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Review

Synthesizing knowledge gaps to prioritize conservation actions for owls and nightjars in Africa

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Owls (Strigiformes) and nightjars (Caprimulgiformes) play important ecological roles but remain among the least studied avian groups, with critical knowledge gaps potentially limiting effective conservation planning. We conducted a systematic literature review to quantify temporal, spatial, taxonomic and thematic patterns of research on African owls and nightjars. We also developed a Research and Conservation Priority Index (RCPI) that combines conservation concern and research scarcity, examined the relationship between threat status and research attention, and evaluated socio-economic predictors of research effort. Research output increased substantially over the past five decades but remained geographically, taxonomically and thematically uneven, being concentrated in a small number of countries and widespread species. More than two-thirds of species were under-studied or had no published studies. Threat status was not associated with research scarcity, indicating that conservation concern and research attention represent distinct dimensions of species prioritization. The RCPI identified several threatened, range-restricted and Data-Deficient species, including the Annobon Scops Owl *Otus feae*, Itombwe Owl *Tyto prigoginei* and Maned Owl *Jubula lettii*, for which conservation concern coincides with limited scientific knowledge. Research effort was positively associated with the Human Development Index, suggesting that socio-economic capacity influences knowledge production across African countries. These findings highlight persistent research biases and demonstrate the need to align future knowledge generation with conservation planning. Importantly, addressing knowledge gaps should complement, rather than replace, immediate conservation action for species facing known threats. Targeted investment in under-represented regions, passive acoustic monitoring, citizen science and research on under-studied threats will help strengthen evidence-based conservation of Africa's owls and nightjars.

Keywords: Africa, conservation concerns, nocturnal birds, RCPI, research gaps, systematic review.

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Global biodiversity is declining at an unprecedented rate, largely driven by human activities such as habitat destruction, overexploitation,

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pollution and climate change (Dirzo *et al.* 2014, Ceballos *et al.* 2017). These pressures are even more severe in tropical regions such as Africa, where escalating habitat loss and conversion threaten ecosystems and the services they provide (Barlow *et al.* 2016, Assede *et al.* 2023, Iniunam *et al.* 2025), thus directly impacting human well-being. In this context, understanding and prioritizing biodiversity conservation requires robust ecological knowledge, yet research effort is unevenly distributed across taxa, regions and functional groups (Brooks *et al.* 2015, Buechley *et al.* 2019). For example, although Africa is home to a remarkable diversity of species, including birds, many of which are under threat of extinction (Dirzo & Raven 2003, Shaw *et al.* 2024), most research has been conducted in the Global North (Velasco *et al.* 2015). Also, threatened species are the least studied when compared to non-threatened species (Ducatez & Lefebvre 2014). This highlights a misalignment between priorities and needs, partly because much work in avian ecology may not be directly conservation-focused. Globally, avian research has disproportionately focused on diurnal and conspicuous groups such as raptors, waterbirds and passerines (Barlow *et al.* 2018, McClure *et al.* 2018), and similar biases have been reported in Africa (Buechley *et al.* 2019, O'Bryan *et al.* 2022).

Nocturnal birds, including owls (Strigiformes) and nightjars (Caprimulgiformes), remain comparatively neglected, despite their key ecological functions (Kettel *et al.* 2018). Owls function as apex or mesopredators that regulate small vertebrate populations, thereby contributing significantly to ecosystem functioning and resilience (Moreno-Mateos *et al.* 2011, Rashid *et al.* 2021). Nightjars, on the other hand, are important insectivores that contribute to natural pest control and agricultural productivity (Jackson 2003, Sekercioglu *et al.* 2019). Yet, these species face multiple threats, including habitat loss, agricultural expansion, urbanization, hunting and climate change (Moreno-Mateos *et al.* 2011, O'Bryan *et al.* 2022). Despite these pressures, the extent to which research reflects these species' conservation needs remains poorly understood (König & Weick 2008, O'Bryan *et al.* 2022).

Africa supports a remarkable diversity of owls (51 species: 20.1% of global owls) and nightjars (25 species: 25.5% of global nightjars) (Gill *et al.* 2025), which occur across all major ecosystems on the continent (BirdLife International 2018). Species such as the Critically Endangered Annobon Scops Owl *Otus feae*, Príncipe Scops Owl *O. bikegila* and Seychelles Scops Owl *O. insularis* are endemic to islands and thus have naturally restricted ranges because of their biogeographical isolation (BirdLife International 2018). This contrasts with widely distributed species such as the Western Barn Owl *Tyto alba*, Little Owl *Athene noctua* and African Scops Owl *Otus senegalensis*. While island endemics face vulnerability linked to their limited geographical range, mainland species also face threats from land-use changes, agricultural expansion, belief-based use and climate variability (de Lima *et al.* 2013, Coetzee & Chown 2016). As a result, many of these species are experiencing severe population declines and are at risk of extinction (BirdLife International 2018, IUCN 2025). Three of the 76 species are already extinct; 14 are listed as Vulnerable (six species), Endangered (five species) or Critically Endangered (three species), while two are Data Deficient (IUCN 2025). The lack of research on owls and nightjars may hinder our ability to identify the key threats they face and develop effective conservation strategies. Thus, investigating the factors contributing to the under-representation of owls and nightjars in research is crucial for addressing knowledge gaps and informing conservation efforts that can help protect these ecologically important species.

Socio-economic and ecological factors can strongly influence patterns of biodiversity research and conservation. Variables such as governance quality, research infrastructure, human development and population density affect both scientific capacity and opportunities for field research, whereas ecological factors such as species-richness and protected area coverage may influence where research effort is concentrated (Bradshaw & Di Minin 2019, Buechley *et al.* 2019, Cazalis *et al.* 2020, Awoyemi & Ibánez-Álamo 2023, Pulido-Chadid *et al.* 2023). Considering these factors provides important context for understanding geographical variation in research effort, identifying regions where knowledge gaps persist and developing strategies that reflect the complex realities facing Africa's owl and nightjar communities.

While conservation concern and research need are often related, they are not necessarily synonymous. Species facing substantial threats may require immediate conservation interventions even

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where ecological knowledge remains incomplete. Such interventions can nevertheless generate further research needs, as their effectiveness should be monitored and evaluated to inform subsequent conservation planning and management. Conversely, other species may remain poorly studied while facing lower conservation concern, indicating that research attention and conservation concern need not be closely aligned. Importantly, assessing research need in relation to conservation concern does not imply that research must precede conservation action or that limited knowledge is the primary constraint on conservation outcomes. Instead, it aims to identify situations where insufficient knowledge may hinder the monitoring, planning or evaluation of conservation interventions (Ferraro & Pattanayak 2006, Martin *et al.* 2012, Troudet *et al.* 2017).

Based on previous evidence of taxonomic and geographical biases in biodiversity research (Troudet *et al.* 2017, Buechley *et al.* 2019), we expected research effort to be unevenly distributed across countries, species and research themes, with studies concentrated on a relatively small subset of widespread species. We also expected conservation concern and overall research attention to be weakly aligned such that higher conservation concern would not necessarily correspond to greater overall research attention. Finally, we expected socio-economic and ecological characteristics to be associated with variation in research effort among African countries, with countries characterized by greater human development, stronger research capacity and more favourable institutional conditions supporting higher levels of scientific output (Buechley *et al.* 2019, Cazalis *et al.* 2020, 2021, Awoyemi & Ibánez-Álamo 2023).

