northern Australia and southeast Asia jointly have the richest invertebrate communities associated with coral reefs in the world (*ibid*). Because of high levels of degradation of these reefs elsewhere in the region, Australia is particularly important as a refuge for such species (*ibid*).

Several animal species (e.g. humpback whales and fur seals) that were over-hunted are now beginning to show good recovery rates following the cessation of commercial exploitation. Australia also comprises the main 'refuge' for a number of marine vertebrates that are heavily exploited elsewhere, particularly the dugong and certain marine turtles (State of the Environment Advisory Council 1996).

It is along the seashores that Australia's major tourism attractions focused on localised populations of free-ranging wildlife occur. These involve mostly seabirds (especially little penguins), seals or sea lions, and turtles. These are all sea-going vertebrates that breed or rest in large colonies on land at the same site year after year.

Australia's oceans, shores and estuaries are the site of the majority of both commercial and recreational fishing (as opposed to the much smaller freshwater sector). Wide ranges of fish are targeted, as well as some invertebrates – especially crustaceans like lobster and prawns.

Strictly aquatic marine wildlife that feature heavily in wildlife tourism are principally:

- underwater life (especially fish and a wide range of invertebrates, including the corals) that feature in scuba diving and snorkelling tourism; and
- whales, dolphins and whale sharks, viewed either from the shore or on specialised boat cruises.

Underwater life suitable for viewing occurs mainly on coral reefs (most notably the Great Barrier Reef, but with patches occurring throughout the northern half of the Australian coast) and rocky reefs. Given the

sessile²⁰ nature of so many marine invertebrates, good wildlife viewing experiences at suitable sites are highly predictable (subject to diving conditions). The two major whale species, the humpback and Southern right, occur along various parts of the southern, western and eastern coasts, but are most easily seen in certain areas such as Hervey Bay in Queensland. The continued recovery of whales from commercial harvesting has facilitated the growth of whale watching tourism. Two species of dolphin are abundant in Australian waters (the common dolphin and the bottlenose dolphin) and are found around most of the coastline²¹. Marine mammal species are highly mobile but can readily be seen when in the area, and given their high popularity, tourists seem willing to travel for some time in order to find them. In addition, guided or unguided encounters with inter-tidal species occur at many sites along the Australian coastline. In temperate and sub-tropical areas, the fauna of rock-pools (such as molluscs and crabs) are of principal interest to tourists. In the Great Barrier Reef Region, some tourists participate in walks across shallow coral reef flats, although the damaging effects of this on corals are of concern.

The most dangerous marine fauna are large sharks capable of preying on adult humans. A few other fish species can bite or sting (e.g. sting-rays²²), some causing such agonising pain that it is possible for the victim to drown (e.g. stonefish). Others, such as the moray eel, are liable to bite if approached too closely underwater, and anemone or clown fish sometimes give a very trivial nip to divers passing 'their' anemones. Sea snakes (section 2.3) are venomous but unlikely to attack unless provoked. Some marine invertebrates can inflict troublesome stings or bites, and a few (especially in tropical waters) are life threatening, notably the box jellyfish, cone shells, the blue-ringed octopus and some sea snakes. Some sea creatures in the sand or mud below shallow water have sharp shells (e.g. razor-shells) or spines (e.g. sea urchins) that can cause painful wounds if trodden on with bare feet. Cuts caused by unprotected skin colliding with coral can become infected if not treated with an antiseptic or anti-bacterial lotion. Swimmers and divers can generally avoid these dangers by seeking and following suitable local advice as to potentially dangerous creatures in the area and how to identify and avoid them. Such advice

would generally include not walking barefoot on coral and not handling any potentially dangerous species (both these guidelines are also advisable for environmental reasons).

Further details of features of Australia's marine and coastal fauna of relevance to wildlife tourism are presented by Birtles *et al.* (2001).

²⁰ non-mobile in the adult phase, usually because they are fixed to the substrate

²¹ there are 10 other species that have been recorded in Australia (Bryden *et al.* 1998)

²² See Kuiter (1996) or Covacevich *et al.* (1987) for others

3. THE SPREADSHEET

3.1 Overview

To provide ready access to the kind of wildlife-related information needed to develop sustainable wildlife tourism, we have compiled a spreadsheet involving a classification of Australian wildlife (attached floppy disk or CD)²³. This provides information relevant to deciding:

- which species might be of particular interest to tourists (some are obvious, others may have little-realised potential);
- where and how they might be found (excluding especially fragile habitats and remnant populations of highly endangered species);
- animals which may prompt negative responses by tourists;
- possible constraints to tourism development; and
- conservation management issues

Ideally, this spreadsheet would cover each animal species separately, but that would result in an unmanageably long file. Even considering only the vertebrates, Australia harbours over 2,000 mammals, birds, reptiles and amphibians, and over 3,500 fish. Including all invertebrates in the spreadsheet, or even all invertebrate families and orders, would of course be impossible, and most of them would be of little interest to general tourists²⁴. We have accordingly excluded groups such as nematodes and fleas (except as 'other invertebrates' or 'other insects', which are unlikely to be tourist attractions. Where possible we have grouped species into taxa (groups of closely-related animals), or into guilds (animals not necessarily related but sharing similar ecological niches) where there are a large number of species that would probably appear similar to most tourists. Sometimes we have further subdivided these into categories we believe reflect

²³ readers who do not have access to a computer can contact the CRC to obtain a hard copy of the latest version of the spreadsheet

²⁴ this is not to imply that invertebrates cannot be interesting, only that there are hundreds of thousands of species, very many of which are tiny and at least superficially very similar to those of other countries

features of particular tourist interest or concern (such as danger or usage). Appendix A lists the animal groups that are used in the spreadsheet.

The spreadsheet comprises, in order as presented within the spreadsheet file and in Appendix A of this report, information on the following factors for each wildlife species or group:

Positive appeal to tourists

- Appearance/voice; other visual/auditory appeal
- Behaviour and other features of special interest
- Distinctiveness/rarity: genetic; biogeographic
- 'Fame' (how well-known is the animal or group of animals?)
- Perceived danger (as opposed to the 'actual danger' category below; note that perceived danger can be seen by tourists as either positive or negative)

Negative reactions by many tourists

- Perceived danger
- Disgust
- Nuisance value

Practical issues with using wildlife for tourism

- Distribution of species or group within Australia
- Habitat
- Ease of finding

- Ease of observing (once detected by sight or sound)
- Approachability

Environmental management

- Conservation status (this will also be of interest to 'eco-minded' tourists)
- Potential tourist impact on animals
- Potential tourist impact on habitat
- Actual danger to humans
- Other notes

These factors will be explained more fully in the following sections.

