

# Food plants of the Eungella Honeyeater (*Bolemoreus hindwoodi*)

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## Abstract

The Eungella Honeyeater (*Bolemoreus hindwoodi*) is classified as Vulnerable under the Nature Conservation Act 1992 due to its limited distribution to rainforest between Cathu State Forest and Crediton State Forest centred on the Clarke Range 70 km to the west of Mackay, Qld. Between January 2019 and December 2020, the feeding habits of banded and unbanded Eungella Honeyeaters were monitored at four sites in the Dalrymple Heights area and one site in Crediton State Forest, 11 km north and south respectively from the township of Eungella, Qld. Individuals were observed feeding on the flowers and fruits of thirty species of native trees and a further seven species of cultivated or non-native species, a far broader range of plant species than previously recorded for this species.

Mean body mass of captured individuals remained constant throughout the period of study. There was evidence of movement to preferred feeding plants at different times of the year consistent with the wide range of flowering and fruiting species that are utilized throughout the year. There was also evidence of adaptive behaviour by the Eungella Honeyeater, with certain plant species used only in times of limited food availability and ignored when other food sources were available. A preference for certain non-native plant species (e.g. *Lantana camara*) when those species were in flower was evidenced by flocking behaviour, providing a further indication of adaptability to changing food types in this honeyeater. Gaining an understanding of the food needs of this honeyeater will help to shed light on its vulnerability to climate change and the influx of non-native plant species.

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## Introduction

The Eungella Honeyeater (*Bolemoreus hindwoodi*) is mainly restricted to the higher altitude rainforest of the Clarke and Connors Ranges, inland from Mackay, Qld, often above 900 m asl (Higgins *et al.* 2001); but at times they can be seen lower in the Finch Hatton Gorge area at 150 m asl. Individuals of this species can also be observed during the dry season May through to November in *Eucalyptus* woodland communities not far from these rainforests. The reasons for the species' limited

range, and local movements, including occasional use of habitats outside of rainforest, are not well understood.

The Eungella Honeyeater is a medium-sized honeyeater (20-25 g body weight), with a short decurved bill and a mostly brown to grey body. The most noticeable facial feature is a narrow off-white gape and moustache stripe that extends through and around the bottom and rear of the eye, almost meeting the small, separate off-white and upswept

narrow plume on the rear ear-coverts (Higgins *et al.* 2001). The species was long considered to be conspecific with the Bridled Honeyeater (*Bolemoreus frenatus*) of the Wet Tropics before being described as a separate species in 1983 (Longmore & Boles 1983).

Little is known of the habits, social structure and food sources of the Eungella Honeyeater. The species is seen often in pairs, or singly, in the upper canopy of the forest habitats that they favour. During times of the year when there is an abundance of flowering trees (e.g. *Elaeocarpus grandis* and *Corymbia intermedia*), larger groups are often seen, usually quite gregariously moving around the canopies of such trees. Records show that the Eungella Honeyeater is a nectarivorous species that forages for nectar at flowering trees and mistletoes, but it will also feed on insects (Higgins *et al.* 2001). Observations have shown the species feeds extensively on Climbing Pandanus (*Freycinetia excelsa*) when it is in flower, with other records of feeding on flowers of *Lophostemon*, *Callistemon* and *Amyema* (Higgins *et al.* 2001). The honeyeater has also been recorded feeding in *Eucalyptus* and *Casuarina* species where the food source was considered to be insects (Thyer 1998).

In this study, we document food plants of the Eungella Honeyeater throughout the year, identifying sources of food not previously identified which may help explain the movements, social behaviour and adaptability of the species to change. Observations to date (summarized in Higgins *et al.* 2001) have involved point-in-time records, providing an incomplete picture of the needs of this species. By monitoring this species throughout the year, we address gaps in knowledge and provide important information to aid in the conservation of this highly range-restricted species.

## Methods

From January 2019 to August 2020, birds at two sites on Chelmans Road (1: -21.055519°, 148.565353°, 2: -21.055519°, 148.565353°), one on Chelmans Road Forest Track (-21.03061°, 148.569901°), one site on Dalrymple Road (-21.034822°, 148.597198°) and a site in Crediton State Forest (-21.24788°, 148.52033°) were monitored regularly as part of a broader program to collect long-term population statistics on Queensland's birds (Coleman 2020). This work has

resulted in 673 birds of 40 species being banded at these sites, with 123 recaptures of previously banded birds. This total has included banding of 55 Eungella Honeyeaters and 9 recaptures of this species (Coleman *et al.* 2021).