Given the ecological importance and vulnerability of owls and nightjars, addressing existing knowledge gaps is both timely and necessary. Therefore, it becomes critical to synthesize the state of research on owls and nightjars in Africa. By reviewing the scientific literature, we aimed to examine trends and gaps in the study of owls and nightjars across Africa. Specifically, we (i) quantified temporal and spatial patterns in research effort; (ii) evaluated thematic biases; (iii) assessed taxonomic biases among owl and nightjar species; (iv) developed a Research and Conservation Priority Index (RCPI) to identify species where elevated conservation concern coincides with limited research effort; (v) examined the relationship between conservation concern and research scarcity; and (vi) evaluated how socio-economic and ecological factors influence patterns of research effort across African countries. By addressing these objectives, we aimed to identify major knowledge gaps about African owls and nightjars and evaluate how these gaps align with indicators of conservation concern. This provides a foundation for directing future research efforts while recognizing that conservation action may be required even where knowledge remains incomplete and contributes to broader biodiversity monitoring and policy goals under the Convention on Biological Diversity and the Sustainable Development Goals.

METHODS

Literature search and paper screening

We compiled a list of owl and nightjar species whose distribution ranges include Africa from the BirdLife International Data Zone (www.datazone.birdlife.org) on 24 August 2025. Using the data explorer tool, we filtered species belonging to the families Caprimulgidae, Strigidae and Tytonidae within the geographical region 'Africa' across all IUCN Red List categories. A systematic literature search was conducted on 25 August 2025 using three major bibliographic databases: Web of Science, Scopus and Google Scholar. We believe that a combination of the three databases would maximize coverage while also minimizing the risk of omitting relevant studies. No publication year restrictions were applied, and all available literature up to the search date was considered. We employed combinations of keywords comprising the common names, scientific names and family names of all African owl and nightjar species, together with the term 'Africa' and the names of each of the 58 countries and autonomous territories across the continent. Independent searches were conducted for each country/territory to maximize coverage and capture geographically specific publications. No language restrictions were applied during the initial literature search. A detailed description of the search strings and database queries is provided in the Appendix.

All 1637 records were imported into Rayyan (https://www.rayyan.ai/) for systematic screening and management of references. Rayyan is an online platform that facilitates semi-automated screening of article abstracts and titles with high accuracy

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(Ouzzani *et al.* 2016, Olofsson *et al.* 2017). The platform's versatile tools enable duplicate detection, collaborative review and transparent decision-making in systematic reviews (Ouzzani *et al.* 2016, Abreha 2019). Following retrieval, we examined the titles and abstracts of all records to identify potentially relevant studies. A total of 208 full-text articles were obtained and examined in detail to determine eligibility and to facilitate subsequent data extraction and thematic classification. Only publications that provided ecological, conservation or distributional information on these species were retained for analysis, since we aimed to identify research gaps and conservation concerns (Buechley *et al.* 2019). Because the objective of this study was to quantify the distribution and characteristics of primary research on African owls and nightjars, we included only studies with primary data. The paper selection adhered to the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher *et al.* 2009, Awoyemi & Ibánez-Álamo 2023), as PRISMA provides a transparent and reproducible approach for documenting literature identification, screening, eligibility assessment and study inclusion, which aligns closely with the objectives of the present review. The number of records identified, screened, excluded and retained at each stage is summarized in Figure S1. We have also included a list of all papers retained in Table S1.

Data extraction and categorization

From each included publication, we recorded the title, year of publication, journal and country of study. Each paper was then categorized according to its main research theme. We classified each publication according to its primary research focus, grouping them into nine thematic categories and making slight modifications to the categorization system used by Magle *et al.* (2012) (see details in Table 1). Thematic classification was based on a full-text assessment of each publication, considering its objectives, methods and principal findings. Where studies addressed multiple research themes, they were assigned to all relevant categories. This approach ensured that thematic classifications reflected the substantive content of each study rather than relying solely on titles, abstracts or keywords. We also noted the focal species of each study.

Table 1. Definitions of the nine thematic categories used to classify research on African owls and nightjars.

Theme	Description
Animal behaviour	Dispersal, home-range, habitat selection, mating, nesting, feeding and habituation
Population ecology	Abundance, density, occupancy, demographics, first species record or species description
Community ecology	Interactions between two or more species
Conservation	Threat assessments, habitat protection, conservation planning
Human–wildlife conflict	Attacks, economic damage, animal-vehicle collisions, road kills
Human dimensions	Perceptions, human attitude, belief-based use, traditional knowledge, wildlife trade
Wildlife disease	Parasites, pathogens
Landscape ecology	Fragmentation, land-use change, Geographic Information Systems analyses, edge effects
Wildlife management	Applied interventions such as population control, relocation, sterilization, sharp shooting

Additionally, we compiled country-level data, including the total population and land area, obtained from Africapolis (OECD/SWAC 2024; accessed 19 September 2025). Africapolis provides a standardized, geospatially consistent and up-to-date dataset on population and land area across African countries, integrating both major cities and smaller towns to ensure comprehensive and comparable coverage. We estimated human population density per country by dividing population by land area. Information on protected areas was obtained from the World Database on Protected Areas (WDPA) (UNEP-WCMC & IUCN 2025; accessed 20 September 2025). The protected area was defined as the proportion of terrestrial area under legal protection per country. Finally, data on species coverage were extracted from the IUCN Red List database (IUCN 2025; accessed 22 September 2025) and were used to estimate the species-richness of owls and nightjars per country. We also obtained socio-economic variables, including the Human Development Index (HDI) and governance index, from the Worldwide Governance Indicators (Kaufmann & Kraay 2024). The HDI is a composite measure comprising indicators of human health (life expectancy), educational attainment (years of schooling) and economic well-being (gross national income per capita). The

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governance index represents the mean of six dimensions of governance: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption. The governance index ranges from −2.5 to 2.5, with higher values indicating better governance, while the HDI is scored from 0 to 1, where higher values reflect improved human development.

Statistical analyses

All statistical analyses were conducted using the R statistical software, version 4.3.1 (R Core Team 2023). We performed descriptive statistics to quantify temporal and spatial trends. Temporal trends were assessed by calculating the number of publications per decade. Spatial trends were evaluated by summarizing publications by country and mapping their distribution across Africa.

Assessment of biased research distribution across themes and species bias in research efforts

To assess whether research was distributed evenly across research themes, we compared the observed distribution of publications with a null expectation. The null model followed a broken-stick distribution (MacArthur 1957, Buechley *et al.* 2019), in which the total number of publications was partitioned randomly across research themes. For each theme, we calculated the expected proportion of publications and generated 95% confidence intervals from 10 000 simulations. Themes were classified as 'Relatively well studied' if the observed proportions exceeded the upper bound; 'Understudied' if they fell below the lower bound; and 'Moderately studied' if they fell within the 95% confidence range (2.5th–97.5th percentiles). To test whether research effort was evenly distributed among species, we compared the observed number of publications per species to a null expectation assuming equal probability of study effort across all species. Species with zero publications were treated as a separate category ('Not studied') and excluded from the goodness-of-fit test because zeros represent absolute gaps rather than variable sampling intensity. We performed a chi-squared goodness-of-fit test to evaluate whether the observed frequencies differed significantly from expected values under a uniform distribution. Specifically, the test compared observed publication counts (O_i) to expected frequencies (E_i) derived from a null model in which each species has an equal chance of being studied. The above is denoted by the formula below:

$$E_i = \frac{\text{Total Publications } (O_i)}{N}$$

where N is the total number of species.

We then applied a hybrid classification scheme to ensure that absolute gaps are recognized and low efforts are flagged, therefore capturing meaningful deviations among studied species. Species with zero publications were labelled 'Not studied'; species with three or fewer publications were labelled 'Under-studied'; among the remaining species, those with observed publications greater than the expected mean but less than twice the expected mean were labelled 'Moderately studied'; and those that were twice the expected mean or above were labelled 'Relatively well studied'.

