

Stress in parrots: what it looks like and considerations to avoid distress

Previous articles in this series have discussed stress in companion animals, including the cat and dog. This article will be discussing stress in a more unusual, but equally as popular companion animal – that is, the parrot – and in particular the Grey Parrot and the Timneh Parrot. However, it should be noted that much of this discussion will be applicable to other species of parrots that are kept as companion pets.

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The keeping of parrots as companion pets is rapidly growing in popularity, and they are often perceived as easier to care for than dogs and more sociable than cats. It is generally accepted that birds (including parrots, finches, and canaries) are the sixth most popular companion animal after both indoor and outdoor fish, dogs, cats and rabbits (PFMA, 2017). Unlike cats and dogs, birds are not considered domesticated animals even when bred in captivity, as many are only one or two generations removed from the wild and, thus, they retain all of their wild bird instincts and behaviours (Davis, 1998; Graham, 1998). When birds are kept as companion animals, constraints are often placed on them in terms of social interaction, flight, foraging, access to appropriate species-specific diets and maintenance behaviour such as nest building, bathing, and preening. These constraints may also be a variable for the occurrence of abnormal behaviours such as feather damaging behaviours (FDBs), reproductive behaviours directed towards caregivers, caregiver-directed aggression, extreme vocalisation, and serotypic behaviours, (Van Zeeland et al, 2009)

Wild ethology of Grey Parrots

Unlike the abundance of research produced on cats and dogs, there has been little actual research conducted on wild Grey Parrots (*Psittacus erithacus*) or Timneh Parrots (*Psittacus timneh*), other than feeding habits (Tose, personal communication), vocalisation, and mimicry (Cruickshank et al, 1993; May, 1996), flight path and habitat use (Amuno et al, 2007). Little is known about their social behaviour with conspecifics and other species, nutrition, preferred nesting

and roosting locations, and general movement around territory. In their review of available literature of the ecology of the wild Grey Parrot and Timneh Parrot, Greenwell and Montrose (2017) suggest that providing suitable care in captivity will be challenging for caregivers not the least because little is known with regards to the parrots' behaviour in the wild. This is important, as it means that advice to caregivers is often inferred rather than reliably based on any scientific fact. This author visited Uganda last year and will return this year to continue studying the social behaviour of wild Grey Parrots (*Figure 1*).

How limited knowledge of wild Grey Parrots may be used to reduce stress in the captive environment

Know your flock

There are more than 390 known parrot species divided into three main super-families, i.e. Strigopoidea, Cacatuoidea, and Psittacoidea. The super-family Strigopoidea has two families: Strigopidae and Nestoridae. The super-family Cacatuoidea has one family – that is, Cacatuidae. And the super-family Psittacoidea has three families, i.e. Psittacidae, Psittichasidae, and Psittaculidae. Although all parrots will display common innate behaviours, they may differ in how these behaviours manifest. Parrots in the wild will form two types of social groups: mono specific and multi specific. Mono-specific parrots consist of a single species of parrot: for example, the Grey Parrot or the Timneh Parrot (one will not witness a flock of both Grey Parrots and Timneh Parrots in the wild.) Multi-specific parrots form smaller groups containing different species of parrots; for example,

Macaws, Amazons, and Conures may be seen together. In captivity, multi-specific parrots may be more sociable with other species of parrots and humans, whereas mono-specific parrots may be reluctant to engage with other species of parrots in the household or with a human other than their primary caregiver.

To consider: it is important for caregivers of multi-species of parrots to consider if these parrots are mono-specific or multi-specific, and to arrange housing and the environment accordingly in order to prevent distress.

Intelligence and cognition

Research comparing the variance in intelligence and cognition skills between species of parrots is limited (Greenwell and Montrose, 2017). However, the Grey Parrot is noted for its cognitive abilities such as problem solving, reasoning, inter-species communication, and numeracy (Pepperberg, 1994, 2002, 2002, 2004, 2006, 2007, 2012). It is likely that the Timneh Parrot is equally as intelligent as the Grey Parrot, although this has not been tested. This intelligence comes at a cost to the Grey Parrot in captivity, with Rosskopf and Woerpel (1991) suggesting that this is why Grey Parrots are more susceptible to FDB than other species of parrots, apart from the Cockatoo.