All birds caught were banded and a series of morphometric measurements taken (to the nearest 0.1 mm), including flattened wing chord, total head and bill length, tarsus length and, for honeyeater species, bill to feather and bill to skull (see Lowe 1989 for details). Birds were also weighed to the nearest 0.1 g and, for Eungella Honeyeaters, each bird was fitted with a unique sequence of colour bands to facilitate individual identification in the field.

In addition to the standardised banding procedures used in regular visits to these sites, the behaviour of Eungella Honeyeaters seen was monitored and recorded. Observations included the presence and number of birds caught, their activity and, if feeding, what food plants or other food sources they were using. Surveys included identification of all flowering plants within 100 m of the central point of the site as a baseline for each site. This was enhanced further by then recording all flowering or fruiting plants within a 30 m radius of the central point at each banding location on each visit. Identification of food plants was done in the field where possible and where identification was not possible or needed confirmation, samples and or photographs were taken for later identification. Resources used in identification included information held by the Mackay Regional Botanic Gardens and the Australian Virtual Herbarium (<https://avh.chah.org.au/>).

## Results

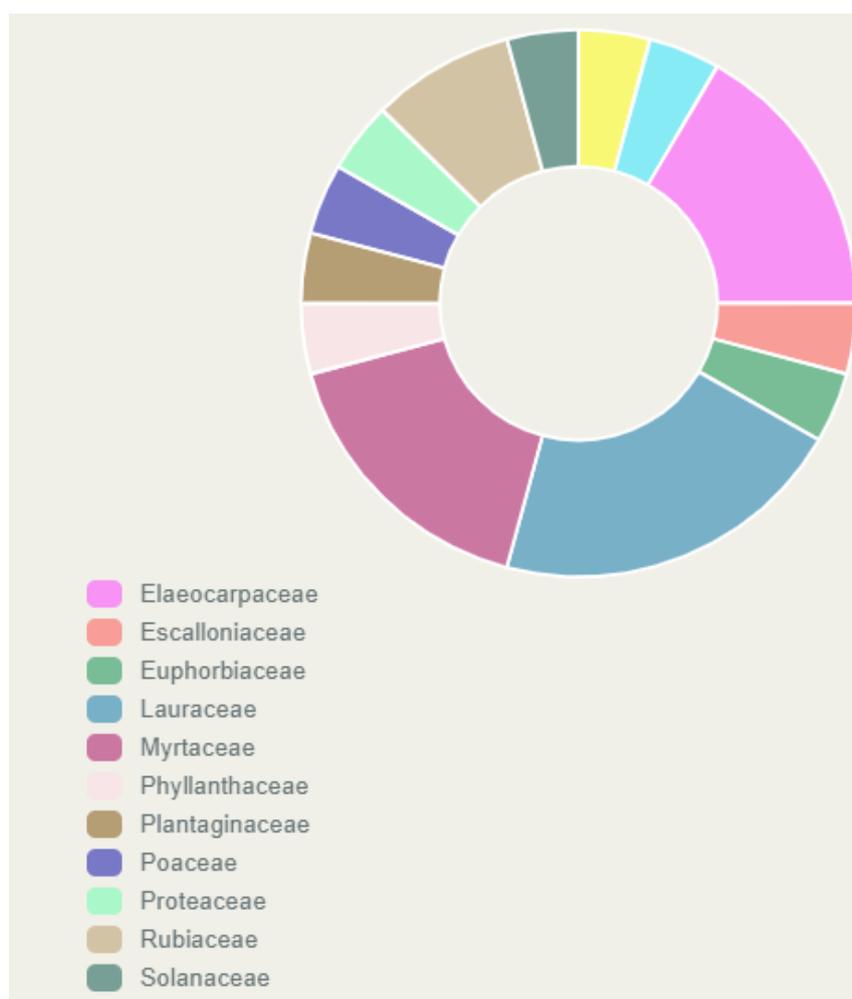
The numbers of Eungella Honeyeater caught at each location on each visit are shown in Table 1. Although the species was seen or heard at every catching event, the numbers caught varied significantly accounting for between 0 and 53% of the catch. The highest catch of 19 birds at one of the Chelmans Road locations involved birds feeding on non-native species planted along the forest edge.

