Why do birds use green nest material? A systematic review and meta-analysis of experiments

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Abstract

Many animals construct nests. Nests are often considered extended phenotypes that shape survival and reproduction beyond the builder's body. Birds are key examples of nest builders, and many add fresh green plant material to their nests. Yet, the adaptive value of this behaviour remains debated. Non-mutually exclusive hypotheses propose roles in courtship signalling, parasite defence, or direct enhancement of offspring condition. Here, we conducted a pre-registered systematic review and meta-analysis of 28 experimental studies (published and unpublished), spanning seven bird species and 274 effect sizes, to test whether green nest material influences fitness, and to evaluate the competing functional explanations. Our synthesis shows that while green nest material can enhance avian fitness, this effect depends on the fitness proxy used, and its functional role remains unresolved. The strongest predictor was experimental design, strongly influencing the outcomes, challenging the role of aromatic compounds in the fitness benefits of green nest material. Our meta-analysis supports the importance of green nest material on fitness, but calls for more research to elucidate its mechanisms.

1. Introduction

Nest and nest-building are fundamental across a diverse range of animals, including arthropods (e.g., ants, spiders), mammals (e.g., platypus, rodents), and perhaps more famously, birds. Nests provide structural support for eggs, parents, and offspring, and protect them against predators and other environmental pressures, and are thus key to reproductive success and survival [1, 2, 3]. Most birds use organic plant materials such as twigs, branches, grass, and moss to build their nests. Some even incorporate inorganic items, including mud, stones, feathers, snake skins and anthropogenic materials like plastic and cigarette butts [4, 5, 6, 7]. The latter are considered non-structural additions and suggest that nests are more than just physical shelters; they can be complex tools shaped by both natural and sexual selection for multiple functions. Indeed, nests can play a key role in sexual display, and features such as nest size have been shown to act as sexually selected signals of parental quality in several bird species [e.g., 8, 9], even interspecifically by brood parasites [10]. Nest-building behaviour is increasingly recognised as an expression of the extended phenotype (reviewed by [11]), and phylogeny has been shown to be an important factor explaining nest morphology [12]. Yet, despite hundreds of scientific articles studying nests and nesting behaviour in birds being published each year, much remains unknown.

An intriguing nesting behaviour observed in some bird species is the addition of fresh, often aromatic, plant material to the nest. This green nest material (hereafter *GNM*) often corresponds to leaves, sprigs, herbs and branches, and is typically added from the start of nest building until egg laying, although some species like the blue tit (*Cyanistes caeruleus*) keep adding it after that. Contrary to the structural nest materials (e.g., twigs, mud), GNM is selected from a small, non-random subset of local flora [13, 14, 15]. The selected plants often possess high levels of aromatic volatile compounds (commonly used by songbirds; [16]) or secondary metabolites such as oils and resins (commonly used by raptors; [17]). GNM is unlikely to be gathered opportunistically, and collecting these uncommon plants and replenishing them, sometimes over weeks, requires extra time and, in some cases, flying outside one's territory [18]. Thus, the general costs associated with nest-building [19], and the additional effort, time and energy devoted to add these non-structural materials, suggest an adaptive function of GNM.

Multiple hypotheses have been proposed to explain the adaptive function of GNM (reviewed in [20]; [21]). First, the courtship hypothesis suggests that (mostly) males use GNM as visual or olfactory signals to attract females and/or advertise nest site occupancy to other males (e.g., [22]; [23]; [24]), particularly in cavity-nesting species where visual cues inside the nest are limited. For instance, the seminal study of [25] showed that male European starlings (*Sturnus vulgaris*) carry fresh plant material to their nests while singing and displaying to females. Subsequent studies in European and spotless starlings (*Sturnus unicolor*) supported this view by showing that females often prefer nests with fresh GNM, and that unpaired males conspicuously deliver GNM during courtship, stopping right after the onset of egg laying [24, 26]. Additionally, males increase the addition of GNM in the presence of potential mates [22]. Altogether, these studies offered support for the courtship hypothesis, which was later extended to explain GNM addition solely by females in blue tits, suggesting that GNM might serve as a sexually selected signal of female quality [27].

Second, the most widely tested hypothesis is the nest protection hypothesis, which proposes that the volatile compounds in GNM reduce the amount of parasites and pathogens in the nests, enhancing offspring survival. This hypothesis was first suggested in a comparative study in raptors (Falconiformes) that provided only indirect evidence by comparing nest reuse, diet composition and GNM presence [28]. Soon after, a preference for GNM containing insect-repellent and antimicrobial volatiles was experimentally confirmed in European starlings and suggested three key criteria for evaluating the nest protection hypothesis (i.e., selective plant use, bioactive chemical properties and demonstrable adaptive benefits; [13]]. Observational and experimental studies on raptors [17, 29] and passerines [30, 31, 16, 32] have shown mixed results. In some cases, GNM was shown to improve offspring condition without reducing the amount of parasites in the nests [33], leading to the development of the drug hypothesis. This alternative hypothesis suggests that the volatiles present in GNM directly enhance offspring immune function and/or health independent of parasite or pathogen control[33, 34]. While both the nest protection and drug hypotheses suggest that GNM enhances offspring survival, the drug hypothesis attributes this effect to a pharmacological mechanism, whereas the nest protection hypothesis emphasises parasite and pathogen repellency. Importantly, these two hypotheses are not mutually exclusive, and their potential effects on offspring survival are difficult to disentangle.

Last, several additional functional hypotheses of GNM that do not refer to its aromatic (i.e., volatiles and secondary metabolites) properties have also been proposed. These include benefits such as enhancing the crypticity of the nest [35], providing insulation or sun protection for eggs and offspring [36], or simply fulfilling a structural function [37]. However, these alternative functional roles have received little support or attention.

Despite decades of research, abundant observational and experimental studies, and two crucial narrative reviews [20, 21], we still do not know the overall adaptive significance of GNM, its generality across bird species, and the relative importance of each of the suggested functions. Given that nest building is widespread across taxa, including but not limited to birds, and is increasingly recognised as an expression of the extended phenotype, a quantitative synthesis of this field is both timely and has potentially far-reaching implications.

To address this gap, we conducted a pre-registered systematic review and meta-analysis of experiments testing the effect of GNM on various fitness proxies across birds. Our meta-analysis explicitly evaluates the overall evidence for the adaptive significance of GNM, as well as assesses the relative importance of the main suggested hypotheses: the courtship hypothesis and parental care hypothesis (i.e., a combination of both the nest protection and drug hypotheses). In addition, we tested potential moderators that might explain the observed context-dependency (i.e., high heterogeneity among effect sizes). Specifically, we tested whether the effect of GNM varied depending on the experimental design used, the timing of GNM addition, the focal species studied, the category of fitness proxy investigated (e.g. morphological, reproductive, etc.), and the type of parasite. Our meta-analysis of experimental studies is the first quantitative synthesis testing the causal relationship between GNM and fitness across birds.

2. Methods

2.1. Registration and reporting

We pre-registered our study protocol on the Open Science Framework [38] prior to exploring or analysing the data. The pre-registration details our objectives, a priori hypotheses and predictions, methods and planned data analyses. Unless stated otherwise, we adhered to the registered protocol. We followed the PRISMA-EcoEvo guidelines [39] for reporting this study (Table S1; Figure S1). All resources associated with this study, including data and code, are available at [https://github.com/shreyadimri/Green_Nest_Material] (insert Zenodo citation later).

2.2. Information source and search

We conducted a systematic search on Web of Science Core Collection and Scopus on the 7th of September, 2022 (see update below). The keyword search query was designed as a three-block query including terms related to our treatment of interest ((“green*” OR “herb*” OR “aromatic*”) AND “nest*”), population of interest ("bird*" OR "aves" OR "avian" OR "ornithol*" OR "passerine*" OR "passeriform*" OR "songbird*" OR list of all bird genera) and to limit the search results to experimental studies only ("experiment*" OR "manipulat*"). The complete search strings tailored to each specific platform are provided in Figure S16. Although our search string only included keywords in English, we planned to screen any study in English, Spanish, Portuguese and Hindi, but found studies only in English. We searched through titles, abstracts and keywords with no restrictions on publication date or study type. We validated our search using an initial library of 15 relevant articles that we had previously identified (Figure S2), ensuring all were retrieved. Additionally, we used the R package 'litsearchr' v1.0.0 [40], which did not yield any new relevant terms, confirming our queries. After removing 152 duplicates using the R package 'revtools' v0.4.1 [41], we identified 383 unique records.

2.3. Eligibility criteria

All titles and abstracts were equally allocated and screened independently by at least two screeners (SD, TR, JMGS) using the R package 'revtools' following a pre-designed decision tree with all inclusion/exclusion criteria (Figure S3). We included all studies on birds that experimentally manipulated the GNM (both aromatics and non-aromatic). Forty articles passed the title-and-abstract screening and were further evaluated during the full-text screening, where each article was independently screened by a single screener (SD, TR, JMGS), with another screener verifying the procedure. We used the same criteria as above (Figure S3) with an additional evaluation of whether the variable of interest in the article was in our list of fitness proxies of interest (Figure S4). Twenty-two aarticles passed the full-text screening and were, thus, eligible for our meta-analysis. All conflicts in screening decisions (1% for title-and-abstract screening, and none for full-text screening) were resolved through discussion.

We updated our systematic literature search by repeating our search on the 12th of August, 2024, and found 53 unique articles after removing 13 duplicates. Only one observer (SD) performed both screenings using the same decision trees as before (Figure S3), and found one additional eligible article for our meta-analysis. Lastly, we identified three additional eligible articles recommended by two colleagues. In all, 26 published articles were eligible for our meta-analysis, but we also obtained two additional unpublished studies (more details below and in Figure S1).

2.4. Data extraction

The data of each article were extracted by one of three authors (SD, TR, JMGS), with another screener verifying the procedure, and four authors (SD, TR, JMGS, AST) collectively discussing and revising unclear cases. We prioritised extracting primary data (i.e., measures of central tendency, variance and sample size) from text and tables, or, if that was not possible, from figures (e.g., boxplots) using the R package 'metaDigitise' v1.0.1 [42]. If primary data were not available, we extracted inferential statistics such as t and

F values or contingency tables to transform them into effect sizes (see below). Last, if the previous steps failed but the article had openly archived data, we calculated the means, standard deviations and sample sizes from each group ourselves (n = 4 studies).

We extracted the means, variances and sample sizes for each control-treatment comparison. Depending on the experimental design of each study, controls included non-aromatic materials (e.g., grass or moss), smaller amounts of aromatic material, no added material, or removal of material added by birds; whereas treatments consisted of aromatic material added by authors, birds, or both. We coded these comparisons in our moderator 'experimental design' as non-aromatic GNM vs. aromatic GNM, or no added GNM vs. aromatic GNM. Another experimental design used in some studies compared nests with experimentally added non-aromatic GNM to nests without any added GNM or in which GNM added by the birds was removed by the authors. In these cases, the non-aromatic GNM was considered the treatment, and we coded these as non-aromatic GNM vs. no added GNM in our moderator 'experimental design' (n = 3 studies). Importantly, our conclusions remained robust to the exclusion of these effect sizes (Table S2), so we kept this category in our dataset, and the moderator 'experimental design' was tested in subsequent meta-regressions. A fourth experimental design compared enhanced supplementation of GNM by the authors (i.e., authors + birds) to birds alone (n = 2). This experimental design represents a fundamentally different contrast focused on potential additive effects of GNM and makes the assumption that a GNM effect is indeed present; therefore, we excluded it from the meta-regression using the 'experimental design' moderator. In studies where three groups were compared (n = 5), we extracted all possible pairwise comparisons, and accounted for (shared-group) non-independence in our analyses (more below).

For each study, we also extracted information related to the study subjects (bird species, geographical location of the study population), the methodology of the study (fitness proxy measured) and the source from which we extracted data (e.g., figures, tables, raw data files, supplementary materials). We categorised the fitness proxies measured into 6 broad categories: physiology, morphology, reproduction, behaviour, parasite and pathogenic load, and phenology. For studies testing whether GNM affects the number of parasites or pathogens found in offspring and/or nests, we categorised them into arthropods or microorganisms. For a complete list of variables extracted, see Figure S8 . During data extraction, we encountered some traits (e.g., WBC ratio, parent mass; 15 effect sizes, n = 5 studies) that we did not include in any of our analyses because it was unclear from the study and our own judgement how these traits related to fitness (see Figure S5 for the list and reasons of exclusion).

We contacted four corresponding authors to obtain missing data (e.g., non-reported results, missing sample sizes). All four authors responded to our email, but only two provided the data as requested; one did not have the data any more, and one did not give a conclusive response. Additionally, to locate grey literature (e.g., unpublished data), we wrote to the corresponding author(s) of all the 22 articles that passed full-text screening to ask for any potential unpublished data that could be included in our meta-analysis using a standardised email template (Figure S6). One author provided data for an unpublished study on blue tits (see description in Figure S7), and one of us (MO) provided data for an unpublished study on common buzzards (*Buteo buteo*).

2.5. Effect size calculation

Using the means, standard deviations and sample sizes for each control-treatment pairwise comparison, we calculated two effect sizes: a log response ratio (lnRR) and a standardised mean difference with heteroskedasticity correction (SMDH), using the escalc function (measure = 'ROM' and 'SMDH', respectively, vtype = 'LS') in the R package 'metafor' v4.8-0 [43]. We specified the treatment group as the numerator and the control group as the denominator for lnRR, and treatment minus control for SMDH, such that positive values indicate a 'fitness' increase in the treatment group. In cases such as measures of parasite load or prevalence, laying or hatching dates, courtship time, or scab score, the effect size sign was inverted before analysis to ensure that a positive value consistently meant an increase in fitness regardless of fitness proxy (i.e., to ensure comparability across effect sizes). SMDH could only be calculated when there were enough data points in both treatment and control groups to estimate the pooled variance; specifically, when the degrees of freedom (i.e., n1+n2−2) were greater than 1. There were nine effect sizes from one) study that did not fulfill that requirement, which we then excluded from the dataset.

For the few cases for which we could not extract means and variances but inferential statistics such as t and F values, we estimated SMD values (k = 4, n = 2) using the equations provided by [44]. For dichotomous variables (e.g., number of successful nests, k = 4, n = 2), we calculated the log odds ratio (lnOR) using the 'escalc' function (measure=OR) from 'metafor' and subsequently converted it to SMD using equations from [44]. Since lnRR cannot be calculated from inferential statistics, dichotomous variables, or traits including zero or negative values (k = 7), the number of effect sizes included in the lnRR subset (k = 259, n = 28) is smaller than that of SMDH (k = 274, n = 28).

When calculating each effect size's associated sampling variance, whenever possible, we used the number of nests in each group over the number of individuals as the sample size to account for genetic relatedness non-independence. In cases where the same control or treatment group was used in multiple comparisons, sample sizes were adjusted before calculating effect sizes by dividing them by the number of times each group was used in a comparison to account for shared group non-independence. For cases where the authors of an original article reported a statistically non-significant difference between two groups but without providing numerical values (k = 16, n = 2), we assigned zero as the effect size for that comparison and imputed its sampling variance using the missing-case approach described in [45] for lnRR, and $\frac{n_1+n_2}{n_1 \times n_2}$ for SMDH [46].

2.6. Data analysis

We performed all analyses in R v4.5.1 [47]. All multilevel meta-analytical models and meta-regressions were fitted using 'metafor' v4.8-0 [43]. Sampling variances were modelled as variance-covariance matrices assuming a 0.5 correlation ( ) between sampling variances from the same study [48] using the 'vcalc' function from 'metafor' (see Supplementary Appendix Figure S10 for sensitivity analyses using different values of).

We originally considered the following levels of non-independence for our analyses: multiple effect sizes collected from (a) same study (Paper ID), (b) bird species (Species ID), (c) geographical locations (Population ID), (d) sub-populations within the same location (Experiment ID; e.g., birds studied at the same location for multiple years), (e) groups of individuals within a population (Group ID; e.g., males and females in a population, first clutch and second clutch), and (f) repeated measurement of the same trait for the same individuals (Repeated trait ID; e.g., chick mass on day 7, 14 and 21). In the end, our random effect structure deviated from our pre-registration since, initially, we had pre-registered the inclusion of Experiment ID and Repeated trait ID, but not Population ID. However, Experiment ID and Group ID were almost indistinguishable, so we decided to leave out the one with lesser resolution (i.e. Experiment ID). Additionally, few effect sizes were measured repeatedly, making Repeated trait ID almost identical to Observation ID (Figure S9), so we excluded Repeated trait ID. Last, we decided to add Population ID since we noticed after extracting the data, but before any analyses, that several studies were performed in the same geographical locations. Therefore, unless stated otherwise, we fitted the following random effects in all our models to account for non-independence: Paper ID, Group ID, Species ID, Population ID and an observation-level random effect (Observation ID).

Meta-analytic mean and hypotheses: To estimate the effect of GNM on fitness across birds, we fitted two separate sets of models for each effect size: lnRR and SMD(H). First, we fitted multilevel intercept-only meta-analytical models to test the overall effect of GNM on fitness estimates, its uncertainty and heterogeneity. We used the 'rma.mv' function from the 'metafor' package (method = 'REML' and test = 't' for calculating the test statistics and confidence intervals for the moderators). We excluded traits for which their link with fitness is debated in the literature (e.g., sex ratio, testosterone levels) from our main analysis, but conducted a sensitivity analysis including these traits to test the robustness of our results (Table S2; k = 21 , n = 8). For all intercept-only models, we estimated the total amount of absolute heterogeneity (σ^2; i.e., the total variation not explained by sampling error), its sources or relative heterogeneity (I^2), mean-standardised metric (CVH2) and variance-mean-standardised metric of heterogeneity (M2) following the pluralistic approach suggested by [49] .

To test the relative importance of the two main functional hypotheses suggested for GNM, that is, the courtship and the parental care hypothesis, which combines the nest protection and drug hypotheses, we ran a multilevel meta-regression including the moderator ‘hypothesis’ (levels: courtship, parental care, both). For all meta-regressions, we estimated $R^2_{marginal}$, which corresponds to the percentage of heterogeneity explained by the moderators [50]. Unless stated otherwise, all meta-regressions correspond to unimoderator meta-regressions.

Exploratory meta-regressions: We performed additional pre-registered multilevel meta-regressions for which we did not have clear directional predictions. To understand the effect of type of experimental design (i.e., whether the authors compared non-aromatic vs. aromatic, no added material vs. aromatic, no added material vs. non-aromatic), we ran a meta-regression with the type of ‘experimental design’ as the moderator. To test the effect of time of addition of GNM on fitness (levels: before egg hatching, after egg hatching, continuously throughout the nesting phase), we ran a meta-regression with ‘time of addition of GNM’ as the moderator. We also ran a meta-regression using ‘bird species’ as the moderator (levels: Buteo buteo, Cyanistes caeruleus, Passer cinnamomeus, Parus major, Sturnus unicolor, Sturnus vulgaris, Tachycineta bicolor) to understand if and how the effect of GNM on fitness might differ among species. Furthermore, we explored the effect of GNM on fitness depending on the ‘category of fitness proxy’ studied (levels: behaviour, morphology, parasite and pathogenic load, phenology, physiology, reproduction) using a meta-regression with the fitness proxy category as the moderator. Last, for the subset focusing on parasites and pathogens (k = 90, n = 16)), we ran a meta-regression with the ‘type of parasite’ as the moderator (levels: arthropod, micro-organism).

In addition, we performed three additional pre-registered multilevel meta-regressions to explore the potential threats to the internal validity of each study on our conclusions (i.e., Risk of Bias or RoB) following recommendations in [51] . We evaluated the effects of (1) blinding (whether outcome assessors were blinded to the experimental group), (2) random assignment to treatment, and (3) partial reporting (whether all measured outcomes were completely reported or only a subset). For each RoB category, we coded studies (levels: yes, no) and included each category as a moderator in a meta-regression run separately for both lnRR and SMD(H).

Publication Bias Test: Publication bias occurs when a subset of research findings, most often statistically non-significant ones, are less likely to be published or published later [52]. There are two types of publication biases that are commonplace in ecology and evolutionary biology: small-study and decline effects [53]. We tested them for both lnRR and SMD(H) separately, following [54]. To test for small-study effects, we ran a multilevel meta-regression using the ‘square-root of the inverse of the effective sample size’ as the moderator (i.e., $\sqrt{(n_1 + n_2)/(4n_1n_2)}$) To test for decline effects (also known as time-lag bias; [55]), we ran a multilevel meta-regression using ‘year of publication’ (mean-centered) as the moderator.

3. Results

We obtained 274 effect sizes from a total of 28 studies conducted on 7 species across 17 geographical locations (Figure1). About 81% of the effect sizes came from only three bird species (Cyanistes caeruleus, k = 77; Sturnus unicolor, k = 60; Sturnus vulgaris, k = 86). Our dataset included 2 unpublished studies (k = 18), with the remaining studies being published between 1988 and 2024. The mean ±standard deviation number of effect sizes per study was 9.8 ± 6.4 (median: 8.5 range: 2–24) and the mean effective sample size (i.e., the number of nests/individuals per effect size after accounting for shared-group non-independence) was 32.3 ±31.1 (median: 22.0, range: 3–210; 31 data points had a sample size of less than 5 nests in each group).

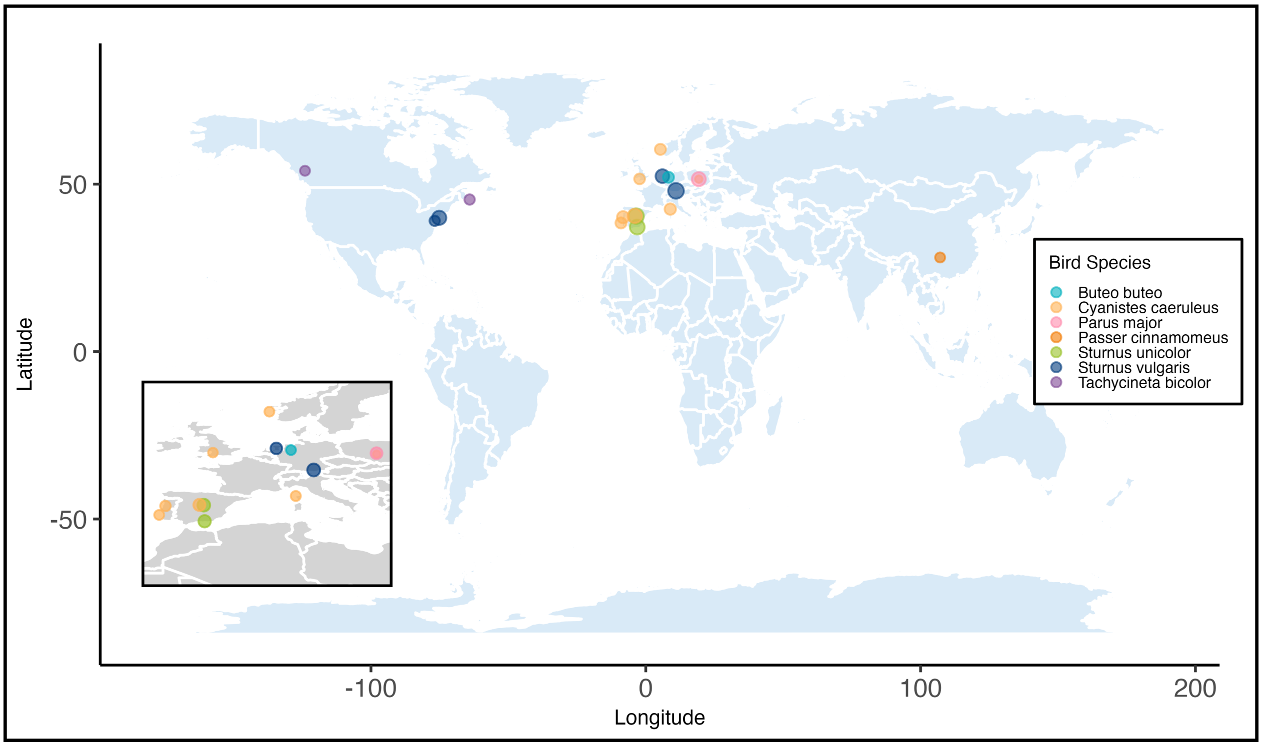

Figure 1: **Geographical distribution of the 17 study populations included in a meta-analysis testing the adaptive value of green nest material in birds.** Point size reflects the number of effect sizes coming from the location (range: 3–34), and colour denotes species (see legend), with an inset zooming in on a dense cluster of data points.

3.1. Meta-analytic mean

Both lnRR and SMD(H) intercept-only multilevel meta-analyses showed an average increase in fitness estimates in nests with an experimental increase in GNM compared to control nests; however, the overall effect was only statistically significant for SMD(H).

First, lnRR showed an average statistically non-significant increase in fitness estimates of 1.9% in nests with an experimental increase in GNM (Figure2 A; lnRR = 0.019, 95% CI: [-0.012, 0.050], 95% PI: [-0.281, 0.319], p-value = 0.223, k = 238, n = 26) but heterogeneity among effect sizes was high. Total raw heterogeneity (σ^2) was 0.023 (Q = 2277.7, p < 0.001), the measures of relative ($I^2{}_{total}$ = 98.6%) and standardised heterogeneity ($CVH2_{total}$ = 63.59; $M2_{total\,=}$ 0.98) all suggested high heterogeneity across effect sizes, exceeding the 75th percentile of empirically derived estimates from meta-analyses in ecology and evolution [49].

