Diet of the Noisy Scrub-bird *Atrichornis clamosus* at Two Peoples Bay, South-western Western Australia

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The Noisy Scrub-bird *Atrichornis clamosus* is a small, semi-flightless inhabitant of dense scrubs and low forests on the south coast of Western Australia. Between 1961, when the species was rediscovered (Webster 1962) and 1976, *A. clamosus* was largely confined to the Mt. Gardner area of the Two Peoples Bay Nature Reserve 40 km east of Albany (Smith 1985a). As a result of habitat management (fire exclusion) and translocation of birds to new sites the population index of the species (determined as the number of singing males) had increased from 45 in 1970 to 290 in 1990, and the range spread over about 30 km of coastal and near coastal land (Danks 1991). The population remains vulnerable to wildfire however, and the species is still classified as endangered (Garnett 1992). Knowledge of the dietary requirements of *A. clamosus* is important in developing a better understanding of its ecological needs, for managing its habitat and in selecting release areas for the translocation program.

John Gilbert, who discovered *A. clamosus* in 1842, recorded that the stomach contents of specimens he collected consisted of 'Coleoptera and seeds' (quoted in Whittell 1951). The naturalist William Webb, who also took specimens of *A. clamosus* in the Albany area between 1875 and 1889, considered the bird's food to consist of 'small beetles and other small insects' (Whittell 1943, quoting Webb 1895).

Field observations in the Mt. Gardner area in the 1970s showed that *A. clamosus* is a predominantly terrestrial insectivore foraging in leaf litter, decayed wood and among shrubs and sedges (Smith 1985b). Observations of prey fed to nestlings and analysis of faecal sacs removed from the nest by the female provided information on the diet of nestlings (Smith & Robinson 1976; Smith & Calver 1984). In the latter study, it was found that nestlings were fed a variety of invertebrates from 19 orders plus a few small vertebrates. The most common prey were Araneida (35%), Orthoptera (27%), larvae (15%) and Blattodea (7%) (Smith & Calver 1984). While this information provided a good guide to *A. clamosus* diet, it was possible that the nestling was being fed a different diet to that taken by adults. The results of a limited study of the diet of adult *A. clamosus* based on analysis of faecal samples from birds captured during the translocation program are reported here.

Methods

During the breeding seasons in June and July of 1989 and 1990, a total of 32 *A. clamosus* were captured from the Mt. Gardner area at Two Peoples Bay Nature Reserve. They were transported in clean cloth bags from the capture site to a holding aviary, spending up to 30 minutes in these bags. The bags with droppings were stored for later analysis. Twenty-four adult birds provided samples and material was identified from 19 of these (15 adult males and four adult females). The remaining five contained no recognisable particles of either plant or animal matter and were omitted from the final analysis. In June–July 1990, a reference collection of invertebrates from one *A. clamosus* territory on Mt. Gardner was made by litter collection, pit trapping, bush beating and opportunistic collecting. The territory was dominated by *Eucalyptus calophylla* (Marri) and *Oxylobium cuneata* vegetation similar to that sampled by Smith & Calver (1984).

Droppings were softened in a detergent solution, teased apart with fine forceps and examined under a dissecting microscope for arthropod remains. Identifications were made mainly to order level by comparison of fragments with specimens from the reference collection, following the procedures in Calver & Wooller (1982).

The proportions of prey types taken by the adults were compared with those reported from faecal analysis of nestlings by Smith & Calver (1984) using χ^2 analy-

sis. The nestling data were based on a much larger sample size of 718 faecal sacs and included six prey taxa with very low frequencies. To correct for this, we excluded prey taxa that did not contribute at least 6% by number to the diets of either nestlings or adults from the analysis, because they generated expected frequencies too small for the test (Everitt 1977). Combining these taxa would have created a potentially significant category that was really a product of sample size. All the taxa represented in the adult diet were included in the analysis, except the myriapods (millipedes and centipedes) and the hemipterans (bugs) which did not meet the 6% criterion.

Results

The results are shown in Table 1. Analysis of the 19 positive samples gave a mean of 2.8 arthropods per bird. Eight prey taxa (categories) were recognised: ants, beetles, spiders, larvae and pupae, crickets, cockroaches, bugs, centipedes and millipedes. Ants, beetles and spiders were the major prey found in the faecal samples together comprising 75.5% by number of all prey eaten. Adult and nestling diets were significantly different ($\chi^2 = 247.17$, $P < 0.001$) with spiders and crickets comprising 80% by number of the nestling diets but only 16% by number of the food of the adults.

Earthworms, springtails, isopods, spiders and centipedes and millipedes were the most numerous taxa recovered from the litter. Smith & Calver (1984) also reported high numbers of earthworms, myriapods and isopods in litter samples from an *A. clamosus* territory but much smaller numbers of springtails and spiders.

Table 1 Diet of adult Noisy Scrub-birds in 1989 and 1990, determined by faecal analysis. F = no. of prey found in that taxon, O = no. of birds eating that taxon (1989 $n = 9$, 1990 $n = 10$, combined $n = 19$). Numbers of arthropods collected in 1990 from litter samples and from bushes are also shown.

