

To feed or not to feed: a contentious issue in wildlife tourism

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ABSTRACT

There is a deep need within humans to be in contact with animals and feeding has arisen as a means of achieving this as well as fostering a sense of nurture and even assistance to wild animals. In tourism situations feeding is frequently used in order to enhance visitor satisfaction through delivering a good sighting and close contact as well as through improved opportunities to photograph wildlife. Wildlife feeding activities comprise one or a combination of being inadvertent and accidental, a result of deliberate habitat modification to attract wildlife, unstructured, namely the intentional provisioning of food for wildlife without any form of management or structured where wildlife are deliberately fed via formal supervised arrangement. All of these situations have the potential to have both positive and negative impacts on wildlife. Recognised advantages of intentional feeding can be divided into two categories. The first relates to visitor experience and tourism product while the second involves animal welfare issues. Potential and realised problems associated with the feeding of wildlife include habituation and attraction, disruption of normal activities, increased aggregation of animals at feeding sites and nutritional problems. Management strategies aim to control access, visitor numbers, the nature and quality of provisioned food and the educational value of the viewing experience. Management styles cater for different circumstances and include wild bird feeding operations, wildlife restaurants, structured fish feeding and highly managed dolphin feeding. All of these involve a specific feeding area, controls over the feeding activity and educational programmes. It seems that on a global scale, birds appear the most suitable candidates for structured feeding operations. Caution must be exercised in developing a feeding situation for tourism purposes and be subject to review in the light of new information on the benefits or otherwise of the feeding situation. Feeding operations should also be based upon the fostering of respect and appreciation of natural values and not entertainment.

Key words: Wildlife tourism, food provisioning, advantages of feeding, impacts, management, interpretation

Introduction

Wildlife tourism is an important economic activity worldwide with visitation to sites of wildlife interest continuing to rise (Braithwaite 2001; Higginbottom 2004; Tisdell and Wilson 2004; Newsome *et al.* 2005). For example, it is estimated that there are 1000-1500 wildlife tourism enterprises in Australia with the associated wildlife tourism industry currently thought to be worth \$1.5 to 3 billion (Hundloe and Hamilton 1997; Tourism Tasmania and Parks and Wildlife Services Tasmania 2005) As discussed by Newsome *et al.* (2005) there is frequently a deep need within humans to be in contact with animals which is reflected in the huge industry associated with various pets, the popularity of zoological collections, and a plethora of books, magazines and television documentaries concerned with wildlife. In addition, there is the ever-increasing interest in viewing animals in the wild. Because of the desire to be in close contact with animals, feeding has arisen as a means of achieving this as well as fostering a sense of nurture and even assistance to wild animals. Feeding can also be viewed as stimulating awareness and knowledge of wildlife particularly in the case of

bringing children into contact with responsive animals. In some cases feeding has a long history and is well established and promoted in places like the USA and UK where the public engage in home backyard feeding as well as attending tourism centered wildlife feeding situations. This is particularly evident in the case of bird feeding where significant conservation groups such as the Royal Society for the Protection of Birds (RSPB) in the UK actively promote food provisioning (Fig 1). The whole concept of helping wildlife and making a contribution to restoring depleted populations has been extended to other species for example, also in the UK, advice on feeding mammals is provided by various Wildlife Trusts and English Nature.

Feeding can also be used in specific tourism contexts in order to enhance visitor satisfaction through delivering a good sighting and close contact as well as through improved opportunities to photograph wildlife (e. g. Fig. 2). The feeding of wildlife therefore can be seen to occupy a spectrum which at one end involves the casual feeding of wildlife in non-tourism situations through to highly structured situations where otherwise difficult



Figure 1. Shop on the Royal Society for the Protection of Birds Reserve Minsmere, England selling a wide range of feeding apparatus and various wild bird foods and seed mixes. Minsmere hosts special events for children that include making bird feeders and bird cake. Slimbridge, in southern England, is another location that sells bird food. Wild bird feeds take place at the Peng Observatory at Slimbridge from January to March. There are special evening floodlit sessions with a commentary educating the public about the feeding of birds during winter. Photo. D. Newsome.

to see, and/or wildlife that occurs in specific locations, are fed as part of a tourism attraction. Because wildlife tourism is a means of learning about wildlife and the way that most people come into contact with exotic, rare and charismatic species this chapter seeks to explore the spectrum introduced above. It is thus necessary to take on a global view, so that the wildlife-feeding situation, particularly from a tourism perspective, can be fully appreciated.



Figure 2. Bird feeding devices such as 'nut feeders' (directly in front of the viewer) provide enhanced viewing opportunities (value added tourism product) at a bird hide at Rutland Water, UK. Photo. D. Newsome.

One of the complexities that lies with understanding the issues associated with food-provisioned wildlife is in the context of inadvertent, unstructured and structured feeding activities. Inadvertent feeding is when wildlife is fed accidentally as compared with accepted feeding practices that can be divided into (a) un-supervised or unstructured food provisioning and (b) structured feeding operations where there is a significant regulated and organised activity. There are recognized advantages (visitor satisfaction; promotion of goodwill towards wildlife) and disadvantages (feeding wildlife the wrong

foodstuffs; abnormal concentrations of animals at feeding sites; pollution; risk of humans being bitten) associated with all these situations and this chapter explores each condition accordingly.

Because of the perceived disadvantages in feeding wild animals (e.g. Green and Higginbottom 2001; Higginbottom 2004; Newsome *et al.* 2005) sitting alongside variable human interests, expectations and attitudes towards wildlife, there are the different and conflicting perspectives as to whether feeding is desirable or not and in many cases debate as to how wildlife feeding should be managed. Moreover, problems of inappropriate feeding, risks to wildlife and public safety are issues that many local authorities, councils and land management agencies have to deal with (e.g. Fig. 3).

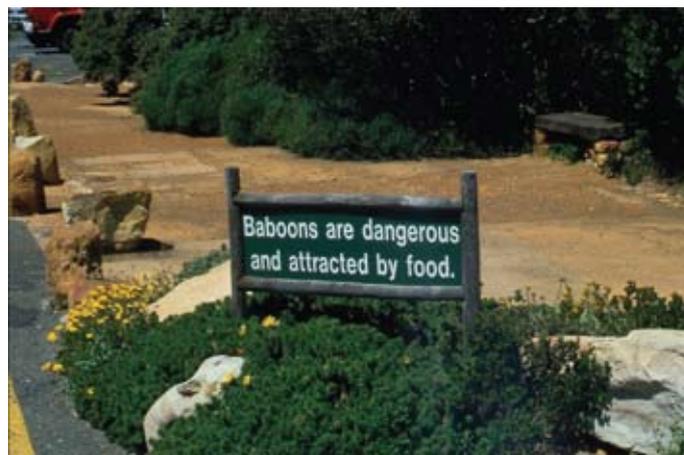


Figure 3. Warning sign Cape Peninsula National Park, South Africa. There is a blur between wildlife tourism and general recreation. Incidental feeding can evolve into a regular pattern of deliberate feeding as animals are attracted to picnic sites and day use areas. The feeding of primates is particularly problematical due to close approach of the animals and individual behaviours that lead to animals 'controlling' the feeding situation. Photo. D. Newsome.

