

# 5

## Social Behavior of Psittacine Birds

*Lynne M. Seibert*

Due to the popularity of keeping psittacine birds as pets, a better understanding of their social behavior, in both natural and captive environments, is crucial in order to provide for their social and physical needs. Many psittacine species do not have an extensive history of domestication. Understanding and addressing their social needs will improve the welfare of captive psittacine birds, behavior problems may be more effectively managed, and captive breeding programs can benefit when social behaviors are better understood. Social behavior varies among the different psittacine species. Solitary behavior is the exception (Kakapo, *Strigops habroptilus*), with most species showing complex social organization.

### **FLOCK FORMATION**

Flock formation is important for predator detection and avoidance, access to mates, defense of territories, and foraging efficiency (Wilson 1975). Psittacine birds often form flocks, a behavior that is promoted by unstable food resources (irregularly distributed sources that are unpredictable through time) and indefensible areas. Feeding together in organized flocks may be advantageous to the individual, who is able to benefit from the collective knowledge of the group. By following the flock, an individual has a better chance of locating adequate amounts of food when resources are unpredictable. Small foraging groups are better able than individual birds to exclude competitors from feeding sites (Wilson 1975). There is some evidence that smaller birds with more limited fasting ability are more likely to flock than larger birds (Gill 1995).

Indefensible areas also promote flocking be-

havior in birds. There is increased security in a large group, with individuals nearest the center of the flock having the least chance of becoming the victim of a predator. Flocking improves the efficiency of predator detection, allowing the individual more time for other activities. Alarm calling is common among flocks and serves to alert other members of the group to possible danger. Birds may also participate in cooperative mobbing behavior against intruders (Gill 1995).

Flocks range in size and species composition, with mixed-species flocks observed in native habitats. Nuclear species form the main elements of the organization, while additional species that join the flock opportunistically are referred to as "followers." The formation of multi-species flocks appears to provide additional advantages for group members. There may be less conspecific competition for similar food and nesting sites. One theory that explains the variety of distinctive plumage coloration in psittacine birds proposes that the coloration promotes recognition of conspecifics for breeding purposes when different species are living in close proximity (Butcher & Rohwer 1989).

### **DOMINANCE RELATIONSHIPS**

The importance and meaning of dominance interactions in psittacine social groups was reviewed by Seibert (2003). Stability of social groups requires both mutual recognition of members and a system for allocation of limited group resources. A dominance relationship exists when predictable dominance-subordinance responses occur between members of a stable social group, based on the outcome of prior interactions between the in-

dividuals. Once relationships are established, there is consistency in social interactions, resulting in fewer, or less intense, aggressive assertions of dominance (Bernstein 1981). Dominance relationships function to reduce the occurrence of competitive conflicts between members of a social group.

Agonistic behaviors consist of both aggressive and submissive actions within the context of a social interaction (Wilson 1975). Agonistic encounters are observed more frequently when relationships are unclear, such as the introduction of new individuals. Dominance relationships also appear to require periodic reinforcement, even in the absence of incentive, to prevent extinction (Bernstein 1981).

Subordinate individuals respond to aggressive behaviors performed by higher-ranking individuals with appeasement or submissive signals. Submissive postures allow avoidance of combat. Patterns of communication that function to terminate aggression are labeled submissive (Bernstein 1981).

### **BENEFITS OF RANK**

The advantages of occupying positions of higher status in the flock have not been determined for most psittacine species. Higher-ranking individuals may have greater access to feeding or roosting sites, lower visibility to predators, or more mating opportunities. Aggressive encounters in a group of Orange-fronted Parakeets were most frequent during feeding, followed by bathing or seeking roosting places (Hardy 1965). However, no aggression occurred in the context of foraging in a captive flock of Cockatiels, but higher-ranking males did appear to have greater access to mates and preferred nest boxes (Seibert & Crowell-Davis 2001). Female domestic gallinaceous hens were found to select mates with larger than average combs, or higher-ranking males if information about social dominance was available (Graves et al. 1985). Female Speckled Parrotlets also appeared to pursue higher-ranking partners, but males showed no preference for higher-ranking females (Garnetzke-Stollmann & Franck 1991).