Research and Conservation Priority Index (RCPI)

To assess the extent to which conservation concern coincides with limited scientific knowledge, we developed an RCPI that integrates each species' IUCN Red List threat status with the number of publications available in the scientific literature, following Buechley *et al.* (2019). Consequently, the RCPI was developed as a heuristic screening tool to identify species for which elevated conservation concern coincides with limited research attention. It should not be interpreted as a measure of overall conservation priority, because it does not incorporate other determinants of conservation outcomes such as habitat protection, funding availability, governance effectiveness or management feasibility. However, adequate ecological knowledge can support conservation planning, monitoring and management (Cook *et al.* 2010, Fraser *et al.* 2018), making the identification of such knowledge gaps an important component of evidence-based conservation. Thus, we define RCPI by the formula:

$$\text{RCPI} = \frac{\text{TS}}{10} + \frac{\left[1 - \left(\frac{\log 1p(nP)}{\log 1p(mP)}\right)\right]}{2}$$

where TS = threat status ranging from 1 (Least Concern) to 5 (Critically Endangered), nP is the observed number of publications for a species and

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mP is the maximum number of publications recorded for any species in the dataset. Here, $\log1p(x)$ denotes the natural logarithm of $1+x$, a transformation that accommodates species with zero publications. The research-scarcity component therefore ranges from approximately 1 for species with no publications to 0 for the most-studied species before being scaled by one-half. The research-scarcity component was divided by two so that its maximum contribution (0.5) was comparable to that of the threat-status component (0.5), thereby giving the two components equal maximum weight in the composite index. The RCPI thus increases with both conservation concern and research scarcity, with values ranging from approximately 0.1 to 1.0. Species with high RCPI values included Critically Endangered and Data-Deficient species with few publications, highlighting species for which substantial knowledge gaps occur alongside elevated conservation concern. The full list of the RCPI for each species is given in Table S2. To evaluate whether conservation concern and research scarcity represented distinct dimensions of species prioritization, we examined the relationship between threat status and research score using Pearson's correlation analysis. This analysis was conducted to assess whether species of elevated conservation concern systematically received greater or lesser research attention.

For our analysis, we conducted two linear models, one at the species level and the other at the country level. First, to assess how a species' Red List Extent of Occurrence (RLEOO; a measure of species' geographical range) and population trend influenced the RCPI, we fitted a linear model. Before model fitting, RCPI normality was evaluated using graphical explorations and the Shapiro–Wilk test (Shapiro & Wilk 1965). Because RLEOO was highly right-skewed, we applied a natural logarithmic transformation to stabilize variance and improve linearity. When the population trend had a significant effect on RCPI, we conducted a Tukey post-hoc test to compare population trend categories using the *emmeans* package (Lenth *et al.* 2023).

Secondly, at the country level, we examined how population density, governance index, HDI, species-richness of nightjars and owls, and the percentage of protected area influenced the research efforts (number of papers published) for owls and nightjars. All predictors were standardized (mean = 0, sd = 1) before modelling, and multicollinearity was assessed using a Pearson correlation matrix (Dormann *et al.* 2013). Correlation coefficients were generally low to moderate ($r < 0.3$), indicating no problematic collinearity among predictors. We then fitted a linear model using these variables. The relationship between research effort (number of published studies per country) and socio-ecological predictors was examined using a generalized linear model with a negative binomial error distribution and log-link function, implemented in the R package MASS (Ripley *et al.* 2013). We fitted a negative binomial model because the number of papers was a count and exhibited overdispersion relative to a Poisson distribution. Model simplification was performed using backward stepwise deletion, sequentially removing variables with the weakest statistical support and comparing models using Akaike's information criterion (AIC). The most parsimonious model was selected as the model with the lowest AIC value. Statistical significance was assessed at $\alpha = 0.05$. See details in Table S3.

RESULTS

Temporal distribution of publications

A total of 208 publications met the inclusion criteria for this review, comprising 157 studies focused on owls, 51 focused on nightjars and two studies that addressed both groups. The earliest owl study identified was published in 1880, whereas the first nightjar study was published in 1906, so research effort spans more than a century. Despite this long history, publication output remained extremely low until the mid-twentieth century. Only two studies were published before 1960, after which research activity gradually increased, reaching 22 publications during the 1980s and 30 during the 1990s. Research effort accelerated substantially after 2000, with the period 2001–2010 accounting for 51 owl studies (23.8% of all publications) and 12 nightjar studies (5.6%) (Fig. 1). Overall, publication output increased markedly through time, with the highest research activity occurring during the most recent decades.

Geographical distribution of publications

There was a strong bias towards a few countries (Fig. 2). South Africa contributed most studies,

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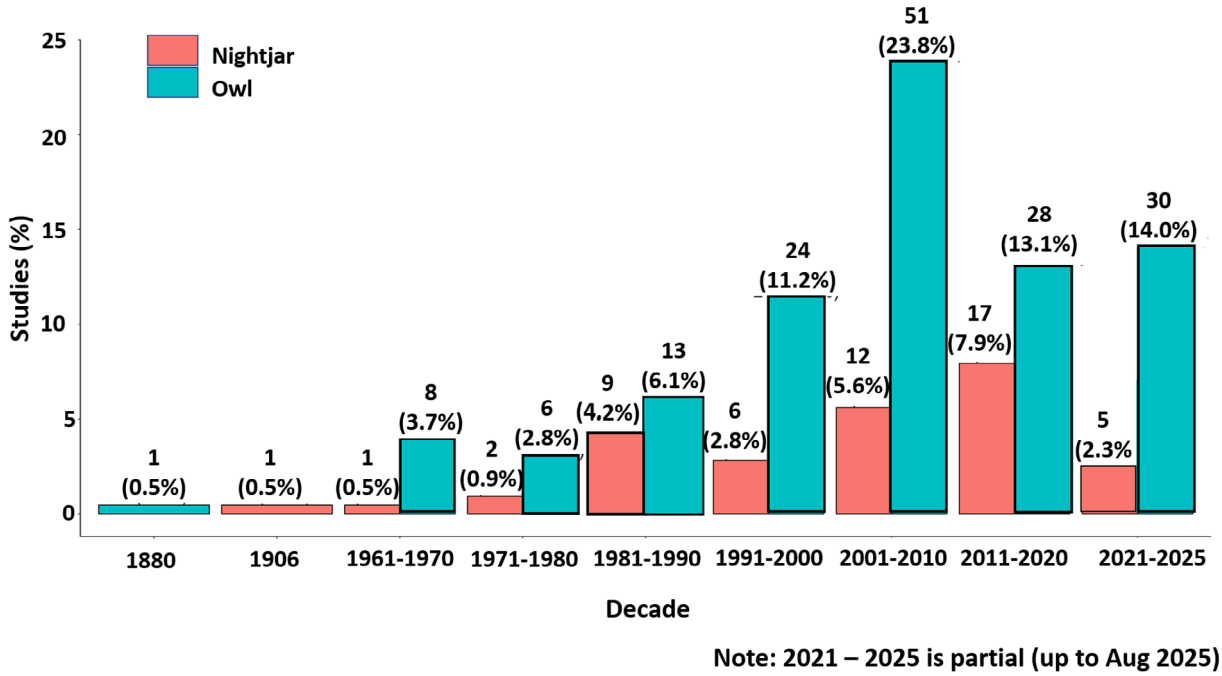


Figure 1. Temporal trends in the number of published studies on African owls and nightjars per decade. The figure shows the absolute number of studies and their relative contribution (in percentage) to the total literature from 1880 to 2025.

with 46 papers (22.1%), followed by Kenya (18 papers; 8.7%), Nigeria (13 papers; 6.3%) and Madagascar (12 papers; 5.8%). Notably, Burkina Faso, Congo, Angola, Lesotho, Sudan, Ghana, Libya, Gabon, Chad, Eritrea and Benin had no contributions.

