

The welfare and suitability of parrots as companion animals: a review

M Engebretson

Animal Protection Institute, 1122 S Street, Sacramento, CA 95814, USA; email: monica@api4animals.org

Abstract

In recent years there has been an increased interest in studies related to the welfare of avian species commonly kept as companion animals, specifically those in the order Psittaciformes, commonly referred to as 'parrots'. During this time the biology and behaviour of wild parrots has also become better understood, aiding the assessment of welfare in captive environments. The impact of the pet trade on wild parrot populations has also become clear. This order now has more globally threatened species than almost any other major group of birds. Many significant aspects of parrot behaviour in the wild, such as flocking, social interaction with conspecifics, foraging on a variety of foods and flight, are denied to varying degrees to parrots kept as companion animals. Captive parrots show high levels of stereotypy, suggesting poor welfare. Welfare may be improved by appropriate environmental enrichment and changes in the social environment of captive parrots kept as companion animals; however, such changes require that caretakers have sufficient knowledge, resources and motivation to accommodate such conditions. The concept of companion animal suitability is an important consideration when developing regulations or policy aimed at improving the welfare of animals kept as companions. Although individual exceptions exist and the level of suitability may vary depending on species, in general, their presence in the pet trade has resulted in serious animal welfare and conservation challenges for parrots, indicating that these animals may be unsuitable as human companions.

Keywords: animal welfare, captive parrots, captive wildlife, companion animals, pet ownership, pet trade

Introduction

Although an accurate estimate of the total number of pet birds in the US is impossible to determine because the numbers vary wildly from source to source, it is generally accepted that birds (including parrots, finches and canaries) are the fourth most popular companion animal after fish, cats and dogs, respectively (Kid & Kid 1998; Meyers 1998).

Unlike cats and dogs, birds are not typically considered domesticated animals even when bred in captivity. This is due in part to the fact that many bird species produced for the pet trade are only one or two generations removed from the wild and, as such, retain most if not all of their wild instincts and behaviours (Davis 1998; Graham 1998). In addition, many bird species that are bred and traded as companion animals also remain physically indistinguishable from their wild counterparts, with the few exceptions of those birds which have been hybridised or selectively bred to express colour mutations.

Parrots are a well-defined group of birds that are so distinctive (small to medium sized with stout, hooked bills and a moveable upper mandible) that their affinities to other bird taxonomies remain unclear (Gill 1990). Species within the parrot family range in size from the relatively small budgerigars, cockatiels and lovebirds, and medium-sized

conures, amazons and African greys to large-sized cockatoos and macaws. Due in part to their popularity as pets, the parrot family also contains a greater proportion of threatened and endangered species than any other large family of birds (Gill 1990).

Some people believe that it is wrong to keep parrots as pets out of concern that birds suffer from being deprived of their freedom and ability to express natural behaviour such as flight (Kid & Kid 1998), whereas others disagree, citing the human benefits of bird companionship (Voren 1995; Kid & Kid 1998) and protection from environmental hazards as justification for keeping parrots as pets (Desborough 1994). Some are concerned that the pet trade threatens the species in the wild or that escaped pet parrots could pose a threat to native birds either through disease transmission or resource competition (Jackson 2003). However, some believe that the captive breeding and private possession of parrots for pet purposes serve to conserve wild species (Desborough 1996; Kid & Kid 1998). All parties in the debate arrive at different opinions on the same issue by evaluating various sets of criteria, placing different degrees of importance on each criterion and perhaps having varying levels of knowledge about relevant animal welfare and conservation issues.

Review approach

Schuppli and Fraser (2000) developed a systematic analysis to evaluate the suitability of different species as companion animals based on a wide range of issues, such as those described above that are relevant to such an assessment. Their analysis considered three main criteria: the welfare of the animal, the welfare of others (including humans and other animals) and the welfare of the environment. This paper will review the current literature on the welfare of captive birds and utilise the framework described by Schuppli and Fraser (2000) to assess the suitability of parrots as companion animals.

Welfare of the animal

The examination of animal welfare is a useful tool in determining the suitability of keeping a particular species as a companion animal. This is because welfare describes the state of an animal at a specific time and can be 'good' or 'poor' regardless of what people think about the morality of using such animals in a particular way.

The 'five freedoms' of the Farm Animal Welfare Council (1992) have been used to evaluate animal welfare for many species and are used as part of the Schuppli and Fraser (2000) criteria for determining companion animal suitability. These freedoms are: (1) freedom from hunger, thirst and malnutrition; (2) freedom from disease and injury; (3) freedom from physical and thermal discomfort; (4) freedom from fear, distress and other negative psychological states and (5) freedom to carry out most normal forms of behaviour. Although many of these freedoms are inter-related — for example, deprivation of the freedom to express normal forms of behaviour may cause a negative psychological state that results in physical injury — I will attempt to evaluate each freedom individually with the exception of the last two freedoms (4 and 5) which will be discussed together.

Freedom from hunger, thirst and malnutrition

This first freedom is further defined as the animal having "ready access to fresh water and a diet to maintain full health and vigour" (Farm Animal Welfare Council 1992). Common captive parrot caging environments provide ample access to both food and water so it would appear that in most cases the first freedom is met. However, as Schuppli and Fraser (2000) have pointed out, the nutritional requirements of the species must be adequately known and suitable foods must be available to the owner in order to assure "full health and vigour".

It has been estimated that malnutrition is responsible for up to 90% of all clinical conditions seen by avian practitioners (Harrison 1998). It is well recognised among avian professionals that seed diets lack nutrients and are high in fat; however, seed diets remain the most widely available and most commonly fed pet bird diet (Harrison 1998; Reid & Perlberg 1998).

Although a number of high-quality formulated diets are available in the form of pellets, dietary standards are rela-

tively non-existent and it is unlikely that detailed nutritional requirements will ever be documented for all the various species of birds kept as pets (Harrison 1998; Reid & Perlberg 1998). Despite this, many labels give the impression that the diet is complete when in fact the food contains only minimum requirements, which may not provide sufficient nutrition for some birds. Further complicating matters, many avian professionals recommend that birds not be fed a pellet-only diet and that formulated pellet diets be supplemented with fresh fruit and vegetables to ensure optimal nutrition and health (Reid & Perlberg 1998). Many nutritional problems diagnosed in birds seem to arise from confusion on the part of the caretaker over conflicting information for achieving balanced nutrition (Donoghue 1997).