Green groups and animal welfare agencies have expressed concerns relating to the manipulation of wildlife in some feeding situations. Differing stakeholder opinions further complicates the situation. While many people seek close interaction and wish to gain photographs and unique experiences there are others who demand more authentic and sustainable wildlife tourism experiences. This chapter therefore explores the arguments for and against feeding in the context of various management situations. The final part of this chapter attempts to formulate some principles and guidelines relating to the issue of feeding of wildlife in tourism situations.

The spectrum of wildlife feeding activity

The feeding of wildlife can be classed as either the intentional or accidental supply of non-natural foods to wild animals. Intentional feeding is where tourists provide food informally for wildlife (e.g. feeding of stingrays, Australia and the Caribbean) or under supervised conditions

(e.g. feeding of dolphins, Australia). Accidental feeding involves the wildlife acquiring food from disposal areas (e.g. dingoes *Canis lupus dingo* Fraser Island, Australia), discarded food wastes (e.g. bears in North America) or by stealing directly from the tourists themselves (monkeys in Africa and Asia, see Fig. 4) (Newsome *et al.* 2005). The spectrum of wildlife feeding activity, which includes both accidental and intentional feeding, can be categorised as inadvertent, via habitat modification, unstructured or structured. All of these have the potential to have both positive and negative impacts on wildlife.



Figure 4. Do not feed the monkey signage at Bukit Timah Nature Reserve, Singapore. Despite the signage and risk of penalties visitors to the reserve have been observed checking for management presence and then secretly giving food to the monkeys. Photo. D. Newsome.

Inadvertent Feeding

Inadvertent feeding is where the provisioning of food is predominantly accidental. This form of feeding is where the wildlife scavenges human foods from campsites and refuse disposal sites. Places where inadvertent feeding is known to take place include campgrounds, fishing sites, picnic and day use areas, as well as at tourist accommodation sites. As animals become habituated to human presence and learn to obtain discarded food items they may also steal food left on unattended picnic tables, or forage through food and storage containers (Howard and Jones 2004; Newsome *et al.* 2005). Such inadvertent feeding by tourists can impact on the normal feeding behaviour of animals. For example, grizzly bears *Ursus arctos horribilis* in Yellowstone National Park, USA were affected when park refuse sites were closed in the 1970s. Upon the closure of refuse sites a significant decrease in the reproductive rate of bears, litter size and body size was detected (Knight and Temple 1995; Roe *et al.* 1997). A further outcome from inadvertent feeding is animals becoming unnaturally aggressive towards humans. For example, in 2001 on Fraser Island, Australia a 9 year old child was mauled to death by two dingoes. This resulted in the cull of 31 dingoes on the island and management focusing on changing tourist behaviour in relation to feeding dingoes at camping areas and the storage and disposal of human foods (Burns and Howard 2003; Howard and Jones 2004).

Feeding through habitat modification

This is the common practice of attracting animals through the planting of lawns, trees and shrubs (Green and Higginbottom 2000; Howard and Jones 2004). The supply of food and water are some of the most powerful attractants for wildlife. Fruiting trees, nectar rich flowers and water holes can thus be used to manipulate the distribution, abundance and proximity of wildlife (Gill 2002). For example, lawns can be planted with the intention of attracting herbivores such as kangaroos in Australia (Green and Higginbottom 2000).

In Africa watering points are commonly used to facilitate wildlife viewing (Green and Higginbottom 2000; Newsome *et al.* 2002). For example in Kenya at Tsavo Park an artificial waterhole was built near Kilguni Lodge to allow hotel guests to watch the animals come to drink. However the constant presence of wildlife resulted in degradation of the area surrounding the waterhole leading to loss of vegetation and the creation of bare eroded areas. The provision of waterholes thus has the potential to bring about a concentration of wildlife that under normal conditions would tend to follow seasonal rains. Such a lack of migratory behaviour can result in damaged and altered habitats around human created waterholes (Ayeni 1977; Goodwin *et al.* 1998; Frost and Shanka, Undated).

While similar to and sometimes overlapping with structured feeding situations, where the nature and supply of food is controlled by management, Newsome *et al.* (2005) observe that the objective of habitat modification is to commonly facilitate viewing and photography of wildlife rather than satisfying a need for the tourist to feed the wildlife. The privately owned Kingfisher Park, Julatten, Australia consisting of rainforest and accommodation for birdwatchers is an example of where both approaches are employed. This park offers high quality interpretative guiding and approximately 150 species can be found in and around the park. To achieve a high diversity of species in good viewing numbers the park uses both habitat modification and a structured feeding programme. The dual approach involves the provision of bird attracting trees and shrubs such as *Grevillea sp.* and the provision of seven water dishes, two nectar feeders, a seed feeder and a fruit feeder. This double strategy attracts many species of birds as part of their natural foraging behaviour while allowing clear viewing and photographing opportunities for tourists (Newsome *et al.* 2005).

Unstructured Feeding

Unstructured feeding is intentional provisioning of food for wildlife without any form of management or informed supervision. In this case little to no education or interpretation takes place. Furthermore, there is often little control over what is fed to wildlife (Newsome *et al.* 2004). This type of feeding can take place in public places (e.g. Fig 5), in the backyards and gardens of private individuals and can also include evolving attractions (this latter point involves a spectrum of feeding activity that may or may not become a regular feeding situation – see later). Further examples of unstructured feeding situations occurring in public places include bird feeding at ponds and lakes such

as at Lake Monger, Western Australia (Fig. 6) and feeding fish to the pelicans outside a fish and chip restaurant on the Gold Coast, Australia (Fig. 7). Backyard feeding is also classified as unstructured feeding. Attracting wildlife to suburban back yards is extremely common throughout the Western world (O'Leary and Jones 2006). Studies in Australia have found 40-60% of households undertake some form of wildlife feeding (Jones and Howard 2001). In North America it is estimated that 63-80 million people feed birds during winter (Wilson 2001). In the UK wild bird feeding is supported by conservation organizations such as the RSPB, which provides advice on what to feed to birds (see Fig. 1).



Figure 5. Unstructured and casual feeding of birds in Sydney Botanic Gardens. Sacred Ibis *Threskiornis aethiopicus* (prominent in this photograph), various species of pigeon and flocks of up to 30 Sulphur-crested Cockatoo *Cacatua galerita* are attracted to and regularly fed by visitors to the gardens. Photo. D. Newsome.



Figure 6. Unstructured feeding of birds taking place at lake Monger, Western Australia. Over time the practice of feeding swans and ducks became very popular resulting in the site being targeted as a visitor attraction by bus tour companies. Risks to the health of wild birds due to the use of bread, the attraction of nuisance species such as Silver Gulls (*Larus novaehollandiae*), pushy behaviour of the swans and the risk of wild birds being killed on nearby roads has resulted in food provisioning being prohibited at lake Monger. Photo. D. Newsome.