Thematic analyses of publications

Across the nine research themes, studies were highly concentrated in a few areas. For both groups of species, animal behaviour was by far the most represented theme (owls: $n = 91$, 46.9%; nightjars: $n = 35$, 54.7%), followed by population ecology (owls: $n = 59$, 30.4%; nightjars: $n = 17$ 26.6%). Conservation was the next most studied theme for owls ($n = 26$; 13.4%), while community ecology was the third most studied theme for nightjars ($n = 5$; 7.8%). In contrast, only studies of owls addressed human dimensions ($n = 6$; 3.1%) and wildlife management ($n = 3$; 1.5%), which were not addressed in studies of nightjars (Fig. 3).

When compared to a broken-stick null expectation, only animal behaviour, population ecology and conservation were relatively well-studied themes in owls. For nightjars, animal behaviour and population ecology were also the relatively well-studied themes. All other themes, including community ecology, human dimensions, wildlife disease, landscape ecology, wildlife management and human–wildlife conflict, were substantially understudied, with observed proportions lower than expected (Fig. 3). There was a significant deviation of the observed distribution from the null expectation (owls: $\chi^2 = 382.79$, $df = 8$, $P < 0.001$; nightjars: $\chi^2 = 106.19$, $df = 6$, $P < 0.001$).

Assessment of biases in research effort

Most species of African owls and nightjars remain poorly studied. Of the 76 species occurring in Africa (including the three extinct species), 36 species (47.4%) were classified as understudied, 17 species (22.4%) were relatively well-studied and 11 species (14.5%) were moderately studied. We did not find any studies of 12 (15.8%) of the species, including the three extinct species. These unstudied species included both owls and nightjars, such as the White-browed Owl *Athene superciliaris*, Maned Owl *Jubula lettii*, Shelley's Eagle-Owl *Ketupa shelleyi* and Bates's Nightjar

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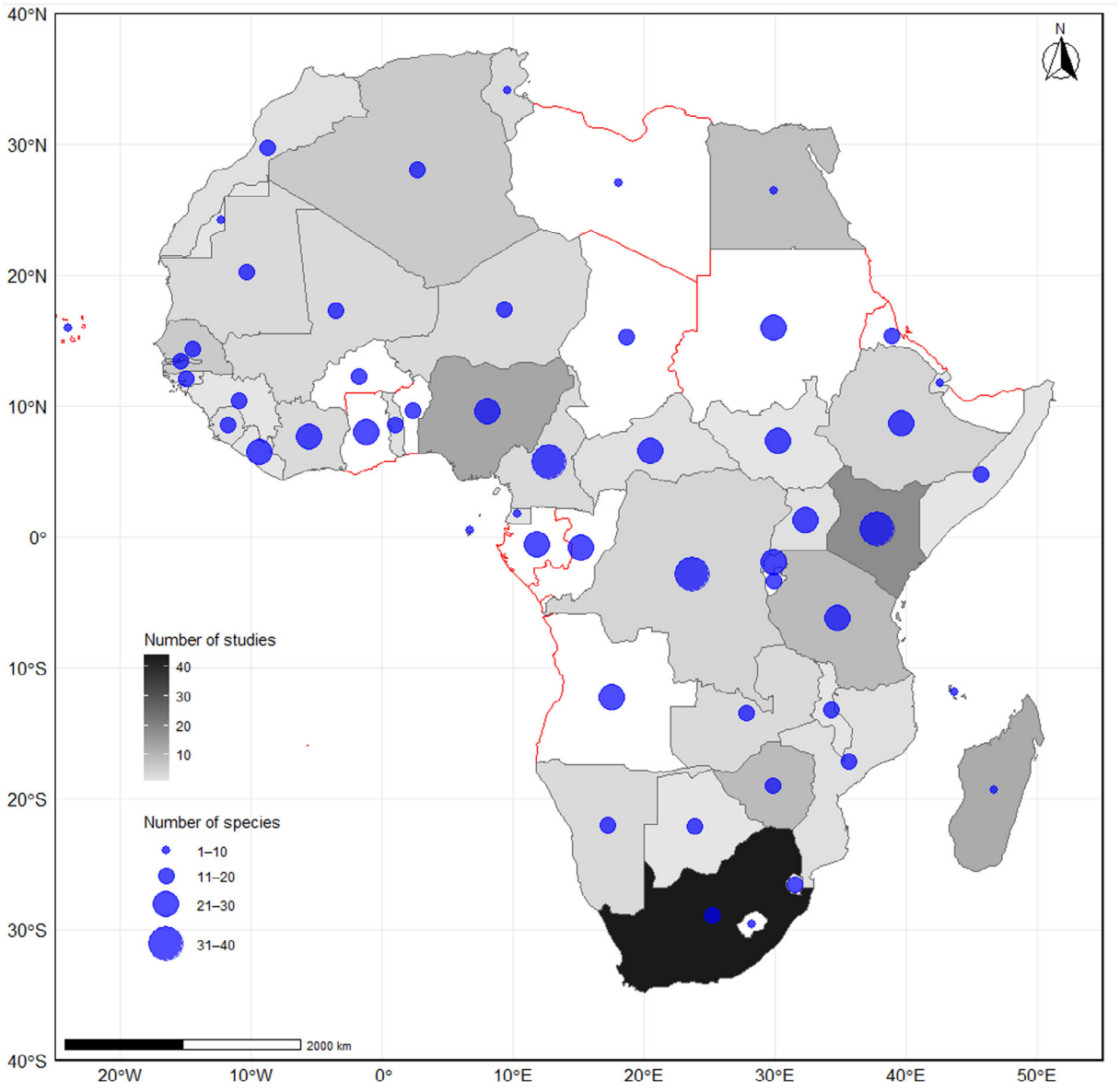


Figure 2. Distribution of owl and nightjar studies across African countries, including studies from 1880 to August 2025. The size of blue dots represents the number of species, while the grey scale with darker shades represents more studies, and completely white backgrounds with red borders show zero studies.

Caprimulgus batesi (Fig. S2). We found several studies on species such as the Western Barn Owl, Spotted Eagle-Owl *Bubo africanus*, Freckled Nightjar *Caprimulgus tristigma* and European Nightjar C. *europaeus*. See detailed results in Figure S2. There was a significant deviation from the null expectation ($\chi^2 = 592.99$, df = 55, $P < 0.001$), indicating that research effort is unevenly distributed among species.

Research and Conservation Priority Index (RCPI)

The RCPI revealed substantial variation among African owls and nightjars, reflecting differences in both Red List threat status and research effort. RCPI values ranged from 0.1 to 1, with higher values indicating species for which elevated conservation concern coincided with limited research

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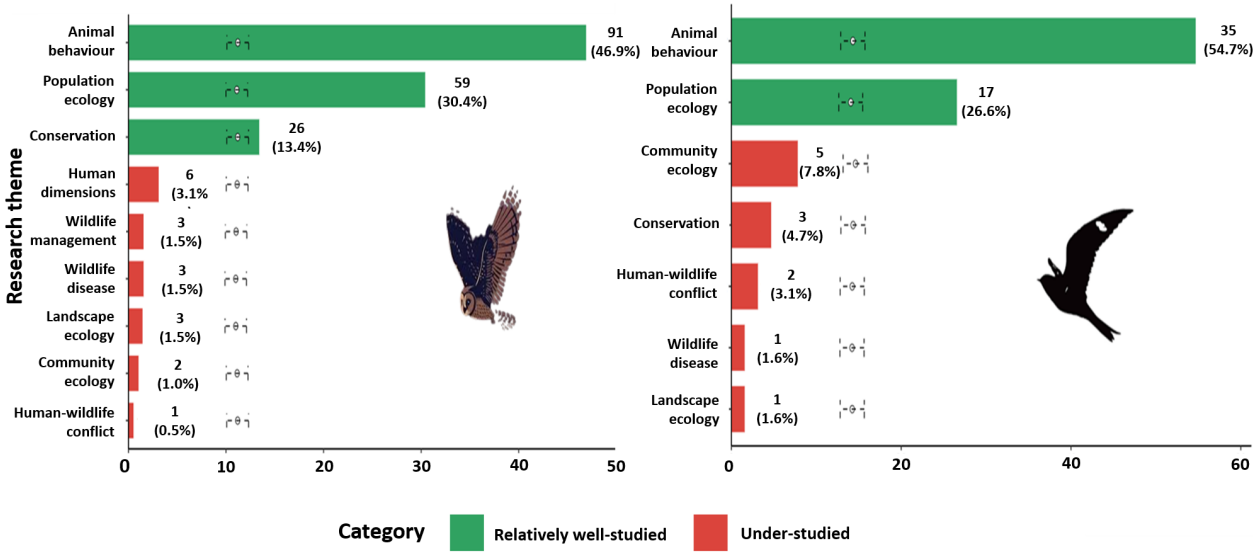


