

**A comparative evaluation of thermal camera and visual counting methods for primate census in a riparian forest at the Lower Kinabatangan Wildlife Sanctuary (LKWS), Malaysian Borneo**

**ABSTRACT**

A number of primate census techniques have been developed over the past half-century, each of which have advantages and disadvantages in terms of resources required by researchers (e.g., time and costs), availability of technologies, and effectiveness in different habitat types. This study aims to explore the effectiveness of a thermal imaging technique to estimate the group size of different primate species populations in a degraded riparian forest in the Lower Kinabatangan Wildlife Sanctuary (LKWS), Sabah. We compared this survey technique to the conventional visual counting method along the riverbank. For 38 days, a total of 138 primate groups were observed by thermal camera and visually throughout the study. Optimal conditions for the thermal camera were clear weather, not more than 100 m distance from the observer to the targeted area, boat speed ranging between 5 and 12 km/h, and early morning between 04:30 and 05:30 am. The limitations of the thermal cameras include the inability to identify individual species, sexes, age classes, and also to discern between animals closely aggregated (i.e., mothers with attached infants). Despite these limitations with the thermal camera technique, 1.78 times more primates were detected than counting by eye ( $p < 0.001$ ), showing the potential benefit of using thermal cameras as an important tool in primate surveys. Nevertheless, ground truthing must be conducted immediately after, or simultaneously during, the thermal survey to verify the species of animals observed on the thermal imagery.