Use of some of these categories is justified by research (see sections 4 to 7 below), while others are based on our professional judgement and experience with wildlife tourism. In particular, one of us (RG) has been a professional wildlife tour operator (mostly with North American and European tourists) for the last four and a half years and has been involved in various aspects of nature-based tourism (mostly with Australian adults and children) for over thirty years.

Not all cells of the spreadsheet have been filled. Some categories (e.g. 'other features of special interest') have been created to enable us to include features of particular groups of wildlife not otherwise readily catered for without including a plethora of additional categories useful only for a few groups. Failure to mention any feature of interest for a particular animal does not mean that it has none, although it does indicate that we did not immediately see it as being as special as those we had in mind when creating the category. It is to be expected that these inclusions and non-inclusions will be edited heavily for the next version of the spreadsheet, and we welcome input from readers and users of the spreadsheet. Some of the information included may seem appallingly simple to those who know particular groups of animals very well, but (a) the information may be far from obvious to

others less familiar with these animals, and (b) even facts that are obvious to everyone had to be included. It would seem an odd omission for instance, not to mention that whales are very large, or similarly not to include the hopping gait and pouches of kangaroos.

The spreadsheet is easily accessible within the Microsoft Excel program in which it was created. The file can be used in various ways (see section 3.2), and it is suggested that copies are made which can be cut and sorted in various ways to suit the needs of the user.

This spreadsheet was from its conception never intended to be a final product. Many of the entries are based on the literature or from information gleaned from informal discussions with zoologists, conservation managers and tourism personnel. However much is also at this stage necessarily based on 'educated guesses' from our background experience with tourists, animals and various kinds of ecological research. It is to be hoped that over the years there will be research on many aspects – especially (a) tourist reactions to wildlife and (b) conservation biology relevant to prediction and mitigation of impacts – which will allow the information to be continually refined, and that by the end of the decade this spreadsheet will have developed into an invaluable resource.

We anticipate that future versions of the spreadsheet will incorporate a weighting of importance of at least some of the various features, and some measure of the strength of that feature for each species or group of species. At present, however, there are so few detailed studies on this topic, that any system we attempted to develop soon became unwieldy and unconvincing. We would appreciate any information about such studies proposed, in progress or completed.

Factual information about the distributions, sizes and other features of animals were largely gleaned from a number of standard references on the various taxa (*mammals*: Bryden *et al.* 1998, Flannery 1995a, 1995b, Strahan 1998; *birds*: Slater *et al.* 1989, Simpson and Day 1996, Pizzey and Knight 1997; *reptiles and amphibians*: Cogger 2000; *fish*: Nelson 1994, Kuitert 1996, Reader's Digest 1997, Hutchins and Swainston 1999; *insects*: Common and Waterhouse 1981, CSIRO 1991; *other arthropods*: Marshall and Williams 1975, Williams 1980, CSIRO 1991; *molluscs*: Marshall and Williams 1975; *other*

invertebrates: Marshall and Williams 1975, Williams 1980, CSIRO 1991). Information on conservation status was taken from Kennedy (1990), Yen and Butcher (1997) and Environment Australia (2001). Information on dangerous animals was taken from Sutherland and Nolch (2000), and Sutherland and Tibballs (2001).

3.2 How to Use the Spreadsheet

There are several ways in which we anticipate the spreadsheet will be useful to both tour operators and conservation managers.

One of the most obvious ways for a tourism operator to use the spreadsheet is to seek ideas on how to utilise the wildlife opportunities in his/her locality. The operator will usually be able to obtain species lists for a particular area (from government departments, publications, internet or local naturalist and conservation societies), and be able to spend some time out in the field with guidebooks for identification. Many wildlife tourism operators have already been doing this for their own interest for many years before beginning the operation. Most however are not familiar with all groups of wildlife, and simple species lists of less familiar groups of animals do not immediately assist the planning of a good tour with interesting interpretation. We would expect that a tour operator, already armed with some knowledge of which animals are (or may be) present, can look these up in the table and use the information presented to prepare the basis of a plan for interpretation. The information will not of itself be sufficient to prepare interpretive talks and activities (the publications and other information sources listed at the end of this paper will assist here), but should generate many ideas for themes and approaches. Even operators and guides who prepare no structured interpretation will probably find many ideas for topics in case of unpredicted sightings or tourist questions.

Being able to predict to at least some degree some of the more common visitor reactions to various animal groups is useful, especially for the novice operator. A knowledge of which animals are likely to have immediate appeal can assist in using such animals in marketing. It can also assist in attracting visitor attention to certain points to be made about ecological adaptations to Australia's climate,

conservation issues, animal behaviour or other themes by using these species as attention-grabbers. This is not to say that visitors will not also be interested in other, less immediately attention-grabbing animals, once introduced to them and told about intriguing aspects of their behaviour and ecology. Even negative reactions to animals do not necessarily imply they cannot be utilised in tourism, just that operators may need to be creative in their approach to these. For example one of us (RG) found that a song about leeches in a Queensland National Parks compendium of natural history songs was probably the most popular in the book for tourists involved in guided nature activities.

Environmental managers, ecolodge managers and responsible tour operators should be able to plan activities and buildings or other facilities that do not impact heavily on wildlife or their habitats²⁵, and it is to be hoped that they will find the Environmental Management section of the spreadsheet useful in doing so. Once again, few people are knowledgeable about all groups of animals, and this section should provide some useful basic facts and 'educated guesses', and prompt users to seek more detailed information.

²⁵ See Green and Higginbottom (2000, 2001) for considerations to be taken into account here

4. FACTORS CONTRIBUTING TO THE POSITIVE APPEAL OF WILDLIFE TO TOURISTS

4.1 Introduction

Wildlife tourism operators need to know what animals their visitors are likely to want to see, so that they can plan their routes accordingly and educate themselves ahead of time on interesting aspects of the animals' behaviour and ecology. Unfortunately, there are very few published studies to allow us to predict the popularity of Australian animals. A recent report by the CRC for Sustainable Tourism (Fredline and Faulkner 2001) however provides a clear indication of preferences of international visitors. When asked prior to their departure from Australia what Australian animals they had most wanted to see when they arrived, 27.6% of respondents listed the koala, and 27.1% listed the kangaroo. The next most frequently listed species – the wombat – was mentioned by only 2.8% of respondents. However, there was some evidence that repeat visitors were relatively more interested in a broad range of species. When asked what animals they most enjoyed seeing, the koala and kangaroo also dominated (21.8% and 19.5% of respondents respectively, with the next most commonly mentioned – the dolphin – at 4.6%). However, no reliable data are available for domestic visitors, and different visitor segments differ in their preferences.