The naturally occurring food plant families available at each location in the study are shown in Figs. 1-3. At the banding site at Dalrymple Road, over 50% of the potential food plants are from the

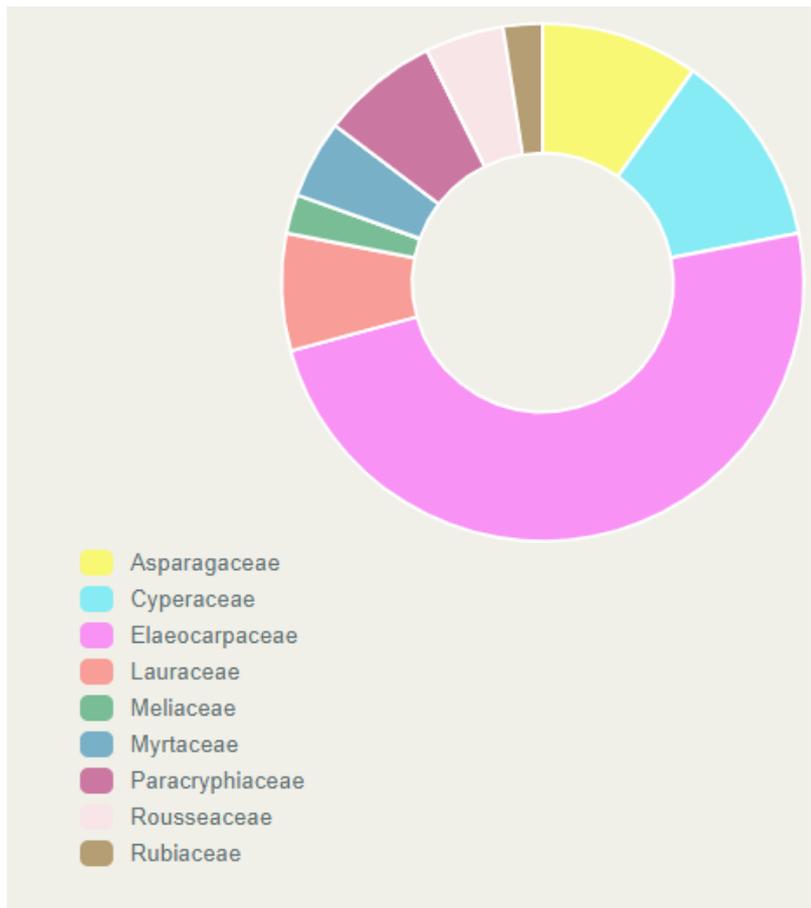
**Table 1. Numbers of Eungella Honeyeaters captured at each location on the Central Mackay Coast by date, expressed as a total and as a percentage of the overall catch.**

Figures are number caught, and in brackets number caught expressed as a percentage of the total catch.

Location	Jan.-Feb. 2019	May 2019	Aug.-Sept. 2019	Nov.-Dec. 2019	Feb. 2020	May 2020	Sept. 2020	Nov. 2020
Chelmans Rd, Site 1 (Fig. 1)	4 (3.8)		1 (2.2)				10 (25.6)	19 (52.8)
Chelmans Rd, Site 2				0 (0.0)			4 (13.3)	0 (0.0)
Chelmans Rd, Forest Track	1 (8.3)	6 (35.3)	2 (4.4)	4 (12.5)	2 (10.5)	0 (0.0)		1 (4.2)
Dalrymple Rd Site (Fig. 2)		3 (14.3)		2 (4.8)	0 (0.0)			0 (0.0)
Crediton State Forest (Fig. 3)						3 (4.5)	1 (1.5)	0 (0.0)



**Figure 1. Plant families recorded at Chelmans Road Track site in 2019 and 2020.** Chart retrieved from Australian Virtual Herbarium <https://avh.chah.org.au/>, accessed 26 September 2020.

