

FRUITS AND SEEDS FROM FAECES OF DWARF CASSOWARY  
*CASUARIUS BENNETTI* FROM 3260 M ON ENGLISH PEAKS,  
PAPUA NEW GUINEA

HELEN FORTUNE HOPKINS

INTRODUCTION

In response to Andrew Mack's request for information on the biology of cassowaries (Mack 1990) I analysed two faecal samples from Lake Omha, English Peaks, in Oro Province, Papua New Guinea (c. 8° 45'S, 147° 29'E, PNG Topographic Survey 1:100,000 Sheet 8380). The samples were collected during short field trips to a site at 3620 m in the Owen Stanley Mountains, where Beehler and co-workers have been studying the feeding biology of Macgregor's Bird of Paradise.

Cassowaries are large, flightless birds whose diet consists almost exclusively of fruits (Crome 1975; Mack 1990; Pratt 1983; Stocker & Irvine 1983). Three species occur in Papua New Guinea but only the Dwarf Cassowary occurs at such a high elevation (Beehler *et al.* 1986).

The faecal samples were lumps of semi-digested plant material in which seeds and partially digested fruits were clearly visible, and there was only a small amount of leaf material. One of the lumps measured 8 x 6 cm, and thus was unlikely to be the droppings of any other animal.

The vegetation at this altitude is a mosaic of forest and subalpine grassland. The forest canopy at c. 10 m is dominated by the gymnosperm *Dacrycarpus compactus* (Podocarpaceae), which has short, needle-like leaves, and small angiosperm trees including *Rapanea* spp. (Myrsinaceae) are also abundant. The open areas of grasses and sedges, with small herbs and some tree ferns (*Cyathea* spp.), have patches of dwarf woody shrubs, such as *Eurya brassii*, *Coprosma divergens*, and *Styphelia suaveolens*, up to c. 30 cm high. Around the forest edge are numerous shrubs such as *Dimorphanthera macbainii* and *D. amplifolium*, *Symplocos cochinchinensis*, *Decatoca spenseri*, and *Rhododendron* spp. from c. 1-3 m high. Many of the small woody plants have small fleshy fruits that are attractive to small frugivorous birds. Vegetation and flora of this type are described and illustrated by Coode & Stevens (1972).

METHODS

Sample 1 was collected by M.J.G. Hopkins from open grassland in April 1988, and was in two lumps which were analysed together. Sample 2 was collected by Keith Harris from forest edge in Oct-Nov 1988.

The samples were air-dried in Port Moresby and weighed. They were then softened by boiling for about one hour. Fruits and seeds were identified by comparison with a reference collection from the study site, for which herbarium vouchers are deposited at UPNG, and with descriptions and illustrations given in van Royen (1979-1983).

## RESULTS

Sample 1 contained the remains of the fruits of at least 8 species of plants, while sample 2 was composed almost entirely of a single species (Table 1). A selection of the fruits and seeds are illustrated in Figure 1. For some species, such as *Rapanea*, with a single hard stone, the number given is likely to be fairly accurate. For others, such as Myrtaceae?, where soft, sometimes empty pericarps with a persistent calyx were counted, the figure may be an underestimate.

There was a considerable range in the degree of digestion both within and between species. In sample 1, for instance, much of the pulp of *Amaracarpus* was at least semi-digested, whereas most of the *Dacrycarpus* fruits were whole and very hard. In sample 2, some of the *Rapanea* seeds were completely exposed but there was a minority of intact fruits as well.

Other plant material consisted of fragments of large leaves and small whole leaves of angiosperms (*Dimorphanthera*, *Styphelia*, Myrtaceae?, grass), two gymnosperms (*Dacrycarpus*, *Papuacedrus*), bryophytes, and some species of lichen. Some of the leaf material might have been merely adhering to the outside of the sample, but some was embedded in pulp, and presumably ingested with fruits picked up from the forest floor.

The insect remains included two small entire beetles, the mouthparts of two large beetles, a small entire wing (fly?), and an abdomen segment from a large beetle. They constituted only a minute fraction of the samples.