### **GENDER EFFECTS ON AGGRESSIVENESS**

In most avian species studied, males show higher frequencies of aggressive behaviors than females (Jackson 1991; Nol et al. 1996; Seibert &

Crowell-Davis 2001; Wilson 1992; Wingfield et al. 1987; Woolfenden & Fitzpatrick 1977). However, Sandell and Smith (1997) found that female European Starlings became more aggressive than males during the breeding season. Tarvin and Woolfenden (1997) reported similar findings in female Blue Jays during the breeding season. Further studies are needed to explore the causes of gender differences in aggressiveness.

Seibert and Crowell-Davis (2001), studying a captive flock of Cockatiels, found that females were significantly more likely to direct aggression against other females than against males in the flock. There was not a significant difference for the male Cockatiels in the gender of their opponents. Female competition for access to mates has been suggested as an explanation for these gender differences in female aggressiveness (Sandell & Smith 1997; Tarvin & Woolfenden 1997).

### **INDICATORS OF DOMINANCE**

Reliable indicators of dominance status have not been determined for most psittacine species. Some postulated indicators of dominance relationships are the frequency of threats and attacks and access to resources. Rushen (1984) proposed that social dominance within established flocks of domestic chickens could be determined using observations of agonistic encounters within the entire flock, rather than paired contests. Seibert and Crowell-Davis (2001) measured dominance relationships by recording the outcomes of all agonistic encounters during focal sampling of each flock member. Power (1966) recorded displacement at feeding and roosting sites to determine relative social status in a breeding flock of Orange-chinned Parakeets.

Studies of other bird populations have shown that social status is directly related to size, age, and gender (Gill 1995). However, Hardy (1965) found no correlation between dominance rank and physical attributes in the group of parrots he studied. Instead, he noted a direct correlation between pair bonding and dominance rank. Other researchers have found that pair bonding increases the social status of psittacine birds within a group (Levinson 1980).

### **MEASURING DOMINANCE**

The agonistic display behaviors of White-fronted Amazon Parrots were classified as low, medium,

or high intensity (Levinson 1980). Threat behaviors (aggressive components of agonistic behavior) are composed of one or more components that differ in valence (intimidatory effectiveness) (Hardy 1965). The displays are partially stereotyped, such that components appear in a characteristic order, but the display may be terminated at any point in the series when intimidation has been accomplished.

In species for which dominance interactions have been recorded, the following behaviors were recorded as aggressive (Garnetzke-Stollmann & Franck 1991; Hardy 1965; Levinson 1980; Power 1966; Seibert & Crowell-Davis 2001).

Turn threat: the aggressing bird abruptly turned toward opponent with head and neck extended

Beak gape: aggressing bird directed open beak toward opponent

Peck threat: aggressor pecked at opponent but did not make contact

Beak spar: short bouts in which birds' beaks made contact

Peck: aggressor's beak closed on some part of recipient

Wing flapping: perched aggressor flapped wings while facing opponent

Side approach: perched aggressor approached with side of the body directed toward opponent

Slow advance: perched aggressor walked directly toward opponent

Rushing: perched aggressor ran at opponent

Flight approach: aggressor flew directly toward opponent

Hardy (1965) and Power (1966) also reported stationary threat behaviors including plumage appression, or sleeking of the body feathers, and malar fluffing, fluffing of feathers in the malar region, which causes the bird's head to appear larger and draws attention to the beak.

Submissive behaviors, also referred to as appeasement behaviors, appear to be less ritualized. Submissive behaviors performed in response to aggressive displays consist of crouching, fluffing feathers, head wagging, foot lifting, or avoidance (Hardy 1965).

Variations in threat display complexity of different psittacine species may be explained by the games-theory approach. Games theory predicts that as the risk of physical injury increases,

species evolve less dangerous strategies for resolving disputes, such as more complex ritualized postural displays. Serpell (1982) studied nine different taxa of *Trichoglossus* parrots that differed in their beak size and the complexity of threat displays. The findings of this study suggest that an interspecific difference in beak length, which is directly related to the risk of injury from the bites of conspecifics, influences the nature of threat displays. With increasing beak size, displays became more complex, and there was a reduced inclination to attack a mirror-image opponent (Serpell 1982).

### GENDER EFFECTS ON DOMINANCE RELATIONSHIPS

Several studies have found that male birds tend to occupy higher social positions than female birds (Seibert & Crowell-Davis 2001; Tarvin & Woolfenden 1997; Weinhold 1998; Woolfenden & Fitzpatrick 1977).