Figure 3. Observed versus expected distribution of research themes in owl and nightjar studies across Africa. Bars represent the proportion of studies observed in each theme, while points and dashed lines show the expected proportions and 95% confidence intervals derived from the broken-stick null model. Colours indicate whether a theme was well-studied or understudied relative to expectation.

attention. The 10 species with the highest RCPI scores included Critically Endangered, Endangered, Vulnerable and Data-Deficient species, many of which are poorly represented in the literature (see Table S2). The Annobon Scops Owl, classified as Critically Endangered with only one published study, had the highest RCPI (1.00). The Critically Endangered Príncipe Scops Owl, with three studies, had the second-highest RCPI score (0.90). Other highly ranked species included the Endangered Itombwe Owl and the Data Deficient Maned Owl (Fig. S3). In contrast, the Western Barn Owl had the lowest RCPI, reflecting its relatively lower conservation concern on the IUCN Red List and extensive research coverage. Overall, RCPI identified species for which conservation concern and limited scientific knowledge overlapped.

The linear regression model with RLEOO and population trend as predictors explained a substantial proportion of the variance in the RCPI for owls and nightjars (adjusted $R^2 = 0.59$, $F_{(3,69)} = 34.99$). The RLEOO of a species (RLEOO) had a negative relationship with RCPI (mean ± se: -0.03 ± 0.003, $t = -7.74$, $P < 0.001$) (Fig. 4).

The RCPI also varied significantly with population trend ($F_{(2,69)} = 12.78$, $P < 0.001$). Tukey honest significant difference (HSD) post-hoc analyses revealed significant differences in RCPI values between species with decreasing and stable population trends ($t = 4.79$, $P < 0.001$), and between stable and unknown population trends ($t = -2.67$, $P = 0.03$), but differences between decreasing and unknown trends were not significant ($t = -1.01$, $P = 0.57$) (Fig. 5). Species with an unknown population trend exhibited the highest RCPI (mean, 95% CI: 0.70, 0.51–0.90), followed by those with decreasing trends (mean, 95% CI: 0.60, 0.56–0.64), while species with stable trends had the lowest RCPI (mean, 95% CI: 0.44, 0.38–0.49) (Fig. 5). This pattern indicates that species experiencing population declines have higher research and conservation needs than those deemed stable. Also, our analysis revealed that threat status was not associated with research score (Pearson's $r = -0.009$, $P = 0.94$), indicating that species of elevated conservation concern do not systematically receive greater or lesser research attention.

Socio-economic predictors of research effort

Research effort differed significantly among countries and was positively associated with HDI ($\beta = 0.472 \pm 0.184$ se, $z = 2.56$, $P = 0.010$).

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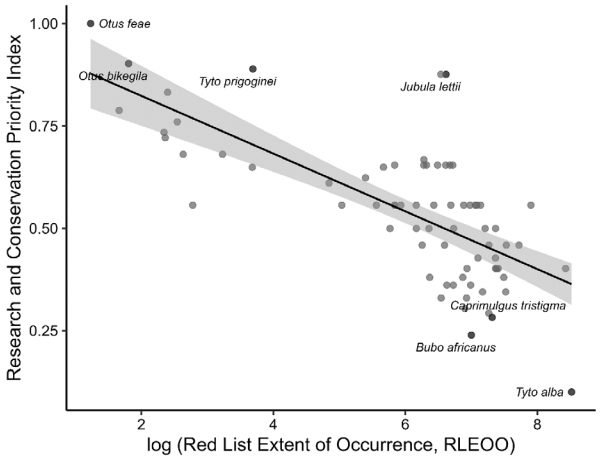


Figure 4. Relationship between the log-transformed Red List Extent of Occurrence (RLEOO) and the Research and Conservation Priority Index (RCPI) for African owls and nightjars. The solid line represents the fitted linear relationship, with the shaded band indicating the 95% confidence interval. Grey points represent species not specifically highlighted, while black points and labels identify species with high and low RCPI values.

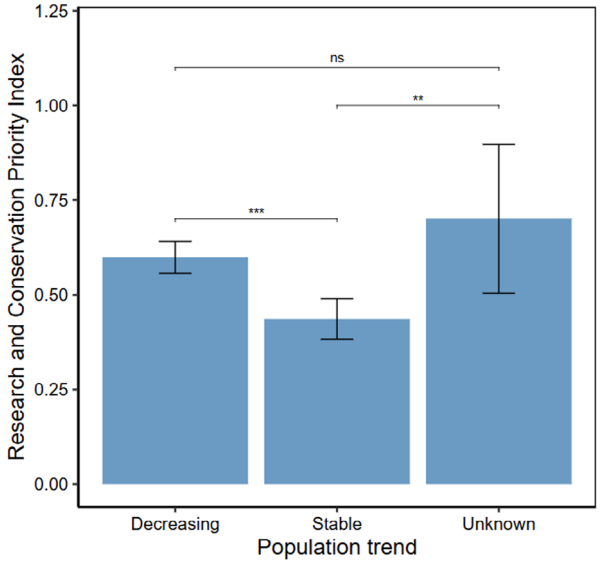


Figure 5. Research and Conservation Priority Index (RCPI) for African owls and nightjars across different population trends. Bars represent estimated marginal means of RCPI for species with decreasing, stable or unknown population trends, and error bars show 95% confidence intervals. Species with declining populations have higher RCPI values, indicating greater research and conservation priority, while stable species have lower RCPI. $***P < 0.001$, $**P < 0.05$.

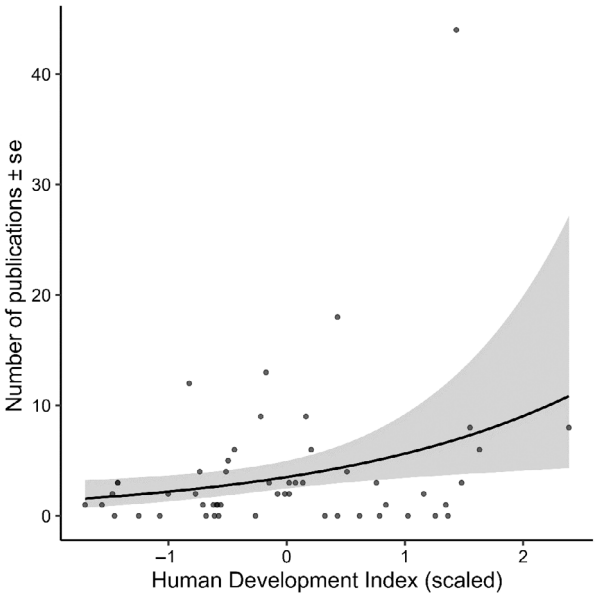


Figure 6. Linear regression models demonstrating the relationship between Human Development Index and the number of publications for owls and nightjars. Each point represents the number of publications at the country level, and the black line shows the predicted number of publications from the model with its standard error (grey-shaded area).

Countries with higher HDI produced more publications on African owls and nightjars. No other socio-economic or ecological predictors improved model performance and were excluded from the final model (Fig. 6). See details in Table S5.