Second, SMD(H) showed an average statistically significant increase in fitness estimates in nests with an experimental increase of GNM (Figure2 B; SMD(H) = 0.179, 95% CI: [0.048, 0.310], 95% PI: [-0.829, 1.188], p-value = 0.008, k = 253, n = 26), but heterogeneity among effect sizes was moderate to high. Total raw heterogeneity (σ^2) was 0.258 (Q = 1114.7, p < 0.001), relative heterogeneity was smaller compared to that of lnRR ($I^2{}_{total}$ = 66.1%) and the standardised heterogeneity metrics ($CVH2_{total}$ = 8.02 ; $M2_{total\,=}$ 0.89) lay between the 50th and 75th percentile of empirically derived estimates [49].

The overall results and their conclusions were robust to several sensitivity analyses. First, we fitted a pre-registered bivariate multilevel meta-analytic model including both effect sizes as response variables (lnRR = -0.015, p-value = 0.624 and SMD(H) = 0.250 , p-value = 0.069). In addition, we ran several sensitivity analyses to test the robustness of the overall results to the: (i) inclusion of traits for which their relationship with fitness was debated in the literature (non-pre-registered); (ii) removal of effect sizes that were originally reported as simply statistically non-significant and we assumed them to be zero (non-pre-registered); (iii) both (i) and (ii) (non-pre-registered); (iv) removal of effect sizes from non-aromatic vs. aromatic experimental design (non-pre-registered); (v) removal of effect sizes from non-aromatic vs. no added material experimental design (non-pre-registered); (vi) removal of effect sizes that were calculated by transforming inferential statistics (pre-registered); (vii) removal of effect sizes that failed the Geary's Test for lnRR (non-pre-registered); (viii) removal of unpublished data (non-pre-registered); and (ix) use of different values of correlation ( ) between sampling variance for variance-covariance matrix (pre-registered). The number of effect sizes included in those sensitivity analyses ranged from 182 to 274, and the conclusions remained largely the same Table S2.

3.2. Functional hypotheses

Our multilevel meta-regressions found no clear support for either of the two main hypotheses proposed in the literature (Figure3). The estimates for the courtship hypothesis ($lnRR_{courtship}$ = 0.039, 95% CI: [-0.172, 0.250], 95% PI: [-0.329, 0.407], p-value = 0.716, k = 8, n = 2; $SMD(H)_{courtship}$ = 0.171, 95% CI: [-0.360, 0.702], 95% PI: [-0.964, 1.305], p-value = 0.527, k = 8, n = 2), and the nest protection and drug hypothesis (i.e., "parental care hypothesis") ($lnRR_{parental\_care}$ = -0.010, 95% CI: [-0.065, 0.045], 95% PI: [-0.316, 0.296], p-value = 0.716, k = 106, n = 19; $SMD(H)_{parental\_care}$ = 0.109, 95% CI: [-0.060, 0.278], 95% PI: [-0.908, 1.126], p-value = 0.204, k = 115, n = 19) were statistically non-significant. However, about half of all effect sizes could not be unequivocally assigned to only one hypothesis, so our meta-regression contained a third category that combined both. This category showed an average positive increase in fitness estimates in nests with an experimental increase of GNM, but the effect was only statistically significant for SMD(H) ($\text{lnRR}_{\text{both}}$ = 0.028, 95% CI: [-0.006, 0.062], 95% PI: [-0.275, 0.331], p-value = 0.110, k = 124, n = 22; $\text{SMD(H)}_{\text{both}}$ = 0.231, 95% CI: [0.079, 0.382], 95% PI: [-0.784, 1.245], p-value = 0.003, k = 130, n = 23). None of the three categories differed statistically significantly from each other ($p - value_{lnRR)} > 0.211$ and $p - value_{SMD(H)} > 0.178$ in all cases), and the moderator explained little heterogeneity ($R^2_{marginal(lnRR)}$= 1.6% and $R^2_{marginal(SMD(H))}$= 1.4%).

3.3. Exploratory meta-regressions

First, the overall effect of GNM on fitness estimate differed largely depending on the experimental design used (Figure4A,B). The overall effect size for the comparison between no added material and aromatic GNM was positive and statistically significant ($\text{lnRR}_{\text{no-material-vs-aromatic}}$ = 0.111, 95% CI: [0.021, 0.200], 95% PI: [-0.225, 0.446], p-value = 0.016, k = 90, n = 12 and $\text{SMD(H)}_{\text{no-material-vs-aromatic}}$ = 0.712, 95% CI: [0.309, 1.114], 95% PI: [-0.826, 2.250], p-value = 0.001, k = 94, n = 12], whereas, the comparison between non-aromatic GNM and aromatic GNM was small and statistically non-significant (Table1). The comparison between no added material and non-aromatic GNM, was negative and, although based on only 3 studies, statistically significantly for lnRR ($\text{lnRR}_{\text{no-material-vs-non-aromatic}}$ = -0.349, 95% CI: [-0.504, -0.195], 95% PI: [-0.708, 0.009], p-value <0.001, k = 10, n = 3;Table1). All levels differed statistically significantly from each other except one ($p - value_{lnRR} < 0.004$ and $p - value_{SMD(H)} < 0.001$ in all cases, except $SMD(H)_{no-material-vs-aromatic}$ vs. $SMD(H)_{no-material-vs-non-aromatic}$ p-value = 0.140), and the moderator experimental design explained a large proportion of heterogeneity, indicating its great importance ($R^2_{marginal(lnRR)}$= 27.8% and $R^2_{marginal(SMD(H))}$= 24.4%).

Second, the overall positive effect of GNM on fitness outcomes tended to be larger when GNM was added continuously throughout the nesting phase (Figure4C,D). The overall effect was positive and statistically significant for SMD(H) when material was continuously and experimentally added to the nest ($\text{lnRR}_{\text{continously}}$ = 0.034, 95% CI: [-0.014, 0.083], 95% PI: [-0.270, 0.338], p-value = 0.165, k = 95, n = 12; $\text{SMD(H)}_{\text{continously}}$ = 0.302, 95% CI: [0.069, 0.534], 95% PI: [-0.726, 1.329], p-value = 0.011, k = 105, n = 12), whereas the effect was small and statistically non-significant when added before egg hatching Table1. Last, the overall effect also tended to be positive for SMD(H) when GNM was added after egg hatching only, although only marginally so ($\text{SMD(H)}_{\text{after\_egg\_hatching}}$ = 0.267, 95% CI: [-0.024, 0.559], 95% PI: [-0.775, 1.310], p-value = 0.072, k = 57, n = 5; Table1). The three categories did not differ statistically significantly from each other ($\text{p-value}_{\text{lnRR}}$ > 0.307 and $\text{p-value}_{\text{SMD(H)}}$ > 0.243 in all cases). The timing of GNM addition explained little heterogeneity ($R^2_{marginal(lnRR)}$= 1.2% and $R^2_{marginal(SMD(H))}$= 4.5%).

Third, although none of the species-specific mean estimates were statistically significant, most were positive Figure S14, Table1, and bird species identity explained a non-negligible amount of heterogeneity

($R^2_{marginal(lnRR)}$= 5.3% and $R^2_{marginal(SMDH)}$= 8.5%). Fourth, most fitness proxy-specific mean estimates were positive, but only morphology was statistically significant, and only for SMD(H) ($\text{SMDH}_{\text{morphology}}$ = 0.310, 95% CI: [0.112, 0.509], 95% PI: [-0.723, 1.343], p-value = 0.002, k = 65, n = 15; Figure S14; Table1) and fitness proxy category accounted for a small amount of heterogeneity ($R^2_{marginal(lnRR)}$= 3.7% and $R^2_{marginal(SMD(H))}$= 2.4%). Fifth, for the subset of outcomes relating to pathogen and parasitic load, estimates for arthropods and micro-organisms did not differ statistically significantly (Figure S14 ; Table1) and the type of parasite or pathogen explained little heterogeneity ($R^2_{marginal(lnRR)}$= 0.4% and $R^2_{marginal(SMD(H))}$= 1.6%). Lastly, the evaluation of potential risk-of-bias categories (i.e., blinding, random assignment to each treatment, and partial reporting) were limited by the small number of studies in some categories (details in Table S3)

3.4. Publication Bias

We found no conclusive evidence for publication bias in the published literature Figure S15. There was no statistical evidence for small-study effect for lnRR ($\text{lnRR}_{\text{intercept}}$= 0.003, 95% CI: [-0.066, 0.072], p-value = 0.926, $\text{lnRR}_{\text{slope}}$ = 0.079, 95% CI: [-0.215; 0.373], p-value = 0.595, k = 221, n = 24, $R^2_{marginal(lnRR)}$= 0.3%). For SMD(H), there was a tendency for effect sizes to be larger when sample size was smaller but this relationship was marginally statistically significant ($\text{SMDH}_{\text{slope}}$ = 1.393, 95% CI: [-0.143, 2.929], p-value = 0.075, k = 235, n = 24, $R^2_{marginal(SMD(H))}$= 8.3%) with the overall adjusted effect decreasing substantially ($\text{SMDH}_{\text{intercept}}$ = -0.035, 95% CI: [-0.319, 0.249], p-value = 0.809). In addition, since published effect sizes did not seem to change considerably over time, our analyses suggest no clear evidence of decline effects in published effect sizes (see Figure S15).

4. Discussion

Our pre-registered systematic review and meta-analysis provide the first quantitative synthesis of the adaptive function of green nest material (GNM) in birds. By aggregating all relevant experimental evidence on different fitness proxies, we found that, on average, GNM has a small positive effect on fitness. Our results were generally consistent across two effect size metrics and robust to various sensitivity analyses; however, the moderate-to-high levels of heterogeneity among effect sizes indicate context-dependency. By testing several biological and methodological moderators, we found that experimental design explains the highest proportion of heterogeneity, raising the question of whether it is the plants' aromatic volatile compounds alone that explain the observed association between GNM and fitness. Below, we discuss our findings in specific contexts, highlight knowledge gaps and potential biases in the current literature, and suggest directions for future research.

Although our synthesis shows that the addition of GNM is associated with an increase in fitness estimates, we found no clear support for either of the two functional hypotheses traditionally proposed: the courtship hypothesis and parental care hypothesis (i.e., nest protection and drug hypotheses combined). Despite several studies explicitly looking into the courtship hypothesis (e.g., [56]; [27]), only a few fitness proxies could be exclusively linked to this mechanism (e.g., courtship time, male provisioning), and these showed no effect of GNM. Similarly, fitness proxies exclusively associated with the parental care hypothesis, such as parasite loads and nestling health, also showed no effect of GNM. The latter finding is particularly surprising because the parental care hypothesis, which is nest protection and drug hypothesis combined, has been most frequently tested. While studies testing the courtship hypothesis have suggested that the aromatic volatile compounds could help receivers of the signal (often females) detect the presence of GNM in dark cavity nests, it is the parental care hypothesis that has stressed the importance of these compounds, perhaps explaining their widespread consideration. Our findings, however, challenge this assumption since experimental designs comparing aromatic vs. non-aromatic GNM, which correspond to over half of all tests, do not suggest a fitness effect, whereas those comparing aromatic vs. no material do. Surprisingly, though, comparing non-aromatic vs. no material suggested a negative effect of non-aromatic GNM on fitness; though this result should be interpreted cautiously, as it was based on only three studies (k = 10 effect sizes). Importantly, experimental design alone explained about one-fourth of the observed heterogeneity ($R^2_{marginal}$ 24-28%). In addition, only proxies that could not be clearly assigned to either of the functional hypotheses (e.g., survival rate, nestling morphology), which were then categorized as being associated with "both" hypotheses, showed a clear positive effect. This ambiguity reflects the challenge of interpreting many fitness proxies in relation to an underlying function, as they are likely influenced by multiple overlapping processes. Our results call for reconsidering the importance of aromatic volatile compounds, and thus, the mechanisms involved in the adaptive function of GNM.

The overall effect of GNM was heterogeneous and mainly associated with within-study variation, with little to none among-study variation. This suggests that, once methodological and biological factors within studies are accounted for, the overall effect found would be potentially generalisable across studies. In addition to experimental design (see paragraph above), another methodological moderator that we tested was the time of GNM addition ($R^2_{marginal}$= 1-5%). Continuous addition of GNM throughout the nesting period showed greater positive effects than addition restricted to before or after egg hatching. Previous work on blue tits has shown that the concentration of active compounds released by the aromatic plants can decrease within 24 hours [14], and females often replace experimentally removed herbs [57, 58]. TThis repeated addition may help maintain an environment high in volatiles that are hostile to parasites. However, the presence of fresh GNM could also lead to a positive effect on fitness via structural or micro-climate benefits. Fresh GNM can act as a renewable lining that improves nest insulation and humidity buffering as nest material gradually desiccates [36, 59]. Such micro-climate stability can accelerate nestling development while reducing thermoregulatory costs for the parents [19]. In addition, regular replenishment of GNM by birds could also help replace the wilted material in the nest, thus maintaining nest structure and helping dilute faecal matter or food debris in the nest (i.e., hygiene function; [60]).

Among the biological moderators tested, species identity seemed the most important one ($R^2_{marginal}$ = 5-9%), providing some evidence for species-specific effects; however, note that three species were represented in only one study each. Such variation across species is not unexpected, since some (e.g., Tachycineta bicolor) do not add GNM in nature, while the others species do. Additionally, species-specific differences in life-history traits, nest construction, or habitat condition, and their interplay likely influence how GNM affects fitness. The second most important biological moderator was the fitness proxy category ($R^2_{marginal}$ = 2-4%), potentially indicating differences in validity across fitness proxies or reflecting differences among underlying mechanisms. Among all categories, morphological outcomes (e.g., nestling mass, tarsus length, wing length) showed the largest positive effects, suggesting that GNM has a more pronounced effect on offspring development or growth. Morphology was the second most commonly measured fitness proxy across studies, likely because it is relatively easy to measure and less prone to measurement error. However, while widely used as an indicator of offspring condition, these morphological measures remain indirect fitness proxies. All other fitness proxy categories, including physiology, reproduction, phenology, and behaviour, showed small to moderate positive effects, whereas proxies related to parasite or pathogen load, despite being the most commonly investigated, showed weak and inconsistent effects. Parasite reduction is central to one of the two mechanisms within the parental care hypothesis (the nest protection hypothesis, [28]; [13]). Our results further emphasise that despite its prominence, there is a lack of clear overall evidence for the parental care hypothesis. The other hypothesis categorised within the parental care hypothesis (i.e., the drug hypothesis; [33] ; [34]), proposes an increase in offspring survival, with volatile compounds directly enhancing offspring immune function and/or health independent of parasite or pathogen control. While the largest positive effects of morphology could support the drug hypothesis, it should be noted that (i) the mechanism linking volatiles to enhanced offspring immune function or health is unclear, (ii) our results suggest that non-aromatic GNM may play a role, and (iii) several other mechanisms could also be at play. For example, improved offspring morphological condition could result from enhanced micro-climate of the nest (e.g., [61]), better incubation of the eggs or indirectly through sexually selected male traits, as suggested by the courtship hypothesis.

When interpreting our results, it is important to acknowledge some constraints of the study and in the available evidence. The overall effect of GNM differed between the two effect size metrics, which make distinct assumptions regarding the underlying biological processes and the statistical properties. These divergent results highlight the importance of choosing appropriate effect size metrics for a meta-analysis that align with the biological data at hand or in cases where several different types of measures are present, using both [62]. We found high reporting quality in the primary study included in our meta-analysis, with only 0.06% partial reporting, but some evidence of small-study effects. After adjusting for this, the effect of GNM was no longer significant. To reduce the influence of small-study effects we contacted all authors for unpublished data, but could only find access to two studies. In addition, many studies had very low sample sizes (41% of the effect sizes were based on fewer than 10 nests per group), which reduces power and increases heterogeneity. Furthermore, studies remain heavily biased towards just three bird species, limiting our ability to infer broad patterns of this behaviour. Expanding the scope to other bird species with diverse nesting ecologies and habitat conditions can be useful in understanding the adaptive benefits of this behaviour.

5. Conclusion

After more than 40 years of research on this topic, ours is the first quantitative synthesis confirming an overall effect of green nest material on fitness in birds. Despite the moderate-to-high heterogeneity observed, our results suggest that the effect may be generalisable across studies once methodological and biological factors within studies are accounted for. An important caveat, however, is that our small-study effects analysis, although non-conclusively, indicates that accounting for potentially missing studies could cause the observed effect to disappear, despite our efforts to include unpublished work. Moreover, our study clearly emphasises that the functions remain largely unclear and challenges the assumption that volatile compounds alone explain the relationship between green nest material and fitness. Future studies should consider focusing on experimental designs that disentangle the different functional hypotheses suggested, prioritising fitness proxies that are more directly linked to fitness, as well as to test explicitly, rather than assume, the role of volatiles. In addition, theoretical work could further solidify the field's foundations and yield testable predictions. Altogether, our synthesis contributes to a more nuanced understanding of the adaptive significance of one of the most fascinating and most studied natural structures: bird nests, as well as opens the door to several questions still unanswered.

5.1. Data and Code Availability Statement

All data and code associated with this project can be found on GitHub at [https://github.com/shreyadimri/Green_Nest_Material]. It is also available on Zenodo [**insert link later**].

5.2. Author contributions

SD: Conceptualisation, Data curation, Formal analysis, Investigation (lead), Methodology, Project administration, Software, Validation, Visualization, Writing - original draft (lead), review & editing; **TR:** Conceptualisation, Investigation (equal), Writing - review & editing; **JMGS:** Conceptualisation, Investigation (equal), Writing - review & editing; **MO:** Investigation (supporting), Validation; **AST:** Conceptualisation, Funding acquisition, Methodology, Supervision, Writing - original draft (supporting), review & editing

5.3. Conflict of interest

Authors declare no competing interests.

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7. Supplementary Appendix

7.1. PRISMA Checklist

Checklist item	**Item score**	**Sub-item number**	**Sub-item**	**Reported by authors?**	**Notes**
Title and abstract	**100%**	1.1	Identify the review as a systematic review, meta-analysis, or both	Yes	Identified in title and in abstract as both a systematic review and a meta-analysis
		1.2	Summarise the aims and scope of the review	Yes	In the abstract
		1.3	Describe the data set	Yes	In the abstract
		1.4	State the results of the primary outcome	Yes	In the abstract
		1.5	State conclusions	Yes	In the abstract
		1.6	State limitations	Yes	In the abstract

Aims and questions	**100%**	2.1	Provide a rationale for the review	Yes	Rationale explained in the Introduction in detail
		2.2	Reference any previous reviews or meta-analyses on the topic	Yes	Clearly stated twice in the introduction
		2.3	State the aims and scope of the review (including its generality)	Yes	Scope (only birds and experimental studies) explained along with the aims in the last paragraph of Introduction
		2.4	State the primary questions the review addresses (e.g. which moderators were tested)	Yes	Moderators tested are clearly stated in the methods in the data analysis section.
		2.5	Describe whether effect sizes were derived from experimental and/or observational comparisons	Yes	Only experimental studies were selected, described in the last paragraph of introduction as well as the methods

Review registration	**100%**	3.1	Register review aims, hypotheses (if applicable), and methods in a time-stamped and publicly accessible archive and provide a link to the registration in the methods section of the manuscript. Ideally registration occurs before the search, but it can be done at any stage before data analysis.	Yes	https://doi.org/10.17605/OSF.IO/S7J6Z
		3.2	Describe deviations from the registered aims and methods	Yes	Described in methods wherever applicable
		3.3	Justify deviations from the registered aims and methods	Yes	When applicable, described in the methods

Eligibility criteria	**100%**	4.1	Report the specific criteria used for including or excluding studies when screening titles and/or abstracts, and full texts, according to the aims of the systematic review (e.g. study design, taxa, data availability)	Yes	Described briefly in the methods, but mainly in the decision tree (see Supplementary Materials)
		4.2	Justify criteria, if necessary (i.e. not obvious from aims and scope.	Yes	Described along with the decision tree (see Supplementary Materials)
Finding studies	**100%**	5.1	Define the type of search (e.g. comprehensive search, representative sample)	Yes	Comprehensive search conducted, described in methods along with search string (complete search string provided in the supplementary materials)
		5.2	State what sources of information were sought (e.g. published and unpublished studies, personal communications)	Yes	Published, unpublished as well as personal communications. Described in detail in the Eligibility Criteria and Data Extraction section of Methods Section

		5.3	Include, for each database searched, the exact search strings used, with keyword combinations and Boolean operators	Yes	See complete search string in the Supplementary Materials
		5.4	Provide enough information to repeat the equivalent search (if possible), including the timespan covered (start and end dates)	Yes	See complete search string details in the Supplementary Materials. Search dates are described in the methods.
Study selection	**100%**	6.1	Describe how studies were selected for inclusion at each stage of the screening process (e.g. use of decision trees, screening software)	Yes	Abstract-Title screening was conducted using the R package revtools GUI and Fulltext screening was conducted in excel manually downloading the articles. Described in detail in the pre-registration and methods section. The decision tree is provided in the supplementary materials.
		6.2	Report the number of people involved and how they contributed (e.g. independent parallel screening)	Yes	Described in detail in the methods section. All screening decision files are shared as .xls/.csv files with notes on the decisions made.

Data collection process	**100%**	7.1	Describe where in the reports data were collected from (e.g. text or figures)	Yes	In all files after the data extraction (shared along with the project), the column data_location contains this information
		7.2	Describe how data were collected (e.g. software used to digitize figures, external data sources)	Yes	Described in detail in the Data extraction section.
		7.3	Describe moderator variables that were constructed from collected data (e.g. number of generations calculated from years and average generation time)	Yes	All moderators are described in detail in the metadata file of the overall dataset. Please see data_cleaning.Rmd and data_preparation.Rmd files for any cleaning done to the files. All codes are provided along with the dataset.

		7.4	Report how missing or ambiguous information was dealt with during data collection (e.g. authors of original studies were contacted for missing descriptive statistics, and/or effect sizes were calculated from test statistics)	Yes	Described in detail in the data extraction and effect size calculation section in the methods.
		7.5	Report who collected data	Yes	The extractor_ID column in the data file has information on the ID of who collected the data. The methods section also describes the ID of the data collector.
		7.6	State the number of extractions that were checked for accuracy by co-authors		Described in the methods section along with % of disagreement and process of resolution. The data_checker_ID column in the data files has information on the ID of who checked the data.
Data items	**100%**	8.1	Describe the key data sought from each study	Yes	The priority order of data extraction is described in detail in the Data extraction section of the methods.

	8.2	Describe items that do not appear in the main results, or which could not be extracted due to insufficient information	Yes	All information that is excluded from analysis is described in detail in the methods. Some proxies that could not be included in the analysis for various reasons are reported in the supplementary material along with the reason.
	8.3	Describe main assumptions or simplifications that were made (e.g. categorising both ‘length’ and ‘mass’ as ‘morphology’)	Yes	All major decisions are described in the methods section, for any remaining description please check the notes column in the data files.
	8.4	Describe the type of replication unit (e.g. individuals, broods, study sites)	Yes	Described in the methods, we prioritised nests as the unit of replication whenever possible.

Assessment of individual study quality	**100%**	9.1	Describe whether the quality of studies included in the systematic review or meta-analysis was assessed (e.g. blinded data collection, reporting quality, experimental versus observational)	Yes	The risk of bias assessment performed for the individual studies is described in the methods and results reported in the results section (See supplementary material for all model output and figures). The risk of bias categories we evaluated were blinding, random assignment to each treatment and partial reporting
		9.2	Describe how information about study quality was incorporated into analyses (e.g. meta-regression and/or sensitivity analysis)	Yes	We conducted three meta-regressions using blinding, random assignment to each treatment and partial reporting as moderators in each analysis. We reported the outcome briefly in the Results (See supplementary material for all model output and figures)
Effect size measures	**100%**	10.1	Describe effect size(s) used	Yes	Described in Effect Size Calculation section in Methods

		10.2	Provide a reference to the equation of each calculated effect size (e.g. standardised mean difference, log response ratio) and (if applicable) its sampling variance	Yes	Described in the Effect Size Calculation section in Methods. Check data_preparation.Rmd in Code to see the exact function, its parameters and any equations that were used to estimate the effect sizes.
		10.3	If no reference exists, derive the equations for each effect size and state the assumed sampling distribution(s)	Yes	Does not apply. Any custom equations used from books etc. are clearly mentioned as well as referenced in the Methods section.
Missing data	**100%**	11.1	Describe any steps taken to deal with missing data during analysis (e.g. imputation, complete case, subset analysis)	Yes	All imputations conducted for the missing data are stated clearly in the Effect Size Calculations in Methods Section
		11.2	Justify the decisions made to deal with missing data	Yes	We decided to impute the missing data but also conducted the sensitivity analysis excluding the imputed value. All justifications are clearly stated in the methods.

Meta-analytic model description	**100%**	12.1	Describe the models used for synthesis of effect sizes	Yes	Described all models in Data Analysis section of the Methods
		12.2	The most common approach in ecology and evolution will be a random-effects model, often with a hierarchical/multilevel structure. If other types of models are chosen (e.g. common/fixed effects model, unweighted model), provide justification for this choice	Yes	Not applicable, Multilevel meta analytical model and meta-regressions were conducted. No justification needed
Software	**100%**	13.1	Describe the statistical platform used for inference (e.g. R)	Yes	R v4.5.1 was used for the analysis and is clearly stated in the Methods.
		13.2	Describe the packages used to run models	Yes	All packages and their versions are described in the Methods.
		13.3	Describe the functions used to run models	Yes	All important functions used for running the models are stated in the Methods.

