

## THE ADVANCEMENT OF CAMERA TRAPPING TECHNIQUE IN UNDERSTANDING WILDLIFE ECOLOGY IN SARAWAK

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Decreasing animal populations and increasing threats to ecosystems have expedited the need for research and conservation work (Rovero *et al.*, 2013). Camera trapping (CT) has been proven countless times to be one of the strongest tools for researchers to aid in creating species inventory lists and population density estimations while posing little to no disturbance to the animals (Ancrenaz *et al.*, 2012). This technique was pioneered by George Shiras in 1896 (Brower, 2008) followed by Chapman (1903) and Champion (1927) to photograph some rare and elusive animals with rather 'primitive' camera technology. Until the 1990's camera traps haven't had received much attention on upgrades, while recent advancement have undergone substantial development and technological advances including infra-red sensors and the ability to take several photos or videos in a row and even to record at night in utter darkness. With the advancement of technology, also came affordable prices for cameras, as a result the number of camera trap studies have increased over the last few years (Rovero *et al.*, 2013). For Sarawak though, the number of published research is growing, most of which were are concentrated in protected areas, e.g. Lambir Hills, Lanjak Entimau, Pulong Tau (Mohd-Azlan & Lading, 2006; Mohd-Azlan & Lading, 2013; Brodie & Giordano, 2012; Brodie *et al.*, 2015; Ampeng *et al.*, 2016). The number of unpublished camera trap studies, however, is also considerably higher and covers a larger area in the state. This paper is a compilation of literature review based on publications using camera trapping techniques in Sarawak, Malaysia. This review aims to shed light on the distribution and temporal scales of such studies in Sarawak as well as pointing out their significant results.

Data was collected from published studies and unpublished reports that includes newspaper articles, thesis and government reports that involved camera trapping as at least one of their methods of data collection. Information were obtained from Google Scholar® and published manuscripts. We do not claim that this literature review is exhaustive and includes each and every camera trapping study that has been conducted in Sarawak, as there may be unrecorded surveys for monitoring purpose. However, it is sufficient to demonstrate the usefulness of camera trapping techniques in different areas of research and identifying gaps in research needs in Sarawak. A total of 15 published papers and 2 reports have been examined for a period of ten years. A total of 17 published researches have been carried out in Sarawak from 2006 to 2016, which indicates the increasing popularity of this technique (Figure 1).

The relative absence of studies in Kapit division and the absolute absence in Sibiu division suggest that these areas need further attention in wildlife surveys (Figure 2). There is also lack of studies in Mukah and Limbang division, which has only been looked at in one published paper. Kapit division, for its size, also still seems to be under-represented. In general it can be concluded increased effort will enable researchers to collect more data on rare and elusive species in Sarawak.

Most camera trap studies have been carried out in Totally Protected Areas (TPA) as these are generally less disturbed by anthropogenic activities. For example Lambir Hills National Park, Lanjak Entimau Wildlife Sanctuary, Maludam NP, Kubah NP and Loagan Bunut NP from the years 2003-2006 (Mohd-Azlan & Engkamat, 2006, 2013). Together with Brodie *et al.* (2015) they also set up camera traps in Mulu NP and Pulong Tau NP. In the very west of Sarawak only Tanjung Datu has been investigated (Mohd-Azlan *et al.*, 2010). But camera

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