Mammalian fur in sample 1 contained hairs up to 3.2 cm long, but there was no sign of any bones.

### Notes on fruits and seeds:

#### Sample 1

a) The 'fruit' of *Dacrycarpus compactus* is strictly speaking a fleshy cone. They covered a range in size from very small (i.e. immature) to full-sized. Most were whole and still very hard.

b) *Dimorphanthera* consisted of whole fruits, probably immature. Two species are common in the study area.

c) *Rapanea* fruits and seeds covered a range in size, perhaps representing more than one species. At least 3 spp. occur in the study area.

d) Myrtaceae? Superficially these fruits resembled dried currants. They had developed from an inferior ovary with 4 or 5 persistent calyx lobes, frequently with a persistent style, and numerous filaments. Since they had been soft and fleshy, their internal structure was difficult to determine. More than one species may perhaps be included.

e) *Prunus costata*, one almost whole fruit and 3 seeds were present.

f) *Amaracarpus* has distinctive seeds which resemble coffee beans with the parchment intact. Most seeds had pulp still adhering. More than one species occurs in the study area.

g) Rutaceae, probably *Evodiella*. The pericarp resembled that of dried orange. This family is not represented in herbarium collection from the study area.

h) Indet A. The material was woody, but appears to have the remains of a calyx at one end though no seeds were visible. Perhaps a fruit of *Symplocos cochinchinensis*.

#### Sample 2

The sample had a strong resinous smell.

a) *Rapanea involucrata* is the only species of *Rapanea* with large enough fruits that occurs at this altitude, according to Sleumer (1986), and its type locality is Mt Scratchley. Fruits covered a range in size, but none were as small as some from sample 1, so perhaps all were from this one species.

## DISCUSSION

While no generalisations can be made on the basis of two samples, their contents are of interest because they come from the upper altitudinal limit for the Dwarf Cassowary, and the vegetation has a very different species composition from the localities in montane forest where its diet has been studied in detail (Mack, 1990; Pratt, 1983).

The contents of these two samples are consistent with the findings of Lamothe *et al.* (in press), Mack (1990) and Pratt (1983) for *C. bennetti*, and Crome (1975) and Stocker & Irvine (1983) for *C. casuarius* in that:

a) the fruits of relatively few species are present in any sample;

b) the pulp of some fruits is partially digested, but other fruits are whole, suggesting a relatively rapid passage time through the gut;

c) many seeds are passed whole, only the pulp is digested, so that cassowaries are likely to be dispersal agents rather than seed predators in most instances;

d) most of the fruits taken must have fallen from the canopy (e.g., *Dacrycarpus*, *Rapanea*, *Prunus costata*), although *Amaracarpus* is an understory shrub or creeping herb, so the fruits could have been picked directly from the plant;

e) insects, mammals, and other plant material are ingested but in very small quantities.

Pratt (1983) found that it was predominantly the large fruits from his study area that were attractive to *C. bennetti*, i.e., those with a diameter greater than 15 mm, and up to 65 mm, although a few in the size class 8.8-15 mm were also taken. At 3620 m in the Owen Stanleys, no species has a fruit greater than c.15 mm.

Stocker & Irvine (1983) and Lamothe *et al.* (in press) have demonstrated that seeds passed through the gut of a cassowary are still viable, and thus cassowaries are likely to be effective dispersers. For the seeds of some species, passage through the gut of *C. bennetti* significantly enhances germination compared with intact fruit (Lamothe *et al.*, in press).

Local information from near Mendi in Southern Highlands Province suggests that Podocarpaceae seeds will only germinate if they have passed through the gut of a cassowary (Lamothe & Arentz pers. comm.). Unfortunately the handling of the samples from English Peaks precluded investigation of the germination capacity of seeds but Dwarf Cassowaries should clearly be considered part of the guild of frugivores which may contribute to seed dispersal in subalpine forest.