Figure 7. The unstructured feeding of pelicans outside a popular fish and chip restaurant on the Gold Coast, Queensland. Here the daily feeding can attract over 20 pelicans and crowds of up to 50 people. Photo. K. Rodger

In some cases unstructured feeding has the potential to develop into more structured form of feeding. An example of this is the feeding of dolphins at Monkey Mia, Western Australia. In the 1960s this unstructured feeding attraction commenced as local fisherman started to feed bottlenose dolphins *Tursiops truncatus*. This expanded throughout the 1970s to include tourists feeding the dolphins (Mann and Krepms 2003). Today Monkey Mia is a multi-million dollar tourism industry that has developed on the basis of the viewing and feeding of the dolphins (Fig. 8) (CALM 1993). In the absence of management controls unstructured feeding can result in negative impacts on the wildlife. The feeding of black *Dasyatis thetidis* and smooth *Dasyatis brevicaudata* stingrays at Hamelin Bay, Australia (Fig. 9) is an example of an evolving attraction. Here unmanaged/uncontrolled feeding has resulted in behavioural impacts with the rays being attracted to humans resulting in aggression and hierarchy towards one another and the possible risk of people being injured by stingray barbs. A major issue for situations such as this is the lack of management supervision and a dearth of information provided to the tourists at the site (Lewis and Newsome 2003; Newsome *et al.* 2004). Some evolving attractions may terminate due to awareness of problems developing or upon the instigation of management controls (e.g. see Fig. 6) or in other cases continue to develop to be subsequently managed as a major tourism attraction such as at Monkey Mia in Western Australia (see Fig. 8).

Structured Feeding

Structured feeding is where wildlife are deliberately fed via formal supervised arrangement. This includes feeding by tourists, the provision of food by tour operators to ensure predictable viewing of wildlife and the feeding by managing agencies (Green and Higginbottom 2001). Structured feeding can take place in a variety of situations involving semi captive to free ranging wildlife on private property through to government managed land or water. An example of structured feeding on private property is the provisioning of Tasmanian Devils *Sarcophilus harrisii* in Australia. Wildlife tours operate to view Tasmanian



Figure 8. The structured feeding of dolphins at Monkey Mia Dolphin Interaction Area, Western Australia. Feeding takes place 3 times a day anywhere between 8am and 1pm attracting crowds of up to 700 people. Staff stand in the water with buckets containing fish while educating visitors on the dolphins and the history of Monkey Mia. Following this several tourists are chosen from the crowd to come into the water and feed a fish to the dolphins. Photo, K. Rodger.



Figure 9. Unstructured feeding of stingrays at Hamelin Bay, Western Australia. Some of the issues identified were risk of rays being damaged by boats, overfeeding, feeding the wrong food, ignorant behaviour of visitors, skin lesions on rays as a result of excessive touching by visitors, damage to rays from fishing hooks and water pollution (see Lewis and Newsome, 2003 and Newsome *et al.* 2004). Photo, D. Newsome.

devils feeding on carcasses placed in a natural setting where tourists view the feeding activity from a hide (Nick Mooney, pers. comm.). The tours operate no more than five days a fortnight and no more than three days in a row to avoid devils becoming dependent on the food.

Structured feeding is also a component of conservation management where management decides that a certain species will benefit from food supplementation because it contributes to the animals' survival while allowing for close contact with wildlife. Furthermore, it provides an opportunity to foster appropriate behaviour towards wildlife (Newsome *et al.* 2005). This is because education and interpretation are normally a part of the tourism-wildlife feeding interaction. An example is the feeding of birds at the Slimbridge Wildfowl and Wetlands Centre in England. Slimbridge contains the largest captive collection

of wildfowl in the world and the public are encouraged to feed the birds which are on display (Fig 10). In addition the centre is adjacent to a nature reserve where over 250 species of wild birds have been identified. Formulated mixes can be purchased and tourists are allowed to feed the captive birds throughout the year. During winter wild birds are also fed at scheduled times when they are under stress due to the cold conditions. However, this aspect of feeding at Slimbridge is supervised with visitors being educated not only on what to feed but also why the wild birds are being fed (Newsome *et al.* 2005).

Recognised advantages of feeding wildlife

Orams (2002) noted that the feeding of wildlife can provide significant social, economic and in some cases environmental benefits, although not all apply at the same time these potential benefits serve to illustrate a range of advantages depending on the situation and the species involved. Recognised advantages of intentional feeding can be divided into two categories. The first relates to visitor experience and tourism product while the second involves animal welfare issues. In many cases the intentional feeding of wildlife for tourism is based predominantly on ensuring a good tourism experience. The viewing of wildlife requires a predictable occurrence of wildlife species within a small spatial area (Duffus and Dearden 1990). To achieve reliable viewing of wildlife provisioning is therefore undertaken to attract them to a particular site resulting in value added to the tourism product (Orams 2002).

For tourists the feeding of wildlife allows for the opportunity to have a close up personal experience and in doing so people are more able to connect with wildlife (Fig. 11). According to Orams (2002) in today's world there is a decreasing number of opportunities to interact with wildlife. A key feature of the wildlife tourism experience therefore is close proximity to the animals resulting in tourists feeling they can commune with nature (see Muloin 1998; Schnazel and McIntosh 2000; Orams 2002). Feeding of wildlife ensures this close interaction will take place resulting in enhanced viewing and photographic opportunities and increased visitor satisfaction. An example of how this works is the Jumping Crocs Cruise on the Adelaide River in the Northern Territory. Tour guides suspend meat from lines above the water to attract crocodiles to jump out and seize the bait providing opportunities for photos (Fig. 12) (Ryan 1998). The jumping for food is a natural part of crocodiles foraging behaviour while allowing for greater viewing and photography. However, studies conducted by Chirgwin and Harvey (1999) indicated that these interactive feeding tours may have some impact on the saltwater crocodiles behaviour. There are particular problems associated with feeding aggressive, carnivorous species. For example in the case of feeding Komodo dragons *Varanus komodoensis* in Indonesia the use of goat carcasses resulted in abnormal concentrations of dragons at the provisioning site in addition to making potentially dangerous animals less wary of humans. This is a predicted situation with the feeding of crocodiles in the Northern Territory of Australia. Currently the Jumping Crocs cruises are not subject to any permits or regulations

but operators seem to have developed their own code of ethics. Furthermore, the Parks and Wildlife Commission have no plans to regulate or introduce a permit system. Yet, the potential impact of crocodile feeding tours on crocodile behaviour, such as attraction to recreational boats, is an important issue for not only the conservation of saltwater crocodiles *Crocodylus porosus* but also the sustainability of the tourism activity.



Figure 10. The Slimbridge Wetlands Centre, England contains the world's largest captive collection of wildfowl including the endangered Hawaiian Goose. Formulated mixes can be purchased and visitors feed many species of wildfowl that roam the ground freely or are otherwise on display in open pens. Photo. by D. Newsome.



Figure 11. This photograph highlights the enjoyment of feeding captive emus *Dromaius novaehollandiae*. Structured feeding in a captive situation allows for visitors to interact with animals which can often be difficult to view in the wild. Feeding wildlife can bring great enjoyment as well as providing the opportunity for education and interpretation. Photograph by K. Rodger.



Figure 12. The structured feeding of crocodiles takes place on the Adelaide River in the Northern Territory, Australia to enhance the tourism product. Meat is delivered from the side of the boat to encourage crocodiles to jump. This allows for not only greater photographic opportunities but also the excitement of seeing the crocodiles jump. Photo. K. Rodger.