Freedom from disease and injury

The existence of adequate veterinary knowledge and availability is necessary for the fulfilment of this freedom. During the past 20 years research by avian practitioners and academics and the skills of avian veterinarians have improved considerably. Speciality avian practices have tailored diagnostic tests, emergency medical procedures and anaesthesia monitoring for birds (Altman 1998; Flammer 1998). However, despite the advances in avian veterinary medicine and the availability of veterinarians specialising in avian care and treatment, only 11.7% of bird-owning households currently seek veterinary advice for their birds (American Veterinary Medical Association 2002).

There are a number of viral, bacterial, fungal and parasitic diseases that pet birds can become infected with but viral infection is one of the major causes of mortality in parrots (Ritchie *et al* 2000). The four most common viral infections infecting pet parrots are avian polyomavirus, proventricular dilatation disease (PDD), psittacine beak and feather disease (PBF), and Pacheco's disease (Ritchie *et al* 2000). There is no cure for avian polyomavirus although there is a reliable vaccine on the market, and there is no known cure or vaccine for PBF or PDD. Although a vaccine for Pacheco's disease (Psittimmune™, Biomune Company, 8906 Rosehill Road, Lenexa, KS 66215, USA) was registered by the United States Department for Agriculture for use in pet birds in 1990 (Center for Veterinary Biologics 2005), it is not routinely used except in the face of an outbreak (Romagnano 2003a). Some veterinarians have had success in treating birds in early stages of the disease with Acyclovir, an anti-herpesvirus agent (Ritchie 1997).

Avian chlamydiosis caused by *Chlamydophila psittaci*, commonly known as psittacosis or 'parrot fever', is one of the more common bacterial infections in birds and is transmittable to humans (see *Welfare of others* below). Birds with mild infection may be asymptomatic carriers and may shed the disease for many months or years with no outward sign of illness. The organism is shed in the faeces and nasal discharge of infected birds, is resistant to drying and can remain infectious for several months (Centers for Disease Control and Prevention [CDC] 1998). Severely ill birds exhibit clinical signs of diarrhoea, severe lethargy, weight loss, poor feather condition, conjunctivitis, nasal discharge

and anorexia (CDC 1998). There is no vaccine for *C. psittaci* and it can be very difficult to diagnose and screen for because infected birds may test negative for the disease (CDC 1998). In birds, the condition is often fatal but veterinarians have had success in treating infected birds with antibiotics.

Aspergillosis caused by the fungus *Aspergillus* is the most common fungal infection in captive birds and can be acute or chronic. The fungus is commonly found in nearly all environments but typically only causes disease or illness in birds whose immune system has already been compromised by stress, malnutrition, poor husbandry (ie inadequate ventilation, mouldy food, etc) or previous injury to the respiratory system (Eifert *et al* 2003).

Birds with acute aspergillosis have severe difficulty in breathing, loss of or decreased appetite, frequent drinking and urination, and even sudden death (Kearns 2003). The chronic form is more common and is difficult to diagnose. As a result, the bird may not become symptomatic until the disease is beyond cure. Once diagnosed, aspergillosis can be treated with antifungal drugs and surgery may be performed to remove lesions but the prognosis is often mixed (Kearns 2003).

Freedom from physical and thermal discomfort

These criteria essentially require that the animal is provided with an environment that protects him or her from physical injury or weather extremes that could lead to considerable discomfort or illness. In order for this freedom to be met, the physical and environmental needs of the animal must be known and the caretaker must be capable of providing those needs (Schuppli & Fraser 2000).

Like mammals, birds are warm-blooded and, as such, are capable of regulating their own body temperature within a reasonable range. The feathers serve a function similar to that served by fur on many mammal species. Although it is advised that caretakers avoid extreme temperature changes and draughts (McCluggage & Higdon 1999), the requirements for accommodating the thermal needs of birds are relatively simple and not dissimilar from the requirements for keeping cats, dogs or small mammals such as guinea pigs or hamsters.

In the US pet parrots are typically housed in cages. Confinement to the cage protects the bird from incurring physical injury from predators, including household dogs and cats, or from other household hazards such as flying into windows or chewing electrical cords. Even if, as discussed above, the diet provided is a nutritionally inadequate all-seed diet, if provided in ample quantity and with ample water, captive birds are generally free from the physical discomfort of hunger and thirst. At first glance, it appears that captive birds experience less discomforts than their wild counterparts which must dodge predators, endure inclement weather and search daily for food and water. However, Graham (1998) reported that, despite the seemingly care-free life of a caged bird, necropsies of pet birds often reveal evidence of "a life beset with stress", in

the form of stress-related lesions in birds submitted for post mortem examination.

Graham (1998) postulated that the stress seen in captive birds may be due in part to physical and behavioural restrictions imposed by standard captive environments. He wrote "It would seem that the ideal enclosure for a captive bird is one of such size and equipped with such internal furnishings that the bird would have no awareness of its captivity. Anything less is a compromise and acceptance, on the part of the keeper, that the kept may or will be subject to the stresses imposed by a lesser or greater degree of restriction of its normal behaviours".

Graham's recommendations for an optimal captive environment seem to exceed the means of the average private owner. Although cage sizes do vary, a cage is typically considered adequate if the bird's extended wing-span and length of tail can be freely accommodated within the cage (Graham 1998). As birds do survive and even reproduce in such enclosures it is generally accepted as adequate housing for pet birds. However, survival and successful breeding alone do not indicate whether welfare is good, as many animals are successfully bred under captive conditions that are found to have severe welfare problems (Fraser & Broom 1990).

Freedom from fear, distress and other negative psychological states and freedom to carry out most normal forms of behaviour

In order to meet the fourth freedom, 'Freedom from fear, distress and other negative psychological states', animals must be housed and treated in a manner that avoids mental suffering. The determination of mental suffering in animals is difficult; however, some mental distresses are manifested physically, such as the stress lesions described by Graham (1998), self mutilation or other outward displays of abnormal or stereotypic behaviour.

The distinction between normal and abnormal behaviour is complicated because some behaviour designated as 'abnormal' in captive animals is actually derived from normal behaviour that fails to serve a practical function in a captive situation. The freedom to express normal behaviour and freedom from distress appear to be inextricably linked in captive parrots and other birds kept as pets (Sargent & Keiper 1967; Keiper 1969; King 1993, Graham 1998; van Hoek & ten Cate 1998; King 2000; Garner *et al* 2003b; Meehan *et al* 2003a, 2004; Meehan *et al* 2003b). For this reason I will consider the last two freedoms concomitantly.

