

Spatial and temporal trajectory analysis of the Crested Ibis (Nipponia Nippon) by fusing multiple sources of data

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Abstract

Aim: Crested Ibis is an endangered animal with extremely high ecological, humanistic and scientific value. However, there is still a survival predicament due to increasingly shrinking foraging grounds, serious interference by human behavior, and increased habitat requirements. The geographical environment is significant for Crested Ibis behavior patterns analysis and habitat protection. The spatial and temporal trajectory contains the habitat location and period information, a vital record of the Crested Ibis' habits, and the basis of all research. Nevertheless, there are only a handful of studies on the missing trajectory data and fusing multiple sources of environmental data research methods. **Location:** Henan Province, Shaanxi Province, China **Methods:** The LSTM model was adopted to supplement the missing trajectory data, and cluster mining was performed. Using Spatial and temporal trajectory and geographic data, we developed a Random Forest model to predict the habitat of the Crested Ibis and assessed the habitat suitability in Luoshan Country. **Results:** Based on trajectory, we identified that the Crested Ibis distribution pattern is characterized by high altitude and proximity to woodland and rivers. And the habitat dependence on the village implicates human agricultural activities positively impacting its reproduction. The Random Forest model with high fitting accuracy ($R^2 = 84.9\%$) is superior, and the influence factors were gained, finding that 68% of the area is suitable in Luoshan County. **Main conclusions:** The trajectory complement model and the habitat prediction model are developed to obtain the Crested Ibis' behavioral patterns and habitat distribution. This paper provides a complete method for analyzing Crested Ibis' spatial and temporal trajectory by fusing multi-source data, which is crucial for protecting the survival and reproduction of Crested Ibis.

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