Anecdotal evidence indicates that people can react in widely varying ways to the same species. For example, the common brush tail possum is seen variously (by both tourists and tourist operators we have spoken to) as a 'very cute and beautiful' animal, with its 'pretty little pink nose', pricked ears and fluffy tail, and by others as a 'damn nuisance' of an animal with an ungainly walk and not at all attractive. The far less common brush-tailed phascogale is seen by some as a highly attractive squirrel-like animal with silver-grey fur and a beautiful plumed tail, and by others as looking like a pointy-nosed rat and therefore unattractive and uninteresting. Moreover, some animals do not have an appearance that would attract more than passing attention by most tourists but behave in ways that generate considerable interest. Examples include the courtship displays of lyrebirds, musk ducks or great crested grebes (which can be witnessed

by tourists), the mating of antechinuses (unlikely to be observed in action) or the nesting behaviour of mallee fowl or pebble-mound mouse (the constructions of which are still visible when the builders are not).

Research has demonstrated some of the features of animals that produce positive reactions from people²⁶. These include:

- Appearance: large size, colourfulness, 'cuddliness', beauty, human-like features
- Presence of infants
- Behaviour: occurrence of behaviour perceived to be interesting
- Distinctiveness: species that the visitor has not seen before, rare or threatened species
- Other perceived attributes: intelligence, strength/power, playfulness, usefulness, personality

This research is reviewed by Moscardo *et al.* (2001) as part of the present project, but certain aspects are expanded on in the following sections to further demonstrate the kind of factors that are involved.

Species that combine two or more of the above features are likely to have the strongest appeal. It is not known to what extent the effects might be synergistic: will such an animal be seen as even more appealing than the 'sum of its parts' would suggest?

4.2 Appearance

Some animals have obvious immediate appeal to tourists. The thought of an almost human-sized wild animal that stands upright on two legs and carries its (very cute) youngster in the pouch while bounding along on its two legs is irresistible to many visitors even if many Australians see 'just another b... roo.' A teddy-bear-shaped, human-baby-sized animal with soft fluffy ears and an expression of

²⁶ only some of these findings relate specifically to tourism, for which there have been relatively few studies on this aspect, and most of these are based on zoo animals or animals in general

gentle innocence – the koala – also has immediate appeal to many tourists. However, dissection of the many factors that determine whether an animal will have visual or auditory appeal to tourists is difficult, and perceptions will vary enormously between tourists. Accordingly no attempt has been made to accommodate all possible factors, but we have concentrated on some of the apparently important ones.

Based on the research mentioned above, we have included the following features²⁷:

- size of the animal, either in an absolute sense (e.g. whales) or relative to its taxonomic or ecological group
- bright colours (e.g. parrots, fairy-wrens, parrot-fish, butterflies)
- level of perceived 'charisma' or 'cuteness' (e.g. koalas, bilbies, joeys in kangaroo pouch)
- elegance (e.g. swans, egrets)
- relative resemblance (e.g. upright stance of kangaroo) or relatedness to humans (e.g. mammals vs. frogs)
- presence of infants (e.g. joey in the mother's pouch or on her back)

In addition, based on our own experience with tourists, we have included:

- oddities (e.g. 'outlandish' bills of pelicans or channel-billed cuckoos, joeys in pouches, hopping gaits of macropods)
- sounds that attract attention (e.g. songs of butcherbirds and shrike-thrushes; 'laughs' of kookaburras; frog calls; choruses of cicadas)

²⁷ these features are combined in the spreadsheet under visual/auditory appeal, except for size, which has its own column

Most of the above features are amenable to objective description, except for charisma, elegance and oddities, which are based on our own perceptions combined with our experience with wildlife tourists. Some of the more objectively definable features are expanded on below.

Zoo studies have shown that large animals tend to attract visitors more than smaller ones, and similarly an Australian study of tourist preferences for different species indicated that size was a factor (Bitgood *et al.* 1988, Ward *et al.* 1998). Thus we might expect that (all else being equal) kangaroos, wombats and crocodiles would be more popular than small carnivorous marsupials, frogs or skinks. Comparisons within groups of otherwise similar animals are probably more meaningful, however. For example, birdwings might be more popular than smaller colourful butterflies, and cassowaries more popular than smaller birds.

A number of studies have shown that people are generally most attracted to relatively human-like (and especially child-like) animals²⁸. Thus, for example, mammals are more popular than other vertebrates, which are in turn generally more popular than invertebrates (Gray 1993). Certain features of animals that resemble human baby features may produce an affective response in humans, causing them to regard them as 'cute' and to 'want to pick them up – to cuddle them' (Eibl-Eibesfeldt 1970, pp 431-432). Eibl-Eibesfeldt cites Lorenz (1943: original in German) who listed such characteristics as including: large head in proportion to body, protruding forehead in relation to rest of face, large eyes below midline of total head, short thick extremities, rounded body shape, soft-elastic body surfaces and round protruding cheeks. Koalas are endowed with several of these features, in addition to having the generally human-like features of forward-facing eyes and upright posture when seated in a fork of a branch.

The upright walk of penguins appears more human-like than the waddle of ducks or the hopping of many ground-foraging songbirds, and the forward-facing eyes of owls seems to add a human-like quality to their stare. Even amongst invertebrates, a few have a more human-like quality than the others: for instance the staring of the preying mantid, its forward-facing large eyes and its head-turning to

²⁸ reviewed by Moscardo *et al.* (2001), who also points out several cautions that should be considered in extrapolating from such studies

continue its view of a moving human. There is ample evidence to indicate that popularity of animals is somewhat biased towards vertebrates as opposed to invertebrates (Davies 1990, Gray 1993, Kellert 1993), an attitude referred to by Kellert (1986) as 'vertebrate chauvinism'.