		13.4	Describe any arguments that differed from the default settings	Yes	We have clearly stated all the important arguments that differed from the default settings. However, see data_analysis.Rmd for full description of the arguments for each model.
		13.5	Describe the version numbers of all software used	Yes	All packages and their versions are described in the Methods.
Non-independence	**100%**	14.1	Describe the types of non-independence encountered (e.g. phylogenetic, spatial, multiple measurements over time)	Yes	See data analysis for more details on how non-independence was handled.
		14.2	Describe how non-independence has been handled	Yes	See data analysis for more details on how non-independence was handled.
		14.3	Justify decisions made	Yes	See data analysis for more details on how non-independence was handled.
Meta-regression and model selection	**100%**	15.1	Provide a rationale for the inclusion of moderators (covariates) that were evaluated in meta-regression models	Yes	All the moderators that were evaluated were pre-registered with the rationale behind it clearly stated. See Data analysis for more details (but also see pre-registration).

		15.2	Justify the number of parameters estimated in models, in relation to the number of effect sizes and studies (e.g. interaction terms were not included due to insufficient sample sizes)	Yes	We described the random effects that were not included in the models in the Methods section
		15.3	Describe any process of model selection	Yes	No model selection was conducted
Publication bias and sensitivity analysis	**100%**	16.1	Describe assessments of the risk of bias due to missing results (e.g. publication, time-lag, and taxonomic biases)	Yes	Time-lag bias and small study bias are reported in the methods, results and discussion.
		16.2	Describe any steps taken to investigate the effects of such biases (if present)	Yes	We discussed the effects of potential biases and conducted a sensitivity analysis accounting these effects for the two main models.

		16.3	Describe any other analyses of robustness of the results, e.g. due to effect size choice, weighting or analytical model assumptions, inclusion or exclusion of subsets of the data, or the inclusion of alternative moderator variables in meta-regressions	Yes	All sensitivity analysis are mentioned in the methods, results and discussed where aproporiate. All the results from the sensitivity analysis/robustness checks are reported as a table in the supplementary material.
Clarification of post hoc analyses	100%	17.1	When hypotheses were formulated after data analysis, this should be acknowledged.	Yes	All analysis are pre-registered and exploratory analysis are clearly stated under exploratory analysis both in the pre-registration and final article
Metadata, data, and code	100%	18.1	Share metadata (i.e. data descriptions)	Yes	See data and code availability statement for details.
		18.2	Share data required to reproduce the results presented in the manuscript	Yes	See data and code availability statement for details.

		18.4	Share analysis scripts (or, if a software package with graphical user interface (GUI) was used, then describe full model specification and fully specify choices)	Yes	See data and code availability statement for details.
Results of study selection process	100%	19.1	Report the number of studies screened	Yes	Details in method and the PRISMA Flowchart in supplementary material
		19.2	Report the number of studies excluded at each stage of screening	Yes	Details in method and the PRISMA Flowchart in supplementary material
		19.3	Report brief reasons for exclusion from the full text stage	Yes	Details in the PRISMA Flowchart in supplementary material
		19.4	Present a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)-like flowchart (www.prisma-statement.org).	Yes	Figure S1 in supplementary materials is a PRISMA Flowchart

Sample sizes and study characteristics	100%	20.1	Report the number of studies and effect sizes for data included in meta-analyses	Yes	Details in method and supplementary tables
		20.2	Report the number of studies and effect sizes for subsets of data included in meta-regressions	Yes	Details in method and supplementary tables
		20.3	Provide a summary of key characteristics for reported outcomes (either in text or figures; e.g. one quarter of effect sizes reported for vertebrates and the rest invertebrates)	Yes	All figures contain effect sizes (k) and unique articles (n) for different moderator levels. Summary of reported outcomes is also in the first paragraph of the Results.
		20.4	Provide a summary of limitations of included moderators (e.g. collinearity and overlap between moderators)	NA	All moderators tested were categorical and only publication year was a continuous moderator. Therefore, no collinearity or overlap is possible.

		20.5	Provide a summary of characteristics related to individual study quality (risk of bias)	Yes	This data is presented in dataset in columns blinding, missing_data, random_assignment
Meta-analysis	100%	21.1	Provide a quantitative synthesis of results across studies, including estimates for the mean effect size, with confidence/credible intervals	Yes	See results and supplementary material for detail of all the synthesis.
Heterogeneity	100%	22.1	Report indicators of heterogeneity in the estimated effect (e.g. I2, tau2 and other variance components)	Yes	All estimates of heterogeneity are reported in the results and model table. Also see supplementary material for the results not reported in the main text.
Meta-regression	100%	23.1	Provide estimates of meta-regression slopes (i.e. regression coefficients) and confidence/credible intervals	Yes	See results and supplementary material for detail of all the synthesis.

		23.2	Include estimates and confidence/credible intervals for all moderator variables that were assessed (i.e. complete reporting)	Yes	See results and supplementary material for detail of all the synthesis.
		23.3	Report interactions, if they were included	NA	There were no interactions included
		23.4	Describe outcomes from model selection, if done (e.g. R2 and AIC)	NA	No model selection was conducted.
Outcomes of publication bias and sensitivity analysis	100%	24.1	Provide results for the assessments of the risks of bias (e.g. Egger's regression, funnel plots)	Yes	Risk of bias was assessed using meta-regression models with moderator levels for blinding, missing data, random assignment in experiments and reported in results (and see supplementary material for complete details). We also reported meta-regressions for publication bias (time-lag bias and small-study effects) in results (and see supplementary material for complete details)

		24.2	Provide results for the robustness of the review's results (e.g. subgroup analyses, meta-regression of study quality, results from alternative methods of analysis, and temporal trends)	Yes	All robustness checks/sensitivity analysis conducted are reported in full detail in the supplementary material and mentioned in the results clearly.
Discussion	100%	25.1	Summarise the main findings in terms of the magnitude of effect	Yes	
		25.2	Summarise the main findings in terms of the precision of effects (e.g. size of confidence intervals, statistical significance)	Yes	We use confidence intervals, prediction intervals and statistical significance to discuss the precision of the effects in the results and discussion section.
		25.3	Summarise the main findings in terms of their heterogeneity	Yes	We report and discuss the heterogeneity and explore some of the possible causes of it in our results and discussion.

		25.4	Summarise the main findings in terms of their biological/practical relevance	Yes	We have discussed all important findings in terms of their biological and practical implications
		25.5	Compare results with previous reviews on the topic, if available	Yes	We have discussed the results comparing them to other published literature (including two narrative reviews that summarise the field) but no quantitative review on the field exists to compare the results with.
		25.6	Consider limitations and their influence on the generality of conclusions, such as gaps in the available evidence (e.g. taxonomic and geographical research biases)	Yes	We discuss the limitations of the evidence.
Contributions and funding	100%	26.1	Provide names, affiliations, and funding sources of all co-authors	Yes	See section Fundings
		26.2	List the contributions of each co-author	Yes	See section Author Contributions
		26.3	Provide contact details for the corresponding author	Yes	See manuscript Author details: Shreya Dimri - shreya.dimri@uni-bielefeld.de

		26.4	Disclose any conflicts of interest	Yes	See section Conflict of interest
References	100%	27.1	Provide a reference list of all studies included in the systematic review or meta-analysis	Yes	See supplementary material for a list.
		27.2	List included studies as referenced sources (e.g. rather than listing them in a table or supplement)	Yes	We have included all the studies in our meta-analysis within the text of the article in appropriate places.

7.2. PRISMA Flowchart

7.3. Initial library used for search validation

7.4. Decision Tree

7.5. Fitness proxies included in the meta-analysis

7.6. Fitness proxies that were excluded from our meta-analysis

7.7. Standardized Email Template

We included two unpublished studies in our meta-analysis:

7.8.0.1. GNM_1_Unpublished:.

Greenery manipulation experiment was conducted over two breeding seasons in 2018 and 2019. There were four treatment groups: Control, Spruce, Plastic (Branches of an artificial Christmas tree) and Greenery removal. Nests assigned to the spruce and plastic treatments, were lined with approximately ten twigs in such a way that the entire nest platform was covered. At nests assigned to the greenery removal treatment, all fresh greenery was carefully removed while the nest structure was left untouched. Greenery removal treatment was conditioned on the existence of fresh greenery at the first sampling occasion. Control nests were handled similarly but the greenery composition was not altered. For the purpose of the meta-analysis we did not include the plastic treatment, only, addition or removal of green material and control group. Sampling interval was 5 to 19 days (mean: 7.72 ± 0.54, $n = 42$ nests).

Sample sizes 42 nests in total: 18 nests allocated to the spruce treatment, 9 greenery removal, 10 plastic and 5 controls

Fitness proxies included in the meta-analysis:

1. Body condition of the nestling
2. Ectoparasite load (Carnus hemapterus): Semi-quantitative measure with five levels, ranging from 0 (no infestation on any of the four locations) to 4 (C. hemapterus larvae or fresh biting marks present on all four examined body locations)
3. Endoparasite load (Leucocytozoon): Five levels 0 – 4

Data used for the meta-analysis can be found data/02_data_extraction/data_extraction_MO_checkedSD.xlsx

7.8.0.2. GNM_2_Unpublished:.

An experiment on Blue Tits conducted in Bergen (Norway), adding lavender in nests and comparing nestling growth & survival with controls. 5 fresh leaves of lavender were added / replaced every 2ndday in broods in the "aromatic" group, from day 5 to day 13 after hatching. In the control group nothing was added, but the broods were otherwise treated similarly.

The following variables were provided in the dataset:

1. Weight D5, D7, D9, D11, D13 - Weight of nestlings at 5, 7, 9, 11, 13 days after hatching of first egg
2. Weight D14-17 - Final weight measure on nestlings at days 14-17 post-hatching, seen as fledging weight
3. TarsusLength D14-17 - Tarsus length measured on nestlings at days 14-17 post-hatching, 0.1mm accuracy
4. Percent Survived - Percentage of all chicks initially hatched in each group that survived until fledging (therefore no SD)
5. Survival Per Brood - Percentage of chicks in each brood that survived until fledging (the unit is the brood here)

This data was part of a Master thesis "**Aromatic plants in nests of blue tits (Cyanistes caeruleus)**" [63] and all the details can be found at https://hdl.handle.net/11250/3172874.

Data used for the meta-analysis can be found data/02_data_extraction/data_extraction_UnpublishedThesis.xlsx

7.9. *Complete List of Variables extracted from each study*

- Authors Complete information of all authors. Each author name to be separated by ;. Example: Dave Shutler and Adam A. Campbell → "Shutler D; Campbell A A".
- Year of Publication The year the article was published.
- Population Location Geographical location of the study population extracted as provided by the authors along with any coordinates provided. If multiple sites are studied in a location, extract them as PopulationName_SiteA.
- Experiment ID An identifier given to the estimates coming from the same sub-population within a location.
- Group ID An identifier given to the estimates coming from the same group of experimental units (e.g., males and females in a population, first clutch and second clutch).
- Repeated Trait ID An identifier given to the repeated measurement of the same trait within the same individuals (e.g., chick mass on day 7, 14, and 21).
- Bird Species Scientific name of the bird species studied.
- Treatment Group Plant Species Scientific or common name of the plant species used as the green nest material (treatment group).
- Control Group Plant Species Scientific name of the plant(s) species used as control treatment(s) in the study. If the scientific name is not given, extract it as reported by the authors. If there is no material used for control, note "blank".
- Comparison Type Experimental design used to code the comparison between the two groups: 1 = non-aromatic (control) vs. aromatic (treatment) 2 = no added material (control) vs. aromatic (treatment) 3 = no added material (control) vs. non-aromatic (treatment)
- CH Estimates related to the courtship hypothesis — yes (1) or no (0).
- PCH Estimates related to the nest protection or drug hypothesis — yes (1) or no (0).
- Measure of Central Tendency (treatment group) Estimated value of central tendency for the samples of the treatment group.
- Type of Measure of Central Tendency (treatment group) Type of central tendency value reported for the treatment group (e.g., Mean, Median, Mode).

- Measure of Dispersal (treatment group) Value of the measure of variation for the treatment group.
- Type of Measure of Dispersal (treatment group) Type of variation of the data (e.g., SE, SD, CI95) reported for the treatment group.
- Sample Size (treatment group) Sample size for the treatment group.
- Measure of Central Tendency (control group) Estimated value of central tendency for the samples of the control group.
- Type of Measure of Central Tendency (control group) Type of central tendency value reported for the control group (e.g., Mean, Median, Mode).
- Measure of Dispersal (control group) Value of the measure of variation for the control group.
- Type of Measure of Dispersal (control group) Type of variation of the data (e.g., SE, SD, CI95) reported for the control group.
- Sample Size (control group) Sample size for the control group.
- Fitness Proxy Measured Variable name used in the study as a proxy of fitness. Extracted as presented in the article and later standardized across studies.
- Category/Type of Fitness Proxy Measured Type of trait (i.e., fitness proxy) studied: behaviour, morphology, parasite and pathogenic load, phenology, physiology, or reproduction.
- Fitness Proxy Sign Sign assigned in relation to fitness: $+1$ if fitness increases with proxy (e.g., survival rate, body mass). -1 if fitness decreases with proxy (e.g., mortality, parasite load).
- Statistics Type Type of statistics used to address the effect of GNM on fitness when primary data were not reported (e.g., t-test, ANOVA). Extracted only when central tendency was not reported.
- Test Statistics Type Type of test statistic used (e.g., t, F).
- Statistics Value Value of the test statistic used.
- P Value Reported p-value (e.g., $p = 0.003$).
- Sign Relationship Positive when treatment increases the trait value and negative when it decreases the trait value. Used when only the statistical value was provided.
- Total Sample Size Total sample size used to calculate the statistical value.

- Degree of Freedom Degrees of freedom for the statistics used.
- Data Location The part of the text or figure from which the data were extracted.
- Parasite Type Type of parasite when fitness proxy measured parasite/pathogen load (Arthropod or Micro-organism).
- Time of Green Nest Material Addition Time of green nest material addition by authors or birds [continuous (c), before (b), or after (a) egg hatching].
- Blinding Whether blinding was conducted — yes (y) or no (n).
- Random Assignment Whether nests were assigned to treatment or control randomly — yes (y) or no (n).
- Missing Data Whether data were only partially or not reported — yes (y) or no (n).
- Shared Treatment Group Used to identify non-independence between shared treatment groups. Value = 1 if individuals were compared only once as a treatment group.
- Shared Control Group Used to identify non-independence between shared control groups. Value = 1 if individuals were compared only once as a control group.

7.10. Random Effects

7.11. Sensitivity analysis of sampling correlation values ( ) in variance–covariance structures

7.12. All sensitivity-analysis/robustness check

7.13. Plots without cropping the axis (showing complete X-axis)

7.14. Risk of Bias Test

The risk of bias categories we evaluated (i.e., blinding, random assignment to each treatment and partial reporting) were not statistically significant for lnRR (Table S3). SMD(H) was positive and statistically significant for studies without blinding ($\mathrm{SMD(H)}_{\text{No Blinding}}$ = 0.184, 95% CI: [0.051, 0.316], 95% PI: [-0.828, 1.195], p-value = 0.007, k = 242, n = 25; Table S3), with random assignment to treatment ($\mathrm{SMD(H)}_{\text{Random Assignment}}$ = 0.205, 95% CI: [0.049, 0.360], 95% PI: [-0.813, 1.223], p-value = 0.010, k = 225, n = 23; Table S3) and where no data was missing ($\mathrm{SMD(H)}_{\text{No Partial Reporting}}$ = 0.196, 95% CI: [0.055, 0.337], 95% PI: [-0.817, 1.209], p-value = 0.007, k = 216, n = 22; Table S3). Notably, other levels of each category included fewer than four studies, indicating that the observed significance likely reflects the higher statistical power in the larger sample level rather than any systematic bias. All the three categories for risk of bias explained very little heterogeneity ($R^2_{marginal(lnRR)} > 0.8\%$; $R^2_{marginal(SMD(H))} > 0.7\%$).

7.15. Publication Bias

Since published effect sizes did not seem to change considerably over time, our analyses suggest no clear evidence of decline effects (i.e., time-lag bias) in published effect sizes ($\text{lnRR}_{\text{intercept}}$ = 0.021, 95% CI: [-0.011; 0.053], p-value = 0.196, $\text{lnRR}_{\text{slope}}$ = -0.002, 95% CI: [-0.005 to 0.001], p-value = 0.225, k = 221, n = 24, $R^2_{marginal(lnRR)}$= 1.8%; $\text{SMDH}_{\text{intercept}}$ = 0.193, 95% CI: [0.058 to 0.329], p-value = 0.005, $\text{SMDH}_{\text{slope}}$ = -0.008, 95% CI: [-0.023 to 0.006], p-value = 0.264, k = 235, n = 24, $R^2_{marginal(SMD(H))}$ = 2.9%).

The search was conducted twice, the first time on 07.09.2022 and then repeated on 12.08.2024 to ensure it was the most up to date and did not miss any additional articles on the topic that were published meanwhile. For both the searches, we did not use any time limitation i.e. it included all the published literature till that given date. We used **Advance Search** option for both Web of Science Core Collection Database and Scopus Database using the search query given below.

Search string for the Web of Science Core Collection
Databases used in the search included
-Science Citation Index Expanded (SCI-EXPANDED) [1900-present]
-Social Sciences Citation Index (SSCI) [1900-present]
-Arts & Humanities Citation Index (AHCI) [1975 - present]
-Conference Proceedings Citation Index - Science (CPCI-S) [1991 - present]
-Conference Proceedings Citation Index - Social Science & Humanities (CPCI-SSH) [1991 - present]
-Emerging Sources Citation Index (ESCI) [2017- present]

We used advance search option and Title (TI), Abstract (AB) and Author Keywords (AK) to conduct our systematic search using the following string

<TI=(((“green*” OR “herb*” OR “aromatic*”) AND “nest*” AND (“bird*” OR “aves” OR “avian” OR “ornithol*” OR “passerine*” OR “passeriform*” OR “songbird*” OR “Accipiter” OR “Aegypius” OR “Aquila” OR “Aviceda” OR “Busarellus” OR “Butastur” OR “Buteo” OR “Buteogallus” OR “Chondrohierax” OR “Circaetus” OR “Circus” OR “Clanga” OR “Elanoides” OR “Elanus” OR “Gampsonyx” OR “Geranoaetus” OR “Geranospiza” OR “Gypaetus” OR “Gypohierax” OR “Gyps” OR “Haliaeetus” OR “Haliastur” OR “Harpagus” OR “Harpia” OR “Hieraaetus” OR “Ictinaetus” OR “Ictinia” OR “Kaupifalco” OR “Leptodon” OR “Leucopternis” OR “Lophotriorchis” OR “Milvus” OR “Morphnarchus” OR “Morphnus” OR “Necrosyrtes” OR “Neophron” OR “Nisaetus” OR “Parabuteo” OR “Pernis” OR “Pithecophaga” OR “Polemaetus” OR “Pseudastur” OR “Rostrhamus” OR “Rupornis” OR “Sarcogyps” OR “Spilornis” OR “Spizaetus” OR “Stephanoaetus” OR “Terathopius” OR “Torgos” OR “Trigonoceps” OR “Cathartes” OR “Coragyps” OR “Gymnogyps” OR

“Sarcoramphus” OR “Vultur” OR “Pandion” OR “Sagittarius” OR “Aix” OR “Alopochen” OR “Amazonetta” OR “Anas” OR “Anser” OR “Asarcornis” OR “Aythya” OR “Branta” OR “Bucephala” OR “Cairina” OR “Callonetta” OR “Cereopsis” OR “Chen” OR “Chenonetta” OR “Chloephaga” OR “Clangula” OR “Coscoroba” OR “Cyanochen” OR “Cygnus” OR”Dendrocygna” OR “Heteronetta” OR “Histrionicus” OR “Hymenolaimus” OR “Lophodytes” OR “Lophonetta” OR “Malacorhynchus” OR “Mareca” OR “Marmaronetta” OR “Melanitta” OR “Merganetta” OR “Mergellus” OR “Mergus” OR “Neochen” OR “Netta” OR “Nettapus” OR “Nomonyx” OR “Oxyura” OR “Plectropterus” OR “Polysticta” OR “Pteronetta” OR “Sarkidiornis” OR “Sibirionetta” OR “Somateria” OR “Spatula” OR “Tachyeres” OR “Tadorna” OR “Thalassornis” OR “Anhima” OR “Chauna” OR “Anseranas” OR “Aegotheles” OR “Aerodramus” OR “Aeronautes” OR “Apus” OR “Chaetura” OR “Collocalia” OR “Cypseloides” OR “Cypsiurus” OR “Hirundapus” OR “Panyptila” OR “Streptoprocne” OR “Tachornis” OR “Tachymarptis” OR “Hemiprocne” OR “Abeillia” OR “Adelomyia” OR “Aglaeactis” OR “Aglaiocercus” OR “Amazilia” OR “Androdon” OR “Anopetia” OR “Anthocephala” OR “Anthracothorax” OR “Archilochus” OR “Atthis” OR “Augastes” OR “Avocettula” OR “Basilinna” OR “Boissonneaua” OR “Calliphlox” OR “Calypte” OR “Campylopterus” OR “Chaetocercus” OR “Chalcostigma” OR “Chalybura” OR “Chlorestes” OR “Chlorostilbon” OR “Chrysolampis” OR “Chrysuronia” OR “Clytolaema” OR “Coeligena” OR “Colibri” OR “Cyanophaia” OR “Cynanthus” OR “Discosura” OR “Doricha” OR “Doryfera” OR “Elvira” OR “Ensifera” OR “Eriocnemis” OR “Eugenes” OR “Eulampis” OR “Eulidia” OR “Eupetomena” OR “Eupherusa” OR “Eutoxeres” OR “Florisuga” OR “Glaucis” OR “Goethalsia” OR “Goldmania” OR “Haplophaedia” OR “Heliactin” OR “Heliangelus” OR “Heliodoxa” OR “Heliomaster” OR “Heliothryx” OR “Hylocharis” OR “Juliamyia” OR “Klais” OR “Lafresnaya” OR “Lampornis” OR “Lamprolaima” OR “Lepidopyga” OR “Lesbia” OR “Leucippus” OR “Leucochloris” OR “Lophornis” OR “Mellisuga” OR “Metallura” OR “Microchera” OR “Myrmia” OR “Myrtis” OR “Ocreatus” OR “Opisthoprora” OR “Oreonympha” OR “Oreotrochilus” OR “Orthorhyncus” OR “Oxypogon” OR “Panterpe” OR “Patagona” OR “Phaeochroa” OR “Phaethornis” OR “Phlogophilus” OR “Polyonymus” OR “Polytmus” OR “Pterophanes” OR “Ramphodon” OR “Ramphomicron” OR “Rhodopis” OR “Sappho” OR “Schistes” OR “Selasphorus” OR “Sephanoides” OR “Stephanoxis” OR “Sternoclyta” OR “Taphrospilus” OR “Thalurania” OR “Thaumastura” OR “Threnetes” OR “Topaza” OR “Trochilus” OR “Urochroa” OR “Urosticte” OR “Apteryx” OR “Anthracoceros” OR “Buceros” OR “Bycanistes” OR “Lophoceros” OR “Penelopides” OR “Rhabdotorrhinus” OR “Rhyticeros” OR “Tockus” OR “Bucorvus” OR “Phoeniculus” OR “Rhinopomastus” OR “Upupa” OR “Antrostomus” OR “Caprimulgus” OR “Chordeiles” OR “Eleothreptus” OR “Eurostopodus” OR “Hydropsalis” OR “Lurocalis” OR “Lyncornis” OR “Nyctidromus” OR “Nyctiphrynus” OR “Nyctipolus” OR “Nyctiprogne” OR “Phalaenoptilus” OR “Setopagis” OR “Systellura” OR “Uropsalis” OR “Nyctibius” OR “Batrachostomus” OR “Podargus” OR “Steatornis” OR “Cariama” OR “Casuarius” OR “Dromaius” OR “Aethia” OR “Alca” OR “Alle” OR “Brachyramphus” OR “Cepphus” OR “Cerorhinca” OR “Fratercula” OR “Pinguinus” OR “Ptychoramphus” OR “Synthliboramphus” OR “Uria” OR “Burhinus” OR “Anarhynchus”

