

Resplendent Quetzal Literature Review

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Quetzal sighting near the Cloudbridge Nature Reserve Welcome Centre. Both a male and female were seen in the vicinity in early February 2018.

INTRODUCTION

The Resplendent Quetzal (*Pharomachrus mocinno*) is a magnificent bird in the Trogon family. It has been and is still revered in Central America and is the national bird of Guatemala (Bowes & Allen, 1969). The male Resplendent Quetzal is known for its long tail feathers, which can reach up to 1m in length, and its vibrant colours (National Geographic, 2018). Although the Resplendent Quetzal is well known among avid bird watchers, relatively few in-depth studies have been completed on the species. Due to inhabiting remote cloud forest locations, studies have been challenging to conduct in the past (Skutch, 1944). Only recently has access to their habitat increased, leading to more studies researching Quetzal behaviour. While it is important to understand many aspects of an organism's life history, for the Resplendent Quetzal, it is especially important to understand their nesting needs and behaviour (Gonzales-Rojas *et al*, 2008; Pulgarin *et al*, 2015).

According to the IUCN Red List, the current status of the Resplendent Quetzal in Central America is Near Threatened and the current population trend shows decreasing numbers (National Geographic, 2018; Bird Life International, 2016). The Resplendent Quetzal can be found in high montane forests throughout its range in Central America, including Guatemala, Costa Rica and Panama (The Cornell Lab of Ornithology, 2015b). Resplendent Quetzals, however, now face serious population decline due to the destruction of their montane habitat over the last several decades (Solorzano *et al*, 2000). The few research studies that have been completed on the Resplendent Quetzal have determined that habitat destruction has significantly contributed to the lack of suitable nest sites (Siegfried *et al*, 2010; Skutch, 1944).

This lack of nesting sites is an important limiting factor that is affecting the Resplendent Quetzal population throughout its range, in both cloud forest locations at Monteverde, and San Gerardo de Rivas in Costa Rica (Bowes & Allen, 1969; Siegfried *et al*, 2010). Due to the lack of secondary hole cavities, interest in creating artificial nest boxes to improve the availability of suitable nest sites has increased recently. The Monteverde Cloud Forest Reserve has already begun a project to place artificial nest boxes in their montane forest and have had success with breeding pairs using the artificial sites. The

Cloudbridge Nature Reserve, located near San Gerardo de Rivas, hopes to be successful as well, using artificial nest boxes to increase Resplendent Quetzal reproduction in their very own cloud forest, as they continue to reforest their high elevation parcel of land.

OVERVIEW

Range

The Resplendent Quetzal is a member of the Trogonidae family, which contains 39 species (Espinosa de Los Monteros, 1998), of which the Resplendent Quetzal is the most well-known and perhaps the most magnificent (Skutch, 1944). Trogons occur from Central America, through South America, the West Indies, sub Saharan-Africa, India to Malaysia and the Philippines (Encyclopaedia Britannica, 2018), however, the Resplendent Quetzal is endemic to the Americas (The Cornell Lab of Ornithology, 2015b). Although many trogon species live in hot lowland areas (Encyclopaedia Britannica, 2018), the Resplendent Quetzal prefers the high montane forests of Central America (Skutch, 1944). The Resplendent Quetzal is an altitudinal migrant whose home range extends to elevations between 1800m – 2000m and organisms migrate to lower elevations to breed (Solorzano *et al*, 2000). Skutch (1944) previously believed the Resplendent Quetzal home range extended anywhere from 1500m – 2700m, however, that might be far too broad of an estimate. The Helm Field Guide to Birds of Costa Rica (Garringues & Dean, 2007) indicates that the home range for the Resplendent Quetzal is within 1400m – 1600m, but Resplendent Quetzals at the Cloudbridge Nature Reserve are most common at elevations of around 2000m during the non-breeding season.

Diet

The Resplendent Quetzal primarily feeds on fruiting members of the Lauraceae family (Wheelwright, 1983). Not only do they move to lower elevations to breed, but their migratory behaviour also corresponds to the availability of Lauraceae fruit (Solorzano *et al*, 2000; Wheelwright, 1983). Resplendent Quetzals feed primarily on small avocado-like fruits from the laurel family (Dayer, 2010), and are considered specialized fruit-eating birds (Wheelwright, 1983). Wheelwright (1983) found that Resplendent Quetzals in the

Monteverde cloud forest feed on 12-18 species of fruits at any specific time of year and upwards of 41 different species annually. They depend heavily on 18 drupe species in the laurel family, including avocados as well as iras (*Ocotea spp.*) and aguacatillos (*Persea spp.*). The peak timing of breeding season is determined by the period of highest abundance and species richness of fruiting laurel trees (12-15 species) (Wheelwright, 1983), showing that they are seasonal migrants that “track” and move with fruit availability (Skutch, 1944). Although Quetzals do eat insects, snails, frogs and lizards, capturing living prey requires more energy expenditure; consequently, they are used as a food source much less frequently than fruit. Only during the first 10 days of parents feeding their hatchlings does animal food become more important than fruit (Wheelwright, 1983).