Both in captivity and in the wild, Grey Parrots are reported to be neophobic and shy, and to avoid contact with unknown humans (Silva, 1991; Wilson and Luescher, 2006); however, Tamungang et al (2013) noted that in Campo in the South and Ndikinimeki in Central Cameroon, most Grey Parrots roost in villages close to human houses and thus gain protection from the villagers. This author also noted the close proximity of several flocks of Grey Parrots to local villages.

To consider: a lack of stimulation may be a contributory factor in developing behavioural problems and distress through boredom (Meehan et al, 2003). Parrots have different play styles: they may be either acrobats, shredders, chain saws, or a combination of all; thus, providing a variety of different toys both inside and outside of their cages is important for enriching their lives. Giving the parrot foraging toys provides mental stimulation, decreases boredom, and may provide exercise opportunities; these toys need not be expensive (Figure 2, Figure 3).

Rearing environment

Due to the newly introduced ban on the capture and transport of wild Grey Parrots and Timneh Parrots to satisfy the pet trade demand, the majority of newly sold Grey Parrots and Timneh Parrots will be captive bred. Traditionally, parrots were hand reared with the belief being that these individuals would make better companion birds, as they would be tamer, more confident, and easier to handle (Rosskopf and Woerpel, 1991). This belief should be treated with caution, however, as this was comparing hand-reared parrots with those reared by captive bred or wild caught parents, and with wild caught parrots, who were nervous of humans and



Figure 1. Grey Parrots as seen on Bulago Island, Uganda 2016



Figure 2. Example of parrot enrichment, hiding some nuts inside a treasure trove-image taken by the author.



Figure 3. A cardboard box, with paper and the addition of a few nuts, provides enrichment.

Case Study

Roy is a 32-year old (DNA tested) male Grey Parrot who came to live with me 4 years ago, after he had been abandoned in a small dog cage inside a garage for the previous 3 years, following the death of his primary caregiver. Roy had self-mutilated, was emotionally shut down, and had a fear of enclosed cages. As part of his behaviour modification, the cage door was removed and, when he was sufficiently settled, the cage was moved to the hall. Roy's first task was to make a path from the top of his cage to access the stairs and the upstairs of his home; he did this by chewing the wooden bannister (Figure 7). This project provided him with much needed enrichment. Once upstairs, Roy liked to go into corners and rip wallpaper from the wall, which he then placed into the corner and made into a nest. Observing his need to build a nest, I provided him with books to enable this enrichment activity. Currently, Roy has several nests around the house, which he frequents and attends to on a daily basis (Figure 8). Today, Roy has grown back the feathers on his back; however, those on his chest will never grow back due to follicle damage. What is enriching to an animal is very much down to individual preferences; what is enriching to one, may not be to another.



Figure 7. Roy proudly showing off his newly chewed wooden bannister; of note, the stain on the bannister was non-toxic for parrots



Figure 8. Roy proudly showing off one of his nests. It is unknown if in the wild it is the male or female Grey Parrot that builds nests, or both. In captivity, many parrots have a biological need to nest build and should be provided with that opportunity, as long as the females are not prolific egg layers — as nest building and excessive egg production may lead to a reduction in calcium levels and ill health.

may have taught their chicks to be nervous of humans too.

Of interest, Aengus and Millam (1999), report that orange-winged Amazon Parrot (*Amazonica amazonica*) chicks from parents who were not shy of humans, and were touched in the natal nest as they developed, may show comparable levels of tameness to hand-reared individuals. However, there will be individual difference influencing neophobia (Fox and Milliam, 2004). Schmid et al (2006) summarised that once adulthood is reached, hand-reared Grey Parrots demonstrate more problem behaviours than those naturally reared. Comparatively, from studies of other species such as cats and dogs, hand rearing in isolation and without social contact with conspecifics is detrimental in terms of behavioural development and those individuals reared in this manner may develop peculiar behavioural issues as a consequence.

Although it is likely that parrots and Grey Parrots in particular have sensitive periods of behavioural development, it is not known when they occur. Athan and Dexter (2000) state that the Grey Parrot will fledge at around 12 weeks of age, but does not reach independence until 2 to 3 years of age, at the time of social and sexual maturity; it is likely that sensitive periods of development may occur at 12 weeks of age, when the chick leaves the safety of the nest cavity, and again between 2–3 years of age, when the adult chick leaves the parents.

