Food of the Mistletoebird near Pumicestone Passage, south-eastern Queensland

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The diet of the Mistletoebird *Dicaem hirundinaceum* was studied near Beerburrum, south-eastern Queensland, by examination of material voided by 92 birds over a three-year period. Between late December and June, the basic food of the few birds present in the area is fruit of the Viscaceous mistletoe *Notothixos subaureus*. Mistletoebirds congregate in the area between July and November to feed on the fruits of the Loranthaceous mistletoe *Amyema cambagei*. Epicarps of neither fruit are eaten. Material voided did not contain the chitinous remains of arthropods.

The basic food of the Mistletoebird *Dicaeum hirundinaceum* consists of the fruits of various species of mistletoes. The only other food recorded with some frequency is berries of the introduced Pepper Tree *Schinus areira* which has been recorded as being eaten by Mistletoebirds from such widespread localities as Wangaratta, Vic. (Cheney 1915), Barellan, N.S.W. (Chisholm 1938), Charters Towers, Qld. (Cohn 1926), Mount Mary Plains, S.A. (Boehm 1957), and Nangeenan, W.A. (Sedgwick 1938). Occasionally other fruits have been recorded as being eaten, and these include such diverse species as the saltbushes *Enchylaena tomentosa* and *Rhagodia spinescens* (Sullivan 1931), native figs *Ficus* sp. (Jarman 1953), African Boxthorn *Lycium ferocissimum* (Watson 1955), Native Bryony *Diplocyclos palmatus* (Jerrard 1932), hawthorn *Cratagaeus* sp. (Quinn 1960), *Comprosma lucida* (Cleland 1952), and the Blackberry Nightshade *Solanum nigrum* (Griffiths 1977).

Young birds are fed small arthropods (Lawrence and Littlejohns 1916), and the remains of spiders have been found in the stomach of an immature bird (Rose 1973).

No account has been published of the diet of the Mistletoebird throughout the year for any locality. The present paper documents part of the diet of the Mistletoebird near Pumicestone Passage, south-eastern Queensland, and is based on the identification of material voided over a three year period to May 1980.

Study Area

Mist netting and banding* activities have been carried out since mid-1971 on a farm at Cowiebank (26°58'S., 153°04'E.), some 11 km east of Beerburrum, south-eastern Queensland. McArthur (1978) presented a map and aerial photograph showing the location of Cowiebank and its surrounds. The farm fronts Pumicestone Passage, which is the waterway between Bribie Island and the adjacent coast of south-eastern Queensland. Except for a relatively narrow strip of native vegetation along the foreshore, the farm is surrounded by extensive plantations of exotic pines *Pinus eliottii, P. teada* and *P. caribaea*.

About half of the 20 ha farm is cleared and cultivated for small crops. The uncleared portions consist of a thin wooded band along the southern and western boundaries, and a more extensive area of modified open forest along the northern boundary. The Pumicestone Passage frontage is fringed with the mangroves *Aegicerus corniculatum, Avicennia marina, Bruguiera gymnorhiza, Excoecaria agallocha* and *Rhizophora stylosa*, varying from scattered trees to stands of about 100 m in width. A salt marsh, generally 10 to 30 m wide, occurs behind much

* Bands used were provided by the Australian Bird-banding Scheme, Division of Wildlife Research, CSIRO.

of the mangroves, except where sandbanks intrude. *Casuarina glauca* is the dominant tree of these sandbanks.

Trees of the modified open forest are generally 10 to 20 m in height, and are principally *Melaleuca quinquenervia, Casuarina glauca, Eucalyptus tereticornis, E. gummifera, E. signata, E. drepanophylla, E. tessellaris, Banksia integrifolia, Tristania suaveolens* and *Acacia aulacocarpa. Cupaniopsis anacardioides* occurs along the landward side of the salt marsh.

The original large eucalypts of the area were logged before 1939. Much of the forest is now sparsely overgrown with Lantana *Lantana camara,* particularly along edges and firebreaks. Various fruit and other exotic trees grow in the cleared areas of the farm. A small dam was constructed at the edge of the open forest during 1973.

The existing 20 ha farm was initially the home area of a grazing property of about 500 ha which was burned annually until 1965. The native forest of the surrounding area was cleared between 1967 and 1970 and planted with *Pinus* sp. The last firing of the study area — a low temperature burn — occurred in 1967.