The presence of actual infants appears to be a factor in popularity of zoo exhibits (Bitgood *et al.* 1988). Factors that might explain the appeal of infants are: the knowledge that the young animal is relatively vulnerable, the clumsiness of movements that provokes sympathetic laughter, and the relatively long periods of time spent in play behaviour.

4.3 Behaviour And Other Features Of Special Interest

Just the fact that the animal is actively doing something can be a visitor draw-card, with higher animal activity levels at zoos having been found to be associated with longer viewing times (Bitgood *et al.* 1988). Degree of 'human-ness' is probably relevant here also, as viewers of animal behaviour often appear to enjoy making anthropomorphic comparisons. A survey of tourists viewing free-ranging animals at an Australian national park showed that 'seeing wildlife behaving naturally' was the most important factor contributing to visitor satisfaction (Moscardo *et al.* 2001).

Some species may be subject only to a passing glance by most tourists but hold their interest for longer periods if strange aspects of their behaviour are explained: for instance the mounds of mallee-fowls and the bowers of bowerbirds. Interest levels will be higher still if the behaviours or resultant structures can be viewed in the wild or at least in captivity (stick-nest rats for instance are now building nests in captivity at Yookamurra Reserve, South Australia).

Most visitors know the platypus has a duck-like bill. Relatively few know of its egg-laying habits, and far fewer know of its spur (making it the world's only poisonous mammal) or the use of its bill to detect electric currents from its potential prey. While waiting for platypus to make an appearance during a wildlife tour, a discussion of this and other aspects of its behaviour can serve both to diminish boredom amongst tourists with limited patience and to enhance the feeling

that they are about to see a very special animal.

Prior knowledge of the behaviour of animals, or knowledge imparted by a tour guide, can affect the degree of excitement at seeing others. A male satin bowerbird may be seen as just another black bird, but it will probably be perceived as more fascinating if its bower-building habits have been explained. Seeing the bird in action at its bower will provoke maximum excitement, but the bower itself is interesting to see even when unattended, and a photo of the bird carried by the tour guide will mean much more after having viewed the bower.

4.4 Perceived Danger (Positive Aspects)

Species perceived as dangerous (such as big cats, reptiles and bears) have been found to attract a higher percentage of zoo visitors than species that are considered harmless (Bitgood *et al.* 1986). This factor may result in either positive or negative reactions by tourists. Duffus and Dearden (1990) suggest that humans most often seem interested in viewing animals they can eat or those they can be eaten by, both of which might provoke a feeling of arousal and have a genetic basis. They comment that the animals apparently causing the greatest stimulation are predators such as lions, tigers, bears and wolves seen in the wild. On top of these, they remind us, are various cultural influences determining which animals they see in a positive or negative light.

Australia does not have many animals capable of preying on humans, apart from crocodiles, sharks and (for children) dingoes: all three provoke considerable emotion and fascination in some visitors. In particular, many attractions have been based solely on the crocodile, and are generally promoted with images of how dangerous it is. Crocodiles, sharks, dingoes and snakes engender amongst some tourists a desire to see them, but from a safe distance (although some tourists are attracted to approach dingoes, which belong to the same species as domestic dogs and thus appear very similar).

4.5 Distinctiveness And Rarity

Tourists interested in looking at wildlife in the country they are visiting presumably wish to see something different from species they can see at home. Although there are few studies dealing with factors that influence visitor satisfaction in viewing free-ranging animals, there are several that demonstrate the importance of seeing unique, unusual or threatened wildlife (reviewed in Moscardo *et al.* 2001). In the case of Australia, some of our wildlife are seen as very different indeed from those elsewhere – and many others should be (refer to section 2 regarding the high levels of endemism in our fauna). One of us (RG) was told by a wildlife tourist that she would much rather see a platypus than a whale while visiting Australia because she could see whales but not platypus in other parts of the world. Some species, such as barn owls, peregrine falcons and ospreys, even though they occur on many other countries, have often not been seen previously by tourists arriving from these countries, and still attract attention (apparently partly because of their size and predatory habits). Others such as Eurasian coots (which are commonly seen in Europe and Asia) and quails (which look superficially very similar to quails of other countries) do not seem so likely to arouse excitement. The appeal of kookaburras and lyrebirds is partly due to the fact that they occur nowhere else. Although kookaburras are generally the better known of the two, the lyrebird has a higher conservation value, as it belongs to a family comprising only two species, both of which are confined to Australia, while the kookaburra belongs to the cosmopolitan kingfisher family. Platypus and echidnas are perhaps the most distinctive of all our animals genetically, as they collectively comprise one of the three sub-classes of mammals, found nowhere else outside the Australian region.

Obscure little brown birds unnoticed by most people may – because of their rarity or difficulty of finding in the wild – arouse great excitement amongst ‘twitchers’ (specialised bird-watchers ever keen to add more species to their life-lists). The eastern bristlebird for example would be seen by most people as a very ordinary-looking small brown bird. Why then do some bird-watchers become very excited about seeing one? It happens to be a threatened species, occupying an area considerably smaller than that of its former range. An interest in conservation, the chance to report one’s sightings to others, and perhaps the feeling that if it is not added to one’s life-list

now the chance may never come again, all presumably contribute to the feeling of satisfaction. Non-twitchers are perhaps not so likely to be interested in the last two points, but may wish to know what factors are responsible for its decline, and whether similar factors are affecting other species. Some species such as the red gos-hawk are likely to cause excitement both amongst twitchers because of their rarity and threatened status, and amongst general tourists because of their impressive appearance.

4.6 Fame

Kangaroos and koalas greatly outstrip other species in terms of their popularity with international visitors (Fredline and Faulkner 2001). Further, the kangaroo has been shown to be one of the most highly recognised icons associated with any country (Hill *et al.* 2001). We have observed that even tourists who specifically book wildlife tours are often hoping to see these species rather than other, lesser-known marsupials such as possums, quolls or bandicoots. Most of our mammals seem to be unknown to most overseas visitors and even to most Australians, especially our smaller marsupials, rodents and bats. Visitors’ satisfaction levels probably depend partly on seeing the animals that they already know of and associate with Australia. This is certainly not to say that the lesser-known animals have no tourism value. To the contrary, promised sightings of the more famous species can be usefully employed to encourage visits to locations where tourist attention can be drawn also to the lesser-known occupants. Appropriate interpretation can then be used to demonstrate how interesting the latter can be in terms of behaviour, ecological role, conservation value or other factors.

