MORE ON MYCOPHAGOUS BIRDS

J. A. Simpson
Forest Research and Development Division, State Forests of NSW, P.O. Box 100, Beecroft, N.S.W. 2119, Australia.

Abstract

The literature on mycophagy by birds is reviewed. *Eopsaltria australis*, the Eastern Yellow Robin, is reported to be mycophagous. Reports that species of *Micropsitta* are specialist fungus and lichen feeders need to be confirmed.

Introduction

Recently Simpson (1998) reviewed the Australian information on mycophagy by birds. That article resulted in helpful comments by various ornithologists and other biologists. The result is this article in which additional published information on mycophagous birds in Australia and overseas are reported plus further personal observations.

The first record of mycophagy by birds is possibly that by Bailey (1904) in North America. Bailey reported birds, including Canada jays, *Perisoreus canadensis*, feeding on 'toadstools'. Andreev (1978) reported the stomachs of Siberian jays, *Perisoreus infaustus*, collected in early winter in the U.S.S.R. contained mostly fungi. It is thought the fungi were taken from caches collected by squirrels. Trappe (Alsheikh & Trappe 1983) observed Oregon jays, *Perisoreus obscurus*, feeding on basidiomata of *Pleurocybella porrigens* (Pers.: Fr.) Singer and *Rhizopogon* spp. Canada jays have also been observed feeding on large yellow plasmodia of an unidentified Myxomycete (Sutherland & Crawford 1979). No species of jay is indigenous to Australia although other members of the Corvidae are widespread. Given the omnivorous eating habits of ravens, crows and currawongs in Australia it is surprising they have not been found to eat fungi.

The sequestrate ascomycete *Phaeangium lefebvrei* Pat., known from north Africa and the Middle East, is actively searched for and eaten by migrating birds in winter and early spring (Alsheikh & Trappe 1983, Dickson 1955). The birds identified as scratching out this fungus for food were mostly larks (*Alaemon alaudipes*, *Ammomanes cincturus*, *A. deserti*, *Cursorius cursor*, *Eremophila alpestris*, *E. bilopha*, *Galerida cristata*, and *G. thecklae*) but also the black-throated accentor, *Prunella atrogularis*, and the hoopoe, *Upupa epops*. Alsheikh & Trappe (1983) reported that Bedouin hunters use freshly harvested ascocarps of *P. lefebvrei* as bait in traps for live birds. Bird mycophagy would seem to be a highly effective means of dispersal to suitable hosts for this presumably ectomycorrhizal fungus.

California quail, *Lophortyx californica*, peck holes in the pilei of *Suillus* spp. (Alsheikh & Trappe 1983) but it is not known if they are feeding on the fungus or on insects.

Simpson (1998) reported the Australian brush turkey, *Alectura lathami*, as eating small agarics. In November 1998 I observed brush turkeys in rainforest near Beerburrum, in southern Queensland, to eat apparently insect free *Lentinula lateritia* (Berk.) Pegler. A further confirmed mycophagous species in Australia is the malleefowl, *Leipoa ocallata*. Malleefowl were observed in remnant mallee and broombush communities near Nhill, Victoria, on numerous occasions in 1995 and 1996, feeding on basidiomata of an undescribed species of *Paxillus* (Reichelt & May 1997). The fungus was identified by comparison of basidiospores from fresh samples of droppings with those from freshly collected basidiomata. It is interesting that only one species of agaricoid fungus was being eaten. The limited information presently available suggests that opportunistic mycophagy may be general in the Megapodiidae.

New Zealand, Norfolk Island and Lord Howe Island have a number of endemic species of secotioid fungi including species of *Gigasperma* E. Horak, *Nivatogastrium* (Harkn.) Singer & A.H. Sm., *Notholepiota* E. Horak, *Thaxterogaster* Singer, *Tympanella* E. Horak and *Weraroa* Singer. Terrestrial marsupials and mammals were absent from these islands before colonisation by humans within the past 1000 years (Diamond 1997). Beever (1993) has suggested these species of secotioid fungi, with their purple, red, orange or white coloration, fragrant odours, epigeous sequestrate habit, and ease of detachment may have evolved to be dispersed by lizards or birds, particularly the now extinct moas. Simpson (1998) reported that both cassowaries and emus, relatives

of moas, are mycophagous. At present there is only one Australian record of a lizard being mycophagous (Webb & Simpson 1985).