If an individual animal is having difficulty in coping with its environment, or is failing to cope, then its welfare is poor but if strongly preferred resources and opportunities for behaviour are available, and normal behaviour can be shown, then good welfare is indicated (Broom 1996). The evaluation of welfare should attempt to encompass the psychological aspects of subjective feelings (Broom 1996; Duncan 1996). Although parrot caretakers frequently describe their parrots as feeling 'happy', 'sad' or 'depressed', these emotional states are difficult to measure

empirically and, as such, this discussion will focus on the physically expressed behaviours that are indicative of welfare states.

Parrots are exceptionally social birds. In the wild, parrots typically travel in large flocks, flying miles each day in search of a wide variety of food and may congregate into a nightly roost of hundreds or even thousands of social conspecifics (Gilardi & Munn 1998). Stamps *et al* (1990) postulated that the formation and maintenance of social relationships within a flock may be as critical for survival as predator avoidance and foraging efficiency and Birchall (1990) reported that wild parrots may use 90% of their time foraging for food and preening their partners.

Schuppli and Fraser (2000) explained that ethical objections to keeping a companion animal arise if benefits to the owner are achieved to the detriment of the animal. They contended that “keeping a particular species might lead to suffering if the animals are prevented from carrying out an important element of their natural behaviour...”. Birds are routinely denied two of their most fundamental natural behaviours: flying and socialisation. It has been suggested that the denial of these activities can cause both physical (Graham 1998) and behavioural abnormalities in captive parrots (van Hoek & ten Cate 1998; Garner *et al* 2003b; Meehan *et al* 2003a, 2004; Meehan *et al* 2003b). Parrots kept as pets are often housed alone or in pairs in small cages incapable of accommodating flight (van Hoek & ten Cate 1998). Even when not confined to cages pet parrots are commonly physically disabled through one of several deflighting procedures to restrict or prevent flight (Hesterman *et al* 2001).

There are several methods of deflighting including ‘pinioning’, the surgical removal of the distal wing portion, and ‘tenonectomy’, the surgical cutting and cauterisation of the main wing tendon preventing extension of the wing (Hesterman *et al* 2001). The most common form of deflighting in captive birds kept as pets is ‘wing clipping’ which is a relatively simple technique that typically involves the non-surgical unilateral cutting of the primary (flight) feathers. This deflighting procedure is temporary and birds regain their flying ability following the natural moult and re-growth of feathers within a year to 18 months.

Hesterman *et al* (2001) examined the welfare implications of various deflighting procedures on captive birds and pointed out that, although deflighting limits or denies the bird the ability to express the normal behaviour of flight, it can allow them to express other behaviours (climbing, exploring, socialisation with human caretakers) that would otherwise be suppressed if confined to a cage.

However, deflighting does not guarantee better welfare. Flight provides cardiovascular exercise beneficial to health and allows birds to escape swiftly from predators including household cats and dogs, and prevents birds from incurring injury when falling from high perches; wing clipping may also initiate feather-plucking behaviour in some parrots (Forbes & Glendell 1999; Hesterman *et al* 2001). Some behaviourists and veterinarians are now recommending against wing clipping for the physical and psychological

well-being of the bird and encourage the use of basic obedience training to assist in the control of flighted birds (Forbes & Glendell 1999; McCluggage & Higdon 1999).

Whether or not wing clipping benefits a bird’s overall welfare in captivity may be irrelevant to the question of whether the birds make suitable pets. Perhaps a more relevant question is whether it is acceptable to keep a particular animal in captivity as a companion animal if ensuring his or her safety or compatibility in the home requires that he or she be physically disabled.

Companion dogs and cats undergo routine physical alterations such as spaying or neutering, declawing for cats, and tail docking and ear cropping in dogs. Although the latter three procedures are controversial, spaying and neutering are generally viewed as beneficial and acceptable physical alterations and none of these procedures interrupts the animals’ natural primary mode of locomotion.

Although spaying or neutering is a physical alteration that effectively disables an animal’s reproductive ability, the process of spaying or neutering also reduces and in some cases eliminates reproductive behaviour due to changes in hormonal activity that accompany the physical removal of the reproductive organs, leading to an assumption that the ‘desire’ to engage in such behaviour is reduced or eliminated. The welfare of the progeny of the reproductively intact animal can also be weighed against any potential welfare benefits of allowing reproductive behaviour in companion animals.

It is unknown whether deflighting a bird reduces or eliminates his or her natural instinct or ‘desire’ to fly. However, deflighted birds who regain their physical ability to fly usually attempt flight suggesting that deflighting alters the bird’s ability to fly but not necessarily his or her interest in doing so.

Abnormal behaviour and stereotypies in captive parrots

Knowledge of the biological functioning of parrots and the systems used by them to cope with adversity can be useful in the selection and interpretation of welfare indicators. The extent to which animals are positively or negatively affected by their captive environments is likely to also depend on their cognitive abilities (Held *et al* 2001). Parrots have been shown to have high-level cognitive abilities (Pepperberg 1999, 2004) and have been likened to primates and human toddlers in terms of their intelligence and psychological and social needs (Birchall 1990; Davis 1998). These capabilities may be an important factor in the apparent high susceptibility of parrots to developing abnormal behaviour in captivity (Birchall 1990).

Stereotypies are abnormal, repetitive, unvarying and functionless behaviours that are often performed by captive and domesticated animals housed in barren or restricted environments and are mostly absent in the wild, and are relatively infrequent in large, environmentally enriched enclosures (Field & Thomas 2000; Garner *et al* 2003a). Stereotypic behaviour is often considered an indicator of

poor welfare (Mason 1991; Broom 1996). With the exception of poultry, there have been few systematic scientific studies of stereotypic behaviour in captive birds kept as pets (van Hoek & ten Cate 1998, Seibert *et al* 2004).

Three studies of stereotypic behaviour in laboratory caged Passeriformes commonly known as ‘songbirds’ described two common repetitive stereotypies in caged birds: spot picking and route tracing in caged canaries (*Serinus canarius* [Sargent & Keiper 1967; Keiper 1969] and route tracing in blue and marsh tits (*Parus caeruleus* and *P. paularis* [Garner *et al* 2003a]).

In *spot picking* a bird will repeatedly touch the tip or side of the bill to a particular spot — either an object or a body part. In *route tracing* a bird will follow a precise and invariable route within its cage. This behaviour is similar to the ‘pacing’ often seen in caged mammals (Sargent & Keiper 1967). Stereotypy levels were significantly reduced in canaries which were provided with opportunity for social interaction with other canaries but interaction with another species had no effect (Sargent & Keiper 1967), suggesting that deprivation of social interaction with the same species can contribute to or cause poor welfare. Keiper (1969) revealed an association between spot picking and captive feeding conditions, suggesting that the behaviour is frustrated natural foraging behaviour. Canaries which were forced to work for food compared to those who had free access to food also showed a reduction in spot-picking behaviour. Route tracing was linked to the size of the enclosure with a significant reduction in the behaviour achieved when birds were housed in an aviary. Interestingly, the housing of birds in flight cages, which were more than twice the size of standard cages, did not significantly reduce route-tracing behaviour (Keiper 1969).