To consider: just as with other species, i.e. cats and dogs, the rearing environment has the greatest impact on future physical and behavioural development; and, just as with cats and dogs, it is at this stage that the Grey Parrot is more susceptible to developing abnormal behaviours. Thus, breeders should be encouraged to allow parent rearing with habituation to humans when the chicks are in the natal nest. Chicks should not be sold before weaning and fledging, as hand weaning may be difficult for novice caregivers. Breeders should allow for chicks of comparable species to be housed together and given the opportunity to interact. Transition from breeder to caregiver will be stressful for the chick; and, as knowledge of wild parrot behaviour grows, so will advice for caregivers on how to make this transition less stressful for the chicks' development.

Housing and environment

For many parrots, their cage is their safe place; thus, the location of the cage is an important consideration, with Brinker and Friedman (1999) recommending that the cage should be placed against a wall, preferably in a corner, so that there may be high visibility of family activities, but also safety. For foot health, there should be a variety of perches in terms of size and substance (Speer, 2016). This author recommends that there should be a perch in the far corner away from approaching humans and above human eye level to allow for a feeling of safety when the bird is approached by a human. Frightened parrots are more likely to become aggressive when approached with direct eye contact by unknown humans. At least one perch should be of a safe

and chewable substance, for example wood or chewable calcium.

To consider: many cages sold to caregivers as suitable for large species of parrots do not allow for wings to be stretched out, for locomotion around the cage, and for adequate toys and enrichment; thus, caregivers should be advised to purchase the largest possible cage that allows for a perch to be above their eye level when approaching the cage. A cage sold as a macaw cage, that is W 91 x D 66 x H 175, is the minimum cage size for a Grey Parrot. Although toys and enrichment are important, the cage should be so cluttered as to prevent movement (*Figure 4*). It is unlikely that an indoor cage, due to size limitations, will allow flying opportunities; hence the need for adequate time being given out of the cage. Parrot caregivers should be encouraged where possible to provide an outdoor flight cage, which while allowing some flight will also provide the parrot with daylight and fresh air.

Social contact with conspecifics and caregiver

In the wild, one rarely observes a solitary parrot for any significant time; wild Grey Parrots have been observed at roosting sites in flocks consisting of several hundred individuals; and, during the day, smaller groups will fly together on foraging trips (Juniper and Parr, 1998). Strong monogamous pair-bonds are reported (de Grahl, 1987; Aydinonat et al, 2014). Individuals are observed flock calling to each other when resting or foraging, and to indicate arrival or departure from a chosen location. This author observed beak rubbing as a means of social greeting between two and more individuals. Aydinonat et al (2014) demonstrated that solitary-housed birds have significantly shorter telomeres than pair-housed birds, that solitary-housed birds at 9 years of age had comparable relative telomere length to pair-housed birds that were 32 years old. Of concern, shortened telomere lengths are associated with age-related diseases in humans, and are indicative of chronic stress. What is not known is if contact with human caregivers can make up for lack of contact with conspecifics. Certainly, Gaskins and Hungerford (2014) report that being out of a cage for more than 8 hours per day and having a minimum of 4 hours per day contact with a human caregiver can decrease the risk of FDB by nearly 90%.

The sense of touch is very important to humans who may use this for both discrimination and emotionality to convey feelings of affection (McGlone et al, 2007). According to Keltner (2010), touch, fundamental to bonding, is a primary means by which humans communicate compassion to one another. Punyanunt-Carter and Wrench (2007), in the first study that considered the effects of touch deprivation in adults, found that touch deprivation decreased humans' self-esteem and increased depression. Similarly, touch is essential to human/non-human relationships (Beck and Katcher, 1996) wherein blood pressure, heart rate, and respiratory rate were recorded in humans petting an unknown cat or dog (Baun et al, 1984).



Figure 4. This cage layout does not provide an adequate sense of security to this Timneh Parrot, whose body language is tense and apprehensive of the person approaching. This situation could be helped if the parrot was in a taller cage with a perch in the far corner, and thus be above the approaching humans line of vision.