DISCUSSION

This review presents the first comprehensive synthesis of research on African owls and nightjars, highlighting both advances and persistent knowledge gaps, with significant conservation consequences. Although research output has grown substantially in the past five decades, it remains highly concentrated in a few well-resourced countries and is largely focused on animal behaviour and population ecology of common or accessible species. As a result, more than two-thirds of nocturnal bird species, including several that are threatened or Data Deficient, remain understudied. This pronounced mismatch between research effort and actual conservation concern may hamper evidence-based decision-making. Under-studied species may decline unnoticed and thus miss out on critical conservation

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interventions. The lack of research targeting threatened and Data-Deficient species undercuts efforts to halt biodiversity loss and undermines progress towards global targets such as the Convention on Biological Diversity and the Sustainable Development Goals. Addressing these shortfalls is vital for prioritizing effective conservation action, allocating resources efficiently and ensuring that African nocturnal birds, many of which are uniquely vulnerable, receive the focused attention they urgently require.

Temporal trends in owl and nightjar research

Our analysis revealed a clear and sustained increase in research output on African owls and nightjars over the past century, particularly since the 1980s. Before 1960, publication records were extremely sparse, with fewer than five papers per decade, reflecting the limited scientific attention afforded to nocturnal birds during the early stages of African ornithology. This period was dominated by opportunistic natural history observations and taxonomic descriptions, consistent with historical trends in global avian research, where nocturnal species were generally overlooked because of methodological constraints and accessibility challenges (König & Weick 2008, Cleere 2010). The increase in publication output may also partly reflect broader global growth in biodiversity, ecological and ornithological research rather than trends unique to African owls and nightjars, as previous studies have documented substantial increases in ecological publications in Africa (Di Marco *et al.* 2017, Beale 2018, Buechley *et al.* 2019, Awoyemi & Ibánez-Álamo 2023), including species-specific studies (Phoswa & Downs 2025).

The increasing surge in research outputs may reflect the global expansion of biodiversity research initiatives, expanding research capacity, improved access to scientific publishing, increasing availability of funding and the emergence of standardized monitoring methods, including passive acoustic monitoring (PAM), which facilitates the study of elusive nocturnal species (Wrege *et al.* 2017, Buechley *et al.* 2019, Sugai *et al.* 2019, Awoyemi & Ibánez-Álamo 2023, Joel *et al.* 2024). Technological advances such as automated acoustic recorders and automated detection tools such as BirdNET and Kaleidoscope have enabled broader spatial coverage and more rigorous sampling of nocturnal communities (Pérez-Granados & Schuchmann 2020, Kahl *et al.* 2021, Darras *et al.* 2025). These methods have facilitated the collection of standardized, repeatable data, enabling researchers to overcome historical biases and improve ecological inferences (Sugai *et al.* 2020, Kahl *et al.* 2021, Pérez-Granados 2023, Clapp *et al.* 2026). However, these algorithms are still being improved, particularly in the context of African owls and nightjars. Addressing these gaps is critical for building robust datasets necessary for evidence-based conservation, particularly for threatened and Data-Deficient species whose ecological needs remain poorly understood (Fröhlich & Ciach 2019, O'Bryan *et al.* 2022).

Geographical distribution of research effort

Our results reveal a pronounced geographical bias in research effort across African countries, with a small number dominating. Several factors probably underlie this spatial bias. First, countries with established research institutions, long-standing ornithological traditions, and higher investment in research and development tend to produce disproportionately more publications (Cresswell 2018, UNESCO 2021). South Africa, for instance, benefits from well-resourced universities and biodiversity research centres such as the Fitzpatrick Institute of African Ornithology at the University of Cape Town, facilitating systematic field studies, long-term monitoring and research publications (Brooks *et al.* 2022, Lee *et al.* 2022). Similarly, Kenya hosts long-standing collaborative field initiatives (e.g. Ngulia bird-ringing and other collaborative programmes co-ordinated by A Rocha Kenya and the National Museums of Kenya) (Pearson *et al.* 2014). Nigeria is the focus of many ornithological studies, as it possesses an ornithological institute, the A.P. Leventis Ornithological Research Institute, serving as a field station for several ornithological research projects that collectively enhance data collection and publication output (Mwansat *et al.* 2011, Cresswell 2018, Tende *et al.* 2024).

Secondly, accessibility and infrastructure play a critical role. Regions with better transportation networks, limited bureaucracy for research permits and logistical support attract more fieldwork, while remote, politically unstable or logistically

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challenging areas are under-represented, especially considering that the focal species are nocturnal (Joppa *et al.* 2016, Amano *et al.* 2018). This is particularly challenging for nocturnal species often found in less disturbed habitats within these understudied areas, causing spatial research gaps driven by socio-economic and ecological factors rather than actual species absence. These geographical disparities have serious implications for conservation planning. Countries leading in research have better-documented species and habitats, facilitating evidence-based policies, while under-studied regions risk neglect, especially for range-restricted or Data-Deficient species in Northern, Western and Central Africa (Pulido-Chadid *et al.* 2023, Danmallam *et al.* 2025, Joel *et al.* 2026). Additionally, AI-based conservation tools may perpetuate spatial biases because of uneven data coverage, resulting in skewed prioritizations (Hortal *et al.* 2015, Farooq *et al.* 2021), because AI and machine learning models rely heavily on input data quality and coverage to generate reliable predictions and prioritize conservation actions (Joppa *et al.* 2016, Amano *et al.* 2018).

Thematic distribution of research effort

Our analysis revealed uneven research focus across ecological and conservation themes. Behaviour and population ecology dominate, probably because these areas are methodologically feasible and provide essential data for conservation status assessments (Acevedo & Villanueva-Rivera 2006, Hardey *et al.* 2013, BirdLife International 2018). For instance, many behavioural studies rely on indirect methods such as pellet analysis, which do not require advanced night-time equipment. In contrast, important areas such as community ecology, landscape-level processes and human–wildlife interactions remain under-studied despite their relevance to understanding ecosystem dynamics and threats such as habitat fragmentation and urbanization (Moreno-Mateos *et al.* 2011). This lack of integrative research restricts our capacity to anticipate how owls and nightjars will respond to rapid environmental change, particularly in Africa, where agricultural expansion, urbanization and infrastructure development continue to reshape landscapes (Awoyemi *et al.* 2024, Danmallam *et al.* 2024, Kumdet *et al.* 2025). Similarly, road mortality remains a potentially important but poorly documented threat to nightjars owing to their habit of resting and foraging on roads at night, which increases their exposure to vehicle collisions (Jackson & Slotow 2002, Dean *et al.* 2019, Camacho *et al.* 2026). The lack of research on wildlife disease and management may also further constrain the development of evidence-based interventions for both species conservation and ecosystem health.

Human dimensions and human–wildlife conflict studies are scarce, despite growing evidence that belief-based use, traditional medicine markets, persecution and illegal trade represent major threats to owls in several African countries (Ogada 2008, Amar *et al.* 2018, Buthelezi *et al.* 2025, 2026). Across many regions, owls are associated with witchcraft, bad omens or misfortune, resulting in persecution, nest destruction and avoidance by local communities (Ogada & Kibuthu 2008, Williams *et al.* 2014, Mikkola 2023, Iniunam *et al.* 2026). At the same time, owls are among the bird groups most frequently sought for belief-based use and traditional medicine markets in several African countries (Williams *et al.* 2014, Mikkola 2023, Iniunam *et al.* 2026). Consequently, owl populations may experience a dual pressure whereby some individuals are killed because they are feared, while others are actively captured and traded because they are culturally valued (Buthelezi *et al.* 2025, 2026, Iniunam *et al.* 2026). This conservation paradox is rarely acknowledged in the scientific literature but has important implications for management. Conservation interventions focused solely on reducing persecution may overlook trade-related pressures, whereas actions targeting wildlife trade may fail to address deeply rooted negative cultural perceptions. Future research should therefore seek to better understand the socio-cultural drivers of both persecution and belief-based use and develop conservation strategies that are sensitive to local cultural contexts while reducing direct exploitation of owl populations.