The recent studies of Meehan *et al* (2003a, 2004 and 2003b) and Garner *et al* (2003b) have examined the causes of stereotypies specifically in captive parrots. Garner *et al* (2003b) found that stereotypy in captive orange-wing Amazon parrots (*Amazona amazonica*) was correlated with poor performance on the same psychiatric task (the ‘gambling task’) as stereotypy in autistic and schizophrenic human patients suggesting “potential psychological distress in animals showing these behaviours”. Similarly, Bordnick *et al* (1994) compared feather-picking behaviour in parrots to compulsive and impulsive human disorders such as trichotillomania — an impulse control disorder in humans characterised by the removal of hair resulting in noticeable bald patches. Feather plucking has also been compared to the commonly reported obsessive-compulsive hand-washing behaviour in humans (Seibert *et al* 2004).

Meehan *et al* (2003a, 2004) showed that environmental enrichment, appropriate foraging substrates and increased physical complexity significantly reduced the development and performance of oral (feather-picking) and/or locomotor stereotypies in parrots. Meehan *et al* (2003a) found that birds caged in isosexual pair housing positively affected the welfare of captive parrots by eliminating the development of stereotypy without jeopardizing the ability of parrots to

relate positively with humans. This finding stands in contrast to ‘popular’ literature on parrot care which recommends that pet parrots not be pair housed under the assumption that the birds will form emotional bonds to each other rather than to the human caretaker, thereby making them less desirable as pets (Blanchard 1999).

It is also important to note that in the research design of Meehan *et al* (2003b) and Meehan *et al* (2004) singly housed birds were caged directly across from one another and were housed within the same building structure; as such the singly housed parrots had visual contact with at least one other parrot of the same species and had vocal contact with several others (Meehan *et al* 2003b; Meehan *et al* 2004). This is in contrast to the condition in which many captive parrots are kept — without any visual or vocal contact with members of their own species. Thus, further studies would be required to determine the impact of total isolation from social conspecifics on the development of stereotypy in caged parrots to accurately reflect conditions under which pet parrots are typically housed.

The combined results of the studies on stereotypic behaviour in captive birds (both songbirds and parrots) suggest that the development of locomotor stereotypy (eg route tracing, pacing) is related to lack of space and physical complexity, and that oral stereotypy (eg feather picking, bar chewing) is related to lack of opportunity to perform foraging behaviour. Lack of social interaction with the same species appears to contribute to the development of both oral and locomotor stereotypy (Sargent & Keiper 1967; Keiper 1969; Meehan *et al* 2003a, 2004; Meehan *et al* 2003b).

Although the studies also suggest that changes in the captive environment (cage size, enrichment, socialisation) can improve the welfare of captive parrots, such changes require that the owner has sufficient knowledge, resources and motivation to fulfil these requisites and that the motivation to provide such complex care regimes is sustained throughout the life of the animal. Schuppli and Fraser (2000) explained that “Animal welfare may also be jeopardised if the owner loses interest in, or commitment to, the animal” and that “consistent care may also be jeopardised if animals are very long lived. For example parrots in captivity can live 30–80 years (Forshaw 1973) as do many primates; such pets may outlive their owners, or the owners may lose the interest or ability to provide care, with the result that the animal is put into a shelter or is passed through a series of owners”. Field and Thomas (2000) noted that even in zoo situations where caretakers are paid to provide care for parrots and enrichment is well recognised as an integral part of captive bird husbandry, enrichment is the first task to be dismissed when time and/or staff shortages occur.

If consistent and high-quality care cannot be guaranteed in a professional zoological setting it is difficult to imagine how consistent high-quality care can be reasonably expected from the general public. Indeed, evidence suggests that many parrots kept as companion animals are not receiving optimal care. In 1998 the World Parrot Trust

stated that perhaps as many as 50% of all companion parrots were kept in cramped and inadequate conditions. This statistic supports the assertion of Davis (1998) that “although birds are intelligent and highly responsive to, and aware of their surroundings, their treatment seldom reflects this fact”.

Proper care can be enforced legally if federal or state laws are written in such a way as to specifically describe standards of care and to require that those standards be met in order to possess a certain animal. Standards of care for captive birds are almost non-existent and, if they do exist, often require only minimum care such as requiring that the cage be wide enough in at least one direction to accommodate completely stretched wings (Animal Protection Institute 2005). Therefore, providing the care needed to avoid the development of stereotypic behaviour in captive birds is entirely voluntary on behalf of the possessor who may not even be aware of the need.

Relinquishment

Lack of interest in or commitment to providing specialised care for a long-lived species may also contribute to pet birds being acquired and resold, given away or abandoned at some time in their lives. There are currently more than 100 self-described bird rescue facilities in the US and several shelters, especially in metropolitan areas, have reported an increase in the number of relinquished birds in recent years. In addition, sightings of free-flying parrots and established flocks suggest that, in addition to accidental escapes, some pet birds may be intentionally set free when their caretakers tire of them. The number of birds released each year and exact estimates of naturalised parrot populations are unknown (Mabb 2002).

Clubb (1998) explained that “many birds are given up within a few years of being brought into their owner’s homes” and noted that “in many cases, owners simply do not have accurate expectations when they purchase parrots or have not been properly educated and made aware of normal psittacine behaviour”. Kid and Kid (1998) reported that “Noisiness is the second (after messiness) most common complaint of parrot owners” and Meehan *et al* (2003b) noted that “incessant screaming is one of the precipitating factors for parrot neglect and abuse”.

Procurement and transportation

The final question in evaluating the welfare of the animal under the Schuppli and Fraser (2000) check list of companion animal suitability is whether or not there is any appreciable risk of suffering, injury, illness or death arising from procurement and/or transportation of a species for the pet trade. Pet parrots may be wild-caught or captive bred. Each of these procurement methods has different welfare implications and, therefore, will be discussed separately.

Wild-capture

Although the 1992 US Wild Bird Conservation Act (WBCA) prohibited imports of wild parrots and reduced the US from the largest importer of birds to one of the smallest,

an unknown number of wild-caught birds are illegally imported over the US–Mexico border each year (Michels 2002). Parrots are also legally and illegally traded within their countries of origin and are legally imported or smuggled into the European Union and throughout Asia. The high mortality rates, inconsistent and insufficient laws, and millions of birds of different species involved in the trade mean that it is impossible to determine the exact number of wild-caught birds traded (Knights & Currey 1990).