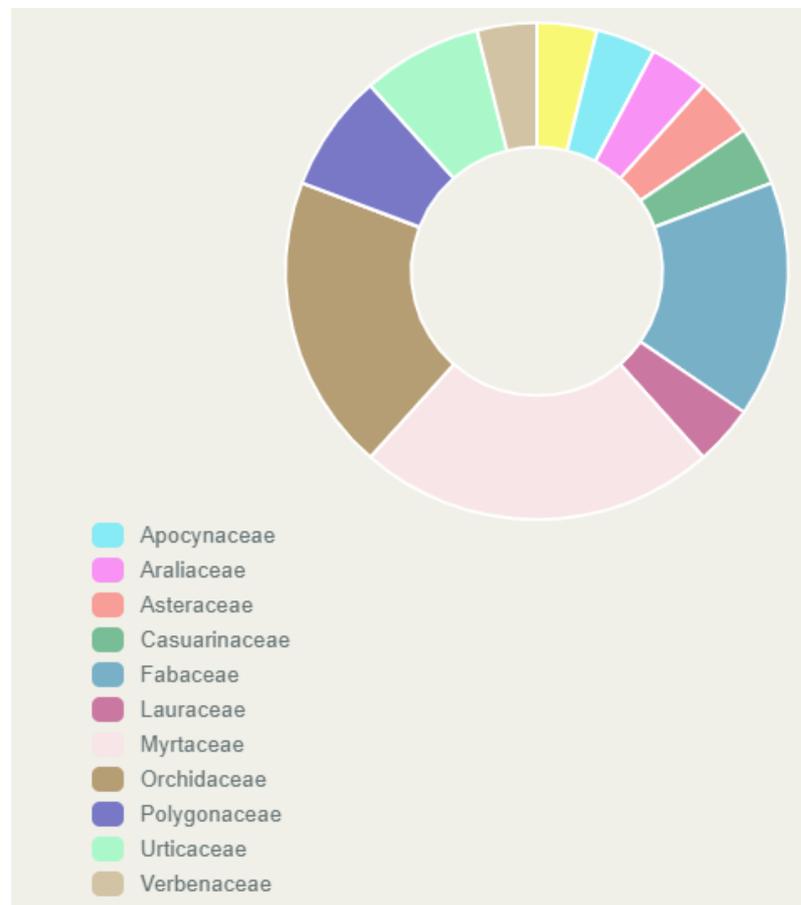


**Figure 2. Plant families recorded at the Dalrymple Road Banding Site in 2019 and 2020.**

Chart retrieved from Australian Virtual Herbarium <https://avh.chah.org.au/>, accessed 26 September 2020.

**Figure 3. Plant families recorded at Crediton State Forest Site in 2019 and 2020.**

Chart retrieved from Australian Virtual Herbarium <https://avh.chah.org.au/>, accessed 26 September 2020.



family *Elaeocarpaceae* with a further eight families represented in the forest in that site (Fig. 2). The flora on the two Chelmans Road sites were of a similar composition. The family ratios identified at the Chelmans Road Track site (Fig. 1) differ from those at the Dalrymple Road site (Fig. 2); the family *Elaeocarpaceae* is not as dominant with three families almost equally accounting for over 50% of the families present: *Elaeocarpaceae*, *Myrtaceae* and *Lauraceae*. Fig. 3 shows the flowering plant families recorded at the Crediton State Forest site. This site demonstrates a very different flora, dominated by the *Orchidaceae*, *Myrtaceae* and *Fabaceae*.

The Eungella Honeyeater was recorded feeding on a range of flowers and fruits during this study (Table 2). We identified 30 native food species, with 25 species used when flowering and fruit being consumed from ten species. A further seven species that are not native or are native cultivars were recorded as food sources by the Eungella Honeyeater (Table 3). Species in the *Myrtaceae* family accounted for eight species of food tree with five in the *Elaeocarpaceae* and four in the *Proteaceae*. Together the species in these three families accounted for 57% of the native food sources identified and 46% of all species identified.

Figure 4 shows the number of trees counted in each site survey as an indication of abundance of each of the families. The Dalrymple Road and Chelmans Road sites had higher densities of *Elaeocarpaceae* Juss. (20) than *Myrtaceae* Juss. (2) but the frequency of encounters with *Myrtaceae* Juss. were far above *Elaeocarpaceae* Juss at the Crediton site (Fig. 3). In contrast the Chelmans Road sites (Fig. 1) had higher in diversity of families with larger number of *Lauraceae* Juss. at this site. Interestingly there were fewer encounters with Eungella honeyeaters at Chelmans Road site 2 when compared to the other Chelmans Road sites (Table 1).

