Chapter 2

Literature Reviews

Behavior

The past three decades have witnessed a major emphasis on detailing the behavior of birds in both field and laboratory. Wallace and Manhan (1966) defined that in ornithology, the study of bird behavior has great ramification with regard to a bird's anatomy, physiology, ecology, life style, and evolution. During the past 20 years, many taxonomic changes have been made as a result of a critical examination of behavior (Table 2.1). The earliest study in animal behavior simply attempted to explain behavior using stimulus-response terminology. The stimulus (internal or external, environmental or social) was responded to by a set pattern of behavior with a certain degree of variability. Scott (1958) suggested that animal behavior studies should portray the adaptive significance of behavior, and should be concerned with the activity of the whole organism and of groups of organisms. He felt that such studies should involve anatomical, physiological, ecological, genetic and even embryological and taxonomic approaches. His categories of behavior that have adaptive significance include aggressive behavior, shelter-seeking behavior, agonistic behavior, sexual behavior, care-giving behavior, care-soliciting behavior, eliminative behavior and contagious behavior.

S. magna is one of many bird species, which is poorly known (Birdlife International, 2003). It is rare. Its foraging pattern involves climbing on tree trunks and branches like woodpeckers and tree creepers (Pettingill, 1985). Whiting (1979) observed

Table 2.1 Examples of the use of behavioral characters in taxonomy (Wallace and Manhan,1966).

Activity	Level Used	Taxonomic Discrimination
Method of head scratching	Familial Subfamilial	*Recurvirostra,Himantopus*,and *Haematopus* related to characrids rather than scolopacids. Suggest Psittacinae may be polyphyletic.
Holding food with the foot	Familial	Separates *Icteria virens* from Parulidae
Dust bathing	Subfamilial	Supports relationship of *Passer* to ploceids
Water bathing and method of oiling feathers	Familial	Separates timaliids from most other passerines.
Visual agonistic displays	Generic	Splits *Hylocichla mustelina* from *Catharus* spp.
Flight call notes	Subfamilial	Suggest relationship of *Fringilla* and carduelines
Form of courtship display	Subfamilial	Shows affinity between *Fringilla* and carduelines
	Interfamilial	Presence of tail quivering suggests possible relationship among corvids,estrildines,and ploceids.

Table 2.1 Continued

Activity	Level Used	Taxonomic Discrimination
Nest construction	Ordinal	Evidence for relationship between humming birds and swifts
Participation of sexes in parental care	Subfamilial	Separates *Anseranas,semipalmata* from other Anatidac
Feeding of nestlings	Subfamilial	Separates estrildines from ploceids
Nest sanitation	Familial	Separates *Peucedramus* from Parulidae

tree climbing foraging of Tufted titmice (*Baeolophus bicolor*) and Carolina chickadees (*Poecile carolinensis*), by dividing trees into four zones : upper crown, middle crown, lower crown, and stem, and measured the time that birds spent in each zone. If a bird moved to other regions within a tree, or to another trees, the first timed observation ended and another started. The data consisted of tree species, tree height, and forest type, number of individual birds, date, time and weather. These data were analysed using t- and z –tests. Both species used the same tree species for foraging, but there were significant differences in the proportion of time that each bird species spend on each tree species. Tufted titmice spent most time on White oaks, Hickories and Sweet gums (54%), whereas Carolina chickadees spent time on Elms, Sweet gums, Hickories and Pines for 80 % of their feeding time.

Birds prefer different tree species for foraging and they also prefer different foods. Jackson (1979) examined the bark characteristics and food diversity, of eight tree species

with different barks by print outer the bark using carpenter's contour gauge and compared between deep and wide bark in each tree species and collecting specimens of insects, ants and other arthropods along tree trunks from 1.50 m from the ground to 2.50 m. He found that trees with deeper bark support greater insect diversity.