Adult or juvenile parrots may be captured by large nets sprung when parrot flocks congregate on the ground near a water or food source (May & Hovetter 2002) or may be snared in trees with fishing line traps (Riupassa personal communication 2001) whereas others may be netted at nest cavity entrances (Bucher *et al* 1992). Neonatal birds are taken directly from nests either by scaling the trees and reaching into the nest cavity or by felling the tree and cutting into the nest cavity to remove the young birds (Bucher *et al* 1992).

There are substantial risks inherent in any live capture of wild animals. Physical deterioration as a result of stress or capture myopathy — a syndrome characterised by severe and often fatal degeneration of skeletal muscle — has been observed in a wide variety of mammalian and avian species associated with capture and handling (Wobeser 1994). Birds are especially fragile. Climatic changes and stress during transport can cause significant mortality even when imported legally (Knights & Currey 1990). Nicaraguan researchers estimate that, in order to compensate for mortalities, up to four times as many parrots are captured than make it to market (Michels 2002). Wright *et al* (2001) found that mortality rates from poaching were significantly greater than mortality due to natural causes.

Domestic production

After the passage of the WBCA dramatically reduced the supply of wild-caught birds for the pet trade in the US, attention focused on domestic production. The appearance of hand-raised baby parrots in the pet market increased the popularity of keeping parrots as pets (Wilson 1998) in part because the neonatal and juvenile stage is a time when the ‘pet quality’ of captive parrots is considered the highest (Clubb 1998).

To meet the demand for pet birds many species of parrots, especially budgerigars, cockatiels, lovebirds and small conures, are mass-produced for the pet trade (Vriends 1996; Low 2000; Blanchard 2001). As illustrated in Vriends (1996) and described in the experimental design in Millam *et al* (1995), modern breeding facilities typically house parrots indoors in individual paired breeding cages furnished with one or two perches, food and water receptacles, and a nesting box. Despite the design similarities to ‘puppy mills’, bird production facilities or ‘bird mills’ have not been met with the same scrutiny from the animal welfare community and the general public. This may be due to the familiarity of seeing birds confined to cages although there is no empirical evidence that suggests that the welfare

of caged breeding dogs is lower than the welfare of caged breeding parrots.

Some parrots produced for the pet trade are bred in free-flight colony aviary situations that allow opportunity for free mate selection, social interaction and physical activity, including flight. Although this situation has obvious welfare advantages it offers less control over the breeding process, less access to young for hand-raising purposes, and may be cost and space prohibitive for some breeders.

There currently exist no legal standards governing bird production facilities whether bred commercially or for research purposes. The US Animal Welfare Act (AWA) — legislation passed in 1966 — extends protection to certain warm-blooded animals maintained by certain animal dealers, transporters, exhibitors and research facilities. Birds were excluded from the AWA until 2000 but standards for regulating breeding facilities are still in development and birds housed and used for research purposes will not be covered. Ironically, the very parrots used at universities to study parrot welfare will not be covered by the AWA. According to unpublished data cited in Meehan *et al* (2004), 96% of the orange-wing Amazon parrots in the research resource colony at the University of California at Davis perform locomotor and/or oral stereotypies.

In order to produce hand-raised parrots, chicks are typically removed from parents shortly after hatching (in some cases eggs are removed from the nest and hatched in an incubator). Unweaned chicks are fed a liquefied or semi-liquefied diet by oral gavage and maintained in thermally controlled brooders until they have sufficient feathers to maintain their own body temperature (Vriends 1996).

Although 'popular literature' suggests that hand-raised parrots make superior pets to parent-reared parrots (Blanchard 1999), hand-rearing has the potential to produce physical as well as behavioural problems in parrots (Harcourt-Brown 2004). There are many risks involved in the hand-feeding of young parrot chicks especially if the feeder is inexperienced in hand-feeding techniques (Harris 1997). Problems associated with improper hand-feeding include: aspiration pneumonia, which results from food inhaled into the lungs of the bird; burned or punctured crops, which result from forceful feeding or feeding formula that is too hot; and malnutrition and starvation, which result from feeding food of inadequate nutritional value or inadequate amounts (Romagnano 2003b). As there is no formal veterinary reporting system to track the incidence of hand-feeding injuries and as some injuries may go untreated by the owner, it is impossible to determine the frequency of such injuries.

A recent study by Harcourt-Brown (2003) found that 44% of hand-reared African grey parrots (*Psittacus e. erithacus*) suffered from a condition known as osteodystrophy, defined as a failure of the normal development of bone. The clinical signs of this condition are distortion and enlargement of the bones, susceptibility to fracture, and abnormal posture and gait (Blood & Studdert 1988). Further studies by Harcourt-Brown (2004) suggested that premature physical activity in

hand-reared chicks may exacerbate the effects of a deficient diet and contribute to skeletal deformity. Parent-reared chicks are naturally confined to the nest and receive skeletal support from huddling with siblings (Harcourt-Brown 2004). Hand-fed birds are typically removed from the nest during feeding and allowed to run around during and after the feeding thus incurring more physical exercise and more stress on their growing bones. Limiting movement until bone growth is complete may reduce the incidence of bone deformities in hand-raised parrot chicks (Harcourt-Brown 2004).

It has also been suggested in recent years that hand-rearing can influence the later development of aberrant behaviours, such as stereotypy, feather plucking and phobic behaviour (Lightfoot 2002). Studies suggest that in animals with highly dependant young, parental care influences behaviour development after nutritional independence and results in better welfare (Nimon & Broom 1999). Recent research also suggests that parent-reared chicks that are handled regularly by humans exhibit tameness without the psychological or physical risks of hand-rearing (Aengus & Millam 1999; Collette *et al* 2000). Aengus and Millam (1999) noted that although continued handling of parent-reared chicks would probably be necessary to maintain tameness, "neonatal handling of parent-raised parrots provides a low labor and low technology alternative to artificial rearing as a means of initially taming birds, thereby improving their adaptation to life in captivity".

The potential for physical injury in hand-fed birds can be reduced if human caretakers are adequately trained and skilled in hand-feeding techniques. In recognition of this, the Association of Avian Veterinarians' (AAV) position paper on the sale of unweaned birds specifies that the organisation "SUPPORTS the conveyance of unweaned birds between qualified parties who possess the necessary skills of handfeeding in accordance with accepted avicultural industry practices" and "OPPOSES the sale or transfer of unweaned birds to individuals KNOWN not to possess the necessary level of experience in accordance with accepted avicultural industry practices [emphasis theirs]". Although position statements such as these are important in that they recognise potential problems and can raise awareness among the avian veterinary community, the effect of veterinary position statements on the sale practices of bird breeders and pet shop owners is unknown.