Three Loranthaceous mistletoes occur in the study area. The most plentiful is *Amyema cambagei,* the only host being *C. glauca. Dendrophthoe vitellina* is much less plentiful; the principal host is *M. quinquenervia* and it also occurs occasionally on *C. glauca, T. suaveolens, E. gummifera, E. tereticornis* and *Angophora woodsiana.* A few plants of *Lysiana exocarpi* occur on *C. glauca.*

Both Viscaceous mistletoes of the area are secondary hemiparasites on the Loranthaceous mistletoes. The most plentiful, *Notothixos subaureus,* occurs on about one tenth of all mature *Amyema* and *Dendrophthoe* plants in the area. *Viscum articulatum* also occurs on both *Amyema* and *Dendrophthoe,* not infrequently in association with *Notothixos,* but is relatively scarce.

Areas close to mist netting sites contain several thousand fruiting *Amyema,* several hundred *Notothixos,* and less than ten each of *Dendrophthoe, Lysiana* and *Viscum. Dendrophthoe* is not uncommon in open forest areas away from the netting sites. The abundance of *Amyema* and associated *Notothixos* is attributed to the cessation of burning in 1967.

The ripe fruit of *Amyema* is globular, pearly-pink in colour and is quite conspicuous. The average weight of the ripe fruit, minus epicarp, is 0.101 g, while the air-dried voided seed averages 0.020 g. Early in the fruiting season some fruits are eaten by Mistletoebirds before they are fully coloured. The ripe fruit of *Notothixos* is globular, and not readily distinguished from the rest of the foliage as the epicarp is green. The fruit is relatively small, the air-dried seed averaging 0.0054 g. No satisfactory method has been found to determine whether or not *Notothixos* fruits are sufficiently ripe to be eaten by Mistletoebirds, and hence the weight of the ripe fruit minus epicarp has not been established.

Between December and June Mistletoebirds are relatively scarce in the study area, and sometimes are absent. They are most plentiful during September and October, when they congregate in the area to feed on the ripe fruits of *Amyema cambagei.* The abundance of *Amyema* fruits, and consequently of Mistletoebirds also, varies from year to year. Both were particularly plentiful during 1977 and 1980, but were much less plentiful during 1978 and 1979. An abundance of ripe fruits does not necessarily mean an abundance of Mistletoebirds. Thus, although Mistletoebirds were generally present in comparatively large numbers during the spring of 1980, few were present and only one was netted on 30 August, when ripe *Amyema* fruits were more plentiful than at any time during the previous nine years. The abundance of Mistletoebirds throughout the year in the study area can be quantified by considering the numbers of birds netted between July 1971 and January 1981 (Table 1).

Methods

Most Mistletoebirds void mistletoe seeds while caught in the mist net, restrained in a calico holding bag or while being handled during banding and examination. For the three years to May, 1980, voided material was collected and identified; some material voided while the birds were caught in the mist nets was not recovered.

Results

During the three year period, Mistletoebirds were handled a total of 108 times, and 92 (85%)

TABLE 1

Numbers of Mistletoebirds netted near Pumicestone Passage, south-eastern Queensland, July 1971 to January 1981.

Month	Number of Mistletoebirds netted	Netting days	Mistletoebirds netted per day
January	1	10	0.1
February	1	5	0.2
March	2	6	0.3
April	3	9	0.3
May	7	12	0.6
June	3	16	0.2
July	34	20	1.7
August	44	18	2.4
September	90	18	5.0
October	79	12	6.6
November	23	12	1.9
December	8	15	0.5

of these birds voided mistletoe seeds. Material voided over the three year period is summarized in Table 2, which also gives an estimate of the abundance of ripe *Amyema* fruits. With one exception, the material voided consisted of the viscid seeds of *Amyema* and/or *Notothixos*, viscid fluid (sometimes voided without seeds), and colourless viscid threads which string the seeds together. Voided material examined did not contain the epicarps of either *Amyema* or *Notothixos;* nor did it contain the chitinous remains of arthropods. Table 2 includes a few birds handled twice during the same day, provided there was an interval of at least one hour between release and re-capture.

One larger viscid mistletoe seed was voided on 26 April 1980, together with *Notothixos* seeds. This larger seed could not be positively identified, but was probably *Lysiana exocarpi*. The seed, placed on *G. glauca*, germinated but did not establish.

Discussion

The basic food of the Mistletoebird near Pumicestone Passage between July and November is fruits of *Amyema cambagei* (Table 2). Mistletoebirds must eat large numbers of *Amyema* fruits each day, as a few individuals have voided 21 and 22 of these seeds in the period between capture and release, and many have voided between 10 to 16 seeds. Between eight and ten seeds are often voided together when the birds are being handled during banding and examination. Free-flying birds, observed through binoculars, appear to void only two to four seeds together, but it has not been possible to verify this by examining the voided materials, and it is possible that several seeds voided simultaneously appear as one.