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**Table 1. Analysis on numbers and sizes of fruits and seeds found in two Dwarf Cassowary dung samples (s1 and s2), with habitat of plant species where known. Dimensions in mm. (+ = present, - = absent)**

|                              | #fruits |      | dimensions |               | #seeds /fruit | habitat           |
|------------------------------|---------|------|------------|---------------|---------------|-------------------|
|                              | s1      | s2   | fruit      | seed          |               |                   |
| Podocarpaceae                |         |      |            |               |               |                   |
| <i>Dacrycarpus compactus</i> | 18      | -    | 12x9.5     | 8.5x6         | one           | forest            |
| Ericaceae                    |         |      |            |               |               |                   |
| <i>Dimorphanthera</i>        | 5       | -    | 5.5x5      | minute        | many          | forest edge       |
| Myrsinaceae                  |         |      |            |               |               |                   |
| <i>Rapanea</i> sp.           | 119     | -    | -          | 4.5x5 - 7x8   | one           | forest            |
| <i>Rapanea involucrata</i>   | -       | 472  | 10x8       | 5.5x4 - 9x6.5 | one           | forest            |
| Myrtaceae?                   | 182     | -    | 6x8        | ?             | ?             | -                 |
| Rosaceae                     |         |      |            |               |               |                   |
| <i>Prunus costata</i>        | 4       | -    | 8x8        | 5x6           | one           | forest            |
| Rubiaceae                    |         |      |            |               |               |                   |
| <i>Amaracarpus</i>           | 183     | 0.5  | 10x7.5     | 8x5           | two           | forest understory |
| Rutaceae                     | 16      | -    | 10x7.5     |               | ?4            | forest            |
| Indet A                      | 7       | -    | 13x6       |               | ?             | ?                 |
| fur                          | +       | -    |            |               |               |                   |
| insects                      | +       | +    |            |               |               |                   |
| leaf material                | +       | +    |            |               |               |                   |
| Bryophyte                    | +       | +    |            |               |               |                   |
| Lichen                       | +       | -    |            |               |               |                   |
| dry weight                   | 56 g    | 60 g |            |               |               |                   |