Nesting

The nesting biology of Neotropical Quetzals is for the most part poorly understood (Pulgarin & Laverde, 2015), however, slightly more is known about Resplendent Quetzals. Studies have found that Resplendent Quetzals migrate to lower elevations during breeding season (Bowes & Allen, 1969; Skutch, 1944; Solorzano *et al*, 2000). They come down from high elevations to look for suitable nesting sites (Solorzano *et al*, 2000). Resplendent Quetzals are secondary cavity nesters and modify natural cavities or abandoned woodpecker cavities in snags (Siegfried *et al*, 2010). A snag is defined as a standing dead or dying tree, often with its top missing (Washington Department of Fish and Wildlife, 2018). Studies have found that a breeding pair will excavate the original cavity to suit their needs (Bowes & Allen, 1969; Siegfried *et al*, 2010). While Acorn Woodpecker holes are around 15.2 cm x 15.2 cm (6” x 6”) (The Cornell Lab of Ornithology, 2015a), Resplendent Quetzals will enlarge these cavities to an average size of 20.3 cm x 20.3 cm x 30.5 cm (8” x 8” x 12”) (below entrance hole) before laying their eggs (Bowes & Allen, 1969). They will also enlarge the entrance hole of their nest to around 10 cm x 10 cm (4” x 4”) (Pulgarin *et al*, 2015).

The beaks of Resplendent Quetzals are not built with the same strength of woodpeckers and so they require the snags to be in a state of decay in order for them to excavate the woodpecker hole or natural cavity further (Pulgarin *et al*, 2015). Many researchers believe that a breeding Quetzal pair needs to partake in some excavation of

their nest sites. Cavity excavation is believed to play a role in ovulation and is most likely necessary for the female to lay her eggs (Bowes & Allen, 1969). Each female will lay two light blue coloured eggs in the bottom of the nest cavity (Pulgarin *et al*, 2015) and will nest in the same tree for subsequent years, until the wood structure finally gets too weak or the snag collapses (Siegfried *et al*, 2010).

Studies, completed in both Guatemala and Costa Rica, have found that the average nest height varies between locations (Bowes & Allen, 1969; Siegfried *et al*, 2010). Siegfried *et al*, (2010), found the average nest height in Costa Rica to be 6.3 m and in Guatemala to be 10.8 m, whereas Bowes & Allen (1969) found the average nest height in Guatemala to be 9.3 m at their two study sites. Another study found nest height relative to the height of the tree to be important (Siegfried *et al*, 2010), but as we are using living trees as well as snags to encourage a wider range of possible nesting sites, we cannot account for relative nest height for each nest placed in this project and will dismiss it. Moving forward, however, if only snags are chosen for nest box placement, the average relative nest height (height of nest/height of tree) was found to be 0.76 in Costa Rica and 0.77 in Guatemala (Siegfried *et al*, 2010).

Incubation and Care of Young

Skutch (1944) did an inclusive study on the life history of Resplendent Quetzals, during which he monitored nest sites and breeding pairs extensively. He found that both males and females share the responsibilities of caring for the young. Skutch (1944) recorded switch times and found that both the males and females took shifts excavating the nest cavities as well as caring for the hatchlings. The shifts were found to change at all times of day, with the average shift being around 3- 4 hours for both the male and female Quetzal, however, the female incubated the young overnight for upwards of 12 hours. Typically, the male began his morning shift between 5:52am and 7:27am and roughly 4 hours later the female returned for her midday shift. The male performed one more shift during the day before the female took over again at dusk (around 5:30pm – 6:00pm) for the night shift once more (Skutch, 1944). Lebbin (2007) found the same pattern of incubation and care in his study as well when he compared the nesting behaviour and food provisioning of the Resplendent Quetzal to the Pavonine Quetzal. Due to this consistent

activity, no set time is required to monitor the nest boxes, however, monitoring does need to be completed for long periods of time. In order to see the shift changes and make sure that the nest box is in use, monitoring should be done at different times of day and at least 2-3 times a week.

Artificial Nest Boxes

Very few other attempts have been completed to introduce artificial nest boxes into Resplendent Quetzal territory to increase the availability of suitable nesting sites for breeding pairs (Siegfried *et al*, 2010). One project was completed in Guatemala in the 1970's, in which they used nest boxes elevated on tall poles, but without success (LaBastille, 1973). The most recent attempt in Costa Rica was at the Monteverde Cloud Forest Reserve, where they wired nest boxes to numerous trees in attempt to increase the number of suitable nesting sites for Resplendent Quetzals in the area. The Monteverde Cloud Forest Reserve has been contacted about what they did, what materials they used, how they created their nest boxes and so forth, but they are in the process of finalizing their report for publication and will only release their information thereafter. Hopefully the information will be available soon as a reference going forward for the project here at the Cloudbridge Nature Reserve.