The *S. magna* usually forages alone, except in the breeding season when it forages with other *S. magna* and other species in a groups for anti-predation benefits. Dolby and Grubb (1997) studied the advantages of mixed species foraging in groups and focused on both foraging and anti - predation benefits, especially bark – foraging birds including Tufted Titmice (*Baeolophus bicolor*), Blackcapped Chichadees (*Poecile carolinensis*), Downy Woodpecker (*Picaides pubercanes*) and White- breasted Nuthatches (*Sitta carolinensis*). Sixteen woodlots were used in the experiment in each of the 2 study seasons, 4 out of 8 woodlots were randomly selected as control ones and four as treatment groups. As predicted, female Downy Woodpeckers in woodlots tended to forage in locations that were more sheltered from wind, presumably thereby reducing metabolic costs. Males and females of both species significantly increased their vigilance. Male nuthatches showed significantly reduced nutritional condition according to ptilochronology analysis of fallen feathers. Lee *et al* (2002) reported that the management and protection of natural areas have primarily occurred in isolation from surrounding land management. The structure of surrounding land cover, however, may be important to the abundance and reproductive success of birds within a habitat patch. They investigated the relative importance of forest patch area, within patch habitat and surrounding landscape forest comer on the abundance of three Neotropical migrant bird

species thought to be area-sensitive (ovenbird, *Seiurus aurocapillus*), wood thrush (*Hylocichla mustelina*) and red-eyed vireo(*Vireo olivaceus*), and on pairing success of the ovenbird. They selected 31 isolated forest patched of differing sizes, and three 80-ha plots in continuous forest each centered within non-overlapping 200-ha landscapes, such that patch area and landscape forest cover were uncorrelated among landscapes. Each study plot was surveyed to estimate abundances of territorial males and ovenbird pairing success. They concluded that both surrounding forest cover and patch size were significant predictors of ovenbird abundance. Of the two, however, surrounding forest cover explained more variation in ovenbird abundance than did patch size. The greater importance of surrounding forest cover on ovenbird abundance contradicts previous reports that stress patch size or core area as the primary predictor of bird abundance, e.g. Freemark and Collins (1992) indicated that the effect of surrounding forest cover on ovenbird abundance is not the result of a correlation with forest patch size, because these two variables were uncorrelated in their study, by design.

Parental care behavior of *S. magna* was studied by Ghalambor and Martin (2000). They hypothesized that high fecundity, short–lived birds invest more in current offspring, whereas less fecund and longer- lived individuals invest more in their own survival and future breeding opportunities. They observed the White-breasted Nuthatch (*Sitta carolinensis*) and Red-breasted Nuthatch (*Sitta canadensis*) from May through to late June of 1996 and 1997. The study sites were in natural cavities and were intensively monitored to assess breeding season, egg laying, incubation and nestling. They used 2 bird models : House Wren (*Troglodytes aedon*), a common predator for eggs, but not for

adults, and the Sharp-shinned Hawk (*Accipiter striatus*) a common predator for adults, but not for eggs. The two models were presented near both Nuthatch nest cavities and the response to the models was compared. Both Nuthatch species responded to predators by increasing the length of time between visits and aborting more visits to the nest. As predicted by their life histories, *S. carolinensis* displayed a significantly stronger response to the eggs predator, whereas *S. canadensis* responded stronger to the adult predator. Therefore, both nuthatch species have different patterning of parental care.

In the breeding season, nests are used by males and females for egg laying, hatching, parental care, and predator protection. So males and females forage near nests (Hansell, 2000). Lomus and Remm (2004) experimentally tested, whether lack of high quality nest holes may limit the number of secondary cavity-nesters in cavity–rich habitats. They defined suitable cavities according to the minimal entrance diameter 2.1 - 5 cm and cavity depth at least 5 cm. In breeding season, they installed nest-boxes on 68 trees with suitable cavities for hole-nesting passerines, enabling the birds to choose between a suitable cavity and a box in five randomly selected plots. The internal size of the nest-boxes was approximately 11×11×30 cm and the diameter of the entrance was 3.5 - 4 cm. Great Tits and Pied Flycatchers used nest-boxes, whereas nuthatch (*Sita europea*) and blue tits (*Parus caeruleus*) avoided them. Nuthatches preferred secondary holes than nest–boxes. In this case, limited availability of suitable holes reduced reproductive success.

