Impacts of climate change on the potential distribution of fruit bats (Chiroptera: Pteropodidae) in the Philippines

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Climate change is occurring at unprecedented rates and can significantly affect biodiversity through the possible expansion or contraction of habitat ranges. The potential impacts of climate change on bats have been assessed for several species. However, these are yet to be assessed for fruit bats in the Philippines, despite the fact that fruit bat diversity and endemicity in the country are among the highest in Southeast Asia. This study, therefore, aimed to determine the present distribution ranges of three fruit bat species in the Philippines, namely *Ptenochirus jagori*, *Cynopterus brachyotis*, and *Otopteropus cartilagonodus*, and assess their potential changes under future climate change scenarios. Species distribution modeling (SDM) was performed using Maximum Entropy (MaxEnt) through the R-based modular workflow *Wallace* with bat occurrence data gathered from museum data, online databases, and published articles, and bioclimatic variables for the current and future climate scenarios obtained from the WorldClim dataset. Two future CMIP5 climate scenarios, Representative Concentration Pathways (RCPs) RCP4.5 and RCP8.5, were projected for the year 2050 using CNRM-CM5 as the Global Climate Model. The current and future distribution ranges were mapped, and suitable habitat areas were measured and compared for each species to determine a possible range shift. Models reveal that most of the suitable habitats can be found in forested areas, mountains, and mountain ranges. All bat species share a similar potential decline in habitat suitability under higher mean annual temperatures but showed differing responses in the remaining bioclimatic variables. Higher rainfall could be favorable for endemic species of *P. jagori* and *O. cartilagonodus* but unfavorable for *C. brachyotis*. Habitats of *O. cartilagonodus* appear to be less tolerant to temperature and precipitation seasonality as opposed to more widespread species *C. brachyotis* and *P. jagori*, whose habitats have higher seasonality. Under climate change, similar trends of distribution range contraction are observed for all three species. *C. brachyotis* and *P. jagori* ranges are predicted to migrate upwards, while the *O. cartilagonodus* range is projected to be further confined towards higher elevations due to warming temperatures. The projected current scenario maps can guide future efforts to identify critical habitats and priority areas for fruit bats in the country, while future range projections provide baseline information for understanding the potential impacts of climate change. Models produced can also aid in conservation management efforts to maintain and enhance the identified suitable forested habitats and corridors to allow fruit bats' movement and expansion of foraging sites.

Keywords: fruit bats, climate change, MaxEnt, species distribution modelling (SDM), *Wallace*