The average weight of a ripe *Amyema* fruit, without epicarp, is 0.101 g. At release, Mistletoebirds weigh between 7 and 10 grams, with an average of about 8.5 g. A Mistletoebird consuming say 16 *Amyema* fruits would therefore temporarily increase its weight by about 20 per cent. The normal swift passage of mistletoe seeds through the Mistletoebird (Keast 1958) thus represents the rapid discharge of substantial quantities of non-nutritive ballast and must have significant advantages for ease of flight.

Relatively few *Notothixos* fruits are eaten by Mistletoebirds when ripe *Amyema* fruits are readily available (Table 2). As the availability of ripe *Notothixos* fruits at these times is uncertain, it is not known if this reflects a specific preference for *Amyema*, or if the *Amyema* fruits are preferentially eaten simply because they are much more conspicuous. However a few birds eat *Notothixos* fruits when ripe *Amyema* fruits are plentiful, e.g. 3 and 17 September 1978, when two birds voided one *Notothixos* and 15 *Amyema*, and one *Notothixos* and seven *Amyema* seeds respectively; occasionally numbers of *Notothixos* fruits are eaten when *Amyema* fruits are readily available, e.g. one bird voided nine *Notothixos* and eight *Amyema* seeds on 15 October 1979.

Between late December and June, the main food of the few Mistletoebirds in the area is the fruit of *Notothixos* (Table 2). Individual birds have voided 34 and 31 *Notothixos* seeds between capture and release, and even a few Mistletoebirds would consume immense numbers of *Notothixos* fruits over the half year if they were required to exist solely on these fruits. It is thought that ripe *Notothixos* fruits are available throughout the year, although seeds were not voided between 1 January and 28 February, between 16 May and 30 June, or between 15 October and 23 December. As noted previously, no satisfactory method of determining whether

TABLE 2

Material voided by Mistletoebirds over a three year period.

Date	Numbers of Mistletoebirds					Abundance of ripe *Amyema* fruits
	Handled	Did not void seeds	Voided *Amyema* only	Voided *Notothixos* only	Voided *Amyema* plus *Notothixos*	
5. 6.77	1	—	1	—	—	None found
9. 7.77	4	1	1	—	2	None found
23. 7.77	2	1	1	—	—	Many
6. 8.77	5	2	3	—	—	Many
20. 8.77	4	2	2	—	—	Multitude
3. 9.77	1	—	1	—	—	Multitude
18. 9.77	14	1	13	—	—	Many
1.10.77	5	1	4	—	—	Many
15.10.77	10	2	7	—	1	Many
29.10.77	4	1	3	—	—	Sparse
13.11.77	1	1	—	—	—	Sparse
20.11.77	2	—	2	—	—	Sparse
31.12.77	2	—	—	—	2	None found
1. 7.78	1	—	—	—	1	None found
23. 7.78	3	—	3	—	—	Sparse
6. 8.78	2	—	1	—	1	None found
19. 8.78	3	—	3	—	—	Sparse
3. 9.78	6	—	5	—	1	Many
17. 9.78	8	—	7	—	1	Many
24.12.78	1	—	—	1	—	Sparse
3. 2.79	1	1	—	—	—	None present
8. 4.79	1	—	—	1	—	None present
15. 5.79	1	—	—	1	—	None present
21. 7.79	1	—	—	—	1	Sparse
1. 9.79	5	1	3	—	1	Sparse
15. 9.79	8	1	6	—	1	Not uncommon
29. 9.79	3	—	3	—	—	Not uncommon
4.11.79	8	1	7	—	—	Not uncommon
1. 3.80	1	—	—	1	—	None present
29. 3.80	1	—	—	1	—	None present
26. 4.80	1	—	—	1*	—	None present

* Also voided one larger unidentified seed, probably *Lysiana excorpi*.

or not *Notothixos* fruits are sufficiently ripe to serve as food for Mistletoebirds during these periods has yet been established.

To date, seeds of *Viscum articulatum* have not been present in material voided by Mistletoebirds, but there is little doubt that the fruits are eaten and the species disseminated by the Mistletoebird. In February 1978, a clump of *D. vitellina*, freshly shed from *M. quinquenervia*, contained one small *Viscum* and three small *Notothixos* plants in close proximity, and it is tolerably certain that the seeds had been voided together by a Mistletoebird.

Seeds other than from mistletoe fruits were not voided by Mistletoebirds during the three year study. However David Evans, owner of the study area, has seen Mistletoebirds feeding on the fruits of one or more of the *Solanum nigrum* group of Blackberry Nightshades which are periodically common weeds of the cultivated areas of the farm. Mistletoebirds have been recorded eating fruits of the Ruby Saltbush *Enchylaena tomentosa* at Moree, N.S.W. (Sullivan 1931). *Enchylaena* is a common prostrate shrub along the landward edge of the salt marsh on Pumicestone Passage, but Mistletoebirds have not been seen eating the fruits.

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