5. FACTORS CONTRIBUTING TO NEGATIVE REACTION OF TOURISTS TOWARDS WILDLIFE

5.1 Introduction

Research has demonstrated some of the perceived features of animals that produce negative reactions from people. These include the following features, as reviewed by Moscardo *et al.* (2001):

- Ugly
- Dangerous/scary/aggressive
- Sneaky/unpredictable
- Creepy/slimy
- Smelly
- Likely to spread disease
- Noisy
- Having detrimental impact on other species
- Small
- Being of no use by humans.

It should be noted that the above list includes 'small' and 'of no use' not because their opposites were found to have positive appeal (Section 4.1) but because these features have been identified as negatives in previous research. It should however be further noted that small size is not always a negative feature, as indicated by the appeal of infant animals, and of 'miniature' breeds such as shetland ponies or chihuahuas. The diminutive size of little penguins and sugar gliders probably adds to their 'cuteness.' Much further research will be needed if we ever are to clarify the details for reasons behind both positive and negative responses.

Failure of a tour operator to realise that some tourists cannot bear to touch a frog or to see a spider could lead to stressful situations. The fact that some animals are seen in a negative light however does not mean that operators should automatically disregard these species or try to reduce their numbers. In some cases it will be necessary to avoid contact as much as possible (e.g. using personal insect repellent, skirting around areas with dense swarms of mosquitoes, removing even harmless snakes from buildings). However it is often possible to create an interest in an animal's behaviour or other attributes that will go a long way towards creating a more positive reaction.

In our spreadsheet we have condensed these features into three factors:

1. Danger (perceived and actual).
2. Features likely to elicit disgust.
3. Features likely to create a nuisance.

Small size is covered indirectly in the section on positive features. Detrimental effects on other species are covered within the section on environmental management. Lack of perceived usefulness to humans is not expected to be a major factor and we expect this to apply equally to most Australian fauna species. Indirect usefulness *via* ecological roles in natural or semi-natural ecosystems can however be a useful topic for interpretation.

5.2 Perceived Danger (Negative Aspects)

Although perceived danger can attract tourists, crocodiles or sharks that inhabit the same water as swimmers are, naturally enough, viewed far more negatively. Similarly the more cryptic but potentially dangerous animals such as funnel-web spiders, box jellyfish and many of our elapid snakes are often viewed negatively. Davies (1990) comments that 'in our popularity stakes, ... spiders and snakes [are] near the bottom of the list (though even these have their champions!)'. Invertebrates are feared and avoided by the general public, particularly insects and spiders (Kellert 1993) and the least

preferred animals are those that are considered harmful to humans, the biting or stinging invertebrates (Gray 1993).

A Queensland national parks employee once commented (pers. comm. to RG) that in the preparation of interpretive displays they avoided using illustrations of snakes because as soon as people noticed a snake they appeared to focus their whole attention on this and forget everything else. A tourist on a wildlife tour (pers. comm. to RG) was proud of herself for not fainting when a snake was seen through the window of the tour vehicle. Lodge and campground proprietors have been pressed to kill both dangerous and totally harmless snakes by customers who are convinced their lives will otherwise be at risk.

One of the ways in which perceived danger may exceed actual danger is that people over-generalise from one or a few species to a whole group of related animals. Although only a few species of Australian reptile are dangerous, many people still fear all snakes and large lizards. Similarly many visitors have heard about poisonous spiders and assume that almost all Australian spiders are dangerous. Scorpions and centipedes are often wrongly viewed as having lethal stings or bites, but they can cause considerable pain, and totally harmless millipedes and scorpion-shaped creatures are frequently also feared. Fear of painful stings from wasps, bees, and large ants has some justification: unfortunately this fear overflows into a general distrust of all insects, especially large or thick-bodied ones. These erroneous beliefs make some people afraid of 'the bush' in general – expecting snakes and spiders lurking everywhere and ready to strike. Tour operators have the opportunity to clear up some of the misconceptions and advise on how to avoid genuine danger.

5.3 Disgust

Animals likely to provoke a feeling of disgust include those perceived as either dangerous (e.g. spiders) or harmless (e.g. slugs). Invertebrates are generally disliked (and certain horror movies and advertisements for insecticides probably intensify such feelings). A survey (Kellert 1993) revealed that the American public particularly disliked ants, bugs, beetles, ticks, cockroaches, crabs, stinging insects, scorpions (which were also feared) and spiders (which were also

feared). There was a desire to eliminate mosquitoes, cockroaches, fleas, moths and spiders, and octopus and cockroach were seen as ugly.

Staff at the Conservation and Land Management (CALM) in Western Australia were instructed not to include any rat-like creatures – principally bandicoots – in their publicity of small mammals, because of negative reaction to these by the public (D. Moncrieff, pers comm.). One of us (RG) had been told by a tourist that even though she realised bandicoots were not actually rats she would not be able to look at them if we came across any during a wildlife tour.

5.4 Nuisance Value

Mosquitoes, flies and ants would seem to come high on the list of species that are seen as nuisances during tours. There are other species that are an attraction for some tourists and a nuisance to others (or even an attractive nuisance to some). These include brushtail possums that fossick in campgrounds for food scraps or gallop across roofs at night, ibises and brush turkeys that demand to be fed at picnic tables, or large frogs that insist on visiting toilet bowls. Anticipation of such reactions, advice to tourists, and a little forethought and appropriate action can reduce most problems.

6. PRACTICAL ISSUES WITH USING WILDLIFE FOR TOURISM

6.1 Introduction

Some species are far easier than others to show to tourists. No matter how fascinating or charismatic an animal may be, there may be little point in planning to include it as a regular tour feature if it is nearly impossible to find. This could be either because the guide lacks relevant skill or knowledge (whether local or general), or because the animal's behaviour makes it difficult to find even for the experts. Once detected, a species that is easily observed is generally easier to hold the non-specialist tourist's attention than one that is occasionally glimpsed amongst the shadows. Some animals will allow a reasonably close approach for photos: others will flee at the first sight of a human, which is a problem both for the observer and the animal²⁹.

It is however not always strictly necessary to see an animal to include it on a tour. Birds (e.g. green catbird, eastern whipbird), frogs and insects (e.g. cicadas) often have distinctive calls. Small bats can be detected by an instrument known as a bat detector, which converts the echolocation frequencies to sounds within our own hearing range (another device called an Anabat goes one step further and attempts to identify the bat by comparison with stored calls). Where animals remain unseen, they sometimes leave evidence of their presence (e.g. scratches on trees made by koalas, mounds of brush-turkeys) that can be shown and discussed. Triggs (1996) provides some very useful information for mammals, with notes on some other vertebrates as well.

