Investigating the nutritional ecology of the Christmas Island Flying-Fox

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Left: Laura collecting Japanese cherries for her study. Middle: Collection of Papaya. Right: Laura holding a captured Christmas Island flying-fox

The Christmas Island Flying-fox (*Pteropus melanotus natalis*; CIFF) is the last endemic mammal on Christmas Island (CI) and is critically endangered. While factors leading to its decline are not well understood, nutritional imbalances stemming from preferential consumption of introduced plants have been theorized as a contributing factor leading to its decline. Nearly 30% of CI has been cleared for phosphate mining and human settlement and much of this area has been re-vegetated with non-native plants many of which the CIFF forages on. Limited studies on flying-fox diets suggest that non-native food sources contain less energy, protein, and essential minerals such as calcium, iron and sodium in comparison to native food sources (Nelson *et al* 2000). Thus, an increased reliance on non-native food plants could ultimately contribute to nutritional imbalances and reduced fitness in flying-foxes.

With help from the ABS Paddy Pallin student grant, this study aimed to determine how CIFFs historically utilized native plants to meet their nutritional requirements, and if the nutritional content of non-native food plants differ from that of native food plants.

Common food plants (nectar, fruit, leaves, stems, and petioles) consumed by the CIFF were collected from May 2018 – February 2019. Nectar and fruit juice were assessed for sugar content and remaining fruit, leaves, stems, and petioles were submitted to a commercial laboratory for nutritional analysis. Results showed that non-native fruit on average had lower quantities of crude protein, calcium, magnesium, sodium, copper, iron, manganese and zinc but higher quantities of carbohydrates and moisture than native fruit. In comparison to all fruit, native leaves had higher quantities of crude protein, content did not vary between native and non-native flowers or fruit in this study. calcium, magnesium , sodium, copper, iron, and manganese but lower carbohydrates and zinc. Sugar

Our findings provide evidence of what CIFF historically consumed to meet their nutritional demands, and how the introduction of non-native food sources could impact nutritional imbalances in the population. Nutritional analysis of native food sources suggested that CIFFs historically obtained the bulk of their energy from fruit and nectar; however, these food sources have minimal amounts of protein and calcium required for energy, growth, and reproduction (Dempsey 2004). Therefore, CIFFs likely supplemented their diets with leaves, petioles, stems, and pollen which are rich sources of essential minerals and protein. In comparison to native fruits, non-native fruit, on average, contained less protein and essential minerals but more carbohydrates. Thus, if the CIFF is preferentially consuming non-native food plants they may not meet nutritional requirements or they may overconsume carbohydrates in order to meet protein demands, resulting in obesity in the population. Alternatively, consumption of excess carbohydrates may provide the excess energy necessary to make long foraging flights across the island (Amitai 2010, Stellar 1986).

A few non-native fruit species had nutritional content similar to native fruit and therefore may be an important non-native food source in the CIFF diet. When choosing plants to re-vegetate mined areas we recommend choosing native food plants or non-native food plants with similar nutritional profiles to maximize nutrition in the population.

The introduction of non-native vegetation is not a unique problem to Christmas Island and is seen all over the world. This study supports the hypothesis that many non-native plants are nutritionally deficient which could lead to decreased fecundity and overall health of flying-foxes if other food sources are not available. This highlights the necessity of providing a diverse dietary landscape in order for flying-foxes to meet their nutritional demands worldwide.

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References:

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