Taxon	Year							
	1989		1990		Combined		Litter	Bush
	F	O	F	O	F	O		
Ants	6	3	16	7	22	10	5	0
Spiders	3	3	2	2	5	5	14	7
Beetles	6	5	7	6	13	11	2	2
Myriapods	1	1	0	0	1	1	10	0
Larvae and pupae	0	0	3	3	3	3	9	0
Crickets	1	1	2	2	3	3	0	0
Cockroaches	1	1	2	2	3	3	0	8
Springtails	0	0	0	0	0	0	19	1
Isopods	0	0	0	0	0	0	14	0
Ticks and mites	0	0	0	0	0	0	3	0
Bugs	2	2	1	1	3	3	4	0
Earthworms	0	0	0	0	0	0	23	0
Stick insects	0	0	0	0	0	0	0	1
Earwigs	0	0	0	0	0	0	0	1
Totals	20		33		53		103	20
$\bar{X}$ prey/bird	2.2		3.3		2.8			

Discussion

A. clamosus adults and nestlings eat similar types of prey but not in the same proportions. Adults take mainly ants, beetles and spiders, whereas the nestlings are fed mainly spiders and crickets. Variations between the diets of nestlings and adults are known for other species (e.g. Royama 1970) but the apparent difference in *A. clamosus* must be interpreted cautiously as the samples were drawn from different years. Smith & Calver (1984) reported differences among nestling diets over the years 1971–75, so annual fluctuations can occur. Nevertheless, their data show that beetles were consistently low in frequency in nestlings' faecal sacs, while spiders were the most abundant prey in four of the five years with crickets second, and in the remaining year crickets were the most abundant prey and spiders second. Consequently, we believe that the difference we noted between adult and nestling diets is unlikely to arise from the different timing of the samples but does in fact reflect greater proportions of beetles and ants in the adult diet.

The fact that the adults eat more ants than the nestlings is consistent with the observations of Bibby (1979) on the Dartford Warbler *Sylvia undata*, Royama (1970) on the Great Tit *Parus major* and Bryant (1973) on the House Martin *Delichon urbica* where in each case the nestlings were fed larger prey than the adults ate themselves. Ants may be a suitable, easily obtained food for a foraging adult but too unrewarding to carry back for a nestling, although it is possible that the small unidentified prey seen fed to nestlings by Smith & Calver (1984) could have been ants. Similarly, adults may eat hard-bodied beetle prey themselves, but not carry them back to nestlings.

The apparent difference in the proportions of crickets in the diets of adults and nestlings may not be real, however. We identified cricket prey mainly from the mandibles, but adults frequently eat only the fleshy abdomen of large prey such as crickets and cockroaches (Danks pers. obs.) and mandibles would be underrepresented in the droppings. The whole body is fed to the nestlings, as cricket prey can be recognised from observation hides when young are fed (Smith & Calver 1984), and the faecal analysis would reflect this. Overall, the major differences between adults and nestlings are that adults eat more small ants and hard-bodied beetles.

Adult *A. clamosus* take a wide range of arthropods and also feed many different taxa to their nestlings, so it is unlikely that availability of specialist foods is essential for their survival. However, the low frequency of abundant prey such as earthworms, isopods, centipedes and millipedes in the diet suggests selective feeding, differential prey catchability or bias in the faecal analysis against small, soft-bodied prey. However, these taxa are generally less accessible, especially earthworms that occur mainly in the top layer of soil. It is also possible that some prey may be taken in small numbers as an important nutrient supplement.

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References

Bibby, C.J. 1979. Foods of the Dartford Warbler, *Sylvia undata* on southern English heathland (Aves: Sylvidae). Journal of Zoology (London) 188, 557-576.

Bryant, D.M. 1973. The factors influencing the selection of food by the House Martin (*Delichon urbica* L.). Journal of Animal Ecology 42, 539-564.

Calver, M.C. & Wooller, R.D. 1982. A technique for assessing the taxa, length, dry weight and energy content of the arthropod prey of birds. Australian Wildlife Research 9, 293-301.

Danks, A. 1991. The role of corridors in the management of an endangered passerine. Pp. 291-296 in Nature Conservation and the Role of Corridors. Eds D.A. Saunders & R.J. Hobbs. Surrey Beatty & Sons, Sydney.

Everitt, B.S. 1977. The Analysis of Contingency Tables. Chapman & Hall, London.

Garnett, S.T. Ed 1992. Threatened and Extinct Birds of Australia. RAOU and ANPWS, Melbourne.

Royama, T. 1971. Factors governing the hunting behaviour and selection of food by the Great Tit (*Parus major* L). Journal of Animal Ecology 39, 619-668.

Smith, G.T. 1985a. Population and habitat selection of the Noisy Scrub-bird *Atrichornis clamosus*, 1962–1983. Australian Wildlife Research 12, 479-485.

Smith, G.T. 1985b. The Noisy Scrub-bird *Atrichornis clamosus*: does its past suggest a future? Pp. 301-08 in Birds of Eucalypt Forest and Woodland: Ecology, Conservation and Management. Eds A. Keast, H. Recher, H. Ford & D.A. Saunders. Surrey Beatty & Sons, Sydney.

Smith, G.T. & Calver, M.C. 1984. The diet of the nestling Noisy Scrub-bird, *Atrichornis clamosus*. Australian Wildlife Research 11, 553-558.

Smith, G.T. & Robinson, F.N. 1976. The Noisy Scrub-bird — an interim report. Emu 76, 37-43.

Webster, H.O. 1962. Rediscovery of the Noisy Scrub-bird *Atrichornis clamosus*. Western Australian Naturalist 8, 57-59.

Whittell, H. M. 1943. The Noisy Scrub-bird. Emu 42, 217-234.

Whittell, H.M. 1951. A review of the work of John Gilbert in Western Australia, Part 4. Emu 51, 17-29.