#### Developing a conservation action plan for Forest Owlet (Heteroglaux blewitti), a Critically Endangered species endemic to central India



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Among the most crucial outcomes of the project was the drafting of the Forest Owlet Conservation Action Plan. This was successfully completed because of the active contribution of several individuals. Their names are listed in the Conservation Action Plan document and we take this opportunity to thank each of them wholeheartedly.

## **EXECUTIVE SUMMARY**

The Forest Owlet *Athene* (*Heteroglaux*) *blewitti* is an Endangered bird with a very restricted distribution, currently limited to the Teak-dominated landscape of some parts of Central India and the northern Western Ghats. Though there have been several surveys and studies on the species, the reasons for its very narrow distribution remain unclear. The objectives of the current study were:

- To update the distribution range of the Forest Owlet using a hierarchical approach through regional Species Distribution Models (SDM), and field surveys.
- 2. To conduct an occupancy sampling based on presence and habitat covariate data in grids shortlisted from SDMs.
- 3. To examine if the populations of the species are genetically connected using NGS techniques.
- 4. To explore if habitat connectivity might have influenced genetic connectivity among populations using GIS techniques
- 5. To prepare a Forest Owlet Conservation Action Plan collaboratively with stakeholders including the Forest Departments, researchers and organisations involved in Forest Owlet research.

#### Methods:

A previous distribution model for the Forest Owlet was used to identify areas to survey in Maharashtra, Gujarat and Madhya Pradesh. This model was updated using primary data gathered in field surveys (January 2017 to March 2020), and secondary data from published literature. Occupancy surveys for Forest Owlet, Jungle Owlet and Spotted Owlet were conducted in and around the Tansa Wildlife Sanctuary, Maharashtra and the Dang Forests, Gujarat. The area was overlaid with 1x1 km grids and 2.5% of randomly picked grids were surveyed using the call-playback method. Previous sites of bird studies in the Dangs region were resurveyed in March 2020. Landscape and climate change data were analysed to detect changes over several decades. Autonomous Recording Units (ARU) were used to explore the utility of passive monitoring for Forest Owlet and to standardise the technique. Blood samples of the three owlets were obtained after receiving necessary permits. DNA was extracted using commercially available kits and sequenced on the Illumina HiSeq 10X platform (150 bp paired-end), for a 30x genome coverage. Ultra Conserved Elements (UCE) were extracted from sequenced genomes and Maximum Likelihood, Bayesian and multispecies coalescent approaches were used for inferring phylogeny. Demographic change for the three owlets over a period of 500,000 years (Late Quaternary) was performed through Pairwise Sequentially Markovian Coalescent (PSMC) analysis. A stakeholders meeting was conducted to draft the Forest Owlet Conservation Action Plan.

#### **Results:**

A total of 410 call-playback points yielded 61 presence points for Forest Owlet. The updated distribution model for the Forest Owlet reveals hotspots in Southwest Gujarat and Northwest Maharashtra. Occupancy surveys in 88 grids revealed that Jungle Owlet occupancy ( $\psi$  = 0.5896, SE = 0.08) was highest followed by Forest Owlet ( $\psi$  = 0.2517, SE = 0.10) and Spotted Owlet ( $\psi$  = 0.1781, SE = 0.07). Forest Owlet showed preference for old-growth forest, open-habitat (agricultural land cover) and avoidance of dense canopy. A total of 46 grids were covered during the resurvey. Assessments of forest cover change over the last two decades showed an overall change of 0.4446 sq. km, across the entire study area. Analysis of climate data revealed some changes in temperature and rainfall across the region since 1988. Results of the resurvey suggest that the Forest Owlet was likely always present in the Dangs region but went undetected in the past. The passive monitoring study, revealed that the software Raven performed 20–70% better than Kaleidoscope in detecting Forest Owlet. The Forest Owlet song had higher detection success than its call. ARUs placed at 300 m from the response site yielded the best results. Phylogenetic analysis with UCEs suggests that the Forest Owlet is an early split from the Athene clade, diverging around 5.2Mya, but sister to other Athene members. Demographic analysis over past climate suggests a low and relatively constant effective population size for Forest Owlet over the Quaternary period. The Forest Owlet Conservation Action Plan was drafted in collaboration with stakeholders outlining research, policy and outreach requirements for the next decade.

#### Salient results of the study:

- Updated distribution model reveals clustered hotspots in southwest Gujarat and northwest Maharashtra.
- Baseline occupancy estimates generated for the three owlets have implications for management and future surveys.
- Resurveys indicate that the Forest Owlet was most likely always present in the Dang Forests but went undetected.
- Passive acoustic detection is a promising technique for future surveys and for monitoring populations of Forest Owlet.
- Well-resolved phylogeny of the *Athene* clade shows Forest Owlet to be an early split in the clade but sister to other *Athene* members.
- Demographic history of Forest Owlet suggests a stable but low population size throughout the Late Quaternary period.
- Forest Owlet Conservation Action Plan prepared in collaboration with stakeholders.