Aggressiveness, or the tendency to initiate agonistic interactions, may or may not be correlated with dominance status. Cloutier et al. (1995) found that subordinate hens were less likely to engage in aggressive behaviors than dominant hens. Graves et al. (1985) also found that aggressiveness was correlated with dominance rank in White Leghorn cocks. Higher-ranking Cockatiels had significantly higher rates of aggression than lower-ranking flock members (Seibert & Crowell-Davis 2001).

### AFFILIATIVE RELATIONSHIPS

Affiliative behaviors in birds consist of allopreening, allofeeding, maintenance of close proximity, pair bonding, and reproductive behaviors. Garnetzke-Stollmann and Franck (1991) described affiliative interactions in a group of captive parrots (*Forpus conspicillatus*) that included perching in close contact, allopreening, and solicitation of allopreening.

Spatial organization of flock members is not random. Members maintain relationships with other flock members that can be measured based on spatial patterns and proximity. Sparks (1964) found that the members of a flock of Red Avadavats (*Amandava amandava*) were not randomly dispersed. Grigor et al. (1995) found that spatial associations in domestic chickens were influenced by the social relationships within the flock. Seibert

and Crowell-Davis (2001) also found the spacing in a flock of Cockatiels to be non-random and indicative of preferred associations. Preferred spatial associations coincided with mating groups, but in addition, males and females in the flock sometimes had same-gender preferred associates. Other researchers have found that mated pairs of birds maintain close spatial associations (Silcox & Evans 1982; Trillmich 1976; Wechsler 1989).

### ALLOPREENING

Allopreening, which occurs when an individual uses its beak to groom another bird, is cited as the most important mechanism for maintenance of the pair bond (Gill 1995). In a review of the allopreening behavior of different psittacine species, Harrison (1994) reported that allopreening was confined to the head and neck region in amazon parrots, lovebirds, and the genus *Melopsittacus*. Allopreening involved the head, wings, and tail in *Aratinga*, *Brotogeris*, *Ara*, and *Cacatua* species.

Since allopreening behavior has been associated with the formation of pair bonds, a predilection for cross-gender allopreening has been supported in various avian species (Gaston 1977; Harrison 1965; Spruijt et al. 1992). Seibert and Crowell-Davis (2001) found that males allopreened females significantly more than they allopreened other males. However, isosexual allopreening does occur and should be viewed as evidence of a social bond. Garnetzke-Stollmann and Franck (1991) observed that preferred associations, allopreening, and support in agonistic interactions were significantly more common among siblings than among unrelated birds in a flock of Speckled Parrotlets.

### ALLOFEEDING

Allofeeding is closely associated with copulation in birds (Skeate 1984). The female solicits feeding by crouching, lowering her head, ruffling her feathers, and vocalizing. The male displays head bobbing, grasps the female's beak at a right angle, and regurgitates food to the female. Allofeeding occurs year-round in some amazon parrots, conures, lovebirds, and Grey-cheeked Parakeets (Harrison 1994).

### PAIR BONDING

Pair bonding has been defined as a mutually beneficial relationship between sexually mature fe-

male and female birds, serving primarily for the cooperative rearing of young (Doane & Qualkinbush 1994; Wilson 1975). Pairs are characterized by allofeeding, pair participation in agonistic encounters, and close spatial associations (Garnetzke-Stollmann & Franck 1991; Levinson 1980; Trillmich 1976). Many psittacine species are thought to maintain pair bonds throughout the year.

Advent of the breeding season can alter the social hierarchy. Power (1966) found that single birds were more successful in an aggressive encounter if their mate was nearby, even if the mate did not appear to be actively participating. Levinson (1980) reported pair participation in agonistic encounters in White-fronted Amazon Parrots (*Amazona albifrons*), a species that maintained pair bonds throughout the year.

According to Butterfield (1970), perching in close proximity can be interpreted as evidence of pair bond formation. Arrowood (1988) observed close spatial associations among bonded pairs of Canary-winged Parakeets (*Brotogeris v. versicolorus*). Mates maintained very close proximity, usually touching. In addition, once pairing was achieved, individual mates no longer displayed affiliative behaviors toward any other flock members, as long as the mate was present in the flock, and agonistic displays did not occur between pair-bonded individuals.