OR “Charadrius” OR “Elseyornis” OR “Erythrogonys” OR “Hoploxypterus” OR “Oreopholus” OR “Peltohyas” OR “Phegornis” OR “Pluvialis” OR “Thinornis” OR “Vanellus” OR “Chionis” OR “Dromas” OR “Cursorius” OR “Glareola” OR “Rhinoptilus” OR “Stiltia” OR “Haematopus” OR “Actophilornis” OR “Hydrophasianus” OR “Irediparra” OR “Jacana” OR “Metopidius” OR “Microparra” OR “Anous” OR “Chlidonias” OR “Chroicocephalus” OR “Creagrus” OR “Gelochelidon” OR “Gygis” OR “Hydrocoloeus” OR “Hydroprogne” OR “Ichthyaetus” OR “Larosterna” OR “Larus” OR “Leucophaeus” OR “Onychoprion” OR “Pagophila” OR “Phaetusa” OR “Rhodostethia” OR “Rissa” OR “Rynchops” OR “Sterna” OR “Sternula” OR “Thalasseus” OR “Xema” OR “Pedionomus” OR “Pluvianellus” OR “Pluvianus” OR “Himantopus” OR “Recurvirostra” OR “Nycticryphes” OR “Rostratula” OR “Actitis” OR “Arenaria” OR “Bartramia” OR “Calidris” OR “Coenocorypha” OR “Gallinago” OR “Limnodromus” OR “Limosa” OR “Lymnocryptes” OR “Numenius” OR “Phalaropus” OR “Scolopax” OR “Tringa” OR “Xenus” OR “Stercorarius” OR “Attagis” OR “Thinocorus” OR “Turnix” OR “Ciconia” OR “Ephippiorhynchus” OR “Jabiru” OR “Leptoptilos” OR “Mycteria” OR “Colius” OR “Urocolius” OR “Alectroenas” OR “Alopecoenas” OR “Caloenas” OR “Chalcophaps” OR “Claravis” OR “Columba” OR “Columbina” OR “Didunculus” OR “Drepanoptila” OR “Ducula” OR “Ectopistes” OR “Gallicolumba” OR “Geopelia” OR “Geophaps” OR “Geotrygon” OR “Goura” OR “Gymnophaps” OR “Hemiphaga” OR “Henicophaps” OR “Leptotila” OR “Leptotrygon” OR “Leucosarcia” OR “Lopholaimus” OR “Macropygia” OR “Metriopelia” OR “Ocyphaps” OR “Oena” OR “Otidiphaps” OR “Patagioenas” OR “Petrophassa” OR “Pezophaps” OR “Phapitreron” OR “Phaps” OR “Ptilinopus” OR “Raphus” OR “Reinwardtoena” OR “Spilopelia” OR “Streptopelia” OR “Treron” OR “Trugon” OR “Turacoena” OR “Turtur” OR “Uropelia” OR “Zenaida” OR “Zentrygon” OR “Actenoides” OR “Alcedo” OR “Caridonax” OR “Ceryle” OR “Ceyx” OR “Chloroceryle” OR “Cittura” OR “Corythornis” OR “Dacelo” OR “Halcyon” OR “Ispidina” OR “Lacedo” OR “Megaceryle” OR “Melidora” OR “Syma” OR “Tanysiptera” OR “Todiramphus” OR “Atelornis” OR “Brachypteracias” OR “Geobiastes” OR “Coracias” OR “Eurystomus” OR “Merops” OR “Nyctyornis” OR “Baryphthengus” OR “Electron” OR “Eumomota” OR “Hylomanes” OR “Momotus” OR “Todus” OR “Cacomantis” OR “Carpococcyx” OR “Centropus” OR “Cercococcyx” OR “Chrysococcyx” OR “Clamator” OR “Coccycua” OR “Coccyzus” OR “Coua” OR “Crotophaga” OR “Cuculus” OR “Dasylophus” OR “Dromococcyx” OR “Eudynamys” OR “Geococcyx” OR “Guira” OR “Hierococcyx” OR “Morococcyx” OR “Neomorphus” OR “Pachycoccyx” OR “Phaenicophaeus” OR “Piaya” OR “Rhinortha” OR “Scythrops” OR “Surniculus” OR “Tapera” OR “Urodynamis” OR “Zanclostomus” OR “Dinornis” OR “Anomalopteryx” OR “Emeus” OR “Euryapteryx” OR “Eurypyga” OR “Rhynochetos” OR “Caracara” OR “Daptrius” OR “Falco” OR “Herpetotheres” OR “Ibycter” OR “Micrastur” OR “Microhierax” OR “Milvago” OR “Phalcoboenus” OR “Polihierax” OR “Spiziapteryx” OR “Aburria” OR “Chamaepetes” OR “Crax” OR “Mitu” OR “Nothocrax” OR “Oreophasis” OR “Ortalis” OR “Pauxi” OR “Penelope” OR “Penelopina” OR “Pipile” OR “Alectura” OR “Megapodius” OR “Acryllium” OR “Guttera” OR “Numida” OR “Callipepla” OR “Colinus” OR “Cyrtonyx” OR “Dendrortyx” OR “Odontophorus” OR “Oreortyx” OR “Philortyx” OR

“Ptilopachus” OR “Rhynchortyx” OR “Alectoris” OR “Ammoperdix” OR “Arborophila” OR “Argusianus” OR “Bambusicola” OR “Bonasa” OR “Caloperdix” OR “Centrocercus” OR “Chrysolophus” OR “Coturnix” OR “Crossoptilon” OR “Dendragapus” OR “Excalfactoria” OR “Falcipennis” OR “Francolinus” OR “Gallus” OR “Haematortyx” OR “Ithaginis” OR “Lagopus” OR “Lerwa” OR “Lophophorus” OR “Lophura” OR “Lyrurus” OR “Meleagris” OR “Pavo” OR “Peliperdix” OR “Perdix” OR “Phasianus” OR “Polyplectron” OR “Pternistis” OR “Pucrasia” OR “Rhizothera” OR “Rollulus” OR “Scleroptila” OR “Syrmaticus” OR “Tetrao” OR “Tetraogallus” OR “Tetraophasis” OR “Tragopan” OR “Tympanuchus” OR “Gavia” OR “Aramus” OR “Anthropoides” OR “Antigone” OR “Balearica” OR “Bugeranus” OR “Grus” OR “Leucogeranus” OR “Heliornis” OR “Psophia” OR “Aenigmatolimnas” OR “Amaurolimnas” OR “Amaurornis” OR “Anurolimnas” OR “Aramides” OR “Atlantisia” OR “Coturnicops” OR “Crex” OR “Dryolimnas” OR “Eulabeornis” OR “Fulica” OR “Gallicrex” OR “Gallinula” OR “Gallirallus” OR “Laterallus” OR “Lewinia” OR “Micropygia” OR “Neocrex” OR “Nesoclopeus” OR “Paragallinula” OR “Pardirallus” OR “Porphyrio” OR “Porphyriops” OR “Porzana” OR “Rallicula” OR “Rallina” OR “Rallus” OR “Tribonyx” OR “Canirallus” OR “Sarothrura” OR “Leptosomus” OR “Corythaeola” OR “Corythaixoides” OR “Crinifer” OR “Musophaga” OR “Tauraco” OR “Opisthocomus” OR “Afrotis” OR “Ardeotis” OR “Chlamydotis” OR “Neotis” OR “Otis” OR “Tetrax” OR “Acanthisitta” OR “Pachyplichas” OR “Traversia” OR “Xenicus” OR “Acanthiza” OR “Acanthornis” OR “Aethomyias” OR “Aphelocephala” OR “Calamanthus” OR “Gerygone” OR “Hylacola” OR “Neosericornis” OR “Oreoscopus” OR “Origma” OR “Pachycare” OR “Pycnoptilus” OR “Pyrrholaemus” OR “Sericornis” OR “Smicrornis” OR “Acrocephalus” OR “Arundinax” OR “Calamonastides” OR “Hippolais” OR “Iduna” OR “Nesillas” OR “Aegithalos” OR “Leptopoecile” OR “Psaltriparus” OR “Aegithina” OR “Alaemon” OR “Alauda” OR “Alaudala” OR “Ammomanes” OR “Calandrella” OR “Calendulauda” OR “Chersomanes” OR “Eremophila” OR “Eremopterix” OR “Galerida” OR “Lullula” OR “Melanocorypha” OR “Mirafra” OR “Pinarocorys” OR “Spizocorys” OR “Artamus” OR “Gymnorhina” OR “Melloria” OR “Bombycilla” OR “Buphagus” OR “Calcarius” OR “Plectrophenax” OR “Rhynchophanes” OR “Callaeas” OR “Heteralocha” OR “Philesturnus” OR “Calyptophilus” OR “Campephaga” OR “Ceblepyris” OR “Coracina” OR “Edolisoma” OR “Lalage” OR “Malindangia” OR “Pericrocotus” OR “Amaurospiza” OR “Cardinalis” OR “Caryothraustes” OR “Chlorothraupis” OR “Cyanocompsa” OR “Cyanoloxia” OR “Granatellus” OR “Habia” OR “Passerina” OR “Periporphyrus” OR “Pheucticus” OR “Piranga” OR “Spiza” OR “Certhia” OR “Salpornis” OR “Abroscopus” OR “Cettia” OR “Horornis” OR “Phyllergates” OR “Tesia” OR “Urosphena” OR “Chloropsis” OR “Cinclus” OR “Apalis” OR “Artisornis” OR “Camaroptera” OR “Cisticola” OR “Eremomela” OR “Heliolais” OR “Hypergerus” OR “Neomixis” OR “Oreolais” OR “Orthotomus” OR “Phragmacia” OR “Poliolais” OR “Prinia” OR “Schistolais” OR “Urolais” OR “Urorhipis” OR “Climacteris” OR “Cormobates” OR “Conopophaga” OR “Struthidea” OR “Aphelocoma” OR “Calocitta” OR “Cissa” OR “Coloeus” OR “Corvus” OR “Cyanocitta” OR “Cyanocorax” OR “Cyanolyca” OR “Cyanopica” OR “Dendrocitta” OR “Garrulus” OR “Gymnorhinus” OR “Nucifraga” OR “Perisoreus” OR “Pica” OR “Platylophus” OR “Podoces” OR “Psilorhinus” OR “Ptilostomus”

OR “Pyrrhocorax” OR “Urocissa” OR “Ampelioides” OR “Ampelion” OR “Carpornis” OR “Cephalopterus” OR “Conioptilon” OR “Cotinga” OR “Doliornis” OR “Gymnoderus” OR “Haematoderus” OR “Lipaugus” OR “Perissocephalus” OR “Phoenicircus” OR “Phytotoma” OR “Pipreola” OR “Porphyrolaema” OR “Procnias” OR “Pyroderus” OR “Querula” OR “Rupicola” OR “Snowornis” OR “Xipholena” OR “Zaratornis” OR “Dasyornis” OR “Dicaeum” OR “Prionochilus” OR “Dicrurus” OR “Donacobius” OR “Dulus” OR “Emberiza” OR “Amadina” OR “Amandava” OR “Cryptospiza” OR “Erythrura” OR “Estrilda” OR “Euodice” OR “Euschistospiza” OR “Lagonosticta” OR “Lonchura” OR “Mandingoa” OR “Neochmia” OR “Nesocharis” OR “Nigrita” OR “Ortygospiza” OR “Parmoptila” OR “Pyrenestes” OR “Pytilia” OR “Spermophaga” OR “Stagonopleura” OR “Taeniopygia” OR “Uraeginthus” OR “Calyptomena” OR “Cymbirhynchus” OR “Eurylaimus” OR “Psarisomus” OR “Serilophus” OR “Smithornis” OR “Chamaeza” OR “Formicarius” OR “Acanthis” OR “Agraphospiza” OR “Akialoa” OR “Bucanetes” OR “Carduelis” OR “Carpodacus” OR “Chloris” OR “Chlorodrepanis” OR “Chlorophonia” OR “Chrysocorythus” OR “Coccothraustes” OR “Crithagra” OR “Drepanis” OR “Eophona” OR “Euphonia” OR “Fringilla” OR “Haemorhous” OR “Hemignathus” OR “Himatione” OR “Leucosticte” OR “Linaria” OR “Linurgus” OR “Loxia” OR “Loxioides” OR “Loxops” OR “Magumma” OR “Melamprosops” OR “Oreomystis” OR “Paroreomyza” OR “Pinicola” OR “Procarduelis” OR “Pseudonestor” OR “Psittirostra” OR “Pyrrhoplectes” OR “Pyrrhula” OR “Rhodopechys” OR “Rhodospiza” OR “Serinus” OR “Spinus” OR “Telespiza” OR “Anabacerthia” OR “Anabazenops” OR “Ancistrops” OR “Anumbius” OR “Aphrastura” OR “Asthenes” OR “Automolus” OR “Berlepschia” OR “Campylorhamphus” OR “Certhiasomus” OR “Certhiaxis” OR “Cinclodes” OR “Clibanornis” OR “Coryphistera” OR “Cranioleuca” OR “Deconychura” OR “Dendrexetastes” OR “Dendrocincla” OR “Dendrocolaptes” OR “Dendroplex” OR “Drymornis” OR “Drymotoxeres” OR “Furnarius” OR “Geocerthia” OR “Geositta” OR “Glyphorynchus” OR “Heliobletus” OR “Hellmayrea” OR “Hylexetastes” OR “Lepidocolaptes” OR “Leptasthenura” OR “Limnoctites” OR “Limnornis” OR “Lochmias” OR “Margarornis” OR “Mazaria” OR “Megaxenops” OR “Metopothrix” OR “Microxenops” OR “Nasica” OR “Ochetorhynchus” OR “Phacellodomus” OR “Philydor” OR “Phleocryptes” OR “Premnoplex” OR “Premnornis” OR “Pseudasthenes” OR “Pseudocolaptes” OR “Pseudoseisura” OR “Pygarrhichas” OR “Roraimia” OR “Schoeniophylax” OR “Sclerurus” OR “Sittasomus” OR “Spartonoica” OR “Sylviorthorhynchus” OR “Synallaxis” OR “Syndactyla” OR “Tarphonomus” OR “Thripadectes” OR “Thripophaga” OR “Upucerthia” OR “Xenerpestes” OR “Xenops” OR “Xiphocolaptes” OR “Xiphorhynchus” OR “Grallaria” OR “Grallaricula” OR “Hylopezus” OR “Myrmothera” OR “Alopochelidon” OR “Atticora” OR “Cecropis” OR “Delichon” OR “Haplochelidon” OR “Hirundo” OR “Neochelidon” OR “Notiochelidon” OR “Orochelidon” OR “Petrochelidon” OR “Phedina” OR “Progne” OR “Psalidoprocne” OR “Pseudhirundo” OR “Pseudochelidon” OR “Ptyonoprogne” OR “Riparia” OR “Stelgidopteryx” OR “Tachycineta” OR “Hyliota” OR “Hypocolius” OR “Agelaioides” OR “Agelaius” OR “Agelasticus” OR “Amblycercus” OR “Amblyramphus” OR “Anumara” OR “Cacicus” OR “Chrysomus” OR “Curaeus” OR “Dives” OR “Dolichonyx” OR “Euphagus” OR “Gnorimopsar” OR “Gymnomystax” OR “Hypopyrrhus” OR “Icterus”

OR “Lampropsar” OR “Leistes” OR “Macroagelaius” OR “Molothrus” OR “Nesopsar” OR “Oreopsar” OR “Psarocolius” OR “Pseudoleistes” OR “Quiscalus” OR “Sturnella” OR “Xanthocephalus” OR “Xanthopsar” OR “Icteria” OR “Ifrita” OR “Irena” OR “Corvinella” OR “Eurocephalus” OR “Lanius” OR “Actinodura” OR “Argya” OR “Garrulax” OR “Grammatoptila” OR “Heterophasia” OR “Ianthocincla” OR “Laniellus” OR “Leiothrix” OR “Liocichla” OR “Minla” OR “Pterorhinus” OR “Trochalopteron” OR “Turdoides” OR “Bradypterus” OR “Cincloramphus” OR “Helopsaltes” OR “Locustella” OR “Megalurus” OR “Poodytes” OR “Machaerirhynchus” OR “Graueria” OR “Hylia” OR “Macrosphenus” OR “Melocichla” OR “Sylvietta” OR “Chlorophoneus” OR “Dryoscopus” OR “Laniarius” OR “Malaconotus” OR “Nilaus” OR “Rhodophoneus” OR “Tchagra” OR “Telophorus” OR “Amytornis” OR “Chenorhamphus” OR “Clytomyias” OR “Malurus” OR “Stipiturus” OR “Melampitta” OR “Melanocharis” OR “Oedistoma” OR “Toxorhamphus” OR “Melanopareia” OR “Acanthagenys” OR “Acanthorhynchus” OR “Anthochaera” OR “Anthornis” OR “Caligavis” OR “Entomyzon” OR “Epthianura” OR “Glycifohia” OR “Gymnomyza” OR “Lichmera” OR “Manorina” OR “Melidectes” OR “Melilestes” OR “Meliphaga” OR “Melipotes” OR “Melithreptus” OR “Myzomela” OR “Nesoptilotis” OR “Philemon” OR “Phylidonyris” OR “Prosthemadera” OR “Ptiloprora” OR “Ptilotula” OR “Pycnopygius” OR “Timeliopsis” OR “Xanthotis” OR “Menura” OR “Allenia” OR “Cinclocerthia” OR “Dumetella” OR “Margarops” OR “Melanoptila” OR “Melanotis” OR “Mimus” OR “Oreoscoptes” OR “Ramphocinclus” OR “Toxostoma” OR “Lamprospiza” OR “Mitrospingus” OR “Moho” OR “Mohoua” OR “Arses” OR “Carterornis” OR “Clytorhynchus” OR “Grallina” OR “Hypothymis” OR “Monarcha” OR “Myiagra” OR “Symposiachrus” OR “Terpsiphone” OR “Trochocercus” OR “Anthus” OR “Macronyx” OR “Motacilla” OR “Alethe” OR “Anthipes” OR “Brachypteryx” OR “Calliope” OR “Campicoloides” OR “Cercotrichas” OR “Chamaetylas” OR “Copsychus” OR “Cossypha” OR “Cyanoptila” OR “Cyornis” OR “Enicurus” OR “Erithacus” OR “Eumyias” OR “Ficedula” OR “Fraseria” OR “Irania” OR “Larvivora” OR “Leonardina” OR “Luscinia” OR “Melaenornis” OR “Monticola” OR “Muscicapa” OR “Myiomela” OR “Myioparus” OR “Myophonus” OR “Myrmecocichla” OR “Niltava” OR “Oenanthe” OR “Phoenicurus” OR “Pogonocichla” OR “Saxicola” OR “Sheppardia” OR “Sholicola” OR “Stiphrornis” OR “Tarsiger” OR “Thamnolaea” OR “Vauriella” OR “Aethopyga” OR “Anabathmis” OR “Anthreptes” OR “Arachnothera” OR “Chalcomitra” OR “Cinnyris” OR “Cyanomitra” OR “Deleornis” OR “Hedydipna” OR “Kurochkinegramma” OR “Leptocoma” OR “Nectarinia” OR “Daphoenositta” OR “Nesospingus” OR “Nicator” OR “Notiomystis” OR “Aleadryas” OR “Oriolus” OR “Pitohui” OR “Sphecotheres” OR “Turnagra” OR “Colluricincla” OR “Falcunculus” OR “Melanorectes” OR “Pachycephala” OR “Pseudorectes” OR “Panurus” OR “Cicinnurus” OR “Diphyllodes” OR “Manucodia” OR “Paradisaea” OR “Ptiloris” OR “Paramythia” OR “Pardalotus” OR “Baeolophus” OR “Cephalopyrus” OR “Cyanistes” OR “Lophophanes” OR “Machlolophus” OR “Melaniparus” OR “Melanochlora” OR “Pardaliparus” OR “Parus” OR “Periparus” OR “Poecile” OR “Pseudopodoces” OR “Sittiparus” OR “Sylviparus” OR “Basileuterus” OR “Cardellina” OR “Catharopeza” OR “Dendroica” OR “Geothlypis” OR “Helmitheros” OR “Leiothlypis” OR “Limnothlypis” OR “Mniotilta” OR “Myioborus” OR “Myiothlypis” OR “Oporornis”

OR “Oreothlypis” OR “Parkesia” OR “Protonotaria” OR “Seiurus” OR “Setophaga” OR “Vermivora” OR “Aimophila” OR “Ammodramus” OR “Amphispiza” OR “Arremon” OR “Arremonops” OR “Artemisiospiza” OR “Atlapetes” OR “Calamospiza” OR “Chlorospingus” OR “Chondestes” OR “Junco” OR “Melospiza” OR “Melozone” OR “Oreothraupis” OR “Oriturus” OR “Passerculus” OR “Passerella” OR “Peucaea” OR “Pezopetes” OR “Pipilo” OR “Pooecetes” OR “Pselliophorus” OR “Rhynchospiza” OR “Spizella” OR “Spizelloides” OR “Xenospiza” OR “Zonotrichia” OR “Carpospiza” OR “Gymnoris” OR “Hypocryptadius” OR “Montifringilla” OR “Onychostruthus” OR “Passer” OR “Petronia” OR “Pyrgilauda” OR “Alcippe” OR “Gampsorhynchus” OR “Illadopsis” OR “Jabouilleia” OR “Kenopia” OR “Laticilla” OR “Malacocincla” OR “Malacopteron” OR “Napothera” OR “Pellorneum” OR “Rimator” OR “Trichastoma” OR “Amalocichla” OR “Drymodes” OR “Eopsaltria” OR “Eugerygone” OR “Heteromyias” OR “Melanodryas” OR “Microeca” OR “Monachella” OR “Pachycephalopsis” OR “Peneoenanthe” OR “Peneothello” OR “Petroica” OR “Poecilodryas” OR “Tregellasia” OR “Peucedramus” OR “Microligea” OR “Phaenicophilus” OR “Xenoligea” OR “Phylloscopus” OR “Picathartes” OR “Antilophia” OR “Ceratopipra” OR “Chiroxiphia” OR “Chloropipo” OR “Corapipo” OR “Cryptopipo” OR “Heterocercus” OR “Ilicura” OR “Lepidothrix” OR “Machaeropterus” OR “Manacus” OR “Masius” OR “Neopelma” OR “Pipra” OR “Pseudopipra” OR “Tyranneutes” OR “Xenopipo” OR “Erythropitta” OR “Hydrornis” OR “Pitta” OR “Batis” OR “Platysteira” OR “Anaplectes” OR “Bubalornis” OR “Euplectes” OR “Malimbus” OR “Plocepasser” OR “Ploceus” OR “Quelea” OR “Sporopipes” OR “Pnoepyga” OR “Microbates” OR “Polioptila” OR “Ramphocaenus” OR “Garritornis” OR “Prunella” OR “Cinclosoma” OR “Ptilorrhoa” OR “Phainopepla” OR “Phainoptila” OR “Ptiliogonys” OR “Ailuroedus” OR “Amblyornis” OR “Ptilonorhynchus” OR “Sericulus” OR “Alophoixus” OR “Andropadus” OR “Arizelocichla” OR “Atimastillas” OR “Baeopogon” OR “Bleda” OR “Chlorocichla” OR “Criniger” OR “Eurillas” OR “Hemixos” OR “Hypsipetes” OR “Iole” OR “Ixos” OR “Neolestes” OR “Phyllastrephus” OR “Pycnonotus” OR “Spizixos” OR “Stelgidillas” OR “Tricholestes” OR “Regulus” OR “Anthoscopus” OR “Auriparus” OR “Remiz” OR “Rhagologus” OR “Eleoscytalopus” OR “Liosceles” OR “Psilorhamphus” OR “Pteroptochos” OR “Scelorchilus” OR “Scytalopus” OR “Teledromas” OR “Rhipidura” OR “Rhodinocichla” OR “Sapayoa” OR “Sitta” OR “Spindalis” OR “Chelidorhynx” OR “Culicicapa” OR “Elminia” OR “Acridotheres” OR “Agropsar” OR “Ampeliceps” OR “Aplonis” OR “Basilornis” OR “Cinnyricinclus” OR “Creatophora” OR “Gracula” OR “Gracupica” OR “Hartlaubius” OR “Hylopsar” OR “Lamprotornis” OR “Leucopsar” OR “Mino” OR “Notopholia” OR “Onychognathus” OR “Pastor” OR “Poeoptera” OR “Rhabdornis” OR “Sarcops” OR “Scissirostrum” OR “Speculipastor” OR “Spodiopsar” OR “Streptocitta” OR “Sturnia” OR “Sturnus” OR “Chamaea” OR “Chleuasicus” OR “Chloropeta” OR “Chrysomma” OR “Conostoma” OR “Fulvetta” OR “Lioparus” OR “Paradoxornis” OR “Pseudoalcippe” OR “Psittiparus” OR “Rhopophilus” OR “Sinosuthora” OR “Suthora” OR “Sylvia” OR “Teretistris” OR “Akletos” OR “Ampelornis” OR “Aprositornis” OR “Batara” OR “Cercomacra” OR “Cercomacroides” OR “Cymbilaimus” OR “Dichrozona” OR “Drymophila” OR “Dysithamnus” OR “Epinecrophylla” OR “Euchrepomis” OR “Formicivora” OR “Frederickena” OR “Gymnocichla” OR “Gymnopithys” OR “Hafferia” OR “Herpsilochmus” OR “Hylophylax” OR “Hypocnemis” OR “Hypocnemoides” OR “Hypoedaleus” OR “Isleria” OR “Mackenziaena” OR “Megastictus” OR “Microrhopias” OR “Myrmeciza” OR “Myrmelastes” OR “Myrmoborus” OR “Myrmochanes” OR “Myrmoderus” OR “Myrmophylax” OR “Myrmorchilus” OR “Myrmornis” OR “Myrmotherula” OR “Neoctantes” OR “Oneillornis” OR “Percnostola” OR “Phaenostictus” OR “Phlegopsis” OR “Pithys” OR “Poliocrania” OR “Pygiptila” OR “Pyriglena” OR “Rhegmatorhina” OR “Rhopias” OR “Rhopornis” OR “Sakesphorus” OR “Sciaphylax” OR “Sclateria” OR “Sipia” OR “Taraba” OR “Thamnistes” OR “Thamnomanes” OR “Thamnophilus” OR “Willisornis” OR “Xenornis” OR “Anisognathus” OR “Bangsia” OR “Buthraupis” OR “Calochaetes” OR “Catamblyrhynchus” OR “Catamenia” OR “Charitospiza” OR “Chlorochrysa” OR “Chlorophanes” OR “Chlorornis” OR “Chrysothlypis” OR “Cissopis” OR “Cnemoscopus” OR “Coereba” OR “Compsospiza” OR “Compsothraupis” OR “Conirostrum” OR “Conothraupis” OR “Coryphospingus” OR “Creurgops” OR “Cyanerpes” OR “Cyanicterus” OR “Cypsnagra” OR “Dacnis” OR “Delothraupis” OR “Diglossa” OR “Diuca” OR “Dolospingus” OR “Donacospiza” OR “Dubusia” OR “Emberizoides” OR “Embernagra” OR “Eucometis” OR “Euneornis” OR “Geospiza” OR “Gubernatrix” OR “Haplospiza” OR “Hemispingus” OR “Hemithraupis” OR “Heterospingus” OR “Incaspiza” OR “Iridophanes” OR “Iridosornis” OR “Lanio” OR “Lophospingus” OR “Loxigilla” OR “Loxipasser” OR “Melanodera” OR “Melanospiza” OR “Melopyrrha” OR “Nemosia” OR “Nephelornis” OR “Oreomanes” OR “Oryzoborus” OR “Parkerthraustes” OR “Paroaria” OR “Phrygilus” OR “Piezorina” OR “Pipraeidea” OR “Poospiza” OR “Pyrrhocoma” OR “Ramphocelus” OR “Rhodospingus” OR “Saltator” OR “Saltatricula” OR “Schistochlamys” OR “Sericossypha” OR “Sicalis” OR “Sporophila” OR “Stephanophorus” OR “Tachyphonus” OR “Tangara” OR “Tersina” OR “Thlypopsis” OR “Thraupis” OR “Tiaris” OR “Trichothraupis” OR “Volatinia” OR “Wetmorethraupis” OR “Xenodacnis” OR “Xenospingus” OR “Tichodroma” OR “Macronus” OR “Pomatorhinus” OR “Spelaeornis” OR “Stachyridopsis” OR “Stachyris” OR “Iodopleura” OR “Laniisoma” OR “Laniocera” OR “Myiobius” OR “Onychorhynchus” OR “Oxyruncus” OR “Pachyramphus” OR “Schiffornis” OR “Terenotriccus” OR “Tityra” OR “Xenopsaris” OR “Campylorhynchus” OR “Cantorchilus” OR “Catherpes” OR “Cinnycerthia” OR “Cistothorus” OR “Cyphorhinus” OR “Henicorhina” OR “Microcerculus” OR “Odontorchilus” OR “Pheugopedius” OR “Salpinctes” OR “Thryomanes” OR “Thryophilus” OR “Thryothorus” OR “Troglodytes” OR “Uropsila” OR “Catharus” OR “Cichlopsis” OR “Entomodestes” OR “Geokichla” OR “Hylocichla” OR “Ixoreus” OR “Myadestes” OR “Neocossyphus” OR “Ridgwayia” OR “Sialia” OR “Stizorhina” OR “Turdus” OR “Zoothera” OR “Agriornis” OR “Alectrurus” OR “Anairetes” OR “Aphanotriccus” OR “Arundinicola” OR “Atalotriccus” OR “Attila” OR “Camptostoma” OR “Capsiempis” OR “Casiornis” OR “Cnemarchus” OR “Cnemotriccus” OR “Cnipodectes” OR “Colonia” OR “Colorhamphus” OR “Conopias” OR “Contopus” OR “Corythopis” OR “Culicivora” OR “Deltarhynchus” OR “Elaenia” OR “Empidonax” OR “Empidonomus” OR “Euscarthmus” OR “Fluvicola” OR “Griseotyrannus” OR “Gubernetes” OR “Hemitriccus” OR “Heteroxolmis” OR “Hirundinea” OR “Hymenops” OR “Inezia” OR “Knipolegus” OR “Lathrotriccus” OR “Legatus” OR