Touch between conspecifics is important in parrot social relationships, especially between pair-bonded individuals (Seibert, 2006a,b). However, most physical contact between adult parrots is for courtship and mating purposes (Van Sant, 2006), although mutual grooming around the head area and beak rubbing are often observed among non-pair-bonded parrots and juveniles. It is not known if touch deprivation with parrots in captivity, or lacking access to conspecifics or touch relationship with caregivers, has a significant effect on a parrot's emotional wellbeing.

Parrots that do not wish to be touched, cuddled, or handled by caregivers are often labelled as 'mean, vicious, dominant, punishing', or 'wanting to burn the world' (Friedman et al, 2006). Although these constructs are unhelpful in understanding why parrots bite, their use informs us of negative feelings caregivers have towards their parrots who bite them. These feelings are perhaps intensified when caregivers are bombarded with images of the perfect parrot that understands language and speaks, performs amazing tricks, and snuggles and cuddles with caregivers.

To consider: potential Grey Parrot caregivers should be advised that if they are not able to spend a minimum of 4 hours with their Grey Parrot, and more so if that Grey Parrot lacks contact with conspecifics, then they should reconsider their choice of companion parrot. It is not necessary for the 4 hours to be spent concurrently; therefore, caregivers may spend time with their parrots before work/other commitments and after work/other commitments. There is no need to strictly impose a 12-hour bedtime routine every night, as this may limit valuable time with caregivers and the parrot will nap when its caregivers are not available for attention, thus avoiding sleep deprivation. However, it should be noted that stress associated with inadequate rest can lower a bird's immune response to disease, may cause



Figure 5, Parrots have evolved to fly, as this provides them with exercise, escape and choice. This is Milo, who has lived with me since he was a chick and he has always been allowed to fly.



Figure 6, Speciality Parrot Carriers are a safe option for taking one's parrot outdoors; giving the parrot further enrichment opportunities as well as fresh air.

hyperactivity, aggression, excessive vocalisation — especially after sunset — and FDBs, as well as unwanted reproductive behaviours.

Covering a parrot's cage, while the cage is situated in the family or living area, is not helpful for the parrot, who may become stressed at hearing sounds it cannot see; ideally, the parrot should have a sleeping room that is free from artificial light, both inside and outside.

Being highly social animals, they benefit from participating in or observing normal family activities, such as having dinner or watching TV with their caregivers.

Caution should be observed if introducing a new parrot to the social group, and expert and professional advice should be sought to ease possible social tensions. Both potential and existing Grey Parrot caregivers should be educated to the fact that not all parrots welcome touch; and, when touch is allowed, that this should be appropriate and non-sexual. Sexual touch for a parrot will include touching their lower back and vent; thus, it is advisable to suggest that caregivers to scratch their parrots' heads and feet only.

Wing clipping

The veterinary team at the Dick Veterinary School in Edinburgh has published a statement on their reasons for no longer routinely clipping the wings of parrots; in the UK, many other avian veterinary surgeons are no longer advocating this practice. Schmid et al (2006) found that wing-clipped parrots were five times more likely to show FBD than flighted birds; although Gaskins and Hungerford (2014) suggest that there could be other factors to consider including levels of social contact with both conspecifics and caregivers, adequate housing, and rearing environment. In this author's opinion and of note, and not considered by researchers into the causes of FDBs, is that there may be a genetic component if one or more parent displayed FDBs, as it is known that in other species of animals there may be a genetic component to compulsive behaviours.

Apart from having evolved a pulmonary and cardio-vascular system that has been designed for coping with flight, parrots have evolved to use their skill in flight behaviourally; flight is their primary means of locomotion, parrots fly as a form of defence to escape predation, or a stimulus that they are frightened of. Removing the option for flight will increase the likelihood of aggression (Figure 5).

To consider: caregivers should be informed that parrots that have been wing clipped still have the potential to fly and therefore escape and that wing clipping is not a substitute for poor environmental management. Alternatives to wing clipping include harness training and taking the parrot outdoors in a bird carrier (Figure 6).

Feeding

Parrots should be fed a biologically and species appropriate diet. In the wild, parrots spend a great deal of their time locating food and manipulating that food for consumption, with Snyder et al (1987) estimating this taking between 4–8 hours of a day; thus, feeding from a food bowl leaves a great deal of the captive parrots' day with little to do. Van Zeeland et al (2009) suggest that even when food is freely available in bowls, parrots prefer to work for food, as this gives them something to do.