Some of the key types of information that will assist tour operators and tourists to find suitable sites for viewing a particular type of animal in the wild are:

- its geographic range and habitat;
- its seasonal availability; and
- habitat features that will cause animals to congregate in small areas (e.g. waterholes, fruiting trees).

²⁹ the animal might desert its nest or expend energy fleeing from favoured feeding grounds: see Green and Higginbottom (2000, 2001)

These are further described in the spreadsheet.

An important issue influencing suitability for tourism development that the spreadsheet at its current level of resolution is unable to cover is the availability of suitable infrastructure (e.g. walking tracks, transport routes, visitor facilities). Tour operators will need to investigate the availability of such infrastructure in locations that are otherwise suitable for viewing particular species.

6.2 Distribution (within Australia) and Habitat

This section of the spreadsheet offers some very basic information on which parts of Australia and the kinds of habitats in which various animals can be found. No attempt has been made to refine this, as details can readily be found in a range of excellent books, including: Williams 1980, Blakers 1984, CSIRO 1991, Kuitert 1996, Pizzey and Knight 1997, Strahan 1998, and Cogger 2000. Local guides such as those produced by the Queensland Museum (1995) and CALM (Johnson and Thomson undated) are also extremely useful. Tour operators and independent travellers should however note that distributions of some species of birds vary greatly between times of the year (see section 2.2).

6.3 Ease of Finding and Observing

Some species, if present, are almost always conspicuous, especially many of our birds. Others are easy to find in places where they are abundant if visited at the right time of day or year (e.g. eastern grey kangaroos in early morning or late afternoon, common brushtail possums around camping areas at night, seals on the beach in the breeding season). Some are very difficult to find even where they are reasonably abundant. Button-quail typically freeze at the approach of humans and blend perfectly with their surroundings. Numbats usually dash into shelters at the approach of footsteps long before they can be seen (although they appear to be less alarmed by approaching vehicles). Feathertail gliders are so tiny and often so high in the foliage that they are rarely detected on spotlighting treks. Marsupial moles are near-impossible to find even for expert mammalogists. Most native Australian vertebrate species fall somewhere between these extremes.

Ease of both finding and observing a species depends largely on:

- the kind of terrain that must be traversed while seeking it; its size, audibility, and use of conspicuous colours and markings (as opposed to camouflage);
- the extent to which it can be found in a small fixed area;
- the extent to which it tends to stay in dense vegetation or other concealing microhabitats;
- its tendency to flee or hide from observers; and
- its daily activity cycle.

The last-named may not always coincide with tourist comfort or operators' schedules. Sometimes different factors operate for finding a species than for observing it. A search for spoonbills or black swans could well prove fruitless, as they often move around between water-holes, even from day to day, but both can be easily observed once found, as they swim around in open water bodies. Some frogs on the other hand can be very easy to locate by their calls but difficult to observe because they are small and either obscured by vegetation, under rocks or in burrows.

6.4 Approachability

'Getting close' to animals has been found to affect satisfaction of some visitors with viewing of free-ranging wildlife (see Moscardo *et al.* 2001). Approachability varies widely not only between species but also within any given species (Green and Higginbottom 2001). Time of year can make a difference, with some species for example being more wary during the breeding season. Similarly approachability can vary with time of day, with reptiles, for instance, tending to be more sluggish early in the morning before they have time to warm up, and thus often possible to approach more closely. Previous experience probably accounts for some of the variability: currawongs or brush turkeys in remote areas are quite shy, but very bold around picnic tables where they are accustomed to being fed. Kangaroos and crows are more likely to be afraid of humans in areas where shooting occurs

(legally or otherwise) than in areas where they are protected. Animals that flee on the first approach of a new tour group may gradually learn over the ensuing few weeks or months that no harm is intended, and even without being fed can learn to tolerate a much closer approach. However this depends on the guides having patience and sensitivity, and giving appropriate advice to their guests (such as moving quietly and not approaching any closer if the animal shows signs of disturbance).

There do, however, seem to be substantial differences between taxa in the extent to which they are amenable to close approach. For example, given similar experience, kangaroos tend to be less flighty than some of the wallaby species, which are often solitary or live in dense vegetation. Birds will often tolerate closer approaches than flightless animals. Bearded dragons and shinglebacks rely heavily on camouflage, and are more likely to allow a close approach than many other lizards.

7. ENVIRONMENTAL MANAGEMENT

7.1 Introduction

It is important that not only environmental managers but also tourism operators take responsibility for minimising impacts on animals and their habitats. This section of the spreadsheet may, in fact, seem oversimplified to many environmental managers, and future versions will include more detail (from our own continuing research and input from researchers, operators, managers, amateur naturalists and others). We hope, however, that it brings to the attention of tourism operators factors they may not have considered, and that they will make the effort to find out more about. Enhanced awareness of this kind should assist in reducing potential conflict between environmental managers and tourism personnel as well as serving to diminish negative effects on wildlife and habitats.

7.2 Conservation Status

Whilst ideally any tourism venture should eliminate negative impacts on all wildlife, in reality some effects are likely to occur. Impacts, therefore, may need to be prioritised according to level and type of impact and the species concerned. For example, if tourists enjoy seeing chicks in nests it would be preferable for them to approach the nest of a noisy miner than the nest of a less common species (although still keeping a reasonable distance, and with clear advice not to approach nests of the latter at all). A walking trail which traverses breeding areas for black-breasted button-quail would be of greater concern than one which passes only nests of common species. Some endangered species should probably never be shown to tourists, in case this leads to repeat, uncontrolled visits or even poaching. No species should be regarded as having zero risk of extinction, but some are obviously at greater risk than others, and we have accordingly provided information on current conservation status as indicated by both international and Australian classification systems.

Although there is still much to be understood about the vertebrates, our lack of knowledge of the ecology and conservation status

invertebrates is relatively enormous. Yen and Butcher (1997) note that 'As most animal species are invertebrates, it is likely that the overwhelming majority of threatened species will be invertebrates,' but that only slightly more than 200 species are listed nationwide. They present a list of over 950 non-marine Australian invertebrates of particular conservation concern, 319 of which are gastropods (snails) and 464 insects.