Crediton State Forest (Fig. 3) in contrast had a higher number of *Myrtaceae* Juss. species (6) and frequency of encounters with those species than the Dalrymple Road site. When the species *Eucalyptus tereticornis* Sm. subsp. *tereticornis* and *Corymbia intermedia* (R.T.Baker) K.D.Hill & L.A.S.Johnson were in flower, higher numbers of Eungella Honeyeaters were observed, notably in Regional Ecosystems 8.12.9 (*Eucalyptus tereticornis* +/- *Corymbia intermedia* +/- *Lophostemon*

*suaveolens* woodland on undulating uplands). Some plant species, when flowering, were associated with flocking behaviour in the Eungella Honeyeater. This was evident when *Syzygium erythroxum* (S.Moore) B.Hyland was in flower, as there were more captures of birds in nets placed around flowering specimens. We also observed that groups of more than twenty Eungella Honeyeaters congregated in flowering specimens of *Elaeocarpus grandis* F.Muell.

*Elaeocarpaceae* Juss. & *Myrtaceae* Juss. were the dominant canopy and sub-canopy families where Eungella Honeyeaters were most frequently encountered. Fig. 4 shows the families that were mostly likely to be encountered by Eungella Honeyeaters at monitoring sites.

Reduced availability of flowering plants (*Elaeocarpaceae* Juss. and *Myrtaceae* Juss) in summer and winter likely resulted in Eungella Honeyeaters consuming fruits from a number of plant species (Table 2). Species that were most frequented for fruits were *Myrsine porosa* F.Muell. and *Freycinetia excelsa* F.Muell., and in higher elevations above 900 m altitude *Myrsine ireneae* Jackes subsp. *ireneae* and *Amylothea dictyophleba* (F.Muell.) Tiegh.

In spring, Eungella Honeyeaters fed almost exclusively on trees and shrubs from the family *Myrtaceae* Juss. This coincided with the flowering of species of *Eucalyptus* L'Hér., *Corymbia* K.D.Hill & L.A.S.Johnson and *Syzygium* P.Browne ex Gaertn. and continued till early summer, when other foods became available.

The use of non-native species around the banding sites was also apparent (Table 3) with flocking behaviour observed when *Jacaranda mimosifolia* was flowering. Eungella Honeyeaters were also recorded feeding regularly on *Grevillea banksii* cultivars and a number of other species more irregularly.

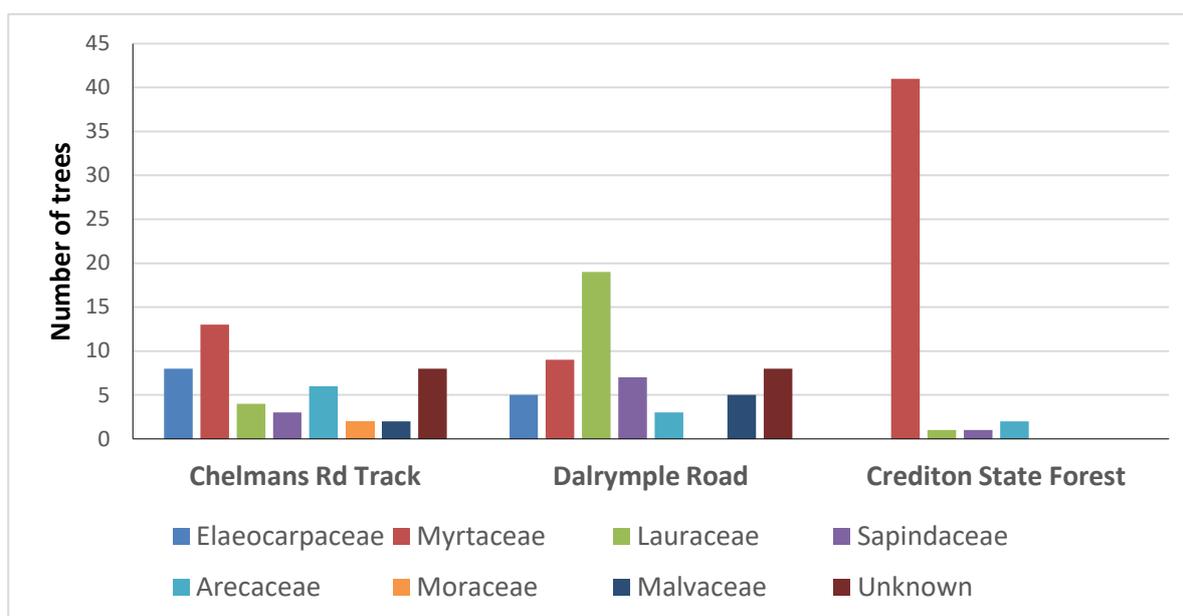
Body mass in the Eungella Honeyeater stayed relatively constant throughout the year (Fig. 5), with no significant difference in body mass between visits (ANOVA  $F=1.3$ ,  $df=10,49$ ,  $P=0.3$ ). This observation, together with the flowering phenology of plant species/families around the Clarke and Connors Ranges, suggests that there is a procession of flowering and fruiting in all seasons across the region that sustains this species.