Feeding is attractive to tour operators because it adds to the value of the tourism product by increasing the chances of sighting the wildlife on which they base their businesses. This is particularly the case in Australia where many of the native species are nocturnal and crepuscular. Provisioning of food can create opportunities for tourists to interact with these animals (Hodgson *et al.* 2004). For example, the structured feeding of semi-captive rare and charismatic fauna (which are often difficult to view) at Barna Mia in Western Australia. Here the wildlife are surrounded by electrified fence to keep feral predators, such as foxes *Vulpes vulpes*, out. Guided walks are offered which include the feeding of the captive wildlife to attract them to the visitor groups. Visitors can also take part in the feeding process. Visitors have reported a great sense of satisfaction with this experience (Hughes *et al.* 2005). Without reliable wildlife viewing the economic viability of tour operators businesses can be compromised (Orams 2002).

The second recognised advantage of wildlife feeding relates to animal welfare issues and in particular is thought to reduce the negative ecological effects from habitat loss. These may be powerful reasons for people wanting to feed wildlife in tourism situations or otherwise. Howard and Jones (2000) noted the most common reason for the feeding of birds by residents in Southeast Queensland was to compensate for the loss or destruction of wildlife and their habitats. In the Northern Hemisphere the feeding of wildlife is promoted as being beneficial to the animals, as raising the importance of conservation (especially in urban areas) and as a means of increasing community interest in wildlife (Cannon 1999, cited in O'Leary and Jones 2006). The most popular of all wildlife for people to feed is birds (Orams 2002). As stated previously organisations including the British Trust for Ornithology (BTO) and Royal Society for the Protection of Birds (RSPB) in the UK actively encourage the feeding of birds as a means

of enriching the urban environment and increasing the survival of birds during severe winter conditions.

Where species have been hunted and persecuted or where habitats have been significantly modified by humans the provisioning of food may aid the recovery of threatened species populations (Orams 2002). The work by Wilbur *et al.* (1974) demonstrated the benefits of provisioning in enhancing populations of endangered species including the California condor *Gymnogyps californianus*. Supplementary food provisioning has resulted in the increased nestling survival of northern goshawks *Accipiter gentilis* in North America. Ward and Kennedy (1996) provided northern goshawks with food from hatching until dispersal. They found that food provisioning influenced the behaviour and/or physiology of northern goshawks. In many circumstances, the increased survival rate of juveniles was attributed to the altered behaviour of provisioned adult females. This was due to the increased time adult females spent in nest stands allowing a greater time in detecting chick predators (Ward and Kennedy 1996).

Provisioning of food can also assist wildlife during periods of natural food shortage such as drought, after bush fires in fire prone environments or during freezing conditions in the Northern Hemisphere. An example of this is the winter feeding of White-tailed Deer (*Odocoileus virginianus*) in Ontario, Canada. In the 1970s deer numbers were diminished and the winter habitat was severely degraded due to farming and land clearing. The lack of accessible food resulted in the starvation and death of deer. In response to this local residents fed the animals and this resulted in feeding becoming commonplace even with the support of the government.

This allowed the deer to survive severe winters which in turn resulted in an increase in the population (Ministry of Natural Resources Ontario Undated).

The overall advantage to be gained from the structured feeding of wildlife is increased education, awareness, and the promotion of goodwill towards wildlife. Feeding of wildlife can allow for information to be delivered to tourists resulting in greater understanding and knowledge of species. Education is an important component of wildlife management (Orams 1996). As Newsome *et al.* (2005) noted increased knowledge could result in increased conservation supporting behaviour.

Problems associated with feeding wildlife

Potential and realised problems associated with the feeding of wildlife are summarized in Table 1. Orams (2002), however, observed that there was a general lack of scientific evidence in support of such claims. Bearing that in mind the scientific evidence continues to grow (e.g. see Lewis and Newsome 2003; Newsome *et al.* 2004; Newsome *et al.* 2005; Milazzo *et al.* 2006; Seminuk *et al.* in Press) and there would be general agreement amongst scientists and managers that food provisioning can lead to health problems for wildlife and/or pose risks to public safety. Thus following on from this the perceived disadvantages associated with feeding of wildlife can be divided into different areas including attraction, habituation, disruption, aggregation and inappropriate human behaviour. All of these can have short and or long term effects on individual species as well as wildlife populations (Fig.13).

Table 1. Problems associated with food supplementation of wildlife. Adapted from Newsome *et al.* (2005)

Perceived disadvantages	Context of problem
Attraction to feeding sites and presence of humans with food	Abnormal concentrations of individuals at a feeding site. Increased populations of provisioned species.
Habituation and creation of semi-domesticated states	Direct contact with and even handling of target species. Increased susceptibility of wildlife to injury and disease. Loss of fear of humans leading to pushy and aggressive behaviour with consequent public safety issues. Increased chance of offending animals having to be re-located or destroyed.
Disruption of normal activities concerned with foraging, breeding and predator avoidance	Disruption of proportion of time and energy devoted to foraging leading to dependence on provisioned foods. Less dominant species displaced by more aggressive species. Individuals may sustain wounds while competing for food Disruption of maternal care leading to reduced breeding success. Increase and regular supply of food resources leading to an increase in local breeding activity of adaptable species
Aggregation of nuisance species	Increased vigilance and displacement of smaller species due to presence of more aggressive dominant species and predators Potential for increased populations of gulls and corvids with subsequent decline in reproductive success of local resident species
Problems associated with facility development	Vehicle collision resulting in death of wildlife Site pollution at feeding stations Pollution of waters at fish feeding sites
Inappropriate human behaviour	Inappropriate foods and poor quality of provisioned foods leading to malnourishment and reduced body condition