“Leptopogon” OR “Lessonia” OR “Lophotriccus” OR “Machetornis” OR “Mecocerculus” OR “Megarynchus” OR “Mionectes” OR “Mitrephanes” OR “Muscigralla” OR “Muscisaxicola” OR “Myiarchus” OR “Myiodynastes” OR “Myiopagis” OR “Myiophobus” OR “Myiornis” OR “Myiotheretes” OR “Myiotriccus” OR “Myiozetetes” OR “Neopipo” OR “Neoxolmis” OR “Nephelomyias” OR “Ochthoeca” OR “Ochthornis” OR “Oncostoma” OR “Ornithion” OR “Phaeomyias” OR “Philohydor” OR “Phyllomyias” OR “Phylloscartes” OR “Piprites” OR “Pitangus” OR “Platyrinchus” OR “Poecilotriccus” OR “Pogonotriccus” OR “Polioxolmis” OR “Polystictus” OR “Pseudelaenia” OR “Pseudocolopteryx” OR “Pseudotriccus” OR “Pyrocephalus” OR “Pyrrhomyias” OR “Ramphotrigon” OR “Rhynchocyclus” OR “Rhytipterna” OR “Satrapa” OR “Sayornis” OR “Serpophaga” OR “Silvicultrix” OR “Sirystes” OR “Stigmatura” OR “Sublegatus” OR “Suiriri” OR “Tachuris” OR “Taeniotriccus” OR “Todirostrum” OR “Tolmomyias” OR “Tumbezia” OR “Tyrannopsis” OR “Tyrannulus” OR “Tyrannus” OR “Uromyias” OR “Xenotriccus” OR “Xolmis” OR “Zimmerius” OR “Urocynchramus” OR “Artamella” OR “Calicalicus” OR “Cyanolanius” OR “Euryceros” OR “Falculea” OR “Hypositta” OR “Leptopterus” OR “Mystacornis” OR “Newtonia” OR “Oriolia” OR “Philentoma” OR “Prionops” OR “Pseudobias” OR “Schetba” OR “Tephrodornis” OR “Tylas” OR “Vanga” OR “Xenopirostris” OR “Anomalospiza” OR “Vidua” OR “Cyclarhis” OR “Erpornis” OR “Hylophilus” OR “Pteruthius” OR “Vireo” OR “Vireolanius” OR “Zeledonia” OR “Apalopteron” OR “Dasycrotapha” OR “Heleia” OR “Lophozosterops” OR “Sterrhoptilus” OR “Yuhina” OR “Zosterops” OR “Zosterornis” OR “Agamia” OR “Ardea” OR “Ardeola” OR “Botaurus” OR “Bubulcus” OR “Butorides” OR “Cochlearius” OR “Dupetor” OR “Egretta” OR “Gorsachius” OR “Ixobrychus” OR “Nyctanassa” OR “Nycticorax” OR “Pilherodius” OR “Syrigma” OR “Tigriornis” OR “Tigrisoma” OR “Zebrilus” OR “Balaeniceps” OR “Pelecanus” OR “Scopus” OR “Bostrychia” OR “Eudocimus” OR “Geronticus” OR “Lophotibis” OR “Mesembrinibis” OR “Nipponia” OR “Phimosus” OR “Platalea” OR “Plegadis” OR “Pseudibis” OR “Theristicus” OR “Threskiornis” OR “Phaethon” OR “Phoeniconaias” OR “Phoenicoparrus” OR “Phoenicopterus” OR “Bucco” OR “Chelidoptera” OR “Hapaloptila” OR “Hypnelus” OR “Malacoptila” OR “Micromonacha” OR “Monasa” OR “Nonnula” OR “Notharchus” OR “Nystalus” OR “Capito” OR “Eubucco” OR “Brachygalba” OR “Galbalcyrhynchus” OR “Galbula” OR “Jacamaralcyon” OR “Jacamerops” OR “Indicator” OR “Melichneutes” OR “Melignomon” OR “Prodotiscus” OR “Buccanodon” OR “Gymnobucco” OR “Lybius” OR “Pogoniulus” OR “Stactolaema” OR “Trachyphonus” OR “Psilopogon” OR “Blythipicus” OR “Campephilus” OR “Campethera” OR “Celeus” OR “Chloropicus” OR “Chrysocolaptes” OR “Chrysophlegma” OR “Colaptes” OR “Dendrocopos” OR “Dendrocoptes” OR “Dendropicos” OR “Dinopium” OR “Dryobates” OR “Dryocopus” OR “Gecinulus” OR “Geocolaptes” OR “Jynx” OR “Leiopicus” OR “Leuconotopicus” OR “Meiglyptes” OR “Melanerpes” OR “Micropternus” OR “Mulleripicus” OR “Nesoctites” OR “Picoides” OR “Piculus” OR “Picumnus” OR “Picus” OR “Reinwardtipicus” OR “Sasia” OR “Sphyrapicus” OR “Veniliornis” OR “Yungipicus” OR “Andigena” OR “Aulacorhynchus” OR “Pteroglossus” OR “Ramphastos” OR “Selenidera” OR “Semnornis” OR “Aechmophorus” OR “Podiceps” OR “Podilymbus” OR “Poliocephalus” OR “Rollandia” OR “Tachybaptus” OR “Diomedea” OR “Phoebastria”

OR “Phoebetria” OR “Thalassarche” OR “Hydrobates” OR “Oceanodroma” OR “Fregetta” OR “Garrodia” OR “Nesofregetta” OR “Oceanites” OR “Pelagodroma” OR “Aphrodroma” OR “Ardenna” OR “Bulweria” OR “Calonectris” OR “Daption” OR “Fulmarus” OR “Halobaena” OR “Macronectes” OR “Pachyptila” OR “Pagodroma” OR “Pelecanoides” OR “Procellaria” OR “Pseudobulweria” OR “Pterodroma” OR “Puffinus” OR “Thalassoica” OR “Cacatua” OR “Callocephalon” OR “Calyptorhynchus” OR “Eolophus” OR “Lophochroa” OR “Nymphicus” OR “Probosciger” OR “Alipiopsitta” OR “Amazona” OR “Anodorhynchus” OR “Ara” OR “Aratinga” OR “Bolborhynchus” OR “Brotogeris” OR “Conuropsis” OR “Cyanoliseus” OR “Cyanopsitta” OR “Deroptyus” OR “Diopsittaca” OR “Enicognathus” OR “Eupsittula” OR “Forpus” OR “Graydidascalus” OR “Guarouba” OR “Guaruba” OR “Hapalopsittaca” OR “Leptosittaca” OR “Myiopsitta” OR “Nannopsittaca” OR “Orthopsittaca” OR “Pionites” OR “Pionopsitta” OR “Pionus” OR “Poicephalus” OR “Primolius” OR “Psilopsiagon” OR “Psittacara” OR “Psittacus” OR “Pyrilia” OR “Pyrrhura” OR “Rhynchopsitta” OR “Thectocercus” OR “Touit” OR “Triclaria” OR “Agapornis” OR “Alisterus” OR “Aprosmictus” OR “Barnardius” OR “Bolbopsittacus” OR “Chalcopsitta” OR “Charmosyna” OR “Coracopsis” OR “Cyanoramphus” OR “Cyclopsitta” OR “Eclectus” OR “Eos” OR “Eunymphicus” OR “Geoffroyus” OR “Glossopsitta” OR “Lathamus” OR “Loriculus” OR “Lorius” OR “Melopsittacus” OR “Micropsitta” OR “Neophema” OR “Neopsephotus” OR “Neopsittacus” OR “Northiella” OR “Oreopsittacus” OR “Parvipsitta” OR “Pezoporus” OR “Phigys” OR “Platycercus” OR “Polytelis” OR “Prioniturus” OR “Prosopeia” OR “Psephotellus” OR “Psephotus” OR “Pseudeos” OR “Psittacella” OR “Psittacula” OR “Psittaculirostris” OR “Psitteuteles” OR “Psittinus” OR “Psittrichas” OR “Purpureicephalus” OR “Tanygnathus” OR “Trichoglossus” OR “Vini” OR “Nestor” OR “Strigops” OR “Pterocles” OR “Syrrhaptes” OR “Rhea” OR “Aptenodytes” OR “Eudyptes” OR “Eudyptula” OR “Megadyptes” OR “Pygoscelis” OR “Spheniscus” OR “Aegolius” OR “Asio” OR “Athene” OR “Bubo” OR “Glaucidium” OR “Ketupa” OR “Lophostrix” OR “Megascops” OR “Micrathene” OR “Ninox” OR “Otus” OR “Pseudoscops” OR “Psiloscops” OR “Pulsatrix” OR “Sceloglaux” OR “Scotopelia” OR “Strix” OR “Surnia” OR “Xenoglaux” OR “Phodilus” OR “Tyto” OR “Aepyornis” OR “Mullerornis” OR “Struthio” OR “Anhinga” OR “Fregata” OR “Leucocarbo” OR “Microcarbo” OR “Nannopterum” OR “Phalacrocorax” OR “Morus” OR “Sula” OR “Crypturellus” OR “Eudromia” OR “Nothocercus” OR “Nothoprocta” OR “Nothura” OR “Rhynchotus” OR “Tinamotis” OR “Tinamus” OR “Apalharpactes” OR “Apaloderma” OR “Harpactes” OR “Pharomachrus” OR “Trogon” OR “Tetrastes” OR “Hesperiphona”) AND (“experiment*” OR “manipulat*”))) OR AB= (((“green*” OR “herb*” OR “aromatic*”) AND “nest*” AND (“bird*” OR “aves” OR “avian” OR “ornithol*” OR “passerine*” OR “passeriform*” OR “songbird*” OR “Accipiter” OR “Aegypius” OR “Aquila” OR “Aviceda” OR “Busarellus” OR “Butastur” OR “Buteo” OR “Buteogallus” OR “Chondrohierax” OR “Circaetus” OR “Circus” OR “Clanga” OR “Elanoides” OR “Elanus” OR “Gampsonyx” OR “Geranoaetus” OR “Geranospiza” OR “Gypaetus” OR “Gypohierax” OR “Gyps” OR “Haliaeetus” OR “Haliastur” OR “Harpagus” OR “Harpia” OR “Hieraaetus” OR “Ictinaetus” OR “Ictinia” OR “Kaupifalco” OR “Leptodon” OR “Leucopternis” OR “Lophotriorchis” OR “Milvus” OR “Morphnarchus” OR “Morphnus”

OR “Necrosyrtes” OR “Neophron” OR “Nisaetus” OR “Parabuteo” OR “Pernis” OR “Pithecophaga” OR “Polemaetus” OR “Pseudastur” OR “Rostrhamus” OR “Rupornis” OR “Sarcogyps” OR “Spilornis” OR “Spizaetus” OR “Stephanoaetus” OR “Terathopius” OR “Torgos” OR “Trigonoceps” OR “Cathartes” OR “Coragyps” OR “Gymnogyps” OR “Sarcoramphus” OR “Vultur” OR “Pandion” OR “Sagittarius” OR “Aix” OR “Alopochen” OR “Amazonetta” OR “Anas” OR “Anser” OR “Asarcornis” OR “Aythya” OR “Branta” OR “Bucephala” OR “Cairina” OR “Callonetta” OR “Cereopsis” OR “Chen” OR “Chenonetta” OR “Chloephaga” OR “Clangula” OR “Coscoroba” OR “Cyanochen” OR “Cygnus” OR “Dendrocygna” OR “Heteronetta” OR “Histrionicus” OR “Hymenolaimus” OR “Lophodytes” OR “Lophonetta” OR “Malacorhynchus” OR “Mareca” OR “Marmaronetta” OR “Melanitta” OR “Merganetta” OR “Mergellus” OR “Mergus” OR “Neochen” OR “Netta” OR “Nettapus” OR “Nomonyx” OR “Oxyura” OR “Plectropterus” OR “Polysticta” OR “Pteronetta” OR “Sarkidiornis” OR “Sibirionetta” OR “Somateria” OR “Spatula” OR “Tachyeres” OR “Tadorna” OR “Thalassornis” OR “Anhima” OR “Chauna” OR “Anseranas” OR “Aegotheles” OR “Aerodramus” OR “Aeronautes” OR “Apus” OR “Chaetura” OR “Collocalia” OR “Cypseloides” OR “Cypsiurus” OR “Hirundapus” OR “Panyptila” OR “Streptoprocne” OR “Tachornis” OR “Tachymarptis” OR “Hemiprocne” OR “Abeillia” OR “Adelomyia” OR “Aglaeactis” OR “Aglaiocercus” OR “Amazilia” OR “Androdon” OR “Anopetia” OR “Anthocephala” OR “Anthracothorax” OR “Archilochus” OR “Atthis” OR “Augastes” OR “Avocettula” OR “Basilinna” OR “Boissonneaua” OR “Calliphlox” OR “Calypte” OR “Campylopterus” OR “Chaetocercus” OR “Chalcostigma” OR “Chalybura” OR “Chlorestes” OR “Chlorostilbon” OR “Chrysolampis” OR “Chrysuronia” OR “Clytolaema” OR “Coeligena” OR “Colibri” OR “Cyanophaia” OR “Cynanthus” OR “Discosura” OR “Doricha” OR “Doryfera” OR “Elvira” OR “Ensifera” OR “Eriocnemis” OR “Eugenes” OR “Eulampis” OR “Eulidia” OR “Eupetomena” OR “Eupherusa” OR “Eutoxeres” OR “Florisuga” OR “Glaucis” OR “Goethalsia” OR “Goldmania” OR “Haplophaedia” OR “Heliactin” OR “Heliangelus” OR “Heliodoxa” OR “Heliomaster” OR “Heliothryx” OR “Hylocharis” OR “Juliamyia” OR “Klais” OR “Lafresnaya” OR “Lampornis” OR “Lamprolaima” OR “Lepidopyga” OR “Lesbia” OR “Leucippus” OR “Leucochloris” OR “Lophornis” OR “Mellisuga” OR “Metallura” OR “Microchera” OR “Myrmia” OR “Myrtis” OR “Ocreatus” OR “Opisthoprora” OR “Oreonympha” OR “Oreotrochilus” OR “Orthorhyncus” OR “Oxypogon” OR “Panterpe” OR “Patagona” OR “Phaeochroa” OR “Phaethornis” OR “Phlogophilus” OR “Polyonymus” OR “Polytmus” OR “Pterophanes” OR “Ramphodon” OR “Ramphomicron” OR “Rhodopis” OR “Sappho” OR “Schistes” OR “Selasphorus” OR “Sephanoides” OR “Stephanoxis” OR “Sternoclyta” OR “Taphrospilus” OR “Thalurania” OR “Thaumastura” OR “Threnetes” OR “Topaza” OR “Trochilus” OR “Urochroa” OR “Urosticte” OR “Apteryx” OR “Anthracoceros” OR “Buceros” OR “Bycanistes” OR “Lophoceros” OR “Penelopides” OR “Rhabdotorrhinus” OR “Rhyticeros” OR “Tockus” OR “Bucorvus” OR “Phoeniculus” OR “Rhinopomastus” OR “Upupa” OR “Antrostomus” OR “Caprimulgus” OR “Chordeiles” OR “Eleothreptus” OR “Eurostopodus” OR “Hydropsalis” OR “Lurocalis” OR “Lyncornis” OR “Nyctidromus” OR “Nyctiphrynus” OR “Nyctipolus” OR “Nyctiprogne” OR “Phalaenoptilus” OR “Setopagis” OR “Systellura” OR “Uropsalis” OR “Nyctibius”

OR “Batrachostomus” OR “Podargus” OR “Steatornis” OR “Cariama” OR “Casuarius” OR “Dromaius” OR “Aethia” OR “Alca” OR “Alle” OR “Brachyramphus” OR “Cepphus” OR “Cerorhinca” OR “Fratercula” OR “Pinguinus” OR “Ptychoramphus” OR “Synthliboramphus” OR “Uria” OR “Burhinus” OR “Anarhynchus” OR “Charadrius” OR “Elseyornis” OR “Erythrogonys” OR “Hoploxypterus” OR “Oreopholus” OR “Peltohyas” OR “Phegornis” OR “Pluvialis” OR “Thinornis” OR “Vanellus” OR “Chionis” OR “Dromas” OR “Cursorius” OR “Glareola” OR “Rhinoptilus” OR “Stiltia” OR “Haematopus” OR “Actophilornis” OR “Hydrophasianus” OR “Irediparra” OR “Jacana” OR “Metopidius” OR “Microparra” OR “Anous” OR “Chlidonias” OR “Chroicocephalus” OR “Creagrus” OR “Gelochelidon” OR “Gygis” OR “Hydrocoloeus” OR “Hydroprogne” OR “Ichthyaetus” OR “Larosterna” OR “Larus” OR “Leucophaeus” OR “Onychoprion” OR “Pagophila” OR “Phaetusa” OR “Rhodostethia” OR “Rissa” OR “Rynchops” OR “Sterna” OR “Sternula” OR “Thalasseus” OR “Xema” OR “Pedionomus” OR “Pluvianellus” OR “Pluvianus” OR “Himantopus” OR “Recurvirostra” OR “Nycticryphes” OR “Rostratula” OR “Actitis” OR “Arenaria” OR “Bartramia” OR “Calidris” OR “Coenocorypha” OR “Gallinago” OR “Limnodromus” OR “Limosa” OR “Lymnocryptes” OR “Numenius” OR “Phalaropus” OR “Scolopax” OR “Tringa” OR “Xenus” OR “Stercorarius” OR “Attagis” OR “Thinocorus” OR “Turnix” OR “Ciconia” OR “Ephippiorhynchus” OR “Jabiru” OR “Leptoptilos” OR “Mycteria” OR “Colius” OR “Urocolius” OR “Alectroenas” OR “Alopecoenas” OR “Caloenas” OR “Chalcophaps” OR “Claravis” OR “Columba” OR “Columbina” OR “Didunculus” OR “Drepanoptila” OR “Ducula” OR “Ectopistes” OR “Gallicolumba” OR “Geopelia” OR “Geophaps” OR “Geotrygon” OR “Goura” OR “Gymnophaps” OR “Hemiphaga” OR “Henicophaps” OR “Leptotila” OR “Leptotrygon” OR “Leucosarcia” OR “Lopholaimus” OR “Macropygia” OR “Metriopelia” OR “Ocyphaps” OR “Oena” OR “Otidiphaps” OR “Patagioenas” OR “Petrophassa” OR “Pezophaps” OR “Phapitreron” OR “Phaps” OR “Ptilinopus” OR “Raphus” OR “Reinwardtoena” OR “Spilopelia” OR “Streptopelia” OR “Treron” OR “Trugon” OR “Turacoena” OR “Turtur” OR “Uropelia” OR “Zenaida” OR “Zentrygon” OR “Actenoides” OR “Alcedo” OR “Caridonax” OR “Ceryle” OR “Ceyx” OR “Chloroceryle” OR “Cittura” OR “Corythornis” OR “Dacelo” OR “Halcyon” OR “Ispidina” OR “Lacedo” OR “Megaceryle” OR “Melidora” OR “Syma” OR “Tanysiptera” OR “Todiramphus” OR “Atelornis” OR “Brachypteracias” OR “Geobiastes” OR “Coracias” OR “Eurystomus” OR “Merops” OR “Nyctyornis” OR “Baryphthengus” OR “Electron” OR “Eumomota” OR “Hylomanes” OR “Momotus” OR “Todus” OR “Cacomantis” OR “Carpococcyx” OR “Centropus” OR “Cercococcyx” OR “Chrysococcyx” OR “Clamator” OR “Coccycua” OR “Coccyzus” OR “Coua” OR “Crotophaga” OR “Cuculus” OR “Dasylophus” OR “Dromococcyx” OR “Eudynamys” OR “Geococcyx” OR “Guira” OR “Hierococcyx” OR “Morococcyx” OR “Neomorphus” OR “Pachycoccyx” OR “Phaenicophaeus” OR “Piaya” OR “Rhinortha” OR “Scythrops” OR “Surniculus” OR “Tapera” OR “Urodynamis” OR “Zanclostomus” OR “Dinornis” OR “Anomalopteryx” OR “Emeus” OR “Euryapteryx” OR “Eurypyga” OR “Rhynochetos” OR “Caracara” OR “Daptrius” OR “Falco” OR “Herpetotheres” OR “Ibycter” OR “Micrastur” OR “Microhierax” OR “Milvago” OR “Phalcoboenus” OR “Polihierax” OR “Spiziapteryx” OR “Aburria” OR “Chamaepetes” OR “Crax” OR