To consider: feeding parrots using enrichment toys and devices; these need not be expensive and will prevent boredom and destruction of other household objects; even

when parrots are given toys, they may reject those in favour of household items. There is a wealth of information available on line regarding parrot enrichment.

Suggested websites for parrot enrichment. <http://www.parrotenrichment.com>

Conclusion

The Grey Parrot and Timneh Parrot, and other species of parrots are remarkable birds and make wonderful pets. However, individuals considering parrots as potential pets should take that responsibility seriously and pay heed to available research and information garnered from experts in the field. Additionally, caregivers will find the foregoing suggestions helpful in providing a supportive and nurturing environment that will enhance their parrot's social development and assist in ensuring its positive behaviour and adaptation to its new home and family life. **VN**

Aengus WL, Millam JR. Taming parent-reared orange-winged Amazon parrots by neonatal handling. *Zoo Biol.* 1999; 18:177e187

Amuno JB, Massa R, Dranzoa C. Abundance, movement and habitat use by African Grey Parrots (*Psittacus erithacus*) in Budongo and Mabira forest reserves, Uganda. *Ostrich, Journal of African Ornithology.* 2007 78(2):225-31

Athan M, Deter D. *The African Grey Parrot Handbook.* 2000. Barron's Educational Series, Hauppauge, NY

Aydinonat D, Penn DJ, Smith S et al. Social isolation shortens telomeres in African Grey parrots (*Psittacus erithacus erithacus*). *PLoS One.* 2014; 9(4):e93839

Baun MM, Bergstrom N, Langston NF, Thoma L. Physiological Effects of Human/Companion Animal Bonding. *Nurs Res.* 1984; 33(3):126-9

Beck AM, Katcher AH. *Between Pets and People: The Importance of Animal Companionship.* Revised edn. 1996. West Lafayette, IN: Purdue University Press

Brinker B, Friedman SG. The nature of greys. *Bird talk.* 1999. Available at: <http://www.thegabrielfoundation.org/pdffiles/greys.pdf>.

Cruikshank AJ, Gautier J-P, Chappuis C. Vocal mimicry in wild African Grey Parrots *Psittacus erithacus*. *Ibis.* 1993; 135:293-9 doi:10.1111/j.1474-919X.1993.tb02846.x

de Grahl W. *The Grey Parrot.* 1987. TFH Publications, Neptune, NJ

Davis C.. Appreciating avian intelligence: the importance of a proper domestic environment. *J Am Vet Med Assoc.* 1998; 212(8): 1220-2

Fox RA, Millam JR. The effect of early environment on neophobia in orange-winged Amazon parrots (*Amazona amazonica*). *Appl Anim Behav Sci.* 2004; 89:117-29

Friedman SG, Martin S, Brinker B. Behavior analysis and parrot learning. In: Luescher AU, ed. *Manual of parrot behaviour.* 2006. Blackwell Publishing, Oxford:147-63

Gaskins LA, Hungerford L. Nonmedical factors associated with feather picking in pet psittacine birds. *J Avian Med Surg.* 2014; 28(2):109-17

Graham DL. Pet birds: historical and modern perspectives on the keeper and the kept. *J Am Vet Med Assoc.* 1998; 212(8):1216-19

Greenwell PJ, Montrose VT. The grey matter: Prevention and reduction of abnormal behavior in companion grey parrots (*Psittacus erithacus*). *Journal of Veterinary Behaviour.* 2017; 20:44-51

Juniper T, Parr M. *Parrots: A Guide to Parrots of the World.* 1998. Yale University Press, New Haven, CT

Keltner D. *Hands On Research: The Science of Touch.* 2010. http://greatgood.berkeley.edu/article/item/hands_on_research (accessed 5th October, 2017)

McGlone F, Vallbo AB, Olausson H, Loken L, Wessberg J. Discriminative touch and emotional touch. *Can J Exp Psychol.* 2007; 61(3):173-83

May DL. Field studies of African Grey parrots in the Central African Republic. In: *Proceedings of the International Aviculturists Society, Orlando, Florida.* 1996

Meehan CL, Millam JR, Mench JA. Foraging opportunity and increased physical complexity both prevent and reduce psychogenic feather picking by young Amazon parrots. *Appl Anim Behav Sci.* 2003; 80:71-85