### MATING PAIRS AND GROUPS

The social behavior of most psittacine species has not been studied in natural habitats, and captive populations have commonly been housed in pairs for breeding. The assumption that psittacine birds maintain exclusive pair bonds is not accurate for all species. Extra-pair matings have been observed in Speckled Parrotlets, Budgerigars, and Cockatiels (Baltz & Clark 1997; Garnetzke-Stollmann & Franck 1991; Seibert & Crowell-Davis 2001). Allopreening occurs less frequently between the male and the secondary female. Extra-pair courtship activities tend to occur while the primary female partner is incubating eggs and unable to observe the activity (Baltz & Clark 1997).

While some psittacine males will actually assist in incubating the eggs (Cockatiels, macaws, conures, and some cockatoo species), all male psittacine birds appear to assist in the

rearing of young. Male birds feed the hen as she incubates, guard the nest entrance, and feed the hatchlings. Many psittacine offspring have relatively long infancies, with weaning taking up to a year in some species, increasing the requirement for parental care (Doane & Qualkinbush 1994).

Successful nesting behavior has been described for endangered Puerto Rican Parrots (*Amazona vittata*) in a field setting. Successful mating pairs, or those producing fledged chicks, followed distinct patterns of nesting activities (Wilson et al. 1995). Females increased nest attendance during egg laying and incubation, while males rarely entered the nest at this stage. Allofeeding of the hen occurred close to the nest. During early chick rearing, male attentiveness increased, while females began to spend more time away from the nest. Regular allofeeding of the young by the male was essential for proper growth. Knowledge of the typical patterns of nest attendance can be used to detect problems in captive breeding programs.

## CONCLUSION

An understanding of the social behaviors of psittacine birds has implications for the prevention and treatment of various undesirable behaviors of pet birds. Problems may occur in birds not provided with appropriate socialization opportunities, or as the birds reach sexual maturity, with reports of behaviors that seem to indicate bonding with a human caregiver. Undesirable behaviors include attempts to preen, allofeed (regurgitate), and copulate with the person; masturbation; aggressive attempts to drive away other members of the family; and defense of the cage as a nesting site (Harrison & Davis 1986). In addition to sexual behaviors, abnormal behaviors indicative of stress or anxiety can occur including feather picking, barbering, and self-mutilation; screaming, aggression and biting; and phobias. The importance of flock social interactions to various species and the effects of isolation or pair housing on welfare are pertinent issues. Spatial and social relationships have important implications for the management of psittacine species, including providing the appropriate amount of space for the flock, optimizing feeding locations, determining stocking density, and identifying mating pairs.

## REFERENCES

- Arrowood, P.C. 1988. Duetting, pair bonding, and agonistic display in parakeet pairs. *Behaviour* 106: 129–157.
- Baltz, A.P., and A.B. Clark. 1997. Extra-pair courtship behaviour of male budgerigars and the effect of an audience. *Animal Behavior* 53:1017–1024.
- Bernstein, I.S. 1981. Dominance: The baby and the bath water. *Behavioral and Brain Sciences* 4:419–457.
- Butcher, G.S., and S. Rohwer. 1989. The evolution of conspicuous and distinctive coloration for communication in birds. *Current Ornithology* 6:51–108.
- Butterfield, P.A. 1970. "The pair bond of the zebra finch." In *Social behavior in birds and mammals: Essays on the social ethology of animals*, ed. J.H. Crook, pp. 249–278. New York: Academic Press.
- Cloutier, S., J.P. Beaugrand, and P.C. Laguë. 1995. The effect of prior victory or defeat in the same site as that of subsequent encounter on the determination of dyadic dominance in the domestic hen. *Behav Proc* 34:293–298.
- Doane, B.M., and T. Qualkinbush. 1994. *My parrot, my friend: An owner's guide to parrot behavior*. New York: Macmillan.
- Garnetzke-Stollmann, K., and D. Franck. 1991. Socialisation tactics of the speckled parrotlet (*Forpus conspicillatus*). *Behaviour* 119:1–29.
- Gaston, A.J. 1977. Social behaviour within groups of jungle babblers (*Turdoides striatus*). *Animal Behavior* 25:828–848.
- Gill, F.B. 1995. *Ornithology*, 2nd ed. New York: WH Freeman and Company.
- Graves, H.B., C.P. Hable, and T.H. Jenkins. 1985. Sexual selection in Gallus: Effects of morphology and dominance on female spatial behavior. *Behav Proc* 11:189–197.
- Grigor, P.N., B.O. Hughes, and M.C. Appleby. 1995. Social inhibition of movement in domestic hens. *Animal Behavior* 49:1381–1388.
- Hardy, J.W. 1965. Flock social behavior of the orange-fronted parakeet. *Condor* 67:140–156.
- Harrison, C.J.O. 1965. Allopreening as agonistic behaviour. *Behaviour* 24:161–209.
- Harrison, G.J. 1994. "Perspective on parrot behavior." In *Avian medicine: Principles and application*, ed. B.W. Ritchie, G.J. Harrison, and L.R. Harrison, pp. 96–108. Lake Worth, FL: Wingers Publishing.
- Harrison, G.J., and C. Davis. 1986. "Captive behavior and its modification." In *Clinical avian medicine and surgery*, ed. G.J. Harrison, pp. 20–28. Philadelphia: WB Saunders Company.
- Jackson, W.M. 1991. Why do winners keep winning? *Behav Ecol Sociobiol* 28:271–276.