The conservation challenges associated with owls also raise important ethical considerations for research and monitoring. For highly exploited or culturally sensitive species, increased scientific attention may inadvertently expose populations to additional risks. Information on breeding locations, nesting-sites or local population occurrences can potentially facilitate collection, egg trade, persecution or illegal trade if not handled carefully. This

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creates a conservation dilemma whereby research is essential for informing management and conservation action, yet the dissemination of ecological information may increase species vulnerability in some contexts (Phelps *et al.* 2016, Lindenmayer & Scheele 2017). Nevertheless, the solution is not to discourage research on African owls and nightjars, many of which remain poorly understood. Rather, future studies should adopt precautionary approaches to data collection, reporting and dissemination, including careful consideration of sensitive locality information and a stronger emphasis on research that directly informs threat mitigation, conservation planning and policy development. Balancing knowledge generation with species protection will be critical for ensuring that research contributes positively to long-term conservation outcomes.

Species-level biases and research–conservation gaps

Our study reveals a striking disparity in research attention among African owls and nightjars, with most species remaining under-studied. This skewed research distribution mirrors global patterns, where accessible or charismatic species dominate scientific literature, while cryptic or range-restricted species are neglected (Joppa *et al.* 2016, Buechley *et al.* 2019). Such biases limit data availability for Data-Deficient or threatened species, thus constraining evidence-based conservation management.

By integrating IUCN Red List threat categories with research effort, the RCPI identifies species for which elevated conservation concern coincides with limited scientific knowledge. Range-restricted species and those with declining or unknown population trends tended to have higher RCPI values, suggesting that substantial knowledge gaps persist for many species of conservation concern (Isaac *et al.* 2007, Buechley *et al.* 2019, Jetz *et al.* 2019). Species such as the Annobon Scops Owl (Critically Endangered), Itombwe Owl (Endangered) or Maned Owl (Data Deficient) ranked among those with the highest RCPI values because they combine elevated conservation concern with limited research attention. In contrast, species such as the Western Barn Owl and Spotted Eagle-Owl, both widespread and relatively well-studied, had the lowest RCPI values. Importantly, high RCPI values do not necessarily mean additional research must precede conservation action. For some species, threats such as habitat loss, persecution, belief-based use, egg trade, illegal trade or other anthropogenic pressures may already be sufficiently understood to justify immediate conservation interventions. However, implementing such interventions does not eliminate the need for research; their effectiveness should be monitored and evaluated so that management can be refined as evidence accumulates. Thus, the RCPI identifies species where conservation concern coincides with limited scientific knowledge and where these knowledge gaps may constrain monitoring, planning or evaluation of conservation actions.

Furthermore, the absence of a relationship between threat status and RCPI suggests that conservation concern and research attention represent complementary rather than redundant dimensions of species prioritization. Highly threatened species often remain poorly studied despite their conservation importance, while many less-threatened species also receive limited research attention, reflecting broader taxonomic and geographical biases in biodiversity research (Di Marco *et al.* 2017, Beale 2018). This reinforces the value of considering both dimensions simultaneously when identifying knowledge gaps relevant to conservation planning (Eaton *et al.* 2024). Identifying species that combine elevated conservation concern with limited research attention can help direct future data collection efforts where knowledge gaps may constrain conservation planning, rather than serve as a substitute for threat-based conservation prioritization, while recognizing that some species may require immediate conservation interventions regardless of existing research coverage.

Socio-economic predictors of research effort

Our results revealed that countries with higher HDI tended to produce more studies on African owls and nightjars. Because HDI integrates indicators of education, health and income (Kaufmann & Kraay 2024), it provides a useful proxy for the broader societal conditions that support scientific research, including access to higher education, research infrastructure, funding opportunities and skilled personnel. This finding is consistent with previous studies demonstrating that biodiversity research effort is unevenly distributed across the

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globe and tends to be concentrated in countries with greater economic resources, stronger scientific institutions and higher levels of human development (Amano & Sutherland 2013, Mayer Pelicice 2019, Asiamah *et al.* 2022). In Africa, disparities in research infrastructure, access to funding and opportunities for postgraduate training continue to shape where biodiversity studies are conducted and published (Cresswell 2018, Awoyemi & Ibánez-Álamo 2023, Bezeng *et al.* 2025). Consequently, countries with higher HDI may be better positioned to support long-term ecological monitoring programmes, maintain research institutions and foster collaborations that facilitate publication output.

The positive relationship between HDI and research effort also provides important context for understanding knowledge gaps in African owls and nightjars. Species occurring in countries with lower levels of human development may remain poorly studied, not because they are of lesser ecological or conservation importance but because the socio-economic conditions necessary to sustain research are limited. This is consistent with the absence of a relationship between threat status and research scarcity in our study, indicating that conservation concern does not automatically attract greater research attention. Together, these findings suggest that research scarcity is influenced by broader socio-economic constraints on knowledge production rather than by conservation need alone. Therefore, addressing research gaps requires not only species-focused research agendas but also investment in the socio-economic conditions that enable biodiversity research, including education, institutional capacity, research funding and international collaboration.

Strengthening research capacity in countries with lower HDI could substantially improve knowledge generation for African nocturnal birds. Capacity-building initiatives, equitable research partnerships, support for postgraduate training and improved access to research funding may help reduce current geographical biases in knowledge production (Mwansat *et al.* 2011, Beale 2018, Cresswell 2018). Such efforts would contribute not only to a more complete understanding of owl and nightjar ecology but also to more equitable conservation planning across the continent. Together, these results show that research effort correlates more strongly with socio-economic capacity than ecological opportunity. Closing critical knowledge gaps for nocturnal birds, particularly those with restricted ranges or declining populations, requires strengthened research infrastructure and investment in under-represented countries. These insights are essential for designing equitable conservation strategies that align scientific research with species' needs.

Study limitations

While this review provides the first comprehensive synthesis of African owl and nightjar research, several limitations mirror global challenges in ornithology. Nocturnal birds worldwide receive less attention than diurnal species because of methodological difficulties, detectability issues and accessibility constraints (Jetz *et al.* 2012, La 2012). In Africa, additional hurdles include limited technological resources, security concerns and research infrastructure disparities, further concentrating studies on a subset of species and regions (Cresswell 2018, Buechley *et al.* 2019). These overlapping challenges emphasize that our findings are not simply regional, but part of an urgent global need for methodological innovation, improved data standardization and strategic investment to redress research inequities for nocturnal avifauna.

Our analysis primarily relied on published peer-reviewed literature with primary data and may exclude valuable grey literature, technical and monitoring reports, newsletters, local conservation records, expert knowledge and locally held datasets that hold important information on threats such as owl trade, persecution and belief-based use. This underscores the need for enhanced data sharing and repository development. As future studies adopt responsible data-sharing practices, it is imperative that detailed breeding locations and nesting-sites of sensitive species not be publicly disclosed, as they may increase risks of collection, persecution or illegal trade.

Taxonomic revisions pose a dynamic challenge for prioritization frameworks such as the RCPI because splitting or lumping of taxa can alter conservation and research priorities over time. Moreover, incorporating additional dimensions, such as evolutionary distinctiveness (Jetz *et al.* 2014) or specific threat exposures (Bellard *et al.* 2012), could refine prioritization and inform more holistic conservation strategies. Future research incorporating these elements will enhance the predictive

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power and application of such frameworks to protect Africa's nocturnal birds effectively.