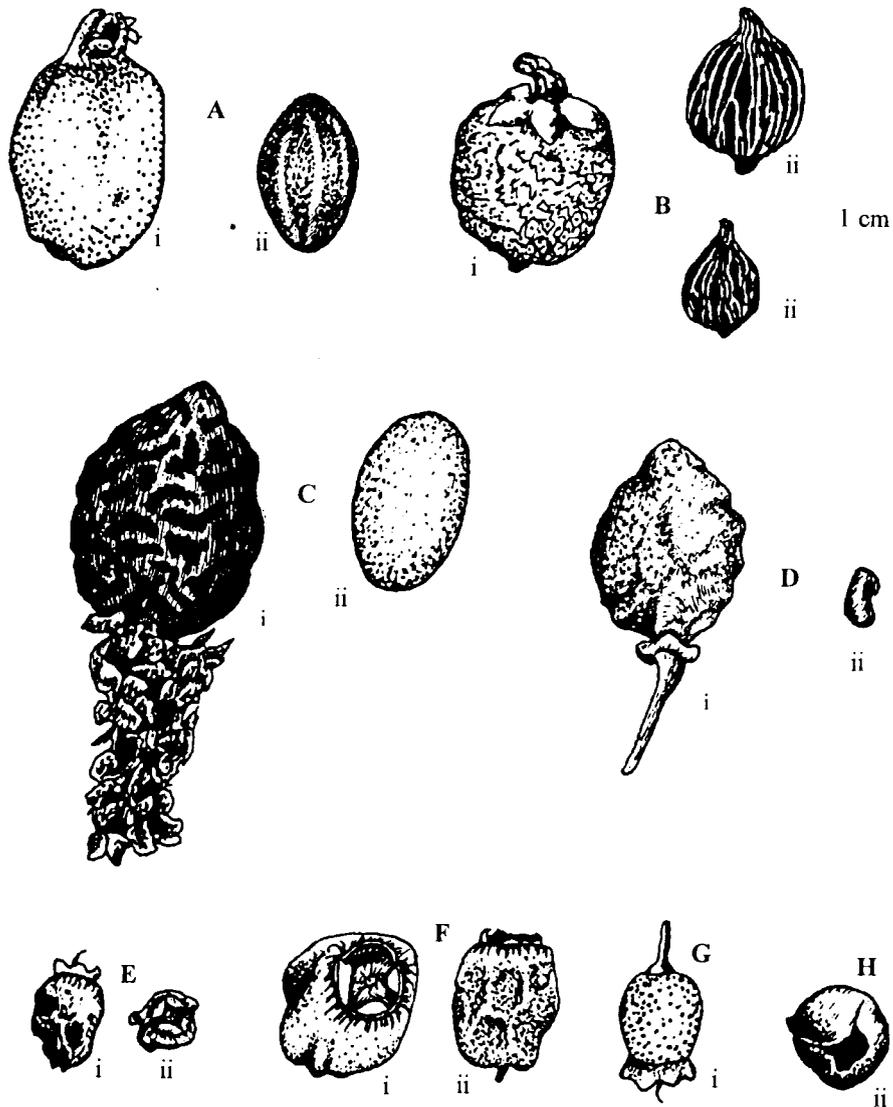


Figure 1. Fruits and seeds from faeces of Dwarf Cassowary.

A: *Amaracarpus*; B: *Rapanea*; C: *Dacrycarpus compactus*; D: Rutaceae;  
E & F: Myrtaceae?; G: *Dimorphanthera*; H: *Prunus costata* (seed only)

i: fruit ii: seed

## OBSERVATIONS OF BIRDS FEEDING AT A FLOWERING *SYZYGium*

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On 5 September 1987 I found a *Syzygium* sp. (Myrtaceae) tree in flower beside the boundary trail in Varirata National Park (Central Province) at c. 750m. The tree was c. 30 m tall and had a large spreading canopy. It stood on the bank of the stream, in the bottom of a steep-sided, relatively narrow valley. The flowers occurred in clusters growing directly from the sides, not at the ends of the branches, and did not grow from smaller twigs. The clusters consisted of many stalks, almost mistletoe-like, with each stalk supporting a flower. These clusters were about 15 cm in diameter. The stalks on which the flowers grew were quite woody and would support a bird the size of a Helmeted Friarbird *Philemon bucceroides*.

Between 5 and 20 September 1987 I visited the tree four times and watched for a total of 520 minutes (5 September 15:00 - 16:45; 12 September 07:45 - 08:10; 13 September 08:45 - 11:30 and 20 September 07:00 - 10:45). The shortest observation period was 25 minutes and the longest 225 minutes. There were many fewer flowers on 20 September, the last visit, than on the first, although I cannot quantify this. I observed the tree from a convenient point on the ground, from where 70% of the canopy was visible. Although the tree was in leaf, the foliage was sparse and it was only the crown of a smaller tree that obscured my view.

Nine species, six honeyeaters (plus one unidentified meliphaga) and two lorries were observed feeding at the flowers of this *Syzygium* tree. Feeding birds were present in the tree for 85% of the observation time, which included all of the first three observation periods. Only during the final observation period, when there were fewer flowers, were there times when there were no birds feeding in the tree.

Between one and four Helmeted Friarbirds were present throughout the first three observation periods. On 20 September two birds made only a brief visit to the tree to feed. Helmeted Friarbirds were present in the tree for 57% of the observation period and during this time at least one bird was feeding at a flower-cluster. While in the tree, the friarbirds moved from flower-cluster to flower-cluster by hopping along the branches or flying from branch to branch. When feeding the friarbirds perched by, or on the flower-cluster, using their long necks and bills to reach the more inaccessible flowers. Although there were many flowers on each cluster, the friarbirds fed from only a few before moving on to the next cluster, so the time spent on each cluster was short, usually less than two minutes. Even when four friarbirds were in the tree together no intraspecific aggression was noticed, although the birds seemed to keep in pairs. When a single bird was alone in the tree it called almost continuously.