As hand-feeding is a labour-intensive procedure there is an economic advantage to selling unweaned birds quickly, thereby ensuring the sale and effectively shifting the hand-feeding burden to the purchaser. Compliance with the AAV position statement also requires that the seller has adequate knowledge of the risks involved in hand-feeding and has the ability to assess the skill level of the purchaser. The seller must also be willing to risk losing a sale or incurring the prolonged cost of caring for the unweaned bird if the sale is delayed or refused.

Although 15 states prohibit the sale of some unweaned animals most limit the restriction to puppies and kittens

under the age of 8 weeks (some states also prohibit the sale of rabbits, chicks [chickens] and ducks under a certain age). California recently became the first state to regulate the sale of unweaned birds in retail venues. The new law requires that hand-fed birds be weaned prior to removal from the retail venue, including pet shops, bird marts and swap meets. The law further requires that pet shops that house unweaned birds employ one or two individuals who have completed the Pet Industry Joint Advisory Council's hand-feeding certification course. The bill was drafted and sponsored by the Animal Protection Institute.

Welfare of others

There is no doubt that many people enjoy parrots as companion animals and are attracted to parrots for various reasons including companionship, entertainment, their 'personality', and their intelligence and vocal ability (Laughlin & Dowrick 1987; Kid & Kid 1998). Like other commonly kept companion animals, pet parrots may fill some social, esteem and cognitive needs of their human caretakers (Laughlin & Dowrick 1987; Kid & Kid 1998).

Schuppli and Fraser (2000) explained that "species may be ill-suited as companion animals simply because they have qualities that may detract from, or fail to enhance, the welfare of the owner". Examples include risk of physical injury inflicted on the owner or others by the animal or exposure and transmission of zoonotic diseases that may have an impact on people, domestic animals or wildlife.

Risk of physical injury and disease transmission

Parrots of all species can inflict painful bites capable of breaking the skin and leaving scar tissue. Larger birds such as macaws and cockatoos are capable of inflicting serious flesh wounds capable of leaving permanent disfigurement. Biting is part of a parrot's natural behaviour used to establish dominance within a flock, to defend territory, or in response to frustration, fear, sexual aggression, or play (Athan 1993). Nearly every parrot will experiment with biting his or her human caretaker; the behaviour can be reinforced or discouraged depending on the knowledge and reaction of the caretaker. Aggressive behaviour in many species of parrots accompanies sexual maturity and attacks may be spontaneous or may be accompanied by subtle warning signs that can be difficult to detect by the inexperienced observer (Athan 1993). Although sexual aggression is reduced or eliminated in mammalian species kept as companions through the routine procedure of spaying and neutering no equivalent procedure currently exists for pet birds (Clubb 1998). Clubb (1998) noted that the adult reproductive stage is the longest life stage of a parrot and that "sexual maturity and resultant behavioural changes are inevitable in pet birds. Bonding (pair formation) with a single person, displaced aggression, sexual frustration, and destructive behaviour are among behavioural changes that many render birds undesirable companions".

There are many books available written by lay behaviourists describing behaviour modification techniques that can be applied with varying levels of success to help maintain pet

quality during the long sexually reproductive life stage of parrots (Clubb 1998). Avian behavioural consultants are also available in some areas to assist parrot caretakers in addressing the behavioural problems that accompany sexual maturity.

Disease transmission

Avian chlamydiosis (*C. psittaci*), commonly known as psittacosis or 'parrot fever', can be transmitted through the air from birds to humans. Although psittacosis has the potential to infect any bird species it is particularly common in parrots, pigeons and doves (Flammer 1997). The vast majority of cases reported to the Centers for Disease Control (between 30 and 100 cases per year) result from exposure to pet birds (CDC 1998). Psittacosis can cause significant illness, especially for people with compromised immune systems, but most persons respond to oral antibacterial treatments (CDC 1998). Considering that millions of birds are kept as pets the incidence of this disease in humans is quite low. The risks to the non-bird-owning community are also quite low unless infected birds, which can be asymptomatic carriers for many years and intermittently shed the bacteria, are housed for public display or sale.

The importation of wild-caught birds significantly increases the disease risks associated with the pet bird trade. The mixing of birds from different geographical ranges coupled with close confinement and highly stressful conditions increases the susceptibility of imported birds to infectious organisms.

Pearson *et al* (1975) found in birds tested in US quarantine prior to the passage of the WBCA that 25% of groups of birds tested positive for Exotic Newcastle Disease (END). Parrots represented over 75% of the positive individuals. According to F Dustan Clark, Extension Poultry Health Veterinarian at the University of Arkansas's Avian Advice, eradication costs associated with exotic poultry disease outbreaks in the US typically cost about \$1 million per day of the outbreak (Clark 2003).

Schuppli and Fraser (2000) also noted that "offensive qualities of animals (noise, odour, unruly or destructive behaviour) may also be undesirable to owners — and possibly other members of the community". As discussed above, many people eventually seek to rid themselves of the responsibility of caring for their parrots (see 'Relinquishment'). The behavioural changes that accompany developmental stages in the lives of parrots are often cited as a primary challenge to the human-parrot relationship (Wilson 1998; Clubb 1998). Wilson (1998) noted that "Under the best of circumstances, parrots are difficult creatures to live with, and few people will actually enjoy long-term cohabitation with them".

Welfare of the environment

Schuppli and Fraser's (2000) final consideration in assessing the suitability of companion animals addresses environmental impacts. Issues to consider in this section include: ecological impacts if the animal escapes or is

released, adequate trade and collection regulation for species that exist in the wild, risks of wild-capture on native populations or ecosystems, and whether or not such risks can be addressed by captive breeding (Schuppli & Fraser 2000). I will examine each of these issues in turn.

Ecological impacts of released or escaped parrots

Released or escaped pet parrots can establish naturalised¹ colonies and it is feared that some could become harmfully invasive pest species adversely impacting native wildlife and/or agriculture (Fisk & Crabtree 1974; Shelgren *et al* 1975). At least 74 free-living exotic parrot species have been reported in North America and at least 19 species have nested in Florida and southern California (Jackson 2003). There is considerable debate about the current and/or potential impacts of naturalised parrots on native wildlife species among scientists, aviculturists, birders, environmentalists and animal advocates (Engebretson 2004). However, further research is needed to provide relevant information on this topic, followed by further discussion about appropriate measures to mitigate any identified impacts.