“Mitu” OR “Nothocrax” OR “Oreophasis” OR “Ortalis” OR “Pauxi” OR “Penelope” OR “Penelopina” OR “Pipile” OR “Alectura” OR “Megapodius” OR “Acryllium” OR “Guttera” OR “Numida” OR “Callipepla” OR “Colinus” OR “Cyrtonyx” OR “Dendrortyx” OR “Odontophorus” OR “Oreortyx” OR “Philortyx” OR “Ptilopachus” OR “Rhynchortyx” OR “Alectoris” OR “Ammoperdix” OR “Arborophila” OR “Argusianus” OR “Bambusicola” OR “Bonasa” OR “Caloperdix” OR “Centrocercus” OR “Chrysolophus” OR “Coturnix” OR “Crossoptilon” OR “Dendragapus” OR “Excalfactoria” OR “Falcipennis” OR “Francolinus” OR “Gallus” OR “Haematortyx” OR “Ithaginis” OR “Lagopus” OR “Lerwa” OR “Lophophorus” OR “Lophura” OR “Lyrurus” OR “Meleagris” OR “Pavo” OR “Peliperdix” OR “Perdix” OR “Phasianus” OR “Polyplectron” OR “Pternistis” OR “Pucrasia” OR “Rhizothera” OR “Rollulus” OR “Scleroptila” OR “Syrmaticus” OR “Tetrao” OR “Tetraogallus” OR “Tetraophasis” OR “Tragopan” OR “Tympanuchus” OR “Gavia” OR “Aramus” OR “Anthropoides” OR “Antigone” OR “Balearica” OR “Bugeranus” OR “Grus” OR “Leucogeranus” OR “Heliornis” OR “Psophia” OR “Aenigmatolimnas” OR “Amaurolimnas” OR “Amaurornis” OR “Anurolimnas” OR “Aramides” OR “Atlantisia” OR “Coturnicops” OR “Crex” OR “Dryolimnas” OR “Eulabeornis” OR “Fulica” OR “Gallicrex” OR “Gallinula” OR “Gallirallus” OR “Laterallus” OR “Lewinia” OR “Micropygia” OR “Neocrex” OR “Nesoclopeus” OR “Paragallinula” OR “Pardirallus” OR “Porphyrio” OR “Porphyriops” OR “Porzana” OR “Rallicula” OR “Rallina” OR “Rallus” OR “Tribonyx” OR “Canirallus” OR “Sarothrura” OR “Leptosomus” OR “Corythaeola” OR “Corythaixoides” OR “Crinifer” OR “Musophaga” OR “Tauraco” OR “Opisthocomus” OR “Afrotis” OR “Ardeotis” OR “Chlamydotis” OR “Neotis” OR “Otis” OR “Tetrax” OR “Acanthisitta” OR “Pachyplichas” OR “Traversia” OR “Xenicus” OR “Acanthiza” OR “Acanthornis” OR “Aethomyias” OR “Aphelocephala” OR “Calamanthus” OR “Gerygone” OR “Hylacola” OR “Neosericornis” OR “Oreoscopus” OR “Origma” OR “Pachycare” OR “Pycnoptilus” OR “Pyrrholaemus” OR “Sericornis” OR “Smicrornis” OR “Acrocephalus” OR “Arundinax” OR “Calamonastides” OR “Hippolais” OR “Iduna” OR “Nesillas” OR “Aegithalos” OR “Leptopoecile” OR “Psaltriparus” OR “Aegithina” OR “Alaemon” OR “Alauda” OR “Alaudala” OR “Ammomanes” OR “Calandrella” OR “Calendulauda” OR “Chersomanes” OR “Eremophila” OR “Eremopterix” OR “Galerida” OR “Lullula” OR “Melanocorypha” OR “Mirafra” OR “Pinarocorys” OR “Spizocorys” OR “Artamus” OR “Gymnorhina” OR “Melloria” OR “Bombycilla” OR “Buphagus” OR “Calcarius” OR “Plectrophenax” OR “Rhynchophanes” OR “Callaeas” OR “Heteralocha” OR “Philesturnus” OR “Calyptophilus” OR “Campephaga” OR “Ceblepyris” OR “Coracina” OR “Edolisoma” OR “Lalage” OR “Malindangia” OR “Pericrocotus” OR “Amaurospiza” OR “Cardinalis” OR “Caryothraustes” OR “Chlorothraupis” OR “Cyanocompsa” OR “Cyanoloxia” OR “Granatellus” OR “Habia” OR “Passerina” OR “Periporphyrus” OR “Pheucticus” OR “Piranga” OR “Spiza” OR “Certhia” OR “Salpornis” OR “Abroscopus” OR “Cettia” OR “Horornis” OR “Phyllergates” OR “Tesia” OR “Urosphena” OR “Chloropsis” OR “Cinclus” OR “Apalis” OR “Artisornis” OR “Camaroptera” OR “Cisticola” OR “Eremomela” OR “Heliolais” OR “Hypergerus” OR “Neomixis” OR “Oreolais” OR “Orthotomus” OR “Phragmacia” OR “Poliolais” OR “Prinia” OR “Schistolais” OR “Urolais” OR “Urorhipis” OR “Climacteris” OR “Cormobates” OR “Conopophaga” OR

"Struthidea" OR "Aphelocoma" OR "Calocitta" OR "Cissa" OR "Coloeus" OR "Corvus" OR "Cyanocitta" OR "Cyanocorax" OR "Cyanolyca" OR "Cyanopica" OR "Dendrocitta" OR "Garrulus" OR "Gymnorhinus" OR "Nucifraga" OR "Perisoreus" OR "Pica" OR "Platylophus" OR "Podoces" OR "Psilorhinus" OR "Ptilostomus" OR "Pyrrhocorax" OR "Urocissa" OR "Ampelioides" OR "Ampelion" OR "Carpornis" OR "Cephalopterus" OR "Conioptilon" OR "Cotinga" OR "Doliornis" OR "Gymnoderus" OR "Haematoderus" OR "Lipaugus" OR "Perissocephalus" OR "Phoenicircus" OR "Phytotoma" OR "Pipreola" OR "Porphyrolaema" OR "Procnias" OR "Pyroderus" OR "Querula" OR "Rupicola" OR "Snowornis" OR "Xipholena" OR "Zaratornis" OR "Dasyornis" OR "Dicaeum" OR "Prionochilus" OR "Dicrurus" OR "Donacobius" OR "Dulus" OR "Emberiza" OR "Amadina" OR "Amandava" OR "Cryptospiza" OR "Erythrura" OR "Estrilda" OR "Euodice" OR "Euschistospiza" OR "Lagonosticta" OR "Lonchura" OR "Mandingoa" OR "Neochmia" OR "Nesocharis" OR "Nigrita" OR "Ortygospiza" OR "Parmoptila" OR "Pyrenestes" OR "Pytilia" OR "Spermophaga" OR "Stagonopleura" OR "Taeniopygia" OR "Uraeginthus" OR "Calyptomena" OR "Cymbirhynchus" OR "Eurylaimus" OR "Psarisomus" OR "Serilophus" OR "Smithornis" OR "Chamaeza" OR "Formicarius" OR "Acanthis" OR "Agraphospiza" OR "Akialoa" OR "Bucanetes" OR "Carduelis" OR "Carpodacus" OR "Chloris" OR "Chlorodrepanis" OR "Chlorophonia" OR "Chrysocorythus" OR "Coccothraustes" OR "Crithagra" OR "Drepanis" OR "Eophona" OR "Euphonia" OR "Fringilla" OR "Haemorhous" OR "Hemignathus" OR "Himatione" OR "Leucosticte" OR "Linaria" OR "Linurgus" OR "Loxia" OR "Loxioides" OR "Loxops" OR "Magumma" OR "Melamprosops" OR "Oreomystis" OR "Paroreomyza" OR "Pinicola" OR "Procarduelis" OR "Pseudonestor" OR "Psittirostra" OR "Pyrrhoplectes" OR "Pyrrhula" OR "Rhodopechys" OR "Rhodospiza" OR "Serinus" OR "Spinus" OR "Telespiza" OR "Anabacerthia" OR "Anabazenops" OR "Ancistrops" OR "Anumbius" OR "Aphrastura" OR "Asthenes" OR "Automolus" OR "Berlepschia" OR "Campylorhamphus" OR "Certhiasomus" OR "Certhiaxis" OR "Cinclodes" OR "Clibanornis" OR "Coryphistera" OR "Cranioleuca" OR "Deconychura" OR "Dendrexetastes" OR "Dendrocincla" OR "Dendrocolaptes" OR "Dendroplex" OR "Drymornis" OR "Drymotoxeres" OR "Furnarius" OR "Geocerthia" OR "Geositta" OR "Glyphorynchus" OR "Heliobletus" OR "Hellmayrea" OR "Hylexetastes" OR "Lepidocolaptes" OR "Leptasthenura" OR "Limnoctites" OR "Limnornis" OR "Lochmias" OR "Margarornis" OR "Mazaria" OR "Megaxenops" OR "Metopothrix" OR "Microxenops" OR "Nasica" OR "Ochetorhynchus" OR "Phacellodomus" OR "Philydor" OR "Phleocryptes" OR "Premnoplex" OR "Premnornis" OR "Pseudasthenes" OR "Pseudocolaptes" OR "Pseudoseisura" OR "Pygarrhichas" OR "Roraimia" OR "Schoeniophylax" OR "Sclerurus" OR "Sittasomus" OR "Spartonoica" OR "Sylviorthorhynchus" OR "Synallaxis" OR "Syndactyla" OR "Tarphonomus" OR "Thripadectes" OR "Thripophaga" OR "Upucerthia" OR "Xenerpestes" OR "Xenops" OR "Xiphocolaptes" OR "Xiphorhynchus" OR "Grallaria" OR "Grallaricula" OR "Hylopezus" OR "Myrmothera" OR "Alopochelidon" OR "Atticora" OR "Cecropis" OR "Delichon" OR "Haplochelidon" OR "Hirundo" OR "Neochelidon" OR "Notiochelidon" OR "Orochelidon" OR "Petrochelidon" OR "Phedina" OR "Progne" OR "Psalidoprocne" OR "Pseudhirundo" OR "Pseudochelidon" OR "Ptyonoprogne" OR "Riparia" OR "Stelgidopteryx" OR

"Tachycineta" OR "Hyliota" OR "Hypocolius" OR "Agelaioides" OR "Agelaius" OR "Agelasticus" OR "Amblycercus" OR "Amblyramphus" OR "Anumara" OR "Cacicus" OR "Chrysomus" OR "Curaeus" OR "Dives" OR "Dolichonyx" OR "Euphagus" OR "Gnorimopsar" OR "Gymnomystax" OR "Hypopyrrhus" OR "Icterus" OR "Lampropsar" OR "Leistes" OR "Macroagelaius" OR "Molothrus" OR "Nesopsar" OR "Oreopsar" OR "Psarocolius" OR "Pseudoleistes" OR "Quiscalus" OR "Sturnella" OR "Xanthocephalus" OR "Xanthopsar" OR "Icteria" OR "Ifrita" OR "Irena" OR "Corvinella" OR "Eurocephalus" OR "Lanius" OR "Actinodura" OR "Argya" OR "Garrulax" OR "Grammatoptila" OR "Heterophasia" OR "Ianthocincla" OR "Laniellus" OR "Leiothrix" OR "Liocichla" OR "Minla" OR "Pterorhinus" OR "Trochalopteron" OR "Turdoides" OR "Bradypterus" OR "Cincloramphus" OR "Helopsaltes" OR "Locustella" OR "Megalurus" OR "Poodytes" OR "Machaerirhynchus" OR "Graueria" OR "Hylia" OR "Macrosphenus" OR "Melocichla" OR "Sylvietta" OR "Chlorophoneus" OR "Dryoscopus" OR "Laniarius" OR "Malaconotus" OR "Nilaus" OR "Rhodophoneus" OR "Tchagra" OR "Telophorus" OR "Amytornis" OR "Chenorhamphus" OR "Clytomyias" OR "Malurus" OR "Stipiturus" OR "Melampitta" OR "Melanocharis" OR "Oedistoma" OR "Toxorhamphus" OR "Melanopareia" OR "Acanthagenys" OR "Acanthorhynchus" OR "Anthochaera" OR "Anthornis" OR "Caligavis" OR "Entomyzon" OR "Epthianura" OR "Glycifohia" OR "Gymnomyza" OR "Lichmera" OR "Manorina" OR "Melidectes" OR "Melilestes" OR "Meliphaga" OR "Melipotes" OR "Melithreptus" OR "Myzomela" OR "Nesoptilotis" OR "Philemon" OR "Phylidonyris" OR "Prosthemadera" OR "Ptiloprora" OR "Ptilotula" OR "Pycnopygius" OR "Timeliopsis" OR "Xanthotis" OR "Menura" OR "Allenia" OR "Cinclocerthia" OR "Dumetella" OR "Margarops" OR "Melanoptila" OR "Melanotis" OR "Mimus" OR "Oreoscoptes" OR "Ramphocinclus" OR "Toxostoma" OR "Lamprospiza" OR "Mitrospingus" OR "Moho" OR "Mohoua" OR "Arses" OR "Carterornis" OR "Clytorhynchus" OR "Grallina" OR "Hypothymis" OR "Monarcha" OR "Myiagra" OR "Symposiachrus" OR "Terpsiphone" OR "Trochocercus" OR "Anthus" OR "Macronyx" OR "Motacilla" OR "Alethe" OR "Anthipes" OR "Brachypteryx" OR "Calliope" OR "Campicoloides" OR "Cercotrichas" OR "Chamaetylas" OR "Copsychus" OR "Cossypha" OR "Cyanoptila" OR "Cyornis" OR "Enicurus" OR "Erithacus" OR "Eumyias" OR "Ficedula" OR "Fraseria" OR "Irania" OR "Larvivora" OR "Leonardina" OR "Luscinia" OR "Melaenornis" OR "Monticola" OR "Muscicapa" OR "Myiomela" OR "Myioparus" OR "Myophonus" OR "Myrmecocichla" OR "Niltava" OR "Oenanthe" OR "Phoenicurus" OR "Pogonocichla" OR "Saxicola" OR "Sheppardia" OR "Sholicola" OR "Stiphrornis" OR "Tarsiger" OR "Thamnolaea" OR "Vauriella" OR "Aethopyga" OR "Anabathmis" OR "Anthreptes" OR "Arachnothera" OR "Chalcomitra" OR "Cinnyris" OR "Cyanomitra" OR "Deleornis" OR "Hedydipna" OR "Kurochkinegramma" OR "Leptocoma" OR "Nectarinia" OR "Daphoenositta" OR "Nesospingus" OR "Nicator" OR "Notiomystis" OR "Aleadryas" OR "Oriolus" OR "Pitohui" OR "Sphecotheres" OR "Turnagra" OR "Colluricincla" OR "Falcunculus" OR "Melanorectes" OR "Pachycephala" OR "Pseudorectes" OR "Panurus" OR "Cicinnurus" OR "Diphyllodes" OR "Manucodia" OR "Paradisaea" OR "Ptiloris" OR "Paramythia" OR "Pardalotus" OR "Baeolophus" OR "Cephalopyrus" OR "Cyanistes" OR "Lophophanes" OR "Machlolophus" OR "Melaniparus" OR "Melanochlora" OR "Pardaliparus” OR “Parus” OR “Periparus” OR “Poecile” OR “Pseudopodoces” OR “Sittiparus” OR “Sylviparus” OR “Basileuterus” OR “Cardellina” OR “Catharopeza” OR “Dendroica” OR “Geothlypis” OR “Helmitheros” OR “Leiothlypis” OR “Limnothlypis” OR “Mniotilta” OR “Myioborus” OR “Myiothlypis” OR “Oporornis” OR “Oreothlypis” OR “Parkesia” OR “Protonotaria” OR “Seiurus” OR “Setophaga” OR “Vermivora” OR “Aimophila” OR “Ammodramus” OR “Amphispiza” OR “Arremon” OR “Arremonops” OR “Artemisiospiza” OR “Atlapetes” OR “Calamospiza” OR “Chlorospingus” OR “Chondestes” OR “Junco” OR “Melospiza” OR “Melozone” OR “Oreothraupis” OR “Oriturus” OR “Passerculus” OR “Passerella” OR “Peucaea” OR “Pezopetes” OR “Pipilo” OR “Pooecetes” OR “Pselliophorus” OR “Rhynchospiza” OR “Spizella” OR “Spizelloides” OR “Xenospiza” OR “Zonotrichia” OR “Carpospiza” OR “Gymnoris” OR “Hypocryptadius” OR “Montifringilla” OR “Onychostruthus” OR “Passer” OR “Petronia” OR “Pyrgilauda” OR “Alcippe” OR “Gampsorhynchus” OR “Illadopsis” OR “Jabouilleia” OR “Kenopia” OR “Laticilla” OR “Malacocincla” OR “Malacopteron” OR “Napothera” OR “Pellorneum” OR “Rimator” OR “Trichastoma” OR “Amalocichla” OR “Drymodes” OR “Eopsaltria” OR “Eugerygone” OR “Heteromyias” OR “Melanodryas” OR “Microeca” OR “Monachella” OR “Pachycephalopsis” OR “Peneoenanthe” OR “Peneothello” OR “Petroica” OR “Poecilodryas” OR “Tregellasia” OR “Peucedramus” OR “Microligea” OR “Phaenicophilus” OR “Xenoligea” OR “Phylloscopus” OR “Picathartes” OR “Antilophia” OR “Ceratopipra” OR “Chiroxiphia” OR “Chloropipo” OR “Corapipo” OR “Cryptopipo” OR “Heterocercus” OR “Ilicura” OR “Lepidothrix” OR “Machaeropterus” OR “Manacus” OR “Masius” OR “Neopelma” OR “Pipra” OR “Pseudopipra” OR “Tyranneutes” OR “Xenopipo” OR “Erythropitta” OR “Hydrornis” OR “Pitta” OR “Batis” OR “Platysteira” OR “Anaplectes” OR “Bubalornis” OR “Euplectes” OR “Malimbus” OR “Plocepasser” OR “Ploceus” OR “Quelea” OR “Sporopipes” OR “Pnoepyga” OR “Microbates” OR “Polioptila” OR “Ramphocaenus” OR “Garritornis” OR “Prunella” OR “Cinclosoma” OR “Ptilorrhoa” OR “Phainopepla” OR “Phainoptila” OR “Ptiliogonys” OR “Ailuroedus” OR “Amblyornis” OR “Ptilonorhynchus” OR “Sericulus” OR “Alophoixus” OR “Andropadus” OR “Arizelocichla” OR “Atimastillas” OR “Baeopogon” OR “Bleda” OR “Chlorocichla” OR “Criniger” OR “Eurillas” OR “Hemixos” OR “Hypsipetes” OR “Iole” OR “Ixos” OR “Neolestes” OR “Phyllastrephus” OR “Pycnonotus” OR “Spizixos” OR “Stelgidillas” OR “Tricholestes” OR “Regulus” OR “Anthoscopus” OR “Auriparus” OR “Remiz” OR “Rhagologus” OR “Eleoscytalopus” OR “Liosceles” OR “Psilorhamphus” OR “Pteroptochos” OR “Scelorchilus” OR “Scytalopus” OR “Teledromas” OR “Rhipidura” OR “Rhodinocichla” OR “Sapayoa” OR “Sitta” OR “Spindalis” OR “Chelidorhynx” OR “Culicicapa” OR “Elminia” OR “Acridotheres” OR “Agropsar” OR “Ampeliceps” OR “Aplonis” OR “Basilornis” OR “Cinnyricinclus” OR “Creatophora” OR “Gracula” OR “Gracupica” OR “Hartlaubius” OR “Hylopsar” OR “Lamprotornis” OR “Leucopsar” OR “Mino” OR “Notopholia” OR “Onychognathus” OR “Pastor” OR “Poeoptera” OR “Rhabdornis” OR “Sarcops” OR “Scissirostrum” OR “Speculipastor” OR “Spodiopsar” OR “Streptocitta” OR “Sturnia” OR “Sturnus” OR “Chamaea” OR “Chleuasicus” OR “Chloropeta” OR “Chrysomma” OR “Conostoma” OR “Fulvetta” OR “Lioparus” OR “Paradoxornis” OR “Pseudoalcippe” OR “Psittiparus” OR “Rhopophilus” OR

“Sinosuthora” OR “Suthora” OR “Sylvia” OR “Teretistris” OR “Akletos” OR “Ampelornis” OR “Aprositornis” OR “Batara” OR “Cercomacra” OR “Cercomacroides” OR “Cymbilaimus” OR “Dichrozona” OR “Drymophila” OR “Dysithamnus” OR “Epinecrophylla” OR “Euchrepomis” OR “Formicivora” OR “Frederickena” OR “Gymnocichla” OR “Gymnopithys” OR “Hafferia” OR “Herpsilochmus” OR “Hylophylax” OR “Hypocnemis” OR “Hypocnemoides” OR “Hypoedaleus” OR “Isleria” OR “Mackenziaena” OR “Megastictus” OR “Microrhopias” OR “Myrmeciza” OR “Myrmelastes” OR “Myrmoborus” OR “Myrmochanes” OR “Myrmoderus” OR “Myrmophylax” OR “Myrmorchilus” OR “Myrmornis” OR “Myrmotherula” OR “Neoctantes” OR “Oneillornis” OR “Percnostola” OR “Phaenostictus” OR “Phlegopsis” OR “Pithys” OR “Poliocrania” OR “Pygiptila” OR “Pyriglena” OR “Rhegmatorhina” OR “Rhopias” OR “Rhopornis” OR “Sakesphorus” OR “Sciaphylax” OR “Sclateria” OR “Sipia” OR “Taraba” OR “Thamnistes” OR “Thamnomanes” OR “Thamnophilus” OR “Willisornis” OR “Xenornis” OR “Anisognathus” OR “Bangsia” OR “Buthraupis” OR “Calochaetes” OR “Catamblyrhynchus” OR “Catamenia” OR “Charitospiza” OR “Chlorochrysa” OR “Chlorophanes” OR “Chlorornis” OR “Chrysothlypis” OR “Cissopis” OR “Cnemoscopus” OR “Coereba” OR “Compsospiza” OR “Compsothraupis” OR “Conirostrum” OR “Conothraupis” OR “Coryphospingus” OR “Creurgops” OR “Cyanerpes” OR “Cyanicterus” OR “Cypsnagra” OR “Dacnis” OR “Delothraupis” OR “Diglossa” OR “Diuca” OR “Dolospingus” OR “Donacospiza” OR “Dubusia” OR “Emberizoides” OR “Embernagra” OR “Eucometis” OR “Euneornis” OR “Geospiza” OR “Gubernatrix” OR “Haplospiza” OR “Hemispingus” OR “Hemithraupis” OR “Heterospingus” OR “Incaspiza” OR “Iridophanes” OR “Iridosornis” OR “Lanio” OR “Lophospingus” OR “Loxigilla” OR “Loxipasser” OR “Melanodera” OR “Melanospiza” OR “Melopyrrha” OR “Nemosia” OR “Nephelornis” OR “Oreomanes” OR “Oryzoborus” OR “Parkerthraustes” OR “Paroaria” OR “Phrygilus” OR “Piezorina” OR “Pipraeidea” OR “Poospiza” OR “Pyrrhocoma” OR “Ramphocelus” OR “Rhodospingus” OR “Saltator” OR “Saltatricula” OR “Schistochlamys” OR “Sericossypha” OR “Sicalis” OR “Sporophila” OR “Stephanophorus” OR “Tachyphonus” OR “Tangara” OR “Tersina” OR “Thlypopsis” OR “Thraupis” OR “Tiaris” OR “Trichothraupis” OR “Volatinia” OR “Wetmorethraupis” OR “Xenodacnis” OR “Xenospingus” OR “Tichodroma” OR “Macronus” OR “Pomatorhinus” OR “Spelaeornis” OR “Stachyridopsis” OR “Stachyris” OR “Iodopleura” OR “Laniisoma” OR “Laniocera” OR “Myiobius” OR “Onychorhynchus” OR “Oxyruncus” OR “Pachyramphus” OR “Schiffornis” OR “Terenotriccus” OR “Tityra” OR “Xenopsaris” OR “Campylorhynchus” OR “Cantorchilus” OR “Catherpes” OR “Cinnycerthia” OR “Cistothorus” OR “Cyphorhinus” OR “Henicorhina” OR “Microcerculus” OR “Odontorchilus” OR “Pheugopedius” OR “Salpinctes” OR “Thryomanes” OR “Thryophilus” OR “Thryothorus” OR “Troglodytes” OR “Uropsila” OR “Catharus” OR “Cichlopsis” OR “Entomodestes” OR “Geokichla” OR “Hylocichla” OR “Ixoreus” OR “Myadestes” OR “Neocossyphus” OR “Ridgwayia” OR “Sialia” OR “Stizorhina” OR “Turdus” OR “Zoothera” OR “Agriornis” OR “Alectrurus” OR “Anairetes” OR “Aphanotriccus” OR “Arundinicola” OR “Atalotriccus” OR “Attila” OR “Camptostoma” OR “Capsiempis” OR “Casiornis” OR “Cnemarchus” OR “Cnemotriccus” OR “Cnipodectes” OR “Colonia” OR “Colorhamphus” OR “Conopias” OR “Contopus” OR