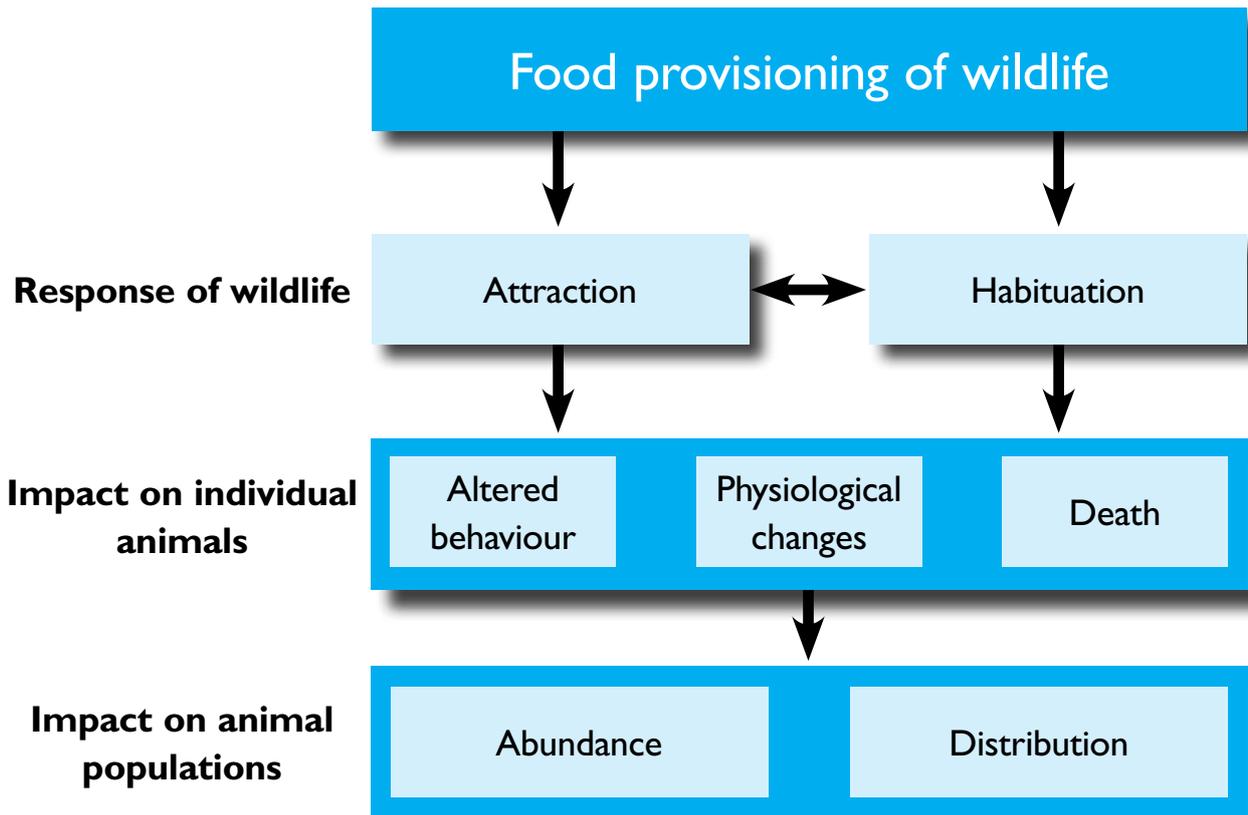


Figure 13. Potential and actual impacts on wildlife from food provisioning.

Habituation and attraction of wildlife

The process of habituation and attraction is typical of wildlife responses to feeding (Thompson *et al.* 2003). The loss of fear of humans can also result in changed behaviour. The attraction and habituation of wildlife through feeding can result in major public safety issues as the wildlife attracted to feeding sites may become aggressive towards humans (see Orams, 2002 and Newsome *et al.*, 2005 for detailed account). Some wildlife remain docile when frequently fed by tourists while others can become aggressive and can attack humans (Orams 2002; Newsome *et al.* 2005). The outcome is an increased chance of offending animals being relocated or destroyed.

It needs to be noted that attraction and habituation are two interrelated problems associated with the feeding of wildlife. Although they are discussed here as separate categories it is often difficult to determine which comes first, attraction or habituation. The EPA (2001) surmise the events leading up to the dingo attacks on people visiting Fraser Island, Australia as attraction > habituation > interaction > aggression. However, it could be suggested that habituation then results in attraction. As the animals become used to humans and less wary they then became confident enough to respond to the provisioning of food. Whittaker and Knight (1998) have raised the issue that habituation is often confused with attraction and emphasise that habituation is a waning of response and neutral while attraction is a positive reinforcement where an animal will be attracted to and, for example, associate with humans in order to acquire food. However, because habituation is where animals learn to become less sensitive to a given stimulus, animals can easily

become habituated to human contact, particularly through feeding. This can result in animals becoming dependent on humans to feed them (Orams 2002). Such continual feeding can also create semi-domesticated wildlife. For example, on Rottneest Island, Western Australia quokkas *Setonix brachyurus* have become so habituated to humans and feeding they have little if any fear of humans (Fig. 14). Quokkas have even been observed stealing food from plates at the outdoor restaurants while diners look on (pers. obs. K. Rodger; Herbert 2007).



Figure 14. Illustration of unstructured feeding of quokkas on Rottneest Island, Australia. Even though management does not encourage this practice feeding is still a common occurrence. Photo. K. Rodger.

Attraction involves animals learning by association. Animals may begin to associate the presence of tourists with food and are attracted accordingly (Newsome *et al.* 2005). This can be the result of structured and unstructured feeding. In some circumstances the supplementary feeding is used to attract the wildlife. However, regular feeding can result in an increased number of animals at the feeding site. An example is the feeding of Komodo dragon in Indonesia. These large carnivores can be quite difficult to view in the wild. To overcome this difficulty goats were used to attract the dragons. This resulted in dragon numbers being at a level generally not found naturally. Due to the potential negative impacts feeding was prohibited in August 1994 (Walpole 2001).

The attraction of wildlife for food can result in increased injury or death to animals. For example, attraction and access by grizzly bears to human foods is still a fundamental cause of bears being killed or removed in certain North American national parks. In Banff and Yoho National Parks, Canada adult females and subadult male grizzlies are more prone to habituation to humans and attracted to human foods increasing their mortality risk as a result of road kill or their potential to be destroyed or relocated as nuisance animals (Benn and Herrero 2005). A further example of road kill problems associated with feeding is the case of Australian Cassowaries that are attracted to roads as a result of people feeding them. Crome and Moore (1990) found that traffic is a major killer of cassowaries in North-eastern Queensland.

The inadvertent feeding of wildlife, as discussed earlier, can also result in abnormal concentrations of individuals at a feeding site. For example, Marzluff and Neatherlin (2006) found populations of corvids including breeding American crows *Corvus brachyrhynchus* and common ravens *Corvus corax* at campsites in Washington's Olympic Peninsula reduced their home range size and enhanced breeding success resulting in increased abundance of these species.

Disruption of normal activities

The feeding of wildlife can result in disruption of normal activities, in particular the proportion of time and energy devoted to foraging. This is because food availability is the most important factor in deciding the amount of time spent on particular activities. When feeding of wildlife takes place animals need to spend less time foraging which therefore results in changes to other activities including breeding and socializing (Orams 2002). Hodgson *et al.* (2004) found that provisioned Mareeba Rock Wallabies *Petrogale mareeba* at Granite Gorge, North Queensland, Australia displayed higher rates of aggression and spend more time performing contact behaviours than non-provisioned groups. The differences in behaviour between the different groups was explained as competition for provisioned food and territorial defence.

The disruption to foraging can result in some species becoming completely dependent upon provisioned foods. Wilson (1994) reported on a dolphin at Monkey

Mia which was so accustomed to being hand fed that it ultimately became completely dependent on provisioned food. Shackley (1998) observed the stingrays at 'Stingray City' in the Cayman Islands showing signs of 'hunger' on the days when divers cannot visit the site due to weather conditions suggesting that the natural foraging skills of the rays may have been distorted as a result of food provisioning. Moreover, rays were observed swarming over the tourists when they arrived resulting in minor injuries to rays as a result of divers panicking and accidentally colliding with the rays.

The feeding of wildlife can also result in changes to intra-species interactions such as social relationships that may result in animals being injured while competing for provisioned food. An example is the feeding of pelicans *Pelecanus conspicillatus* on the Gold Coast, Australia. Individual pelicans were seen to have long battles with each other, caught together by their beaks in an effort to obtain food (Fig. 15). In addition to this, when wildlife are fed by humans changes in the composition of animal communities may be seen. Larger more aggressive species or individual animals may displace the less dominant species. This is because the more aggressive species are likely to successfully access the human-provided food (Orams 2002). For example, at Hamelin Bay, Western Australia stingrays *Dasyatis thetidis* and *Dasyatis brevicaudata* were seen to fight over large pieces of fish offal. If the rays approached the provisioned food from a similar angle one will slide a pectoral fin under the other and forcefully push it away. Also if the eagle rays *Myliobatis australis* tried to approach the food they would be chased up the beach or in some cases the stingrays would pin them to the sand (Newsome *et al.* 2004).