Risks of wild capture on parrot populations

Nearly one-third of the world's approximately 330 extant parrot species are threatened with extinction due to the combined forces of habitat destruction and continued collection for the pet trade (Collar & Juniper 1992). The trade in wild parrots seems to be driven by market demand coupled with the large profits to the pet industry and the poverty in many rural areas in many countries with wild-parrot populations (Wright *et al* 2001).

Perhaps the single most effective tool against organised poaching, wildlife smuggling and over-utilisation of wildlife is the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

CITES was first signed into law in 1973 in order to protect certain species of wild fauna and flora against over-exploitation through commercial trade. The US adopted the treaty in 1975 and the Endangered Species Act is its enabling legislation. Under CITES, the trade in live or dead wildlife and their body parts is restricted or even prohibited for species listed in CITES' three appendices, which are based on the level of endangerment of species. Trade in species threatened with extinction is prohibited under Appendix I and monitored to varying degrees under the other two Appendices. Specifically, CITES prohibits the import of Appendix I species for 'commercial purposes' unless the animal was specifically bred in captivity for that purpose.

The US WBCA of 1992 provides further protections to wild birds traditionally imported as companion animals for Americans. Congress found that the international pet trade

in wild-caught exotic birds contributes greatly to the decline of species in the wild, and also that the trade produces an unacceptably high rate of mortality among the imported animals. The Act requires documentation by the importer on the source of the bird, a complete description and the reasons for import. Also, the importer is permitted to import only two exotic birds as companion animals per year. The Department of the Interior administers the Act through the Fish and Wildlife Service. Wright *et al* (2001) revealed that the WBCA cut poaching rates from almost 50% to 20%, refuting the claims of some aviculturists (Desborough 1996) that limiting legal trade intensifies illegal trade and poaching (Wright *et al* 2001).

Although the concept of a legal trade in parrots managed under a 'sustainable harvest' regime has been suggested as a potential conservation approach (Snyder *et al* 2000; Beissinger 2001) and is in fact specifically listed as an exception under the WBCA, to date no successful sustainable harvest project has been demonstrated (Snyder *et al* 2000). In 2003, however, Argentina submitted a sustainable harvest proposal to the US Fish and Wildlife Service in the hope of exporting wild-caught blue-fronted Amazons (*Amazona aestiva*) harvested through the programme. The decision on the permit is still pending and has been opposed by 93 scientists with expertise in parrot biology and by numerous animal welfare organisations concerned that the trade will be unsustainable and/or will compromise the welfare of individual parrots.

Sustainable harvest seems to hold little promise as an effective conservation tool. There is a documented relationship between legal and illegal international trade with the legal trade providing a smokescreen behind which poachers operate (Wright *et al* 2001). Currently there is no marking system that could reliably distinguish legally collected birds from illegally collected birds (Beissinger 2001). In the absence of reliable marking systems and tight controls, attempts at implementing sustainable harvest programmes could actually increase conservation problems rather than solve them (Beissinger 2001).

Despite the protections afforded by CITES and the WBCA, the international and domestic bird trade continues to be a major threat for many species (Collar & Juniper 1992). Enforcement of international and local laws continues to be a major conservation challenge especially in areas where illegal practices are viewed as socially acceptable at the local level (Snyder *et al* 2000).

Captive breeding

Captive breeding might have the potential to reduce pressures on wild populations by reducing the profitability of wild capture (Snyder *et al* 2000). However, the cost of wild capture tends to be much less than captive breeding (Snyder *et al* 2000). Indeed, the demand for and subsequent collection of wild parrots for the global pet trade continues to threaten wild parrots despite the ability to produce captive-bred birds (Wright *et al* 2001). The yellow-headed Amazon parrot, for example, has suffered the greatest decline of any bird in the Americas — over 90% since the

¹ The term 'naturalised' is used in accordance with the terminology outlined in Holmes and Stroud (1995) where 'naturalised' refers to an established population of organisms that have not been domesticated and 'feral' refers to an established population of organisms that have been domesticated.

1970s, with the majority of the decline (68%) in the last 10 years (Michels 2002). This decline has continued despite the wide availability of captive-reared yellow-headed Amazons for pet purposes. It also unclear whether the availability of inexpensive captive-bred birds would result in fewer birds being captured for the trade or would merely result in a greater number of individuals acquiring birds as pets with no real reduction in the total number of wild-caught birds entering the pet trade.

One of the most common assertions made by private aviculturists and pet parrot owners is that captive breeding contributes to conservation of the species (Clubb 1992; Desborough 1996). In reality, breeding birds in captivity contributes little or nothing to conservation efforts because most captive breeding is done outside official species survival plans or other directed conservation efforts (Derrickson & Snyder 1992, Snyder *et al* 2000; Gilardi 2001; Wright *et al* 2001). Even if mutations are not specifically selected for, the moment the first generation is produced (F1 generation) a breeder has been involved, to one degree or another, in a process whereby 'natural selection' no longer applies; thus the birds are diverging from whatever they were (or are) in the wild. Invariably, selection factors begin to shift from factors that enable a bird to survive in the wild to factors that enable a bird to survive in captivity so that the release of captive-bred birds may reduce the fitness of wild populations (Derrickson & Snyder 1992; Ford 2002).

It has been suggested that captive birds may support conservation efforts by serving as 'ambassadors', thus generating funds for conservation efforts (Gilardi 2001). There is a lack, however, of behavioural research demonstrating an association between viewing animals in a captive setting and either knowledge about the animal or intention to take action to conserve the animal in the wild. In *The Modern Ark* (1997), Vicki Croke noted that zoo visitors spend on average 3 min or less viewing each exhibit and typically do not read informational signs, and McGovern (2002) noted that although zoos around the world receive close to \$10 billion annually in revenue, less than one-tenth of one percent goes to conservation efforts. It is unclear what factors inspire the public to support conservation efforts or what impact such support has on the conservation of the species in the wild. For example, despite a long history of public display in zoos and travelling shows, tiger populations in the wild continue to dwindle, whereas blue, right and humpback whales have received a high level of public support for conservation efforts despite the fact that these species have never been held in captivity.

Discussion and conclusions

The concept of companion animal 'suitability' as discussed here takes into account animal welfare, ecological and societal considerations, and holds implications for shaping public opinion and creating public policy. This review has examined the available scientific evidence relating to the welfare of captive parrots and examined other variables aimed at evaluating the suitability of parrots as companion

animals. In essence, Schuppli and Fraser (2000) outlined that ethical objections to keeping a companion animal arise if benefits to the owner are achieved to the detriment of the animal, if the animal poses a health or safety risk to the owner or the community, or if the acquisition or possession of a particular species poses a risk to the environment.

