

附录1 北京城区乌鸦夜栖地生境因子测量方法
Appendix 1 Measurement of habitat factors in the nocturnal habitat of crows in the Beijing urban area

生境因子	变量	测量方法
Habitat factors	Variables	Measurement
夜栖树因子 Roosting tree factors	树高 Tree height (m)	指从地面基部到夜栖树最高点的垂直距离, 使用激光测距仪测量 Vertical distance from ground base to roost tree apex, measured via laser rangefinder
	胸径 Diameter at breast height (cm)	夜栖树高1.2 m处树干的直径, 使用卷尺测量 Trunk diameter at 1.2 m height of roost tree, measured with a tape measure
	冠幅 Crown width (m)	夜栖树的树冠南北和东西方向的最大宽度 Maximum crown width of roost tree in north-south and east-west directions, measured with a tape measure
	郁闭度 Canopy closure	样方内乔木郁闭度, 划分四个等级: $\leq 25\%$ 、 $25\% - 50\%$ 、 $50\% - 75\%$ 、 $> 75\%$, 记录为1、2、3、4 Arbor canopy density in quadrat, classified into four grades: $\leq 25\%$, $25\% - 50\%$, $50\% - 75\%$, $> 75\%$, recorded as 1, 2, 3, or 4
夜栖环境因子 Roosting environmental factors	噪声 Noise (dB)	乌鸦进入夜栖稳定状态后, 使用分贝仪测量30 s内的最大值, 测量3次, 间隔1 min, 记录平均值 Maximum value within 30 s measured by sound level meter after crows entered stable roosting state, measured 3 times at 1-min intervals, with average value recorded
	照度 Illuminance (lx)	使用伸缩杆将照度仪置于乌鸦栖息高度附近测量的照度, 测量3次, 间隔1 min, 记录平均值 Measured by lux meter placed near crow roosting height via telescopic rod, measured 3 times at 1-min intervals, with average value recorded
	温度 Temperature ($^{\circ}\text{C}$)	使用伸缩杆将环境温度计置于乌鸦栖息高度附近测量的温度, 测量3次, 间隔1 min, 记录平均值 Measured by environmental thermometer placed near crow roosting height via telescopic rod, measured 3 times at 1-min intervals, with average value recorded
	风速 Wind speed (m/s)	使用伸缩杆将风速计置于乌鸦栖息高度附近测量的风速, 记录3 min中的最大值 Measured by anemometer placed near crow roosting height via telescopic rod, with the maximum value recorded over 3 min
	到最近水体距离 Distance to the nearest water (m)	在ArcGIS 10.4.1中测量最近水体的距离 Measured in ArcGIS 10.4.1
	人流量 Pedestrian flow (人/min)	乌鸦进入夜栖稳定状态后, 统计1 min内周围经过的行人数量, 测量3次, 间隔1 min, 记录平均值 Number of passing pedestrians within 1 min after crows entered stable roosting state, counted 3 times at 1-min intervals, with average value recorded
	车流量 Traffic flow (辆/min)	乌鸦进入夜栖稳定状态后, 统计1 min内周围经过的车辆数量, 测量3次, 间隔1 min, 记录平均值 Number of passing vehicles within 1 min after crows entered stable roosting state, counted 3 times at 1-min intervals, with average value recorded
	街道走向 Street orientation	夜栖树所在街道的走向, 记录为: 南-北、东-西、西北-东南、东北-西南 Orientation of the street where the roosting tree is located, categorized as: North-South, East-West, Northwest-Southeast, Northeast-Southwest

生境因子	变量	测量方法
Habitat factors	Variables	Measurement
	到最近道路距离 Distance to the nearest road (m)	指从夜栖树树干到最近道路的垂直距离, 使用激光测距仪测量 Vertical distance from roost tree trunk to the nearest road, measured via laser rangefinder
	最近道路宽度 Width of the nearest road (m)	最近道路的宽度, 使用激光测距仪测量 Measured via laser rangefinder
	建筑密度 Building density	记录夜栖树周围50 m范围内四个方向中几面有建筑, 记录为1、2、3、4 Number of sides with buildings within 50 m of the roost tree across four directions, recorded as 1, 2, 3, or 4
	到最近建筑距离 Distance to the nearest building (m)	指从夜栖树树干到最近建筑的垂直距离, 使用激光测距仪测量 Vertical distance from roost tree trunk to the nearest building, measured via laser rangefinder
	最近建筑高度 Height of the nearest building (m)	最近建筑的高度, 使用激光测距仪测量 Measured via laser rangefinder
	最近建筑是否高于栖树 Whether the nearest building is higher than the roosting tree	目视比较, 记录为1(是)或0(否) Visually compared and recorded as 1 (yes) or 0 (no)

附录2 北京城区乌鸦枝条变量测量方法
Appendix 2 Measurement of branch variables used by crows in the Beijing urban area

变量 Variables	测量方法 Measurement
枝条直径 Branch diameter (cm)	在LiDAR360MLS 8.2中利用矢量编辑功能绘制直径矢量线, 导入ArcGIS 10.4.1后通过计算几何中的“3D长度”计算功能计算获得 The branch diameter was obtained by drawing diameter vector lines using the vector editing function in LiDAR360MLS 8.2, and then calculated via the “3D Length” tool under the Geometry Calculation module after importing the data into ArcGIS 10.4.1
枝条长度 Branch length (m)	在LiDAR360MLS 8.2中绘制乌鸦枝条长度矢量线, 导入ArcGIS 10.4.1后通过计算几何中的“3D长度”计算功能获得 The branch length was obtained by drawing vector lines in LiDAR360MLS 8.2, and then calculated via the “3D Length” tool under the Geometry Calculation module in ArcGIS 10.4.1
枝条角度 Branch angle (°)	在LiDAR360MLS 8.2中绘制乌鸦栖息位置或对照枝条的枝条倾斜度矢量线, 导入ArcGIS 10.4.1后提取起点和终点的三维坐标(x_1 、 y_1 、 z_1 和 x_2 、 y_2 、 z_2), 通过公式 $\theta = \tan^{-1}\left(\frac{ z_2-z_1 }{\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}}\right) \times \frac{180}{\pi}$ 计算获得 Obtained by drawing a vector line along the branch at crow roosting positions or control branch locations in LiDAR360MLS 8.2, and then extracted the 3D coordinates of the start point (x_1 , y_1 , z_1) and the end point (x_2 , y_2 , z_2) in ArcGIS 10.4.1. The angle θ was then calculated by the formula: $\theta = \tan^{-1}\left(\frac{ z_2-z_1 }{\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}}\right) \times \frac{180}{\pi}$
枝条高度 Branch height (m)	在LiDAR360MLS 8.2中绘制乌鸦栖息位置的矢量点, 根据地面点归一化后, 矢量点的z坐标记录为夜栖枝条高度, 对照枝条高度取枝条长度矢量线的中心到地面的垂直高度, 即 $\frac{z_2+z_1}{2}$ The height of nocturnal perching branches was recorded as the z-coordinate of the vector point drawn at the crow's roosting location in LiDAR360MLS 8.2 after ground point normalization. The height of control branches was determined as the vertical distance from the center of the branch length vector line to the ground, calculated as $\frac{z_2+z_1}{2}$