“Corythopis” OR “Culicivora” OR “Deltarhynchus” OR “Elaenia” OR “Empidonax” OR “Empidonomus” OR “Euscarthmus” OR “Fluvicola” OR “Griseotyrannus” OR “Gubernetes” OR “Hemitriccus” OR “Heteroxolmis” OR “Hirundinea” OR “Hymenops” OR “Inezia” OR “Knipolegus” OR “Lathrotriccus” OR “Legatus” OR “Leptopogon” OR “Lessonia” OR “Lophotriccus” OR “Machetornis” OR “Mecocerculus” OR “Megarynchus” OR “Mionectes” OR “Mitrephanes” OR “Muscigralla” OR “Muscisaxicola” OR “Myiarchus” OR “Myiodynastes” OR “Myiopagis” OR “Myiophobus” OR “Myiornis” OR “Myiotheretes” OR “Myiotriccus” OR “Myiozetetes” OR “Neopipo” OR “Neoxolmis” OR “Nephelomyias” OR “Ochthoeca” OR “Ochthornis” OR “Oncostoma” OR “Ornithion” OR “Phaeomyias” OR “Philohydor” OR “Phyllomyias” OR “Phylloscartes” OR “Piprites” OR “Pitangus” OR “Platyrinchus” OR “Poecilotriccus” OR “Pogonotriccus” OR “Polioxolmis” OR “Polystictus” OR “Pseudelaenia” OR “Pseudocolopteryx” OR “Pseudotriccus” OR “Pyrocephalus” OR “Pyrrhomyias” OR “Ramphotrigon” OR “Rhynchocyclus” OR “Rhytipterna” OR “Satrapa” OR “Sayornis” OR “Serpophaga” OR “Silvicultrix” OR “Sirystes” OR “Stigmatura” OR “Sublegatus” OR “Suiriri” OR “Tachuris” OR “Taeniotriccus” OR “Todirostrum” OR “Tolmomyias” OR “Tumbezia” OR “Tyrannopsis” OR “Tyrannulus” OR “Tyrannus” OR “Uromyias” OR “Xenotriccus” OR “Xolmis” OR “Zimmerius” OR “Urocynchramus” OR “Artamella” OR “Calicalicus” OR “Cyanolanius” OR “Euryceros” OR “Falculea” OR “Hypositta” OR “Leptopterus” OR “Mystacornis” OR “Newtonia” OR “Oriolia” OR “Philentoma” OR “Prionops” OR “Pseudobias” OR “Schetba” OR “Tephrodornis” OR “Tylas” OR “Vanga” OR “Xenopirostris” OR “Anomalospiza” OR “Vidua” OR “Cyclarhis” OR “Erpornis” OR “Hylophilus” OR “Pteruthius” OR “Vireo” OR “Vireolanius” OR “Zeledonia” OR “Apalopteron” OR “Dasycrotapha” OR “Heleia” OR “Lophozosterops” OR “Sterrhoptilus” OR “Yuhina” OR “Zosterops” OR “Zosterornis” OR “Agamia” OR “Ardea” OR “Ardeola” OR “Botaurus” OR “Bubulcus” OR “Butorides” OR “Cochlearius” OR “Dupetor” OR “Egretta” OR “Gorsachius” OR “Ixobrychus” OR “Nyctanassa” OR “Nycticorax” OR “Pilherodius” OR “Syrigma” OR “Tigriornis” OR “Tigrisoma” OR “Zebrilus” OR “Balaeniceps” OR “Pelecanus” OR “Scopus” OR “Bostrychia” OR “Eudocimus” OR “Geronticus” OR “Lophotibis” OR “Mesembrinibis” OR “Nipponia” OR “Phimosus” OR “Platalea” OR “Plegadis” OR “Pseudibis” OR “Theristicus” OR “Threskiornis” OR “Phaethon” OR “Phoeniconaias” OR “Phoenicoparrus” OR “Phoenicopterus” OR “Bucco” OR “Chelidoptera” OR “Hapaloptila” OR “Hypnelus” OR “Malacoptila” OR “Micromonacha” OR “Monasa” OR “Nonnula” OR “Notharchus” OR “Nystalus” OR “Capito” OR “Eubucco” OR “Brachygalba” OR “Galbalcyrhynchus” OR “Galbula” OR “Jacamaralcyon” OR “Jacamerops” OR “Indicator” OR “Melichneutes” OR “Melignomon” OR “Prodotiscus” OR “Buccanodon” OR “Gymnobucco” OR “Lybius” OR “Pogoniulus” OR “Stactolaema” OR “Trachyphonus” OR “Psilopogon” OR “Blythipicus” OR “Campephilus” OR “Campethera” OR “Celeus” OR “Chloropicus” OR “Chrysocolaptes” OR “Chrysophlegma” OR “Colaptes” OR “Dendrocopos” OR “Dendrocoptes” OR “Dendropicos” OR “Dinopium” OR “Dryobates” OR “Dryocopus” OR “Gecinulus” OR “Geocolaptes” OR “Jynx” OR “Leiopicus” OR “Leuconotopicus” OR “Meiglyptes” OR “Melanerpes” OR “Micropternus” OR “Mulleripicus” OR “Nesoctites” OR “Picoides” OR “Piculus” OR “Picumnus” OR “Picus” OR “Reinwardtipicus” OR “Sasia” OR “Sphyrapicus” OR “Veniliornis” OR “Yungipicus” OR “Andigena” OR “Aulacorhynchus” OR “Pteroglossus” OR “Ramphastos” OR “Selenidera” OR “Semnornis” OR “Aechmophorus” OR “Podiceps” OR “Podilymbus” OR “Poliocephalus” OR “Rollandia” OR “Tachybaptus” OR “Diomedea” OR “Phoebastria” OR “Phoebetria” OR “Thalassarche” OR “Hydrobates” OR “Oceanodroma” OR “Fregetta” OR “Garrodia” OR “Nesofregetta” OR “Oceanites” OR “Pelagodroma” OR “Aphrodroma” OR “Ardenna” OR “Bulweria” OR “Calonectris” OR “Daption” OR “Fulmarus” OR “Halobaena” OR “Macronectes” OR “Pachyptila” OR “Pagodroma” OR “Pelecanoides” OR “Procellaria” OR “Pseudobulweria” OR “Pterodroma” OR “Puffinus” OR “Thalassoica” OR “Cacatua” OR “Callocephalon” OR “Calyptorhynchus” OR “Eolophus” OR “Lophochroa” OR “Nymphicus” OR “Probosciger” OR “Alipiopsitta” OR “Amazona” OR “Anodorhynchus” OR “Ara” OR “Aratinga” OR “Bolborhynchus” OR “Brotogeris” OR “Conuropsis” OR “Cyanoliseus” OR “Cyanopsitta” OR “Deroptyus” OR “Diopsittaca” OR “Enicognathus” OR “Eupsittula” OR “Forpus” OR “Graydidascalus” OR “Guarouba” OR “Guaruba” OR “Hapalopsittaca” OR “Leptosittaca” OR “Myiopsitta” OR “Nannopsittaca” OR “Orthopsittaca” OR “Pionites” OR “Pionopsitta” OR “Pionus” OR “Poicephalus” OR “Primolius” OR “Psilopsiagon” OR “Psittacara” OR “Psittacus” OR “Pyrilia” OR “Pyrrhura” OR “Rhynchopsitta” OR “Thectocercus” OR “Touit” OR “Triclaria” OR “Agapornis” OR “Alisterus” OR “Aprosmictus” OR “Barnardius” OR “Bolbopsittacus” OR “Chalcopsitta” OR “Charmosyna” OR “Coracopsis” OR “Cyanoramphus” OR “Cyclopsitta” OR “Eclectus” OR “Eos” OR “Eunymphicus” OR “Geoffroyus” OR “Glossopsitta” OR “Lathamus” OR “Loriculus” OR “Lorius” OR “Melopsittacus” OR “Micropsitta” OR “Neophema” OR “Neopsephotus” OR “Neopsittacus” OR “Northiella” OR “Oreopsittacus” OR “Parvipsitta” OR “Pezoporus” OR “Phigys” OR “Platycercus” OR “Polytelis” OR “Prioniturus” OR “Prosopeia” OR “Psephotellus” OR “Psephotus” OR “Pseudeos” OR “Psittacella” OR “Psittacula” OR “Psittaculirostris” OR “Psitteuteles” OR “Psittinus” OR “Psittrichas” OR “Purpureicephalus” OR “Tanygnathus” OR “Trichoglossus” OR “Vini” OR “Nestor” OR “Strigops” OR “Pterocles” OR “Syrrhaptes” OR “Rhea” OR “Aptenodytes” OR “Eudyptes” OR “Eudyptula” OR “Megadyptes” OR “Pygoscelis” OR “Spheniscus” OR “Aegolius” OR “Asio” OR “Athene” OR “Bubo” OR “Glaucidium” OR “Ketupa” OR “Lophostrix” OR “Megascops” OR “Micrathene” OR “Ninox” OR “Otus” OR “Pseudoscops” OR “Psiloscops” OR “Pulsatrix” OR “Sceloglaux” OR “Scotopelia” OR “Strix” OR “Surnia” OR “Xenoglaux” OR “Phodilus” OR “Tyto” OR “Aepyornis” OR “Mullerornis” OR “Struthio” OR “Anhinga” OR “Fregata” OR “Leucocarbo” OR “Microcarbo” OR “Nannopterum” OR “Phalacrocorax” OR “Morus” OR “Sula” OR “Crypturellus” OR “Eudromia” OR “Nothocercus” OR “Nothoprocta” OR “Nothura” OR “Rhynchotus” OR “Tinamotis” OR “Tinamus” OR “Apalharpactes” OR “Apaloderma” OR “Harpactes” OR “Pharomachrus” OR “Trogon” OR “Tetrastes” OR “Hesperiphona”) AND (“experiment*” OR “manipulat*”))) OR AK= (((“green*” OR “herb*” OR “aromatic*”) AND “nest*” AND (“bird*” OR “aves” OR “avian” OR “ornithol*” OR “passerine*” OR “passeriform*” OR “songbird*” OR “Accipiter” OR “Aegypius” OR “Aquila” OR “Aviceda” OR “Busarellus” OR “Butastur” OR “Buteo” OR “Buteogallus” OR “Chondrohierax” OR “Circaetus” OR “Circus” OR “Clanga” OR “Elanoides” OR “Elanus” OR “Gampsonyx”

OR “Geranoaetus” OR “Geranospiza” OR “Gypaetus” OR “Gypohierax” OR “Gyps” OR “Haliaeetus” OR “Haliastur” OR “Harpagus” OR “Harpia” OR “Hieraaetus” OR “Ictinaetus” OR “Ictinia” OR “Kaupifalco” OR “Leptodon” OR “Leucopternis” OR “Lophotriorchis” OR “Milvus” OR “Morphnarchus” OR “Morphnus” OR “Necrosyrtes” OR “Neophron” OR “Nisaetus” OR “Parabuteo” OR “Pernis” OR “Pithecophaga” OR “Polemaetus” OR “Pseudastur” OR “Rostrhamus” OR “Rupornis” OR “Sarcogyps” OR “Spilornis” OR “Spizaetus” OR “Stephanoaetus” OR “Terathopius” OR “Torgos” OR “Trigonoceps” OR “Cathartes” OR “Coragyps” OR “Gymnogyps” OR “Sarcoramphus” OR “Vultur” OR “Pandion” OR “Sagittarius” OR “Aix” OR “Alopochen” OR “Amazonetta” OR “Anas” OR “Anser” OR “Asarcornis” OR “Aythya” OR “Branta” OR “Bucephala” OR “Cairina” OR “Callonetta” OR “Cereopsis” OR “Chen” OR “Chenonetta” OR “Chloephaga” OR “Clangula” OR “Coscoroba” OR “Cyanochen” OR “Cygnus” OR “Dendrocygna” OR “Heteronetta” OR “Histrionicus” OR “Hymenolaimus” OR “Lophodytes” OR “Lophonetta” OR “Malacorhynchus” OR “Mareca” OR “Marmaronetta” OR “Melanitta” OR “Merganetta” OR “Mergellus” OR “Mergus” OR “Neochen” OR “Netta” OR “Nettapus” OR “Nomonyx” OR “Oxyura” OR “Plectropterus” OR “Polysticta” OR “Pteronetta” OR “Sarkidiornis” OR “Sibirionetta” OR “Somateria” OR “Spatula” OR “Tachyeres” OR “Tadorna” OR “Thalassornis” OR “Anhima” OR “Chauna” OR “Anseranas” OR “Aegotheles” OR “Aerodramus” OR “Aeronautes” OR “Apus” OR “Chaetura” OR “Collocalia” OR “Cypseloides” OR “Cypsiurus” OR “Hirundapus” OR “Panyptila” OR “Streptoprocne” OR “Tachornis” OR “Tachymarptis” OR “Hemiprocne” OR “Abeillia” OR “Adelomyia” OR “Aglaeactis” OR “Aglaiocercus” OR “Amazilia” OR “Androdon” OR “Anopetia” OR “Anthocephala” OR “Anthracothorax” OR “Archilochus” OR “Atthis” OR “Augastes” OR “Avocettula” OR “Basilinna” OR “Boissonneaua” OR “Calliphlox” OR “Calypte” OR “Campylopterus” OR “Chaetocercus” OR “Chalcostigma” OR “Chalybura” OR “Chlorestes” OR “Chlorostilbon” OR “Chrysolampis” OR “Chrysuronia” OR “Clytolaema” OR “Coeligena” OR “Colibri” OR “Cyanophaia” OR “Cynanthus” OR “Discosura” OR “Doricha” OR “Doryfera” OR “Elvira” OR “Ensifera” OR “Eriocnemis” OR “Eugenes” OR “Eulampis” OR “Eulidia” OR “Eupetomena” OR “Eupherusa” OR “Eutoxeres” OR “Florisuga” OR “Glaucis” OR “Goethalsia” OR “Goldmania” OR “Haplophaedia” OR “Heliactin” OR “Heliangelus” OR “Heliodoxa” OR “Heliomaster” OR “Heliothryx” OR “Hylocharis” OR “Juliamyia” OR “Klais” OR “Lafresnaya” OR “Lampornis” OR “Lamprolaima” OR “Lepidopyga” OR “Lesbia” OR “Leucippus” OR “Leucochloris” OR “Lophornis” OR “Mellisuga” OR “Metallura” OR “Microchera” OR “Myrmia” OR “Myrtis” OR “Ocreatus” OR “Opisthoprora” OR “Oreonympha” OR “Oreotrochilus” OR “Orthorhyncus” OR “Oxypogon” OR “Panterpe” OR “Patagona” OR “Phaeochroa” OR “Phaethornis” OR “Phlogophilus” OR “Polyonymus” OR “Polytmus” OR “Pterophanes” OR “Ramphodon” OR “Ramphomicron” OR “Rhodopis” OR “Sappho” OR “Schistes” OR “Selasphorus” OR “Sephanoides” OR “Stephanoxis” OR “Sternoclyta” OR “Taphrospilus” OR “Thalurania” OR “Thaumastura” OR “Threnetes” OR “Topaza” OR “Trochilus” OR “Urochroa” OR “Urosticte” OR “Apteryx” OR “Anthracoceros” OR “Buceros” OR “Bycanistes” OR “Lophoceros” OR “Penelopides” OR “Rhabdotorrhinus” OR “Rhyticeros” OR “Tockus” OR “Bucorvus” OR “Phoeniculus” OR “Rhinopomastus”

OR “Upupa” OR “Antrostomus” OR “Caprimulgus” OR “Chordeiles” OR “Eleothreptus” OR “Eurostopodus” OR “Hydropsalis” OR “Lurocalis” OR “Lyncornis” OR “Nyctidromus” OR “Nyctiphrynus” OR “Nyctipolus” OR “Nyctiprogne” OR “Phalaenoptilus” OR “Setopagis” OR “Systellura” OR “Uropsalis” OR “Nyctibius” OR “Batrachostomus” OR “Podargus” OR “Steatornis” OR “Cariama” OR “Casuarius” OR “Dromaius” OR “Aethia” OR “Alca” OR “Alle” OR “Brachyramphus” OR “Cepphus” OR “Cerorhinca” OR “Fratercula” OR “Pinguinus” OR “Ptychoramphus” OR “Synthliboramphus” OR “Uria” OR “Burhinus” OR “Anarhynchus” OR “Charadrius” OR “Elseyornis” OR “Erythrogonys” OR “Hoploxypterus” OR “Oreopholus” OR “Peltohyas” OR “Phegornis” OR “Pluvialis” OR “Thinornis” OR “Vanellus” OR “Chionis” OR “Dromas” OR “Cursorius” OR “Glareola” OR “Rhinoptilus” OR “Stiltia” OR “Haematopus” OR “Actophilornis” OR “Hydrophasianus” OR “Irediparra” OR “Jacana” OR “Metopidius” OR “Microparra” OR “Anous” OR “Chlidonias” OR “Chroicocephalus” OR “Creagrus” OR “Gelochelidon” OR “Gygis” OR “Hydrocoloeus” OR “Hydroprogne” OR “Ichthyaetus” OR “Larosterna” OR “Larus” OR “Leucophaeus” OR “Onychoprion” OR “Pagophila” OR “Phaetusa” OR “Rhodostethia” OR “Rissa” OR “Rynchops” OR “Sterna” OR “Sternula” OR “Thalasseus” OR “Xema” OR “Pedionomus” OR “Pluvianellus” OR “Pluvianus” OR “Himantopus” OR “Recurvirostra” OR “Nycticryphes” OR “Rostratula” OR “Actitis” OR “Arenaria” OR “Bartramia” OR “Calidris” OR “Coenocorypha” OR “Gallinago” OR “Limnodromus” OR “Limosa” OR “Lymnocryptes” OR “Numenius” OR “Phalaropus” OR “Scolopax” OR “Tringa” OR “Xenus” OR “Stercorarius” OR “Attagis” OR “Thinocorus” OR “Turnix” OR “Ciconia” OR “Ephippiorhynchus” OR “Jabiru” OR “Leptoptilos” OR “Mycteria” OR “Colius” OR “Urocolius” OR “Alectroenas” OR “Alopecoenas” OR “Caloenas” OR “Chalcophaps” OR “Claravis” OR “Columba” OR “Columbina” OR “Didunculus” OR “Drepanoptila” OR “Ducula” OR “Ectopistes” OR “Gallicolumba” OR “Geopelia” OR “Geophaps” OR “Geotrygon” OR “Goura” OR “Gymnophaps” OR “Hemiphaga” OR “Henicophaps” OR “Leptotila” OR “Leptotrygon” OR “Leucosarcia” OR “Lopholaimus” OR “Macropygia” OR “Metriopelia” OR “Ocyphaps” OR “Oena” OR “Otidiphaps” OR “Patagioenas” OR “Petrophassa” OR “Pezophaps” OR “Phapitreron” OR “Phaps” OR “Ptilinopus” OR “Raphus” OR “Reinwardtoena” OR “Spilopelia” OR “Streptopelia” OR “Treron” OR “Trugon” OR “Turacoena” OR “Turtur” OR “Uropelia” OR “Zenaida” OR “Zentrygon” OR “Actenoides” OR “Alcedo” OR “Caridonax” OR “Ceryle” OR “Ceyx” OR “Chloroceryle” OR “Cittura” OR “Corythornis” OR “Dacelo” OR “Halcyon” OR “Ispidina” OR “Lacedo” OR “Megaceryle” OR “Melidora” OR “Syma” OR “Tanysiptera” OR “Todiramphus” OR “Atelornis” OR “Brachypteracias” OR “Geobiastes” OR “Coracias” OR “Eurystomus” OR “Merops” OR “Nyctyornis” OR “Baryphthengus” OR “Electron” OR “Eumomota” OR “Hylomanes” OR “Momotus” OR “Todus” OR “Cacomantis” OR “Carpococcyx” OR “Centropus” OR “Cercococcyx” OR “Chrysococcyx” OR “Clamator” OR “Coccycua” OR “Coccyzus” OR “Coua” OR “Crotophaga” OR “Cuculus” OR “Dasylophus” OR “Dromococcyx” OR “Eudynamys” OR “Geococcyx” OR “Guira” OR “Hierococcyx” OR “Morococcyx” OR “Neomorphus” OR “Pachycoccyx” OR “Phaenicophaeus” OR “Piaya” OR “Rhinortha” OR “Scythrops” OR “Surniculus” OR “Tapera” OR “Urodynamis” OR “Zanclostomus” OR “Dinornis” OR

“Anomalopteryx” OR “Emeus” OR “Euryapteryx” OR “Eurypyga” OR “Rhynochetos” OR “Caracara” OR “Daptrius” OR “Falco” OR “Herpetotheres” OR “Ibycter” OR “Micrastur” OR “Microhierax” OR “Milvago” OR “Phalcoboenus” OR “Polihierax” OR “Spiziapteryx” OR “Aburria” OR “Chamaepetes” OR “Crax” OR “Mitu” OR “Nothocrax” OR “Oreophasis” OR “Ortalis” OR “Pauxi” OR “Penelope” OR “Penelopina” OR “Pipile” OR “Alectura” OR “Megapodius” OR “Acryllium” OR “Guttera” OR “Numida” OR “Callipepla” OR “Colinus” OR “Cyrtonyx” OR “Dendrortyx” OR “Odontophorus” OR “Oreortyx” OR “Philortyx” OR “Ptilopachus” OR “Rhynchortyx” OR “Alectoris” OR “Ammoperdix” OR “Arborophila” OR “Argusianus” OR “Bambusicola” OR “Bonasa” OR “Caloperdix” OR “Centrocercus” OR “Chrysolophus” OR “Coturnix” OR “Crossoptilon” OR “Dendragapus” OR “Excalfactoria” OR “Falcipennis” OR “Francolinus” OR “Gallus” OR “Haematortyx” OR “Ithaginis” OR “Lagopus” OR “Lerwa” OR “Lophophorus” OR “Lophura” OR “Lyrurus” OR “Meleagris” OR “Pavo” OR “Peliperdix” OR “Perdix” OR “Phasianus” OR “Polyplectron” OR “Pternistis” OR “Pucrasia” OR “Rhizothera” OR “Rollulus” OR “Scleroptila” OR “Syrmaticus” OR “Tetrao” OR “Tetraogallus” OR “Tetraophasis” OR “Tragopan” OR “Tympanuchus” OR “Gavia” OR “Aramus” OR “Anthropoides” OR “Antigone” OR “Balearica” OR “Bugeranus” OR “Grus” OR “Leucogeranus” OR “Heliornis” OR “Psophia” OR “Aenigmatolimnas” OR “Amaurolimnas” OR “Amaurornis” OR “Anurolimnas” OR “Aramides” OR “Atlantisia” OR “Coturnicops” OR “Crex” OR “Dryolimnas” OR “Eulabeornis” OR “Fulica” OR “Gallicrex” OR “Gallinula” OR “Gallirallus” OR “Laterallus” OR “Lewinia” OR “Micropygia” OR “Neocrex” OR “Nesoclopeus” OR “Paragallinula” OR “Pardirallus” OR “Porphyrio” OR “Porphyriops” OR “Porzana” OR “Rallicula” OR “Rallina” OR “Rallus” OR “Tribonyx” OR “Canirallus” OR “Sarothrura” OR “Leptosomus” OR “Corythaeola” OR “Corythaixoides” OR “Crinifer” OR “Musophaga” OR “Tauraco” OR “Opisthocomus” OR “Afrotis” OR “Ardeotis” OR “Chlamydotis” OR “Neotis” OR “Otis” OR “Tetrax” OR “Acanthisitta” OR “Pachyplichas” OR “Traversia” OR “Xenicus” OR “Acanthiza” OR “Acanthornis” OR “Aethomyias” OR “Aphelocephala” OR “Calamanthus” OR “Gerygone” OR “Hylacola” OR “Neosericornis” OR “Oreoscopus” OR “Origma” OR “Pachycare” OR “Pycnoptilus” OR “Pyrrholaemus” OR “Sericornis” OR “Smicrornis” OR “Acrocephalus” OR “Arundinax” OR “Calamonastides” OR “Hippolais” OR “Iduna” OR “Nesillas” OR “Aegithalos” OR “Leptopoecile” OR “Psaltriparus” OR “Aegithina” OR “Alaemon” OR “Alauda” OR “Alaudala” OR “Ammomanes” OR “Calandrella” OR “Calendulauda” OR “Chersomanes” OR “Eremophila” OR “Eremopterix” OR “Galerida” OR “Lullula” OR “Melanocorypha” OR “Mirafra” OR “Pinarocorys” OR “Spizocorys” OR “Artamus” OR “Gymnorhina” OR “Melloria” OR “Bombycilla” OR “Buphagus” OR “Calcarius” OR “Plectrophenax” OR “Rhynchophanes” OR “Callaeas” OR “Heteralocha” OR “Philesturnus” OR “Calyptophilus” OR “Campephaga” OR “Ceblepyris” OR “Coracina” OR “Edolisoma” OR “Lalage” OR “Malindangia” OR “Pericrocotus” OR “Amaurospiza” OR “Cardinalis” OR “Caryothraustes” OR “Chlorothraupis” OR “Cyanocompsa” OR “Cyanoloxia” OR “Granatellus” OR “Habia” OR “Passerina” OR “Periporphyrus” OR “Pheucticus” OR “Piranga” OR “Spiza” OR “Certhia” OR “Salpornis” OR “Abroscopus” OR “Cettia” OR “Horornis” OR “Phyllergates” OR “Tesia” OR “Urosphena” OR “Chloropsis” OR “Cinclus”