Many people enjoy keeping parrots as companion animals; indeed, birds (including finches and canaries) are the fourth most popularly kept companion animals in the US (Kid & Kid 1998; Meyers 1998). Even when bred in captivity, exotic parrots are not considered domesticated animals and, as such, they retain the inherent behavioural and physical needs of wild parrots (Davis 1998; Graham 1998). However, enclosures and housing arrangements for captive parrots held by private owners are typically designed for the convenience of the possessor, not the needs of the animal (Graham 1998; van Hoek & ten Cate 1998), and the restrictions imposed by the captive environment may significantly reduce the ability of the animal to express natural behaviour including socialisation, foraging behaviour and flight (Sargent & Keiper 1967; Keiper 1969; Graham 1998). The restriction of natural behaviour may lead to stereotypic behaviour, an indication of poor welfare (Sargent & Keiper 1967; Keiper 1969; Mason 1991; King 1993; Broom 1996; Graham 1998; van Hoek & ten Cate 1998; Garner *et al* 2003b; Meehan *et al* 2003a, 2004; Meehan *et al* 2003b). Many natural parrot behaviours, especially those expressed after sexual maturity, may lead to a reduction in benefits of parrot ownership for the caretaker and a reduction in quality of care provided to the bird, and/or abuse, abandonment or relinquishment of the bird. The trade in parrots as pets negatively impacts wild populations and jeopardises the welfare of individual wild-caught birds (Snyder *et al* 2000; Wright *et al* 2001; Michels 2002).

Schuppli and Fraser (2000) developed a classification system of five categories based on the degree of suitability of animal species as companion animals. Parrots were not specifically mentioned or listed under any one category described by the two authors. Based on the above evaluation, parrots seem to fall between categories C and E, but do not fit neatly into any one category.

At first glance it appears that parrots belong in category C, which is described as follows: "Species that have complex or demanding requirements needing skillful and knowledgeable owners who are prepared to commit significant time and/or resources to animal ownership, but where ownership is unproblematic with regard to procurement, transportation, and effects on the community and the environment. Control of ownership (eg ownership by only qualified persons) may be appropriate for such species" (Schuppli & Fraser 2000).

However, the lack of species-specific dietary information (Harrison 1998; Reid & Perlberg 1998), the tendency for bird owners not to seek veterinary care (American Veterinary Medical Association 2002) and the unknown impact of released non-native parrots suggest that parrots might belong to category D, defined as "Species where

there is insufficient knowledge (eg regarding procurement, transportation, environmental impact or the animal's needs) to allow a confident assessment of its suitability as a companion animal. Use of these species might be acceptable in the future if knowledge becomes adequate and any necessary safeguards are in place" (Schuppli & Fraser 2000).

Placing parrots in either category C or D, however, fails to account for the considerable environmental impacts of the wild bird trade, which are directly linked to the demand and desire for parrots as pets. Considering the welfare of the environment, most parrot species (particularly those whose wild counterparts are still traded) would fall under category E — "Species that are unsuitable as companion animals because of undue harm or risk to one or more of: the animal, the owner, the community, or the environment". The authors further explained that category E animals include "long-lived species whose lifespan is likely to exceed an owner's ability to provide care" and "species whose requirements (eg for normal social behaviour) cannot reasonably be met in captivity" (Schuppli & Fraser 2000). As parrots are long-lived, flight-adapted flock animals that have been compared to primates and human toddlers in the needs of their social and emotional lives, it may be argued that they fit the criteria for being deemed a category E animal.

Unfortunately, retail pet shops typically sell parrots with little or no screening or training of prospective caretakers and place an emphasis on the sale of juveniles or unweaned babies because a parrot's 'pet quality' is highest prior to reaching sexual maturity (Clubb 1998). Retail pet shops appear to regard and treat parrots as category A or B animals, categories assigned to mice and hamsters and dogs and cats respectively by Schuppli and Fraser (2000).

In contrast, avian rescue organisations typically adopt out adult birds and require that prospective adopters agree to an application process complete with parrot care and behavioural training courses, home inspections and follow-up consultations prior to receiving a companion parrot. In following such a protocol avian rescues are effectively 'controlling the ownership' of birds in their care by essentially limiting ownership to 'qualified' caretakers, thus following the recommendation set forth under Schuppli and Fraser's (2000) category C.

As behaviour and care requirements vary between species it may be appropriate to evaluate each parrot species separately or to divide parrot species into groups based on size; small-sized parrots such as budgerigars (*Melopsittacus undulatus*), cockatiels (*Nymphicus hollandicus*) and lovebirds (*Agapornis* spp), medium-sized parrots such as conures (*Aratinga* spp), Amazons (*Amazona* spp) and African grey parrots (*Psittacus erithacus*), and large-sized parrots such as cockatoos (*Cacatua* spp) and macaws (*Ara* spp). It is important to note, however, that although smaller birds in general should be easier to care for in terms of meeting environmental needs, the relatively low cost of these species may mean that they are at an increased risk of

being purchased on impulse or as a child's pet. Their lower commercial value may also place them at a greater risk of being considered 'disposable' when no longer wanted by a caretaker or when necessary veterinary care exceeds the retail value of the animal (Low 2000). Thus, smaller birds may face different challenges in the pet trade but not necessarily fewer challenges than their larger higher priced counterparts.

Many animal advocates believe that regulation of the acquisition, sale and relinquishment of animals kept as companions could improve animal welfare (Rollin & Rollin 2003), especially for animals that require specialised care (Schuppli & Fraser 2000). However, regulations protecting captive birds from inappropriate care, acquisition and sales are sorely lacking at the federal and state level (Animal Protection Institute 2005).

In welfare assessments it is important to take account of individual variation in response to situations or environmental conditions (Broom 1996). Despite the difficulty of care and potential for the development of stereotypic behaviours, aggression and injury, there appear to be some parrot-human relationships in which both the caretaker and the animal experience good welfare. It has also been suggested that basic obedience training for parrots and their caretakers can improve the welfare of captive parrots (Glendell personal communication 2004) thereby increasing an individual bird's compatibility in a home environment. Evidence suggests, however, that as long as the private ownership of parrots remains socially acceptable and commercial profits persist, the smuggling of parrots for the pet trade will probably continue despite trade restrictions and availability of captive bred birds (Snyder *et al* 2000). Therefore, finding ways to replace the demand for parrots as 'pets' with a demand for preserving the species in the wild may be the best way to reduce captive parrot welfare problems and ensure the welfare of wild parrots and the environment.

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