Table 2. Native species on which the Eungella Honeyeater was observed feeding at study sites on the Central Mackay Coast from 2019 to 2020.

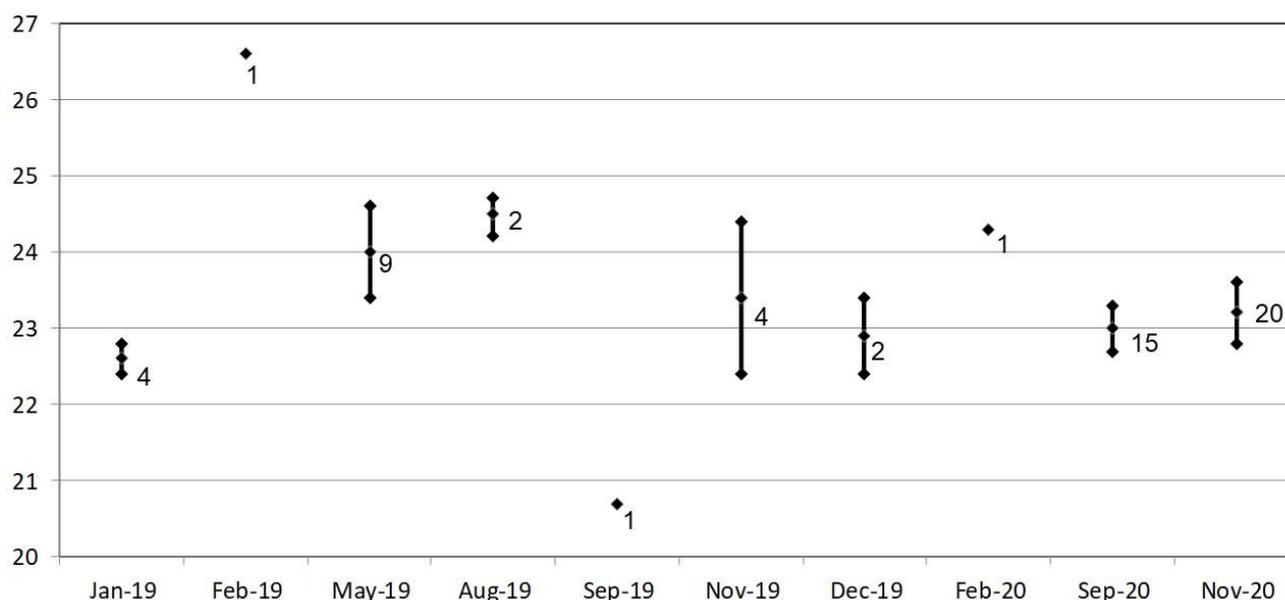
Family	Species	Flower	Fruit
Arecaceae	<i>Archontophoenix alexandrae</i>	X	X
Bignoniaceae	<i>Pandorea floribunda</i>	X	
Elaeagnaceae	<i>Elaeagnus triflora</i> var. <i>triflora</i>	X	X
Elaeocarpaceae	<i>Elaeocarpus foveolatus</i>	X	
Elaeocarpaceae	<i>Elaeocarpus grandis</i>	X	X
Elaeocarpaceae	<i>Elaeocarpus largiflorens</i> subsp. <i>largiflorens</i>	X	
Elaeocarpaceae	<i>Sloanea langii</i>	X	
Euphorbiaceae	<i>Mallotus philippensis</i>	X	
Goodeniaceae	<i>Scaevola enantophylla</i>	X	
Loranthaceae	<i>Amylothea dictyophleba</i>	X	
Meliaceae	<i>Synoum glandulosum</i> subsp. <i>paniculosum</i>	X	X
Myrsinaceae	<i>Myrsine porosa</i>		X
Myrsinaceae	<i>Myrsine ireneae</i> subsp. <i>ireneae</i>		X
Myrtaceae	<i>Corymbia intermedia</i>	X	
Myrtaceae	<i>Corymbia tessellaris</i>	X	
Myrtaceae	<i>Eucalyptus thozetiana</i>	X	
Myrtaceae	<i>Eucalyptus tereticornis</i>	X	
Myrtaceae	<i>Syzygium erythroxum</i>	X	X
Myrtaceae	<i>Syzygium australe</i>	X	
Myrtaceae	<i>Syzygium johnsonii</i>	X	
Myrtaceae	<i>Syzygium wesa</i>	X	X
Pandanaceae	<i>Freycinetia scandens</i>		X
Pandanaceae	<i>Freycinetia excelsa</i>	X	
Proteaceae	<i>Bleasdalea bleasdalei</i>	X	
Proteaceae	<i>Grevillea hilliana</i>	X	
Proteaceae	<i>Stenocarpus sinuatus</i>	X	
Proteaceae	<i>Helicia glabriflora</i>	X	
Rhamnaceae	<i>Alphitonia petriei</i>		X
Rhamnaceae	<i>Emmenosperma cunninghamii</i>		X
Sterculiaceae	<i>Argyrodendron actinophyllum</i> subsp. <i>diversifolium</i>	X	