Simpson (1998) suggested the superb lyrebird *Menura superba* might be mycophagous. Microscopic examination of lyrebird droppings has not resulted in finding of spores of any fungi (J.M. Trappe, pers. comm.). However, Jim Trappe has identified another species of mycophagous Australian bird. In about 1993, while collecting hypogeous fungi near Lake Eildon, Victoria, he found an abundant fruiting of a species of *Gymnomyces* Massee & Rodway. 'I noticed an Eastern Yellow Robin, *Eopsaltria australis*, standing on a picnic table and watching. I flipped a small *Gymnomyces* sporocarp at it. The sporocarp hit the table and bounced to the ground. The robin immediately flew to the sporocarp and ate it. As I raked for truffles over the next half hour or so, the robin followed me and continued eating the specimens I occasionally flipped at it' (J.M. Trappe, pers. comm.).

A surprise has been numerous records of parrots being mycophagous (Forshaw 1989). Best (1984) and Forshaw (1989) reported that in New Zealand kakapos, *Strigops habroptilus*, are versatile feeders including diverse fruits, shoots, leaves, mosses and fungi in the diet. The kea, *Nestor notabilis*, spends much of the time foraging and fossicking on the ground in moist mountain forests and may also be mycophagous. The smallest of all parrots, the Micropsittini or pygmy parrots, live in the forests of New Guinea and the Solomon Islands. The single genus in the tribe, *Micropsitta*, includes six species that are reported to be specialist fungus feeders (Forshaw 1989). All have been reported to feed on small fruits, seeds, insect larvae, lichens and fungus gathered from tree trunks or attached branches (Forshaw 1989, Greensmith 1975, Rand 1942, Schodde 1977, Sibley 1951). However, of the studies involving detailed examination of the crop contents, only Rand (1942) has confirmed the presence of a fungus: in this instance a jelly-like fungus forming layers on decayed wood. In the few other studies of the crop contents of pygmy parrots they have been described as indeterminate white paste (Gilliard & LeCroy 1967, Mayr & Rand 1937, Ripley 1964), crushed seeds (Rothschild *et al.* 1932) or vegetable matter (Diamond & LeCroy 1979) which may have been lichen (Cain & Galbraith 1956). It would be very useful to have crop contents of species of *Micropsitta* examined by a mycologist to determine if fungi are being eaten.

The nutritional benefits of mycophagy have been comprehensively reviewed (Cork & Kenagy 1989, Fogel & Trappe 1978, Gronwall & Pehrson 1984, Martin 1979). The moisture content, and digestability of many fungi is comparable to that of many wild fruits. Apart from fleshy macrofungi, other fungi would seem to be of a size and colour that might attract birds *e.g.* ascoma of some Nectriaceae are similar in size to that of many insects. Given the wide seasonal availability of fungi on diverse substrata, it is surprising this resource is not utilised by more birds.

It is also worth pointing out that the presence of fungi can deter feeding by at least one species of insectivorous bird. The Regent honeyeater, *Xanthomyza phygia*, does not, it seems, feed on lerps or other sap-sucking insects overgrown by sooty moulds (Oliver 1998).

Acknowledgements

Lorraine Lamothe, Clifford Frith, Mathew Stanton, Tom May, Ross Beever, Cheryl Grgurinovic, Jim Trappe and Michael Lenz are thanked for helpful advice, discussions and comments.

References

Alsheikh, A.M. & Trappe, J.M. (1983). Taxonomy of *Phaeangium lefebvrei*, a desert truffle eaten by birds. *Canadian Journal of Botany* **61,** 1919–1925.

Andreev, A.V. (1978). Winter energy balance and hypothermia of the Siberian jay. *Soviet Journal of Ecology* **9,** 352–357.

Bailey, F.M. (1904). Additional notes on the birds of the upper Pecos. *Auk* **21,** 349–363.