Vocal communication

Nuthatches communication with distant groups has been partly shown in the

increasing of population. Vehrencamp et al (2003) conducted interactive playback experiments on foraging Orange-fronted Conure (*Aratinga canicularis*) in the Area de Conservation Guanacaste of Costa Rica during June-August 1996. They used contact calls that had been recorded at 11 different sites along a 30 km transect, for analysis and found that 9 km was the upper limit of conure home ranges measured in this study site. They distinguished 7 or 8 different contact call groups. They cleared obvious background noises by viewing the spectrogram using the CANARY 1.2 program. Playback trials were conducted during 07.00 - 10.00 and 14.00-16.00. They selected a slightly different playback site each day, to avoid habituating the birds. They initiated a trial by playing three contact calls spaced 4 seconds apart, if the birds responded vocally, they played another contact call, waited for a response, and continued to counter-call as long as possible. The trial ended when the birds either left the area or stopped responding to play backs. Approach distances, and other behavior of the responses and commentary the approach period, and number of responses were noted. They found that Orange-fronted Conures (*Aratinga canicularis*) were significantly more likely to land, approach, and interact vocally with play back of chee contact calls recorded from nearby sites than recorded from distant sites, so these birds rejected the distant contact calls.

Territorial breakdown

S. magna populations have been seriously reduced because their habitat is being destroyed. They are rare (Bird Life International, 2003). Disturbed habitats were studied by Fort and Otter (2004). They studied territorial breakdown of black-capped chickadees (*Poecile atricapillus*) in disturbed habitats. They conducted research immediately west of

the University of Northern British Columbia, Prince George, British Colombia, Canada (53° 55' N, 122° 45' W; 850 m elevation). The study area was composed of two adjacent habitat types: 1) an 85-ha block of mature forest and 2) two sites that had been disturbed as a result of forest management practices. They captured the birds, using box traps mounted on platform feeders during December-February of both years and banded each bird with one numbered aluminums leg band and a unique combination of three colored plastic leg bands. They determined the sex of the birds at capture using a combination of three morphological measures and later confirmed sex by behavioral observations during the breeding season. They determined age of the birds as after second year or second year at the time of banding by shape of the outer tail feather to compare ages of birds breeding in either habitat.

Determination of territory boundaries for each breeding pair of chickadees in the 170-ha site was determined from daily surveys conducted during May-June 2000, 2001. Male song posts and locations of inter pair boundary disputes were recorded on map of the study site, with reference to grid point markers (50x50m) or other spatial reference points (trails, other geographical landmarks). Using the combination of grid points and spatial references, bird locations could be plotted on maps to approximately ±10m. These data, accumulated over the course of the early breeding season, allowed them to determine territory polygons for each breeding pair. Territory boundaries were defined as the minimum convex polygon (hereafter referred to simply as territory polygons) created by the outermost set of song posts and boundary dispute locations. A few territory disputes were also witnessed during formal radio tracking trials. They incorporated these

observations in the assessment of territory boundaries to more accurately determine the active space defended by a pair, particularly in response to territorial intrusions.

The number of territories in the disturbed and undisturbed sites was similar in the two years (19 versus 22 pairs in undisturbed and disturbed habitat in 2000, and 20 versus 15 pairs in undisturbed and disturbed habitat in 2001). The age ratios of breeding birds were similar in 2000 [disturbed site: 18 ASY (after second years) and 19 SY(second years) birds; undisturbed: 9 ASY and 20 SY birds.] The birds in the disturbed site were slightly older in 2001(disturbed site: 18 ASY and 9 SY birds; undisturbed: 13 ASY and 19 SY birds (P=0.07), which appeared to be due to slightly higher survival of previous breeders in the disturbed site between 2000 and 2001. Fifteen of the 27 banded birds breeding in the disturbed habitat in 2001 were known to have bred in the site in 2000, compared with only 6 of 32 of birds breeding in the undisturbed site in 2001(P=0.05). Thus, the disturbed site did not have disproportionately more first-time breeders, nor did it have a higher territorial turnover than the undisturbed site, rather, the opposite trend appeared to be true during the course of the study. They suggested that birds settling in the disturbed site were not inherently of lower quality than those settling in the undisturbed site.