Moving forward after my preliminary research, I decided to begin with a project size of 5 artificial nest boxes. The project variables chosen to control were the wood type used, size of entrance hole and nest cavity, tree placement height and nearness to hiking trails. It was important to try and control some variables in order to minimize the variation between artificial nest boxes. Using Burio (*Heliocarpus americanus*) tree deadfall, the nest cavities were excavated and one nest has so far been placed on Sendero Principal. In time, the 4 other nest boxes will be placed throughout the Cloudbridge Nature Reserve, in hopes that breeding Resplendent Quetzals will use the artificial sites. By monitoring the sites and assessing the placement locations, it will hopefully be possible to determine what factors are affecting nest box usage for nest box construction and placement in subsequent years.

SEARCH METHODS

Due to there being very few in-depth studies on Resplendent Quetzals in general, and even less on their nesting behaviours and requirements, I needed to broaden my search. I included not only Resplendent Quetzals in my search, but also the five other Quetzal species, including: the Golden-Headed Quetzal, Eared Quetzal, Crested Quetzal, Pavonine Quetzal and White-Tipped Quetzal. I used my student account to access journal articles through the Mount Royal University library. Any current student should be able to access journal articles as well using their account. I also made use of credible websites, such as National Geographic in order to learn general knowledge and information about the species.

REFERENCES

- Bird Life International. (2016). *Pharomachrus mocinno*. The IUCN Red List of Threatened Species 2016: e.T22682727A92958465. <http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22682727A92958465.en>. Downloaded on 01 March 2018.
- Bowes, A. & Allen, D. (1969). Biology and Conservation of the Quetzal. *Biological Conservation* 1(4): 297-306.
- Dayer, A. A. (2010). Resplendent Quetzal (*Pharomachrus mocinno*), version 1.0. In Neotropical Birds Online (T.S. Schulenberg, editor). Cornell Lab of Ornithology, Ithaca, New York, USA. <https://doi.org/10.2173/nb.resque1.01>
- Encyclopaedia Britannica. (2018). Trogon: Bird Family. Retrieved February 5, 2018 from <https://www.britannica.com/animal/trogon>
- Espinosa de Los Monteros, A. (1998). Phylogenetic Relationships Among the Trogons. *Trogon* *The Auk* 115(4): 937-954.
- Garrigues, R. & Dean, R. (2007). *Helm Field Guide: Birds of Cost Rica*. London: A&C Black Ltd.
- Gonzalez-Rojas, J., Crus-Nieto, J., Ruvalcaba-Ortega, I. & Cruz-Nieto, M. (2008). Breeding Biology of Eared Quetzals in the Sierra Madre Occidental, Mexico. *Journal of Field Ornithology* 79(1): 20-23.
- LaBastille, A. (1973). Establishment Of A of a Quetzal Cloud-Forest Reserve in Guatemala. *Biological Conservation* 5(1):60-62.

- Lebbin, D. (2007). Nesting Behaviour and Nesting Care of the Pavonine Quetzal (*Pharomachrus pavoninus*). *The Wilson Journal of Ornithology* 119(3): 458-463.
- National Geographic. (2018). Resplendent Quetzal. Retrieved January 31, 2018 from <https://www.nationalgeographic.com/animals/birds/r/resplendent-quetzal/>
- Pulgarin, P. & Laverde-R, O. (2015). The Nest and Eggs of the White-tipped Quetzal (*Pharomachrus fulgidus*) from the Sierra Nevada de Santa Marta, Northern Columbia. *The Wilson Journal of Ornithology* 127(1): 145-148.
- Siegfried, D., Linville, D. & Hille, D. (2010). Analysis of Nest Sites of the Resplendent Quetzal (*Pharomachrus mocinno*): Relationship between Nest and Snag heights. *The Wilson Journal of Ornithology* 122(3): 608-611.
- Solorzano, S., Castillo, S., Valverde, T. & Avila, L. (2000). Quetzal Abundance in Relation to Fruit Availability in a Cloud Forest in Southeastern Mexico. *Biotropica* 32(3): 523-532.
- The Cornell Lab of Ornithology. (2015a). All About Birds: Acorn Woodpecker. Retrieved January 31, 2018 from https://www.allaboutbirds.org/guide/Acorn_Woodpecker/lifehistory
- The Cornell Lab of Ornithology. (2015b). All About Birds: Resplendent Quetzal. Retrieved January 31, 2018 from <https://neotropical.birds.cornell.edu/Species-Account/nb/species/resque1/appearance>
- Washington Department of Fish and Wildlife. (2018). Snags – The Wildlife Tree. Retrieved February 23, 2018 from <https://wdfw.wa.gov/living/snags/>