It is also noteworthy that the RCPI relies partly on IUCN Red List classifications, which may underestimate conservation concern for species lacking sufficient demographic information. Several African owls and nightjars occur in regions where long-term monitoring data are scarce, potentially limiting the ability of Red List assessments to fully capture population declines. Consequently, some Least Concern species experiencing undocumented declines may have lower RCPI values than warranted and may require greater conservation attention than implied by their RCPI values. Moreover, the RCPI does not explicitly account for other factors that influence conservation outcomes independently of research availability, including funding opportunities, governance effectiveness, habitat protection, policy implementation and management feasibility. Consequently, the index cannot determine whether lack of research is the primary factor constraining conservation delivery for a given species. Future prioritization frameworks could incorporate these additional dimensions to provide a more comprehensive assessment of conservation needs.

Implications, recommendations and conclusions

Our findings have several important implications for nocturnal bird research and conservation in Africa. For instance, some species are already extinct in some countries: Verreaux's Eagle-Owl *Ketupa lactea* (RCPI = 0.43) is extinct in Lesotho, Pel's Fishing Owl *Scotopelia peli* (RCPI = 0.46) is extinct in Eswatini and Marsh Owl *Asio capensis* (RCPI = 0.38) is extinct in Algeria (IUCN 2025). Three other species (Mauritius Owl *Mascarenotus sauzieri*; Reunion Owl *M. grucheti;* Rodrigues Owl *M. murivorus*) for which we found no studies were also already extinct, underscoring the need for strategic research (O'Bryan *et al.* 2022). Bridging the gap between research effort and conservation concern requires targeted rather than generic interventions. Thus, we recommend the following:

1 Research on under-studied, threatened and Data-Deficient species should be prioritized. Species such as the Annobon Scops Owl, Itombwe Owl, Maned Owl and other high-RCPI taxa remain poorly represented in the scientific literature despite elevated conservation concern. Future work should focus on generating baseline information on distribution, population status, habitat requirements and threats, particularly for geographically restricted species.
2 Strengthening monitoring efforts in under-represented regions, particularly Central Africa, West Africa and parts of North Africa, should be a priority, while recognizing the logistical, financial and security challenges that often constrain field-based research in these areas. Emerging approaches such as citizen science, PAM and automated species detection algorithms provide cost-effective opportunities to expand data collection across large and remote landscapes (Sugai *et al.* 2019, Joel *et al.* 2024, Darras *et al.* 2025), although the lack of security continues to threaten the use of such technologies in some areas. To maximize the value of these approaches, PAM protocols should be standardized across sites and years, including consistent recording schedules, sampling durations, metadata collection and analytical workflows. Such standardization would facilitate robust spatial and temporal comparisons, support the development of long-term monitoring datasets and provide evidence for reassessing Data-Deficient species and tracking population trends of threatened taxa. This is also important for Least Concern species that might be experiencing undocumented declines. Integrating these monitoring efforts with continent-wide initiatives such as African Bird Atlas projects and regional biodiversity monitoring networks would further strengthen data sharing, improve geographical coverage and establish a co-ordinated framework for assessing changes in the distribution and status of African owls and nightjars.
3 Research on poorly studied anthropogenic threats should be expanded. Our review revealed limited attention to human dimensions despite growing evidence that belief-based use, persecution, illegal trade and traditional medicine markets represent significant threats to owls in many African countries. Similarly, road mortality, electrocution and infrastructure-related impacts remain poorly documented for nightjars. Addressing these threats should be a priority for future research and conservation

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programmes. Artificial intelligence and predictive modelling rely heavily on diverse, comprehensive datasets to generate robust recommendations. When research efforts disproportionately target a narrow subset of ecological and conservation themes, AI applications may exacerbate these biases, prioritizing well-studied behavioural and population parameters at the expense of broader ecological and socio-ecological contexts (Skaldina & Blande 2025). Thus, we recommend broadening the research scope beyond behaviour and population ecology to include landscape ecology, disease dynamics and human dimensions.

4 Ethical research and responsible data sharing for owls should be promoted. Increased research attention can pose threats to owl populations, thus highlighting a conservation dilemma in the study of highly exploited or culturally sensitive species, where increased knowledge generation may simultaneously enhance conservation capacity while also increasing exposure to harm (Minteer & Collins 2008, McShane *et al.* 2011). Researchers should therefore adopt precautionary approaches when disseminating information on breeding sites, nest locations and highly localized populations, balancing scientific transparency with species protection (Lindenmayer & Scheele 2017). In this context, the ethical risks associated with studying owls and nightjars should be explicitly considered in study design, rather than being viewed as a reason to avoid research altogether.

5 Targeted investment in research infrastructure and capacity-building is urgently needed in under-represented regions, particularly in Central Africa. We also argue for investment in African-led research capacity. In areas where these institutions exist, we argue that researchers recognize the urgent need to build capacity as part of their research, especially with African residents, as this increases the likelihood of continued research (Crosswell 2018). We also noted that species with the highest RCPI values were island or very range-restricted species, reinforcing the need for funding opportunities to consider funding enough to cover logistics that allow for studies of such species.

6 The RCPI should be used as a screening tool rather than a stand-alone conservation framework. The RCPI can help identify species for which conservation concern coincides with limited scientific knowledge. However, prioritization decisions should also consider threat severity, habitat status, governance, funding availability, management feasibility and local conservation contexts.

7 Future reviews should evaluate research effort across habitat types to identify ecosystems that remain under-represented in owl and nightjar research. Such analyses would help determine whether particular habitats, such as tropical forests, savannas, wetlands, islands, or human-modified landscapes, receive disproportionate research attention and would provide a stronger basis for directing future monitoring and conservation investments.

8 Cross-sector collaboration is essential, bringing together academic researchers, protected area authorities, local communities and citizen scientists to co-produce data and conservation strategies. Furthermore, strengthening governance and regulatory frameworks will help translate knowledge into effective policy, addressing challenges in enforcement, resource allocation and stakeholder engagement.

In conclusion, by addressing these research gaps and aligning scientific efforts with conservation urgency, stakeholders can strengthen evidence-based policies, contribute to the Sustainable Development Goals and the Kunming–Montreal Global Biodiversity Framework. Importantly, closing knowledge gaps should complement, rather than replace, immediate conservation action for species facing known threats.

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AUTHOR CONTRIBUTIONS

Iniunam A. Iniunam: Conceptualization; methodology; data curation; investigation; validation; formal analysis; funding acquisition; visualization; project administration; writing – original draft; writing – review and editing. **Gabriel Marcacci:** Methodology; writing – review and editing; visualization; supervision; resources; validation; investigation. **Yitmwa Joel:** Data curation; writing – review and editing. **Adewale G. Awoyemi:** Methodology; writing – review and editing; visualization; validation; investigation. **Njideka Scholastica Okwu:** Data curation; writing – review and editing. **Danjuma Filibus Dami:** Supervision; writing – review and editing. **Ulf Ottosson:** Supervision; writing – review and editing. **Alain Jacot:** Methodology; visualization; supervision; writing – review and editing; resources; validation; investigation. **Adams A. Chaskda:** Conceptualization; methodology; validation; visualization; resources; writing – review and editing; investigation; supervision; project administration.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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ETHICAL NOTE

None.

DATA AVAILABILITY STATEMENT

The data will be made available upon request.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Figure S1 PRISMA flow diagram for paper selections of owls and nightjar studies in Africa using the Rayyan Software.

Figure S2 Observed versus expected research effort across species. Red X marks indicate the expected mean under a null distribution, and error bars show the 95% confidence interval of the expected values.

Figure S3 Research and Conservation Priority Index (RCPI) for the owl and nightjar species with the highest combined threat and research gap scores. Bars represent scaled RCPI values (0.1–1.0), highlighting species such as the Critically Endangered Annobon Scops (*Otus feae*),

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Principe Scops Owl (*Otus bikegila*) and Data Deficient Maned Owl (*Jubula lettii*) that require urgent attention.

Table S2 Research and Conservation Priority Index for African owls and nightjars.

Table S3 Backward stepwise deletion to obtain a parsimonious model.

Table S1 Published journal articles of owl and nightjar studies included in the systematic literature review.

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