Figure 15. Pelicans fighting over a fish. These two pelicans remained joined with neither willing to retreat until tourists stepped in to break them up. Photo. K. Rodger.

Food provisioning can also disrupt maternal care resulting in reduced breeding success. This was seen with dolphins at Monkey Mia, Western Australia where there was an increased mortality of juveniles due to decreased parental behaviour (Wilson 1994; Newsome *et al.* 2005).

Aggregation

The feeding of fish around Ustica Island Management Priority Area in the Mediterranean Sea demonstrates changes in the density and distribution of coastal fish species. Increased aggregation of fish as a result of feeding by the public may have negatively impacted upon local populations of fish (Milazzo *et al.* 2005). In particular the aggregation of predatory fish due to food provisioning is considered to have a detrimental impact on the reproductive success of nesting damsel fish (Milazzo *et al.* 2006).

A well recognised problem associated with the feeding of wildlife is the presence of opportunistic and nuisance species (Higginbottom *et al.* 2003; Newsome *et al.* 2005). Increased vigilance is needed by smaller species due to the presence of larger or more aggressive dominant species. This can result in the displacement of the smaller and/or less aggressive species. Feeding can also attract a greater number of scavenging species. For example, the feeding of bald eagles *Haliaeetus leucocephalus* at sites such as at Homer in Alaska attracts not only a large number of eagles to the site but also other scavenging species including American crows *Corvus brachyrhynchos*, common ravens *Corvus corax*, coyotes *Canis latrans* and bobcats *Lynx rufus* (Gill 2002).

Feeding wildlife can result in being in a state of increased vigilance as well as increases in the vulnerability of some species to predation. This is particularly the case when feeding occurs in areas where there is little or no cover for vulnerable species to escape to.

High visitor numbers and nutritional issues

Where facilities and accommodation are developed there is always the risk of wildlife being attracted as a result of inadvertent and/or deliberate feeding. Linked with this is the loss of habituated wildlife on roads due to vehicle collision. Where structured feeding takes place site pollution at feeding stations can be a problem unless the interaction area is designed accordingly (Fig. 16). A critical management issue is the problem of ignorant or inappropriate human behaviour. The stingray study undertaken in 2004 at Hamelin Bay, Western Australia by Newsome *et al.* (2004) highlights many of the problems that can arise from the unsupervised feeding of wildlife. The stingrays were originally attracted to the beach for feeding of fish remnants and offal from returning commercial and recreational fishermen in the 1950s. This has grown over the years to include visitors who come with the sole purpose of feeding the stingrays (see Fig. 9). This study found that due to the increased feeding, stingrays are now vulnerable to increased risks due to attraction, habituation, inappropriate human behaviour and facility development. The stingrays face the risk of injury from boats, over feeding, injury from fishing hooks and lesions from over-handling. While at the same time the natural environment is vulnerable to pollution from decomposing fish and petrol spillage. The visitors were also identified as being at risk from this interaction with reports of bruised hands as a result of feeding the rays as well as increased risk of being stung by a ray (Newsome *et al.* 2004).



Figure 16. The feeding of birds at O'Reillys Guesthouse, Queensland. Here management strategies include the selling of seed to visitors and the construction of a designated paved feeding area that can readily be cleaned and maintained. Photo. K. Rodger.

An additional problem is the feeding of continuous amounts of the same or the wrong types of food resulting in the malnourishment of wildlife and reduced condition. Semeniuk *et al.* (2007) have examined the diet of provisioned stingrays in the Cayman Islands. They compared the blood fatty acid levels of provisioned and non-provisioned rays. It was found that the squid fed to rays does not provide a diet comparable to that of non-provisioned rays with respect to essential fatty acids. The long-term implications of such physiological condition remain unclear but the results suggest that fatty acid profiles can be a useful indicator for the future monitoring of food-provisioned stingrays. A similar study undertaken by Ishigame *et al.* (2006) in Brisbane, Australia examined the physiological effects of backyard feeding of Australian magpies *Gymnorhina tibicen* and found that the plasma cholesterol of wild magpies to be affected by backyard feeding. Ishigame *et al.* (2006) suggested that the current levels of food provisioning could influence the population ecology of magpies. However, a study of the foraging and breeding ecology of food-supplemented magpies conducted by O'Leary and Jones (2006) found that the birds were not reliant on supplemental feeding.

An additional example of the problems associated with feeding is the case of marmots and chipmunks in America. The quality and quantity of stored body fats are important in these animals for hibernation. If these animals are fed food high in saturated fats the fats can impede an effective hibernation resulting in increased mortality rates (Gill 2002).

Public views on feeding wildlife

Public perceptions on feeding of wildlife vary. Historically the feeding of wildlife has been common practice in the Northern Hemisphere where many wildlife agencies and conservation groups actively promote wildlife feeding as an important role in conserving wildlife, for example the British Trust for Ornithology and the Royal Society for the Protection of Birds actively encourage the feeding of birds

(Moore and Jones undated; O'Leary and Jones 2006). In Australia wildlife agencies are still mostly opposed to the provisioning of wildlife. Despite objections raised by government agencies and conservation groups, and the prohibition of feeding in most national parks, the provisioning of wildlife still remains popular in Australia (Orams 2002; O'Leary and Jones 2006).

A recent survey undertaken with marine and terrestrial wildlife tour operators in Australia found almost two-thirds of operators did not feed wildlife (Rodger *et al.* 2007). Yet, for tour operators the feeding of wildlife can contribute to the reliable viewing of wildlife. Wildlife operators base their tours on the predictable occurrence of species within a particular area (Duffus and Dearden 1990). The guaranteed close up interaction with wildlife adds value to the tourism product. Many tour operators oppose the prohibition of wildlife feeding as it could decrease visitor enjoyment (Moscardo *et al.* 2001). Smith *et al.* (2006) found that managers and tour operators felt the prohibition of dolphin feeding at Monkey Mia, Western Australia would detract from the quality of visitor experience.

The next perspective on feeding that needs to be considered is the visitor. For many tourists feeding of wildlife is still an important component of the human-wildlife interaction. They believe it is their right to feed the wildlife (Fig. 17). However recent studies have shown that seeing animals in their natural state is becoming important as well (see Croft and Leiper 2001; Smith *et al.* 2005). This is where the wildlife tourists' satisfaction comes from being in the presence of other animal species (Bentrupperbaumer 2005). Lewis and Newsome (2003) with their study on stingray tourism in Hamelin Bay, Western Australia found that seeing animals in their natural state was the most important aspect of the human-wildlife interaction while feeding ranked only sixth out of seven items. Yet when visitors to Hamelin Bay were asked on their management preferences if uncontrolled stingray feeding were to increase the most preferred option was education and regulation on feeding while the least preferred option was to prohibit all stingray feeding. The differing perspectives held by wildlife agencies, tour operators and tourists on wildlife feeding highlight the many difficulties management faces.