Species, genera and especially whole families that are endemic to Australia also deserve special attention. If they become extinct here, or even if their habitat is so disturbed that their ecology and behaviour is severely disrupted, this means there are no natural populations left anywhere. Hence information on endemism should ideally be incorporated in future versions of the table. High degrees of endemism can also be seen as a positive feature in terms of distinctiveness, and this issue is partially covered in that column of the spreadsheet (section 4.5).

7.3 Potential Tourist Impact on Animals and Habitats

The extent to which a species might be impacted by wildlife tourism depends not only on its overall conservation status but also on its vulnerability to the types of activities involved in tourism. Negative impacts on wildlife include: direct injury and death (e.g. collisions with cars); habitat changes; and immediate disruption of activity or physiological state of the animal (covered in more depth by Green and Higginbottom 2000, 2001). Such impacts should be addressed in any responsible tourism development plan.

Where remnant populations or habitats are especially sensitive it may be necessary to find a compromise between the ideal of showing tourists an animal in its native habitat³⁰ and the ideal of zero impact. A semi-tame group of animals in a well-visited reserve may be less exciting for the tourist to see, but provide a way of satisfying the desire to see them while not disturbing any of the remaining wild breeding colonies. Alternatively, some form of remote viewing (such as hides, telescopes or remote cameras) which does not disturb the animals (at least after initial installation of the system) may be an option.

³⁰ Moscardo *et al.* (2001) review evidence that at least some tourists prefer to see animals in their natural habitats

7.4 Actual Danger To Humans

Information on actual (as opposed to perceived) danger presented by wildlife is needed not only to protect the tourists themselves, but also to: (a) protect other animals which are essentially harmless but perceived as dangerous, (b) find ways of reducing danger to humans with minimal impact to the species concerned and their ecosystems, and (c) ensure that new ventures are not commenced in localities which would subsequently necessitate the removal of native animals for human safety.

General information on dangerous animals found within each major group of animals was given in section 2. In general, there is no reason for wildlife tourists to be concerned about dangerous animals or avoid whole regions of the natural environment as long as they adopt sensible precautions.

8. OTHER SOURCES OF INFORMATION

This report and spreadsheet are not intended as the sole source of information on wildlife for the purposes of sustainable development and management of wildlife tourism. Their use should be supplemented by referring to the wealth of literature available on Australian wildlife.

While there is abundant information on Australian wildlife, little of this is designed specifically for tourism purposes. Based on an extensive literature review, there are two publications providing information especially for tourists on wildlife viewing Australia-wide. These are a book recently published by Lonely Planet (Bennett *et al.* 2000) and a briefer booklet produced by the Gould League (Grant 1996), focusing on viewing free-ranging wildlife. Both provide suggestions on locations to see wildlife, tips on wildlife viewing, and information on key species. Both, however, provide very limited information on commercial tourism operators. There are also publications designed for bird watching tourists (e.g. Bransbury 1987), whale watchers (e.g. Tucker 1989, Dalton and Isaacs 1992) and guides to wildlife of certain regions (e.g. Victorian Department of Conservation and Environment 1992, The Bush Book Series by CALM, Western Australia e.g. Johnson and Thomson *undated*).

In addition, most bookshops sell a range of field guides and books containing general information on Australian fauna.

Appendix B provides a list of suggested references for (a) operators, resource managers and researchers and (b) tourists. Appendix C provides a list of websites that may be of further assistance.

9. FUTURE EXPANSION OF THE SPREADSHEET

As stated earlier, it is hoped that the spreadsheet presented here is just the first step in presenting a tourism classification of Australian wildlife that will be useful for supporting sustainable development of wildlife tourism. We anticipate that:

- experts on various animal groups will contribute further useful knowledge both to assist the usage of animals in tourism and to minimise negative impacts on animals and habitats;
- further research will be conducted into the perceptions and needs of tourists; and
- tourism operators will communicate their needs and experiences.

Groupings of animals in the current spreadsheet will be subdivided to refine the information and make it increasingly useful. Future versions of the spreadsheet should also contain further suggestions for the educational/interpretive potential of the various species or groups of species, plus a detailed numerical key to sources of information.

There is much yet to be discovered, and much also that is known by experienced people but unpublished. We encourage anyone with further relevant information to contact us, and also anyone who (even without information to offer) sees important gaps that we can aim to fill, so that the spreadsheet can become increasingly useful over the next few years, and build progressively into a highly-valuable resource.

To this end we plan to provide access to the latest version of the spreadsheet via the CRC website (www.crctourism.com.au) via use of a password. This will allow wide access to the most up-to-date information, and will allow interested parties to contact us readily regarding suggested changes. Contact may also be made at any time by sending an email to Ronda Green at ronda.green@mailbox.gu.edu.au.

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APPENDIX A: WILDLIFE GROUPS CONTAINED IN THE TOURISM CLASSIFICATION SPREADSHEET

NB: Most categories are taxonomic. Non-taxonomic groupings are in square brackets []. Non-native species are denoted by *. Blank cells indicate characteristic relatively unimportant or information not readily available: latter to be augmented in subsequent versions.

MAMMALS	
Marsupials: Kangaroos (largest <i>Macropus</i> species, and world's largest living marsupials) Wallaroos and large wallabies (other <i>Macropus</i> species) Rock-wallabies Other small wallabies Tree-kangaroo Potoroids (bettongs, potoroos, rat-kangaroo) Koala Wombat Cuscus Greater glider Other Gliders Possum – Common Brushtail Possums – Other Honey possum (not a true possum) Bandicoot Bilby Marsupial Mole Numbat Quoll (<i>Dasyuridae</i> : see below)	Tasmanian Devil (<i>Dasyuridae</i> : see below) Small members of <i>Dasyuridae</i> (the major family of carnivorous/insectivorous marsupials) Monotremes: Echidna Platypus Placentals: Dolphins Whales Sea-lion/Seals Dugong Macro bats (fruitbats, flying foxes, blossom bats) Microbats (small, echo-locating, insect-eating) Rodents (native species are all in the rats and mice tribe <i>Murinae</i>) *Dingo (not truly native – appears to have arrived a few thousand years ago, probably with Indonesian traders) [*Introduced mammals – large] [*Introduced mammals – small]
BIRDS	
Non-passerines Emu Cassowary Australian Bustard Brolga Black-necked Stork ('Jabiru': this name applies strictly to a South American stork) Black Swan Magpie Goose	Ducks Comb-crested Jacana (Lotus-bird, Lily-trotter) Australian Pelican Spoonbills [Secretive waterbirds] [Other waterbirds] Little Penguin Other Penguins