**Table 3. Plant species that are not locally native on which the Eungella Honeyeater was observed feeding, Central Mackay Coast from 2019 to 2020.**

Native cultivars		Introduced	
Family	Species/Cultivar	Family	Species
Myrtaceae	<i>Melaleuca citrina</i> cultivar	Amaryllidaceae	<i>Agapanthus</i> sp.
Proteaceae	<i>Grevillea banksii</i> cultivar	Bignoniaceae	<i>Jacaranda mimosifolia</i>
		Musaceae	<i>Musa acuminata</i>
		Verbenaceae	<i>Lantana camara</i>
		Verbenaceae	<i>Stachytarpheta jamaicensis</i>



**Figure 4. The total number of trees (>20 cm stem diameter) counted from each plant family at monitored sites on the Central Mackay Coast in 2019 and 2020.**



**Figure 5. Mean (± standard error) body mass (in grams) of Eungella Honeyeaters caught on the Central Mackay Coast between January 2019 and December 2020. Numbers are of birds weighed.**

## Discussion

This study has demonstrated that the Eungella Honeyeater feeds on a broader diversity of food plants than has been previously reported, and that they move seasonally in pursuit of food resources. There were no observations of Eungella Honeyeaters feeding on *Sapindaceae* Juss. or *Malvaceae* Juss., even though these families were frequently encountered in the rainforest habitats on the Clark and Connors Ranges.

Our observations of the Eungella Honeyeater demonstrate that this species can be opportunistic, utilising many facets of the plant communities in the Clarke and Connors Ranges located in the Central Mackay Coast Bioregion of Queensland. Over the two years of the study (2019-2020), this species showed an adaptability to changes in environmental conditions, and, in that time, fed on multiple families of plants and used different parts of each species (flowers, fruits) within those families. One tendency that the Eungella Honeyeater showed was to broaden its food selection during extremes of prolonged hot and dry conditions in spring of 2019, and the sudden cold snaps in early winter 2020, which caused flower and fruit drop, taking species that were under-utilised during more favourable times.

The only activity involving plant species of the family *Lauraceae* Juss. was of birds observed foraging around the bark and leaves, suggesting that this was protein-seeking behaviour, with the birds feeding on insects. Similar behaviour has been noted in this species before (Thyer 1998) and may reflect dietary needs associated with physiologically stressful activities such as breeding or moulting.

Many authors (Higgins *et al.* 2001) have considered *Freycinetia* Gaudich. to be a main food source for the Eungella Honeyeater. Our observations show that although they do frequent this genus, they utilise a much larger breadth of fruiting and flowering plants throughout their range. The use of non-native species, and an apparent preference for species such as Jacaranda, also indicate the ability of the Eungella Honeyeater to adapt to new food sources when available, demonstrating an adaptability to change.

## Acknowledgements

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