Management of wildlife feeding activities

Context

Although Newsome *et al.* (2005 p209) state that 'management should aim to restrict formal feeding activities' the fact that wildlife is an important reason for many people visiting natural areas around the world, along with the educational, environmental protection and economic potential of tourism, food provisioning is likely to continue as an aspect of many wildlife viewing situations. A further reason for the likely continuance of feeding activities is that many countries promote their wildlife as part of tourism marketing strategies and that the global interest in nature based tourism is increasing along with increasing recognition that tourism can contribute to the conservation of species and their habitats. Furthermore, as international travel and tourism continue to rise people with expectations of feeding



Figure 17. In some situations people feel it is their choice and prerogative to be able to feed wildlife. This poster was positioned in the front window of a garage and retail outlet in Albany, Western Australia and reflects public indignation at the potential banning of feeding wild birds by a local tour operator. Photograph by D. Newsome.

wildlife in one country may have expectations of feeding wildlife at some stage of their visit to their destination of choice. Recognition of this means that visitor expectations may have to be met and managed and wildlife feeding activities selected that are suitable for different species and conditions. Management therefore has an opportunity to shape the feeding experience and the outcomes of visitor contact with wildlife. In support of this last assertion is the increasing evidence that the wildlife tourism visitor is increasingly expecting more authentic, well-managed and sustainable experiences (see Lewis and Newsome 2003; Smith *et al.* 2006).

The central issues that set the agenda for management lie in developing a management presence that can control access, visitor numbers and the viewing experience. How this reflects in the detail of practical management depends on the specifics of the situation. Of critical importance is the appropriate management of children and ignorance amongst adults as in both cases such conditions can lead to touching, manipulation via use of food items and even entertainment in order to elicit a reaction from the target species. The following case studies of formal bird, mammal and fish feeding situations serve to illustrate management approaches designed to minimize environmental impacts educate the public and foster sustainable tourism.

Management styles: some examples

Feeding wild birds

There is a strong tradition of feeding wild birds in the Northern Hemisphere ranging from casual backyard/village pond feeding through to structured feeding situations where people may congregate at feeding sites to watch wild birds being fed and/or engage in feeding birds themselves under controlled and supervised conditions. In other situations such as at Kingfisher Park, Julatten Australia, birds are attracted to water dishes, a fruit feeder, a seed feeder, nectar feeders and flowering shrubs. Staff service the entire feeding programme and visitors are not directly involved in the feeding process. More common, however, bird feeding involves public participation in some form or other with food being provided by site management and/or tourism operators.

Famous as a site for bird watching O'Reillys Guesthouse, Queensland, Australia has scheduled natural history programmes comprising bird watching tours. There is a strong commitment to environmental education and sustainable tourism. Bird feeding is a very important part of the ecotourism services offered by the guesthouse, which has a visitation profile of 300,000 per annum with the day visit component being 264,000 (Fig. 18). There are 36,000 overnight stays and 50-60% repeat visitation. Bird feeding has been in operation since the 1920's. Problems were recognized early on when day-trippers were feeding birds bread, chips and other unsuitable food items. Seed was provided in order to avoid this but coach drivers and some tourism operators were observed to be providing their own supply of the wrong mix of seed. As part of a strategy to counteract this in 1988, formulated seed was sold to visitors. This was combined with feeding under supervision at a designated feeding station and the construction of a paved feeding area that can be readily cleaned (See Figs 16 and 18).



Figure 18. The feeding of birds at O'Reillys Guesthouse, Queensland. Photo. D. Newsome.

Overnight visitors are also able to observe birds attending bowls of food placed outside the windows of the guesthouse dining room. The birds are given a mixture of fruit and vegetables at 8am and 1pm daily. Birds in attendance include the Regent Bowerbird *Sericulus chrysocephalus*, Satin Bowerbird *Ptilonorhynchus violaceus*, Green Catbird *Ailuodius crassirostris* and Lewin's Honeyeater *Meliphaga*

lewinii. In this instance there is no contact between people and the birds and the bowls are removed after each feeding session for cleaning and storage. In order to avoid wastage minimal amounts of food are provided and the use of high-sided bowls prevent spillage that might attract rats and mice. Interpretive signs provide information on bird ecology and conservation. In addition to this there is a private use walk trail where hotel guests can accompany a guide to view insectivorous birds being fed a meat mix. As with the bowls of food there is no direct contact between the birds and visitors and the guide provides an interpretive talk.

Wildlife restaurants

The concept involves putting food out at a designated feeding site with tourists viewing from a distance and usually from a concealed hide. This approach lends itself to the observation of shy and/or nocturnal, but food provisioned, wildlife with minimal disturbance with 'close contact' being achieved with the use of binoculars and telescopes.

In the case of nocturnal species a good example is the Tasmanian Devil which is normally difficult to observe because it is shy and nocturnal. The devil restaurant comprises a feeding station situated some 40 m from a viewing hide. This distance was selected following monitoring of animal behaviour and ensures minimal disturbance (Mooney 2005). Native animal road kills, which form part of the devils' natural diet, are located, removed and then placed at the feeding station under as hygienic conditions as possible. The use of telescopes combined with an intercom system gives visitors direct 'ownership' of the viewing experience. At 40 m distance visitors can enter and leave the hide without disturbing the devils and disrupting the viewing for anyone else. A guide supervises groups of up to 8 people. The entire experience is supported with an interpretation programme that explains vocalizations at the carcass and biology of the Tasmanian Devil. This is supported with the use of visual aids such as bones, plastic skulls, items chewed by devils, scats containing echidna spines and the sale of souvenirs such as Plaster of Paris footprints taken from the actual feeding station.

Feeding stations or restaurants are an increasing popular means of observing vultures in Asia and Europe. A site located in the Preah Vihear Protected Forest in Cambodia is becoming popular with the international bird watching circuit. Bookings are taken one week in advance to give sufficient time for a cow to be slaughtered and located at the feeding station. Tourists can stay at a camp located 1 km from the station and are then taken to hides by rangers in order to view the vultures feeding at the carcass. Vultures tend to stay in the area for 5-7 days with numbers peaking on days 2-4. Similarly bird watchers can visit a vulture restaurant in Bulgaria where a local farmer employs a similar concept to that described for Cambodia.

Best practice fish feeding

Despite the concerns raised by Milazzo *et al.* (2005; 2006), fish feeding is an established means of enhancing visitor experience in marine protected areas. Harriott (2002) notes the importance of tourism in the Great Barrier Reef marine Park with tourist visits peaking at around 1.7 million in 2000 with an associated tourism

value of \$1 billion. Along with vessel and shore based operations is the use of tourist pontoons. The pontoons can cater for up to 400 day visitors at a time. Fish feeding has been part of their tourism profile that centres on snorkelling and diving. Best practice operation (Table 2) involves several components regulated according to permit and based on the observations of Sweatman (1996) who concluded that fish respond to the presence of humans and are attracted to the pontoon by feeding (Fig.19) but disperse away from pontoons when tourist boats are not present.

Dolphin feeding

The feeding of wild bottlenose dolphins at Monkey Mia provides a major focus for tourism in Shark Bay, Western Australia. Dolphins have been fed since the 1960's with a corresponding evolution of facilities and the development of the Monkey Mia Reserve Draft Management Plan and the Shark Bay Marine Reserves Management Plan (CALM, 1993; 1996). Current visitation runs at around 100,000 per year with up to 700 people assembling at the interaction site during peak periods (see Fig. 8). The current feeding programme, although highly controlled by management, is a major component of the overall dolphin tourism package. For example, a survey of visitors and management strongly suggests that preventing food provisioning would significantly reduce the quality of a visit to Monkey Mia (Smith *et al.* 2006). The current management strategy is based upon an extensive research programme (eg. see Wilson, 1994; Mann and Kemp, 2003; Bejder and Samuels 2003) and includes supervision of feeding by rangers within a designated interaction zone, controls over the quality of food and the amount and timing of feeding (Table 3). Education forms part of the official feeding programme and this is supported by the presence of a dolphin interpretation centre (Fig. 20).