Albatross Booby, Gannet [Other marine birds] [Birds of shore and reef] Masked Lapwing (Spur-wing Plover) Lorikeets Rosellas Cockatoos Other parrots Mallee fowl Brush-turkey Button-quails Pheasant coucal Channel-bill cuckoo Other cuckoos Fruit-doves Other Doves and Pigeons Quails [Large diurnal raptors (eagles etc)] [Other diurnal raptors (hawks etc)] Swifts Owls Frogmouths Nightjar Dollarbird Rainbow Bee-eater Kookaburra Other Kingfishers	Passerines (Songbirds) Lyrebirds Pittas Bowerbirds Catbirds Riflebirds Whipbirds [Other rainforest songbirds] Friarbirds Bell Miner (Bellbird) Other Honeyeaters Fairy-wrens Fantails Whistlers Treecreepers [Other small open-forest insect-eating songbirds] Finches and firetails Australian Magpies Currawongs Butcherbirds Woodswallows Cuckoo-shrikes Crows [Other open forest/woodland song birds] [Small grassland and heathland songbirds] [Small songbirds of the outback] Swallows and kin Willy Wagtail [Other common suburban songbirds]
REPTILES	AMPHIBIANS
Crocodiles Dragon Lizards Goannas (Monitors) Large skinks Other skinks Geckos Legless lizards [Dangerous elapids] Other elapids Colubrids Pythons Blind snakes Sea snakes Turtle – freshwater Turtle – marine	Tree Frogs 'Southern' Frogs Other Frogs *Cane toad
MOLLUSCS	
Giant clams Other marine bivalves Marine snails – coneshells [Other marine snails – colourful shells] Other marine snails Octopus and kin Other marine molluscs Terrestrial molluscs	

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APPENDIX C: KEY WEBSITES WITH WILDLIFE INFORMATION RELEVANT TO WILDLIFE TOURISM

(Current as at March 2001)

AUSTRALIAN ZOOS AND WILDLIFE PARKS

LOCATION	NAME	ADDRESS
VIC	Melbourne Zoo, Healesville Sanctuary and Werribee Open Range Zoo	www.zoo.org.au
	Seal Rocks Sea Life Centre	www.phillipisland.com
WA	Perth Zoo	www.perthzoo.wa.gov.au
NSW	Taronga Zoo and Western Plains Zoo – Zoological Parks Board of New South Wales	www.zoo.nsw.gov.au
	Mogo Zoo	www.mogozoo.com.au
	Sydney Aquarium	www.sydneyaquarium.com.au
NT	Territory Wildlife Park	www.nt.gov.au/paw/parks/twp
SA	Adelaide Zoo	www.adelaide-zoo.com.au
	Monarto Zoological Park	www.monartozp.com.au
TAS	Talune Wildlife Park	www.talune.com.au
QLD	Alma Park Zoo	www.almaparkzoo.com.au
	Australia Zoo	www.crocodilehunter.com/australian_zoo/welcome/index.htm
	Seaworld	www.seaworld.com.au
	Dreamworld	www.dreamworld.com.au
	Currumbin Sanctuary	www.currumbin-sanctuary.org.au
	David Fleay Wildlife Park	www.env.qld.gov.au/environment/plant/fleays/

GOVERNMENT CONSERVATION AGENCIES

LOCATION	NAME	ADDRESS
VIC	Department of Natural Resources and Environment	www.nre.vic.gov.au
	Parks Victoria	www.parkweb.vic.gov.au
WA	Department of Conservation and Land Management (CALM)	www.calm.wa.gov.au
NSW	National Parks and Wildlife Service	www.npws.nsw.gov.au
NT	Parks and Wildlife Commission of the Northern Territory	www.nt.gov.au/paw/welcome
SA	Department for Environment and Heritage – National Parks and Wildlife	www.dehaa.sa.gov.au
TAS	Tasmanian Parks and Wildlife Service	www.parks.tas.gov.au
QLD	Queensland Parks and Wildlife Service and the Environmental Protection Authority	www.env.qld.gov.au
ACT	Environment ACT	www.act.gov.au/enviro
National	Environment Australia	www.environment.gov.au

ENVIRONMENTAL EDUCATION AND INTERPRETATION

LOCATION	NAME	ADDRESS
Australia	Interpretation Association of Australia	home.vicnet.net.au/~interpoz/
	Australian Association for Environmental Education	members.iinet.net.au/~aeee/
	Environmental Education Network	www.sofweb.vic.edu.au/een/index1.htm
	'Best Practice in Park Interpretation and Education' – A report to the ANZECC working group on National Park and Protected Area Management Benchmarking and Best Practice Program by DNRE Victoria and Parks Victoria April 1999	www.biodiversity.environment.gov.au/protecte/anzecc/index1.html
International	InterpNet – The National Association for Interpretation	www.interpnet.org/
	National Wildlife Federation – Environmental Education	www.nwf.org/education

GENERAL

LOCATION	NAME	ADDRESS
Australia	CRC for Conservation and Management of Marsupials	www.newcastle.edu.au/marsupialcrc
	Australasian Wildlife Management Society	www.awms.org
	Australian Mammal Society	ikarus.jcu.edu.au/mammal/vnabar.htm
	Australasian Bat Society	batcall.csu.edu.au/batcall/abs/home.htm
	Victorian Herpetological Society	www.smuggled.com/vhs1.htm
	Birds Australia (formerly RAOU)	www.birdsaustralia.com.au
	Australian Wildlife	www.australianwildlife.com.au
	Threatened Species Network	nccnsw.org.au/member/tsn
	Araucaria Ecotours: Australian Wildlife links	www2.eis.net.au/~ecotoura/Wildlifeinfo.html
	Earth Sanctuaries Ltd	www.esl.com.au
	Australian Conservation Foundation	www.acfonline.org.au
	International	International Fund for Animal Welfare
World Wildlife Fund		www.wwf.org
Zoological Record: Internet Resource Guide for Zoology		www.biosis.org/zrdocs/zoolinfo/subj_ind.htm
	IUCN – International Union for the Conservation of Nature and Natural Resources	www.iucn.org

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