Beever, R.E. (1993). Dispersal of truffle-like fungi in New Zealand, *in* R.S. Hill (ed.), *Southern Temperate Ecosystems: Origin and Diversification* 22. Hobart, Australia.

Best, H.A. (1984). The foods of Kakapo on Stewart Island as determined from their feeding signs. *New Zealand Journal of Ecology* **7,** 71–83.

Cain, A.J. & Galbraith, I.C.J. (1956). Field notes on birds of the eastern Solomon Islands. *Ibis* **98,** 100–134.

Cork, S.J. & Kenagy, G.J. (1989). Nutritional value of a hypogeous fungus for a forest-dwelling ground squirrel. *Ecology* **70,** 577–586.

Diamond, J. (1997). *Guns, germs and steel: A short history of everybody for the last 13,000 years*. Jonathon Cape, London, U.K.

Diamond, J.M. & LeCroy, M. (1979). Birds of Karkar and Bagabag Islands, New Guinea. *Bulletin of the American Museum of Natural History* **164,** 467–531.

Dickson, V. (1955). *The Wild Flowers of Kuwait and Bahrain.* George Allen & Unwin Ltd, London, U.K.

Fogel, R. & Trappe, J.M. (1978). Fungus consumption (mycophagy) by small animals. *Northwest Science* **52,** 1–31.

Forshaw, J.M. (1989). *Parrots of the world,* 3rd rev. edn. Illustrated by W.T. Cooper. Lansdowne Editions, Willoughby, Australia.

Gilliard, E.T. & LeCroy, M. (1967). Results of the 1958–1959 Gilliard New Britain Expedition: 4. Annotated list of birds of the Whiteman Mountains, New Britain. *Bulletin of the American Museum of Natural History* **135,** 173–216.

Greensmith, A. (1975). Some field notes on Melanesian Psittaciformes. *New Guinea Bird Society Newsletter* **114,** 7–10.

Gronwall, O. & Pehrson, A. (1984). Nutrient content in fungi as a primary food of the red squirrel, *Sciurus vulgaris. Oecologia* **64,** 230–231.

Martin, M.M. (1979). Biochemical implications of insect mycophagy. *Biological Reviews* **54,** 1–21.

Mayr, E. & Rand, A.L. (1937). Results of the Archbold Expeditions, XIV. Birds of the 1933–1934 Papuan Expedition. *Bulletin of the American Museum of Natural History* **73,** 1–248.

Oliver, D.L. (1998). The importance of insects and lerp in the diet of juvenile regent honeyeaters, *Xanthomyza phrygia*: implications for the conservation of an endangered woodland bird. *Wildlife Research* **25,** 409–417.

Rand, A.L. (1942). Results of the Archbold Expeditions, No. 43. Birds of the 1938–1939 New Guinea expedition. *Bulletin of the American Museum of Natural History* **79,** 425–516.

Reichelt, R.C. & May, T.W. (1997). Malleefowl eating fungi and orchid tubers. *The Victorian Naturalist* **114,** 198.

Ripley, S.D. (1964). A systematic and ecological study of birds of New Guinea. *Bulletin of the Peabody Museum of Natural History* **19,** 1–85.

Rothschild, W., Stresemann, E. & Paludan, K. (1932). Ornithologische ergebnisse der Expedition Stein 1931–1932. *Novitates Zoologicae* **38,** 127–247.

Schodde, R. (1977). Contributions to Papuasian ornithology. VI. Survey of the birds of southern Bougainville Island, Papua New Guinea. *CSIRO Division of Wildlife Research Technical Paper* **34,** 1–103.

Sibley, C.G. (1951). Notes on the birds of New Georgia, central Solomon Islands. *Condor* **53,** 81–92.

Simpson, J.A. (1998). Why don't more birds eat more fungi? *Australasian Mycological Newsletter* **17,** 67–68.

Sutherland, J.B. & Crawford, R.C. (1979). Gray jay feeding on slime mold. *Murrelet* **60,** 28.

Webb, G.A. & Simpson, J.A. (1985). Some unusual food items for the Southern Blotched Blue-Tongued lizard *Tiliqua nigrolutea* (Quay and Gaimard) at Bombala, New South Wales. *Herpetofauna* **16,** 44–49.