Wild bottlenose dolphins have been provisioned at Tangalooma, a tourist resort on Moreton Island, Queensland, Australia since 1992 (Neil and Brieze 1998). Up to nine bottlenose dolphins have been recorded regularly attending the provisioning sessions. The Tangalooma Dolphin Management Program as discussed by Neil and Brieze (1998) comprises two components in the areas of education and food provisioning management:

1. Visitors intending to feed the dolphins must book at the Dolphin Education Centre on the afternoon preceding the night they wish to participate. One

provisioning token per person is issued. Attendance at the centre provides opportunities for visitors to view publications and displays about marine mammals. There is also a small theatre and activities for children. Visitors are not allowed to provision dolphins unless they have a token.

2. Dolphin provisioning occurs at a specific area of the beach, marked by buoys. Signs landward and seaward state that the area is off-limits to swimming, fishing and boating activities at all times. Participants are required to be at the site 30 minutes prior to the scheduled feed time, and are given a briefing before the feeding regime. Briefings include behaviour in the presence of dolphins such as no touching, the need for minimising pollution such as avoiding the use of insect repellents and sun screens and reasons are given for the short period that visitors are allowed in the water.



Figure 19. The feeding of fish forms part of the natural attractions available at the Great Barrier Reef Marine Park and attracts more than 1.7 million tourists per annum. Photo. D. Newsome.

Table 2. Guidelines for fish feeding on the Great Barrier Reef. Adapted from Great Barrier Reef Marine Park Authority (1999).

No more than one fish feeding station to be operated at each site
Food to consist of fresh raw marine products and/or manufactured aquaculture fish food pellets approved by Great Barrier Reef Marine Park Authority
Total food used not to exceed 1 kg/day or, where fish feeding is carried out at more than one site per day, 2kg/day
Fish to be fed only by tour operation staff and must not be fed directly by hand
Participants in the programme must be given practical and adequate warning of the potential dangers of fish feeding
Guidelines to be displayed at the fish feeding station

Table 3. Management of dolphin feeding at Monkey Mia, Western Australia. Adapted from Smith *et al.* (2006).

An exclusive dolphin interaction area has been designated in which boating and swimming are prohibited.
Human-dolphin interactions are supervised by rangers in order to prevent touching of dolphins by the public and in order to control the feeding activity.
Only adult female dolphins are offered fish, which helps to prevent male dolphins becoming aggressive, and using the situation to herd females. They are fed a maximum of 2kg of fish per day with no more than three feeds taking place per day. Feeding times vary between 8am and 1pm (this encourages dolphins to spend afternoons offshore, socialising and foraging for wild food) and are variable and dependent on when the dolphins come in-shore.
Fish used to feed the dolphins is caught in the local area, frozen and stored for no longer than 3 months. In order to minimise the risk of disease it is thawed immediately prior to being fed to the dolphins.
In preparation for feeding, rangers ask visitors to move out of the water; buckets are then brought down to the water and each ranger takes a bucket to a specific female. The feeding begins with rangers selecting one person at a time and asking them to approach each bucket. The ranger hands each person a fish and they feed it to the dolphin head-first. After they have given the fish to the dolphin, they are asked to leave the water immediately so the next person can be called. The last fish is offered to each dolphin simultaneously to any avoid competition. After the final fish is offered, the buckets are tipped over and dipped in the water to show the dolphins that the feed is over. The entire feeding regime usually takes three to five minutes. The dolphins almost always leave the dolphin interaction area within five minutes after the feed.
Any feeding of dolphins is prohibited outside the designated interaction area and feeding from boats is strongly discouraged.
Visitor information is given during the dolphin interaction. Rangers impart information via a public address system broadcast at the beach during the interaction about dolphin biology, behaviour, the feeding regime and also provide information to prevent inappropriate dolphin interactions.



Figure 20. Monkey Mia Dolphin Interpretation Centre. Such facilities facilitate the delivery of education and interpretation. Information can be presented on local fauna and flora and there is the opportunity for face-to-face contact with staff. A particular advantage is the potential for the application of a wide range of techniques including audiovisual presentations, interactive displays and the opportunity to handle various objects such as bones, skulls and models (Newsome *et al.* 2002). Photo. D. Newsome.

The educational component of the dolphin-feeding program at Tangalooma was used by Orams (1997) as an opportunity to assess the effectiveness of environmental education as a mechanism to promote ecologically desirable changes in the attitudes and behaviour of tourists. He concluded that both visitor enjoyment and knowledge increased following the education programme. Orams (1997) also found that the structured education programme was more likely to increase environmentally responsible behaviour. This work is an example of the importance of education programmes in informing the public about how to behave and can increase their knowledge of wildlife

biology in food provisioning situations. This vital aspect of management is reinforced by Newsome *et al.* (2005) who note the value of education and interpretation in increasing visitor knowledge, reducing impacts, increasing satisfaction and fostering a greater respect for wildlife.

Conclusion

This chapter has explored the complexities and controversy surrounding the feeding of wildlife, especially from the standpoint of tourism operations. The situation is further complicated by the different attitudes and expectations of the wildlife feeding public in that while many wish to simply 'consume' a wildlife encounter there are others whose intent lies in experiencing animals under natural conditions and behaving in a setting of minimal manipulation. Having said this it is important to recognize that feeding is an important means of 'connecting' with wildlife.

Given that there are recognized advantages and disadvantages to the feeding of wildlife, the material explored in this chapter can lead to the development of guidelines that become important in deciding whether to feed or not. Moreover, principles can be designed that can be utilized in setting the agenda for the approval and/or continuance of wildlife feeding in tourism situations.

It is therefore recommended that it is not acceptable to feed wildlife under the following conditions:

- Where there is an absence of management
- Where there is an absence of education and interpretation
- Where there is an absence of risk assessment where humans come into contact with large carnivorous species
- Where target species are likely to be strongly attracted to humans

- Where there is a significant risk of dependence on feeding
 - Where there is distortion of natural behaviour that is likely to lead to the activity budget of a particular species being compromised
 - Where scientific evidence suggests that the body condition of provisioned species is being compromised
- Conversely it can be argued that it is acceptable to feed wildlife when the following conditions are operational:
- Where there is management presence
 - Where there are educational and interpretive strategies in place
 - Where management show awareness of visitor expectation (e.g. the importance of feeding to the visitor)
- Where the feeding programme builds upon natural foraging behaviour
 - Where a feeding interaction plan forms the basis of the feeding programme
 - Where there is monitoring and review of operations

With regard to the acceptability of feeding, it would appear that on, a global scale, birds appear (eg Julatten O'Reillys, Slimbridge) the most suitable candidates for structured feeding operations. There are two final points to be made. The first being that developing a feeding situation for tourism purposes must always be treated with caution and, if developed, be subject to review in the light of new information on the benefits or otherwise of the feeding situation. The second point being that feeding operations should be based upon the fostering of respect and appreciation of natural values and not entertainment.

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