- Levinson, S.T. 1980. The social behavior of the white-fronted Amazon (*Amazona albifrons*). In *Conservation of new world parrots: Proceedings of the ICBP Parrot Working Group Meeting*, ed. R.F. Pasquier, pp. 403–417. Washington, DC: Smithsonian Institution Press.
- Nol, E., K. Cheng, and C. Nichols. 1996. Heritability and phenotypic correlations of behaviour and dominance rank of Japanese quail. *Anim Behav* 52:813–820.
- Power, D.M. 1966. Agonistic behavior and vocalizations of orange-chinned parakeets in captivity. *Condor* 68:562–581.
- Rushen, J. 1984. How peck orders in chickens are measured: A critical review. *Appl Anim Ethol* 11:255–264.
- Sandell, M.I., and Smith, H.G. 1997. Female aggression in the European starling during the breeding season. *Anim Behav* 53:13–23.
- Seibert L.M. 2003. "Social dominance: The peck order revealed." Proc Assoc Avian Vet, Pittsburgh, PA, pp. 187–188.
- Seibert, L.M., and Crowell-Davis, S.L. 2001. Gender effects on aggression, dominance rank, and affiliative behaviors in a flock of captive adult cockatiels (*Nymphicus hollandicus*). *Appl Anim Behav Sci* 71 (2):155–170.
- Serpell, J.A. 1982. Factors influencing fighting and threat in the parrot genus *Trichoglossus*. *Animal Behaviour* 30:1244–1251.
- Silcox, A.P., and Evans, S.M. 1982. Factors affecting the formation and maintenance of pair bonds in the zebra finch, *Taeniopygia guttata*. *Anim Behav* 30:1237–1243.
- Skeate, S.T. 1984. Courtship and reproductive behaviour of captive white-fronted Amazon parrots (*Amazona albifrons*). *Bird Behaviour* 5:103–109.
- Sparks, J.H. 1964. Flock structure of the red avadavat with particular reference to clumping and allopreening. *Anim Behav* 12:125–136.
- Spruijt, B.M., VanHooff, J.A., and Gispen, W.H. 1992. Ethology and neurobiology of grooming behavior. *Physiol Rev* 72:825–852.
- Tarvin, K.A., and Woolfenden, G.E. 1997. Patterns of dominance and aggressive behavior in blue jays at a feeder. *Condor* 99:434–444.
- Trillmich, F. 1976. Spatial proximity and mate-specific behaviour in a flock of budgerigars. *Z Tierpsychol* 41:307–331.
- Wechsler, B. 1989. Measuring pair relationships in jackdaws. *Ethology* 80:307–317.
- Weinhold, J. 1998. Analysis of the social behavior of a community of blue-fronted Amazons (*Amazona aestiva*) kept in an aviary. *Amazona Quarterly* 14:11–13.
- Wilson, E.O. 1975. *Sociobiology*. Cambridge: Belknap Press.
- Wilson, J.D. 1992. Correlates of agonistic display by great tit *Parus major*. *Behaviour* 121:168–214.
- Wilson, K.A., Field, R., and Wilson, M.H. 1995. Successful nesting behavior of Puerto Rican parrots. *Wilson Bulletin* 107 (3):518–529.
- Wingfield, J.C., Ball, G.F., Dufty, A.M., Hegner, R.E., and Ramenofsky, M. 1987. Testosterone and aggression in birds. *Amer Scientist* 75:602–608.
- Woolfenden, G.E., and Fitzpatrick, J.W. 1977. Dominance in the Florida scrub jay. *Condor* 79:1–12.