PREDICTIVE SPATIAL MODELLING AND DISTRIBUTION MAPPING OF BORNEAN BANTENG (*Bos javanicus lowi*) IN SABAH, MALAYSIA

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ABSTRACT

Habitat fragmentation and poaching threatens the Bornean banteng (*Bos javanicus lowi*) population within Sabah. The first banteng distribution map was published by Davies and Payne in 1982 using community surveys. A lack of up-to-date information on their current distribution prevents effective conservation and management, and mitigation against the threats. Using quantitative data from camera traps, this study modelled and mapped the habitat suitability of Bornean banteng within Sabah using two species distribution modelling methods: 1) Maximum Entropy (MaxEnt) and 2) Boosted Regression Trees (BRT), to compare their predictive power. Fifty-eight presence and 182 absence of banteng were modelled with twelve environmental predictors, and the predictive power of the models were tested with cross-validation and independent data. Cross-validation AUC values were high for MaxEnt (0.932 ± S.D 0.041), and intermediate for BRT (0.719 ± S.E 0.419), similarly the independent testing AUC values were high for MaxEnt (0.939), and intermediate for BRT (0.713). The most influential environmental predictors for both models were precipitation during driest quarter (MaxEnt: 21.6% and BRT: 31.4%). Tabin Wildlife Reserve was predicted as suitable in the MaxEnt model, however was not suitable in the BRT model. Habitat that receives rainfall between 550 to 600 mm during the driest quarter of the year, and these areas should be targeted for conservation. The MaxEnt model illustrated the central forest and Ulu Tungud Forest Reserve are suitable for banteng. The central reserve is the largest forest patch in Sabah and is highly suitable for banteng; it is essential that the connectivity between forests in this central area is maintained for gene flow and dispersal. The banteng in Tabin Wildlife Reserve are highly fragmented however the nearby forest Kulamba Wildlife Reserve has suitable habitat, therefore a potential wildlife corridor could be developed between these areas.

ABSTRAK

Simulasi kesesuaian habitat dan peta taburan tembadau (Bos javanicus lowi) dalam Sabah, Malaysia

Fragmentasi habitat dan pemburuan haram adalah faktor utama yang mengancam populasi tembadau Borneo (*Bos javanicus lowi*) di Sabah. Peta taburan tembadau dalam Sabah yang pertama oleh Davies dan Payne pada 1982 hanya menggunakan maklumat temuduga komuniti tempatan. Kekurangan maklumat taburan tembadau yang terkini menyebabkan proses pemuliharaan dan pengurusan sukar dan tidak berkesan. Data-data perangkap kamera telah digunakan untuk simulasi dan model habitat yang sesuai untuk tembadau dalam Sabah melalui dua cara: 1) Maximum Entropy (MaxEnt) dan 2) Boosted Regression Trees (BRT) serta membandingkan kekuatan jangkaan model antara dua model tersebut. Simulasi tersebut dijalankan menggunakan 58 data kehadiran dan 182 ketiadaan tembadau, dan 12 jenis peramal persekitaran. Kekuatan jangkaan model telah diperiksa melalui pengesahan silang dan pengesahan data bebas. Nilai AUC pengesahan silang adalah tinggi kepada MaxEnt (0.932 ± S.D 0.041), dan sederhana kepada BRT (0.713± S.D 0.419). Peramal persekitaran yang paling penting dalam dua model tersebut adalah pengendapan musim paling kering (MaxEnt: 21.6% dan BRT: 31.4%). Taman Hidupan Liar Tabin merupakan habitat tembadau yang sesuai mengikut model MaxEnt, tetapi tidak sesuai dalam model BRT. Habitat yang mempunyai taburan hujan antara 550 hingga 600 mm pada musim paling kering dianggap kawasan sesuai untuk tembadau dan perlu dipulihara. Model MaxEnt menunjukkan kawasan hutan di pedalaman Sabah adalah kawasan hutan yang paling besar dalam negeri Sabah dan amat sesuai kepada tembadau. Oleh itu, koridor antara hutan dalam kawasan tersebut perlu dilindungi untuk aliran genetik dan pergerakan tembadau. Koridor hidupan liar antaran Taman Hidupan Liar Tabin dan Taman Hidupan Liar Kulamba diperlukan supaya populasi tembadau antara dua taman tersebut dapat dihubungkan.