Pepperberg IM. (Numerical competence in an African gray parrot (*Psittacus erithacus*). *J Comp Psychol.* 1994; 108:36e44

Pepperberg IM. Cognitive and communicative abilities of grey parrots. *Curr Dir Psychol Sci.* 2002a; 11:83e87

Pepperberg IM. In search of King Solomon's ring: cognitive and communicative studies of Grey parrots (*Psittacus erithacus*). *Brain Behav Evol.* 2002b; 59:54e67

KEY POINTS

- Unlike cats and dogs, birds are not considered domesticated animals even when bred in captivity, as many are only one or two generations removed from the wild and, thus, they retain all of their wild bird instincts and behaviours.
- When birds are kept as companion animals, constraints are often placed on them in terms of social interaction, flight, foraging, access to appropriate species-specific diets and maintenance behaviour such as nest building, bathing, and preening.
- Unlike the abundance of research on cats and dogs, there has been little actual research conducted on wild parrots; and thus knowledge of how to keep them in captivity is limited.
- All species of parrots are very intelligent and have an evolutionary need for social living.
- A lack of stimulation may be a contributory factor in developing behavioural problems and distress through boredom.

Pepperberg IM. 'Insightful' string-pulling in Grey parrots (*Psittacus erithacus*) is affected by vocal competence. *Anim Cogn.* 2004; 7:263e266

Pepperberg IM. Ordinality and inferential abilities of a grey parrot (*Psittacus erithacus*). *J Comp Psychol.* 2006; 120:205e216

Pepperberg IM. Grey Parrot (*Psittacus erithacus*) numerical abilities: addition and further experiments on a zero-like concept. *J Comp Psychol.* 2006; 120:1e11

Pepperberg IM. Individual differences in grey parrots (*Psittacus erithacus*): effects of training. *J Ornithol.* 2007; 148:161e168

Pepperberg IM. Further evidence for addition and numerical competence by a Grey parrot (*Psittacus erithacus*). *Anim Cogn.* 2012; 15:71e717

Punyanunt-Carter NM, Wrench JS. Development and validity testing of a measure of touch deprivation. *Human Communication. A Publication of the Pacific and Asian Communication Association.* 2007; 12(1):67-76

Roskopf WJ, Woerpel RW. Pet avian conditions and syndromes of the most frequently presented species seen in practice. *Vet Clin North Am Small Anim Pract.* 1991; 21:1189e1211

Schmid R, Doherr MG, Steiger A. The influence of the breeding method on the behaviour of adult African grey parrots (*Psittacus erithacus*). *Appl Anim Behav Sci.* 2006; 98:293e307

Seibert LM. Feather picking disorder in pet birds. In: Luescher AU, ed. *Manual of parrot behaviour.* 2006a. Blackwell Publishing, Oxford:255-65

Seibert L. Social behavior of Psittacine birds. In: Luescher AU, ed. *Manual of parrot behaviour.* 2006a. Blackwell Publishing, Oxford:43-8,

Silva T. *Psittaculture.* 1991. Silvio Mattacchione and Co, Ontario, Canada

Speer B. *Current Therapy in Avian Medicine and Surgery, 1st Edition.* 2016. Saunders

Snyder NFR, Wiley JW, Kepler CB. *The Parrots of Luquillo: Natural History and Conservation of the Puerto Rican Parrot.* 1987. The Western Foundation of Vertebrate Zoology, Los Angeles, California, USA

Tamungang SA, Cheke RA, Koungoum GP et al. Linking population size to conservation needs of the Grey Parrot in Cameroon. *International Journal of Biodiversity and Conservation.* 2013; 5(8):478-85

Van Sant F. Problem sexual behaviors of companion parrots. In: Luescher AU, ed. *Manual of Parrot Behavior.* 2006. Blackwell Publishing, Oxford: 233-46

Van Zeland YRA, Spruit BM, Rodenburg TB et al. Feather damaging behaviour in parrots: A review with consideration of comparative aspects. *Appl Anim Behav Sci.* 2009; 121:75-95

Wilson L, Luescher AU. Parrots and fear. In: Luescher AU, ed. *Manual of Parrot Behavior.* 2006. Blackwell Publishing, Ames, IA:225e231