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Ecological factors influence primate vocal behaviour in a Neotropical Dry Forest: Habitat and behaviour in three species of monkey

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TITLE: Ecological factors influence primate vocal behaviour in a Neotropical Dry Forest: Habitat and behaviour in three species of monkey

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ABSTRACT: Animals across many taxa use auditory signals to convey information over long distances. Animals can alter their vocal behaviour in response to environmental differences such as variation in habitat age or habitat complexity. The seasonal dry forests of the Guanacaste Conservation Area offer a unique situation to study the behaviour of primates in varying habitats as it is a large protected area of one of Earth's most endangered ecosystems. Our research uses a bioacoustic approach to explore the relationship between vocal behaviour and the environment in three tropical primate species: Golden-Mantled Howler Monkeys (*Alouatta palliata*), Geoffroy's Spider Monkeys (*Ateles geoffroyi*), and White-faced Capuchin Monkeys (*Cebus capucinus*). Understanding how behaviour relates to habitat age and vegetation complexity within a protected tropical forest can help to identify areas of particular concern. We hypothesize that habitat maturity and seasonal changes in habitat structure influence the presence of primates as well as primate vocal behaviour. We collected acoustic recordings at 44 sites within the Guanacaste Conservation Area, revisiting sites in both wet and dry seasons. We compared acoustic detections of each of the three species of monkey to vegetation characteristics, and evaluated whether monkey detections changed with time of year. We show that the vocal behaviour of all three monkey species varies with vegetation features and with the transition from the dry season to the rainy season. Our results illustrate

the impacts of restoration programs and provide support for further restoration efforts in other at-risk tropical environments.

KEY WORDS: Bioacoustics, Primate, Neotropical, Conservation, *Alouatta palliata*, *Ateles geoffroyi*, *Cebus capucinus*