OR “Apalis” OR “Artisornis” OR “Camaroptera” OR “Cisticola” OR “Eremomela” OR “Heliolais” OR “Hypergerus” OR “Neomixis” OR “Oreolais” OR “Orthotomus” OR “Phragmacia” OR “Poliolais” OR “Prinia” OR “Schistolais” OR “Urolais” OR “Urorhipis” OR “Climacteris” OR “Cormobates” OR “Conopophaga” OR “Struthidea” OR “Aphelocoma” OR “Calocitta” OR “Cissa” OR “Coloeus” OR “Corvus” OR “Cyanocitta” OR “Cyanocorax” OR “Cyanolyca” OR “Cyanopica” OR “Dendrocitta” OR “Garrulus” OR “Gymnorhinus” OR “Nucifraga” OR “Perisoreus” OR “Pica” OR “Platylophus” OR “Podoces” OR “Psilorhinus” OR “Ptilostomus” OR “Pyrrhocorax” OR “Urocissa” OR “Ampelioides” OR “Ampelion” OR “Carpornis” OR “Cephalopterus” OR “Conioptilon” OR “Cotinga” OR “Doliornis” OR “Gymnoderus” OR “Haematoderus” OR “Lipaugus” OR “Perissocephalus” OR “Phoenicircus” OR “Phytotoma” OR “Pipreola” OR “Porphyrolaema” OR “Procnias” OR “Pyroderus” OR “Querula” OR “Rupicola” OR “Snowornis” OR “Xipholena” OR “Zaratornis” OR “Dasyornis” OR “Dicaeum” OR “Prionochilus” OR “Dicrurus” OR “Donacobius” OR “Dulus” OR “Emberiza” OR “Amadina” OR “Amandava” OR “Cryptospiza” OR “Erythrura” OR “Estrilda” OR “Euodice” OR “Euschistospiza” OR “Lagonosticta” OR “Lonchura” OR “Mandingoa” OR “Neochmia” OR “Nesocharis” OR “Nigrita” OR “Ortygospiza” OR “Parmoptila” OR “Pyrenestes” OR “Pytilia” OR “Spermophaga” OR “Stagonopleura” OR “Taeniopygia” OR “Uraeginthus” OR “Calyptomena” OR “Cymbirhynchus” OR “Eurylaimus” OR “Psarisomus” OR “Serilophus” OR “Smithornis” OR “Chamaeza” OR “Formicarius” OR “Acanthis” OR “Agraphospiza” OR “Akialoa” OR “Bucanetes” OR “Carduelis” OR “Carpodacus” OR “Chloris” OR “Chlorodrepanis” OR “Chlorophonia” OR “Chrysocorythus” OR “Coccothraustes” OR “Crithagra” OR “Drepanis” OR “Eophona” OR “Euphonia” OR “Fringilla” OR “Haemorhous” OR “Hemignathus” OR “Himatione” OR “Leucosticte” OR “Linaria” OR “Linurgus” OR “Loxia” OR “Loxioides” OR “Loxops” OR “Magumma” OR “Melamprosops” OR “Oreomystis” OR “Paroreomyza” OR “Pinicola” OR “Procarduelis” OR “Pseudonestor” OR “Psittirostra” OR “Pyrrhoplectes” OR “Pyrrhula” OR “Rhodopechys” OR “Rhodospiza” OR “Serinus” OR “Spinus” OR “Telespiza” OR “Anabacerthia” OR “Anabazenops” OR “Ancistrops” OR “Anumbius” OR “Aphrastura” OR “Asthenes” OR “Automolus” OR “Berlepschia” OR “Campylorhamphus” OR “Certhiasomus” OR “Certhiaxis” OR “Cinclodes” OR “Clibanornis” OR “Coryphistera” OR “Cranioleuca” OR “Deconychura” OR “Dendrexetastes” OR “Dendrocincla” OR “Dendrocolaptes” OR “Dendroplex” OR “Drymornis” OR “Drymotoxeres” OR “Furnarius” OR “Geocerthia” OR “Geositta” OR “Glyphorynchus” OR “Heliobletus” OR “Hellmayrea” OR “Hylexetastes” OR “Lepidocolaptes” OR “Leptasthenura” OR “Limnoctites” OR “Limnornis” OR “Lochmias” OR “Margarornis” OR “Mazaria” OR “Megaxenops” OR “Metopothrix” OR “Microxenops” OR “Nasica” OR “Ochetorhynchus” OR “Phacellodomus” OR “Philydor” OR “Phleocryptes” OR “Premnoplex” OR “Premnornis” OR “Pseudasthenes” OR “Pseudocolaptes” OR “Pseudoseisura” OR “Pygarrhichas” OR “Roraimia” OR “Schoeniophylax” OR “Sclerurus” OR “Sittasomus” OR “Spartonoica” OR “Sylviorthorhynchus” OR “Synallaxis” OR “Syndactyla” OR “Tarphonomus” OR “Thripadectes” OR “Thripophaga” OR “Upucerthia” OR “Xenerpestes” OR “Xenops” OR “Xiphocolaptes” OR “Xiphorhynchus” OR “Grallaria” OR “Grallaricula” OR “Hylopezus” OR “Myrmothera” OR “Alopochelidon" OR "Atticora" OR "Cecropis" OR "Delichon" OR "Haplochelidon" OR "Hirundo" OR "Neochelidon" OR "Notiochelidon" OR "Orochelidon" OR "Petrochelidon" OR "Phedina" OR "Progne" OR "Psalidoprocne" OR "Pseudhirundo" OR "Pseudochelidon" OR "Ptyonoprogne" OR "Riparia" OR "Stelgidopteryx" OR "Tachycineta" OR "Hyliota" OR "Hypocolius" OR "Agelaioides" OR "Agelaius" OR "Agelasticus" OR "Amblycercus" OR "Amblyramphus" OR "Anumara" OR "Cacicus" OR "Chrysomus" OR "Curaeus" OR "Dives" OR "Dolichonyx" OR "Euphagus" OR "Gnorimopsar" OR "Gymnomystax" OR "Hypopyrrhus" OR "Icterus" OR "Lampropsar" OR "Leistes" OR "Macroagelaius" OR "Molothrus" OR "Nesopsar" OR "Oreopsar" OR "Psarocolius" OR "Pseudoleistes" OR "Quiscalus" OR "Sturnella" OR "Xanthocephalus" OR "Xanthopsar" OR "Icteria" OR "Ifrita" OR "Irena" OR "Corvinella" OR "Eurocephalus" OR "Lanius" OR "Actinodura" OR "Argya" OR "Garrulax" OR "Grammatoptila" OR "Heterophasia" OR "Ianthocincla" OR "Laniellus" OR "Leiothrix" OR "Liocichla" OR "Minla" OR "Pterorhinus" OR "Trochalopteron" OR "Turdoides" OR "Bradypterus" OR "Cincloramphus" OR "Helopsaltes" OR "Locustella" OR "Megalurus" OR "Poodytes" OR "Machaerirhynchus" OR "Graueria" OR "Hylia" OR "Macrosphenus" OR "Melocichla" OR "Sylvietta" OR "Chlorophoneus" OR "Dryoscopus" OR "Laniarius" OR "Malaconotus" OR "Nilaus" OR "Rhodophoneus" OR "Tchagra" OR "Telophorus" OR "Amytornis" OR "Chenorhamphus" OR "Clytomyias" OR "Malurus" OR "Stipiturus" OR "Melampitta" OR "Melanocharis" OR "Oedistoma" OR "Toxorhamphus" OR "Melanopareia" OR "Acanthagenys" OR "Acanthorhynchus" OR "Anthochaera" OR "Anthornis" OR "Caligavis" OR "Entomyzon" OR "Epthianura" OR "Glycifohia" OR "Gymnomyza" OR "Lichmera" OR "Manorina" OR "Melidectes" OR "Melilestes" OR "Meliphaga" OR "Melipotes" OR "Melithreptus" OR "Myzomela" OR "Nesoptilotis" OR "Philemon" OR "Phylidonyris" OR "Prosthemadera" OR "Ptiloprora" OR "Ptilotula" OR "Pycnopygius" OR "Timeliopsis" OR "Xanthotis" OR "Menura" OR "Allenia" OR "Cinclocerthia" OR "Dumetella" OR "Margarops" OR "Melanoptila" OR "Melanotis" OR "Mimus" OR "Oreoscoptes" OR "Ramphocinclus" OR "Toxostoma" OR "Lamprospiza" OR "Mitrospingus" OR "Moho" OR "Mohoua" OR "Arses" OR "Carterornis" OR "Clytorhynchus" OR "Grallina" OR "Hypothymis" OR "Monarcha" OR "Myiagra" OR "Symposiachrus" OR "Terpsiphone" OR "Trochocercus" OR "Anthus" OR "Macronyx" OR "Motacilla" OR "Alethe" OR "Anthipes" OR "Brachypteryx" OR "Calliope" OR "Campicoloides" OR "Cercotrichas" OR "Chamaetylas" OR "Copsychus" OR "Cossypha" OR "Cyanoptila" OR "Cyornis" OR "Enicurus" OR "Erithacus" OR "Eumyias" OR "Ficedula" OR "Fraseria" OR "Irania" OR "Larvivora" OR "Leonardina" OR "Luscinia" OR "Melaenornis" OR "Monticola" OR "Muscicapa" OR "Myiomela" OR "Myioparus" OR "Myophonus" OR "Myrmecocichla" OR "Niltava" OR "Oenanthe" OR "Phoenicurus" OR "Pogonocichla" OR "Saxicola" OR "Sheppardia" OR "Sholicola" OR "Stiphrornis" OR "Tarsiger" OR "Thamnolaea" OR "Vauriella" OR "Aethopyga" OR "Anabathmis" OR "Anthreptes" OR "Arachnothera" OR "Chalcomitra" OR "Cinnyris" OR "Cyanomitra" OR "Deleornis" OR "Hedydipna" OR "Kurochkinegramma" OR "Leptocoma" OR "Nectarinia" OR "Daphoenositta" OR "Nesospingus" OR "Nicator" OR "Notiomystis" OR "Aleadryas" OR "Oriolus" OR "Pitohui" OR "Sphecotheres" OR "Turnagra" OR "Colluricincla" OR "Falcunculus" OR "Melanorectes" OR

“Pachycephala” OR “Pseudorectes” OR “Panurus” OR “Cicinnurus” OR “Diphyllodes” OR “Manucodia” OR “Paradisaea” OR “Ptiloris” OR “Paramythia” OR “Pardalotus” OR “Baeolophus” OR “Cephalopyrus” OR “Cyanistes” OR “Lophophanes” OR “Machlolophus” OR “Melaniparus” OR “Melanochlora” OR “Pardaliparus” OR “Parus” OR “Periparus” OR “Poecile” OR “Pseudopodoces” OR “Sittiparus” OR “Sylviparus” OR “Basileuterus” OR “Cardellina” OR “Catharopeza” OR “Dendroica” OR “Geothlypis” OR “Helmitheros” OR “Leiothlypis” OR “Limnothlypis” OR “Mniotilta” OR “Myioborus” OR “Myiothlypis” OR “Oporornis” OR “Oreothlypis” OR “Parkesia” OR “Protonotaria” OR “Seiurus” OR “Setophaga” OR “Vermivora” OR “Aimophila” OR “Ammodramus” OR “Amphispiza” OR “Arremon” OR “Arremonops” OR “Artemisiospiza” OR “Atlapetes” OR “Calamospiza” OR “Chlorospingus” OR “Chondestes” OR “Junco” OR “Melospiza” OR “Melozone” OR “Oreothraupis” OR “Oriturus” OR “Passerculus” OR “Passerella” OR “Peucaea” OR “Pezopetes” OR “Pipilo” OR “Pooecetes” OR “Pselliophorus” OR “Rhynchospiza” OR “Spizella” OR “Spizelloides” OR “Xenospiza” OR “Zonotrichia” OR “Carpospiza” OR “Gymnoris” OR “Hypocryptadius” OR “Montifringilla” OR “Onychostruthus” OR “Passer” OR “Petronia” OR “Pyrgilauda” OR “Alcippe” OR “Gampsorhynchus” OR “Illadopsis” OR “Jabouilleia” OR “Kenopia” OR “Laticilla” OR “Malacocincla” OR “Malacopteron” OR “Napothera” OR “Pellorneum” OR “Rimator” OR “Trichastoma” OR “Amalocichla” OR “Drymodes” OR “Eopsaltria” OR “Eugerygone” OR “Heteromyias” OR “Melanodryas” OR “Microeca” OR “Monachella” OR “Pachycephalopsis” OR “Peneoenanthe” OR “Peneothello” OR “Petroica” OR “Poecilodryas” OR “Tregellasia” OR “Peucedramus” OR “Microligea” OR “Phaenicophilus” OR “Xenoligea” OR “Phylloscopus” OR “Picathartes” OR “Antilophia” OR “Ceratopipra” OR “Chiroxiphia” OR “Chloropipo” OR “Corapipo” OR “Cryptopipo” OR “Heterocercus” OR “Ilicura” OR “Lepidothrix” OR “Machaeropterus” OR “Manacus” OR “Masius” OR “Neopelma” OR “Pipra” OR “Pseudopipra” OR “Tyranneutes” OR “Xenopipo” OR “Erythropitta” OR “Hydrornis” OR “Pitta” OR “Batis” OR “Platysteira” OR “Anaplectes” OR “Bubalornis” OR “Euplectes” OR “Malimbus” OR “Plocepasser” OR “Ploceus” OR “Quelea” OR “Sporopipes” OR “Pnoepyga” OR “Microbates” OR “Polioptila” OR “Ramphocaenus” OR “Garritornis” OR “Prunella” OR “Cinclosoma” OR “Ptilorrhoa” OR “Phainopepla” OR “Phainoptila” OR “Ptiliogonys” OR “Ailuroedus” OR “Amblyornis” OR “Ptilonorhynchus” OR “Sericulus” OR “Alophoixus” OR “Andropadus” OR “Arizelocichla” OR “Atimastillas” OR “Baeopogon” OR “Bleda” OR “Chlorocichla” OR “Criniger” OR “Eurillas” OR “Hemixos” OR “Hypsipetes” OR “Iole” OR “Ixos” OR “Neolestes” OR “Phyllastrephus” OR “Pycnonotus” OR “Spizixos” OR “Stelgidillas” OR “Tricholestes” OR “Regulus” OR “Anthoscopus” OR “Auriparus” OR “Remiz” OR “Rhagologus” OR “Eleoscytalopus” OR “Liosceles” OR “Psilorhamphus” OR “Pteroptochos” OR “Scelorchilus” OR “Scytalopus” OR “Teledromas” OR “Rhipidura” OR “Rhodinocichla” OR “Sapayoa” OR “Sitta” OR “Spindalis” OR “Chelidorhynx” OR “Culicicapa” OR “Elminia” OR “Acridotheres” OR “Agropsar” OR “Ampeliceps” OR “Aplonis” OR “Basilornis” OR “Cinnyricinclus” OR “Creatophora” OR “Gracula” OR “Gracupica” OR “Hartlaubius” OR “Hylopsar” OR “Lamprotornis” OR “Leucopsar” OR “Mino” OR “Notopholia” OR “Onychognathus” OR “Pastor” OR “Poeoptera” OR “Rhabdornis” OR

“Sarcops” OR “Scissirostrum” OR “Speculipastor” OR “Spodiopsar” OR “Streptocitta” OR “Sturnia” OR “Sturnus” OR “Chamaea” OR “Chleuasicus” OR “Chloropeta” OR “Chrysomma” OR “Conostoma” OR “Fulvetta” OR “Lioparus” OR “Paradoxornis” OR “Pseudoalcippe” OR “Psittiparus” OR “Rhopophilus” OR “Sinosuthora” OR “Suthora” OR “Sylvia” OR “Teretistris” OR “Akletos” OR “Ampelornis” OR “Aprositornis” OR “Batara” OR “Cercomacra” OR “Cercomacroides” OR “Cymbilaimus” OR “Dichrozona” OR “Drymophila” OR “Dysithamnus” OR “Epinecrophylla” OR “Euchrepomis” OR “Formicivora” OR “Frederickena” OR “Gymnocichla” OR “Gymnopithys” OR “Hafferia” OR “Herpsilochmus” OR “Hylophylax” OR “Hypocnemis” OR “Hypocnemoides” OR “Hypoedaleus” OR “Isleria” OR “Mackenziaena” OR “Megastictus” OR “Microrhopias” OR “Myrmeciza” OR “Myrmelastes” OR “Myrmoborus” OR “Myrmochanes” OR “Myrmoderus” OR “Myrmophylax” OR “Myrmorchilus” OR “Myrmornis” OR “Myrmotherula” OR “Neoctantes” OR “Oneillornis” OR “Percnostola” OR “Phaenostictus” OR “Phlegopsis” OR “Pithys” OR “Poliocrania” OR “Pygiptila” OR “Pyriglena” OR “Rhegmatorhina” OR “Rhopias” OR “Rhopornis” OR “Sakesphorus” OR “Sciaphylax” OR “Sclateria” OR “Sipia” OR “Taraba” OR “Thamnistes” OR “Thamnomanes” OR “Thamnophilus” OR “Willisornis” OR “Xenornis” OR “Anisognathus” OR “Bangsia” OR “Buthraupis” OR “Calochaetes” OR “Catamblyrhynchus” OR “Catamenia” OR “Charitospiza” OR “Chlorochrysa” OR “Chlorophanes” OR “Chlorornis” OR “Chrysothlypis” OR “Cissopis” OR “Cnemoscopus” OR “Coereba” OR “Compsospiza” OR “Compsothraupis” OR “Conirostrum” OR “Conothraupis” OR “Coryphospingus” OR “Creurgops” OR “Cyanerpes” OR “Cyanicterus” OR “Cypsnagra” OR “Dacnis” OR “Delothraupis” OR “Diglossa” OR “Diuca” OR “Dolospingus” OR “Donacospiza” OR “Dubusia” OR “Emberizoides” OR “Embernagra” OR “Eucometis” OR “Euneornis” OR “Geospiza” OR “Gubernatrix” OR “Haplospiza” OR “Hemispingus” OR “Hemithraupis” OR “Heterospingus” OR “Incaspiza” OR “Iridophanes” OR “Iridosornis” OR “Lanio” OR “Lophospingus” OR “Loxigilla” OR “Loxipasser” OR “Melanodera” OR “Melanospiza” OR “Melopyrrha” OR “Nemosia” OR “Nephelornis” OR “Oreomanes” OR “Oryzoborus” OR “Parkerthraustes” OR “Paroaria” OR “Phrygilus” OR “Piezorina” OR “Pipraeidea” OR “Poospiza” OR “Pyrrhocoma” OR “Ramphocelus” OR “Rhodospingus” OR “Saltator” OR “Saltatricula” OR “Schistochlamys” OR “Sericossypha” OR “Sicalis” OR “Sporophila” OR “Stephanophorus” OR “Tachyphonus” OR “Tangara” OR “Tersina” OR “Thlypopsis” OR “Thraupis” OR “Tiaris” OR “Trichothraupis” OR “Volatinia” OR “Wetmorethraupis” OR “Xenodacnis” OR “Xenospingus” OR “Tichodroma” OR “Macronus” OR “Pomatorhinus” OR “Spelaeornis” OR “Stachyridopsis” OR “Stachyris” OR “Iodopleura” OR “Laniisoma” OR “Laniocera” OR “Myiobius” OR “Onychorhynchus” OR “Oxyruncus” OR “Pachyramphus” OR “Schiffornis” OR “Terenotriccus” OR “Tityra” OR “Xenopsaris” OR “Campylorhynchus” OR “Cantorchilus” OR “Catherpes” OR “Cinnycerthia” OR “Cistothorus” OR “Cyphorhinus” OR “Henicorhina” OR “Microcerculus” OR “Odontorchilus” OR “Pheugopedius” OR “Salpinctes” OR “Thryomanes” OR “Thryophilus” OR “Thryothorus” OR “Troglodytes” OR “Uropsila” OR “Catharus” OR “Cichlopsis” OR “Entomodestes” OR “Geokichla” OR “Hylocichla” OR “Ixoreus” OR “Myadestes” OR “Neocossyphus” OR “Ridgwayia” OR “Sialia” OR “Stizorhina” OR “Turdus”

OR “Zoothera” OR “Agriornis” OR “Alectrurus” OR “Anairetes” OR “Aphanotriccus” OR “Arundinicola” OR “Atalotriccus” OR “Attila” OR “Camptostoma” OR “Capsiempis” OR “Casiornis” OR “Cnemarchus” OR “Cnemotriccus” OR “Cnipodectes” OR “Colonia” OR “Colorhamphus” OR “Conopias” OR “Contopus” OR “Corythopis” OR “Culicivora” OR “Deltarhynchus” OR “Elaenia” OR “Empidonax” OR “Empidonomus” OR “Euscarthmus” OR “Fluvicola” OR “Griseotyrannus” OR “Gubernetes” OR “Hemitriccus” OR “Heteroxolmis” OR “Hirundinea” OR “Hymenops” OR “Inezia” OR “Knipolegus” OR “Lathrotriccus” OR “Legatus” OR “Leptopogon” OR “Lessonia” OR “Lophotriccus” OR “Machetornis” OR “Mecocerculus” OR “Megarynchus” OR “Mionectes” OR “Mitrephanes” OR “Muscigralla” OR “Muscisaxicola” OR “Myiarchus” OR “Myiodynastes” OR “Myiopagis” OR “Myiophobus” OR “Myiornis” OR “Myiotheretes” OR “Myiotriccus” OR “Myiozetetes” OR “Neopipo” OR “Neoxolmis” OR “Nephelomyias” OR “Ochthoeca” OR “Ochthornis” OR “Oncostoma” OR “Ornithion” OR “Phaeomyias” OR “Philohydor” OR “Phyllomyias” OR “Phylloscartes” OR “Piprites” OR “Pitangus” OR “Platyrinchus” OR “Poecilotriccus” OR “Pogonotriccus” OR “Polioxolmis” OR “Polystictus” OR “Pseudelaenia” OR “Pseudocolopteryx” OR “Pseudotriccus” OR “Pyrocephalus” OR “Pyrrhomyias” OR “Ramphotrigon” OR “Rhynchocyclus” OR “Rhytipterna” OR “Satrapa” OR “Sayornis” OR “Serpophaga” OR “Silvicultrix” OR “Sirystes” OR “Stigmatura” OR “Sublegatus” OR “Suiriri” OR “Tachuris” OR “Taeniotriccus” OR “Todirostrum” OR “Tolmomyias” OR “Tumbezia” OR “Tyrannopsis” OR “Tyrannulus” OR “Tyrannus” OR “Uromyias” OR “Xenotriccus” OR “Xolmis” OR “Zimmerius” OR “Urocynchramus” OR “Artamella” OR “Calicalicus” OR “Cyanolanius” OR “Euryceros” OR “Falculea” OR “Hypositta” OR “Leptopterus” OR “Mystacornis” OR “Newtonia” OR “Oriolia” OR “Philentoma” OR “Prionops” OR “Pseudobias” OR “Schetba” OR “Tephrodornis” OR “Tylas” OR “Vanga” OR “Xenopirostris” OR “Anomalospiza” OR “Vidua” OR “Cyclarhis” OR “Erpornis” OR “Hylophilus” OR “Pteruthius” OR “Vireo” OR “Vireolanius” OR “Zeledonia” OR “Apalopteron” OR “Dasycrotapha” OR “Heleia” OR “Lophozosterops” OR “Sterrhoptilus” OR “Yuhina” OR “Zosterops” OR “Zosterornis” OR “Agamia” OR “Ardea” OR “Ardeola” OR “Botaurus” OR “Bubulcus” OR “Butorides” OR “Cochlearius” OR “Dupetor” OR “Egretta” OR “Gorsachius” OR “Ixobrychus” OR “Nyctanassa” OR “Nycticorax” OR “Pilherodius” OR “Syrigma” OR “Tigriornis” OR “Tigrisoma” OR “Zebrilus” OR “Balaeniceps” OR “Pelecanus” OR “Scopus” OR “Bostrychia” OR “Eudocimus” OR “Geronticus” OR “Lophotibis” OR “Mesembrinibis” OR “Nipponia” OR “Phimosus” OR “Platalea” OR “Plegadis” OR “Pseudibis” OR “Theristicus” OR “Threskiornis” OR “Phaethon” OR “Phoeniconaias” OR “Phoenicoparrus” OR “Phoenicopterus” OR “Bucco” OR “Chelidoptera” OR “Hapaloptila” OR “Hypnelus” OR “Malacoptila” OR “Micromonacha” OR “Monasa” OR “Nonnula” OR “Notharchus” OR “Nystalus” OR “Capito” OR “Eubucco” OR “Brachygalba” OR “Galbalcyrhynchus” OR “Galbula” OR “Jacamaralcyon” OR “Jacamerops” OR “Indicator” OR “Melichneutes” OR “Melignomon” OR “Prodotiscus” OR “Buccanodon” OR “Gymnobucco” OR “Lybius” OR “Pogoniulus” OR “Stactolaema” OR “Trachyphonus” OR “Psilopogon” OR “Blythipicus” OR “Campephilus” OR “Campethera” OR “Celeus” OR “Chloropicus” OR “Chrysocolaptes” OR “Chrysophlegma” OR “Colaptes” OR “Dendrocopos” OR “Dendrocoptes” OR

“Dendropicos” OR “Dinopium” OR “Dryobates” OR “Dryocopus” OR “Gecinulus” OR “Geocolaptes” OR “Jynx” OR “Leiopicus” OR “Leuconotopicus” OR “Meiglyptes” OR “Melanerpes” OR “Micropternus” OR “Mulleripicus” OR “Nesoctites” OR “Picoides” OR “Piculus” OR “Picumnus” OR “Picus” OR “Reinwardtipicus” OR “Sasia” OR “Sphyrapicus” OR “Veniliornis” OR “Yungipicus” OR “Andigena” OR “Aulacorhynchus” OR “Pteroglossus” OR “Ramphastos” OR “Selenidera” OR “Semnornis” OR “Aechmophorus” OR “Podiceps” OR “Podilymbus” OR “Poliocephalus” OR “Rollandia” OR “Tachybaptus” OR “Diomedea” OR “Phoebastria” OR “Phoebetria” OR “Thalassarche” OR “Hydrobates” OR “Oceanodroma” OR “Fregetta” OR “Garrodia” OR “Nesofregetta” OR “Oceanites” OR “Pelagodroma” OR “Aphrodroma” OR “Ardenna” OR “Bulweria” OR “Calonectris” OR “Daption” OR “Fulmarus” OR “Halobaena” OR “Macronectes” OR “Pachyptila” OR “Pagodroma” OR “Pelecanoides” OR “Procellaria” OR “Pseudobulweria” OR “Pterodroma” OR “Puffinus” OR “Thalassoica” OR “Cacatua” OR “Callocephalon” OR “Calyptorhynchus” OR “Eolophus” OR “Lophochroa” OR “Nymphicus” OR “Probosciger” OR “Alipiopsitta” OR “Amazona” OR “Anodorhynchus” OR “Ara” OR “Aratinga” OR “Bolborhynchus” OR “Brotogeris” OR “Conuropsis” OR “Cyanoliseus” OR “Cyanopsitta” OR “Deroptyus” OR “Diopsittaca” OR “Enicognathus” OR “Eupsittula” OR “Forpus” OR “Graydidascalus” OR “Guarouba” OR “Guaruba” OR “Hapalopsittaca” OR “Leptosittaca” OR “Myiopsitta” OR “Nannopsittaca” OR “Orthopsittaca” OR “Pionites” OR “Pionopsitta” OR “Pionus” OR “Poicephalus” OR “Primolius” OR “Psilopsiagon” OR “Psittacara” OR “Psittacus” OR “Pyrilia” OR “Pyrrhura” OR “Rhynchopsitta” OR “Thectocercus” OR “Touit” OR “Triclaria” OR “Agapornis” OR “Alisterus” OR “Aprosmictus” OR “Barnardius” OR “Bolbopsittacus” OR “Chalcopsitta” OR “Charmosyna” OR “Coracopsis” OR “Cyanoramphus” OR “Cyclopsitta” OR “Eclectus” OR “Eos” OR “Eunymphicus” OR “Geoffroyus” OR “Glossopsitta” OR “Lathamus” OR “Loriculus” OR “Lorius” OR “Melopsittacus” OR “Micropsitta” OR “Neophema” OR “Neopsephotus” OR “Neopsittacus” OR “Northiella” OR “Oreopsittacus” OR “Parvipsitta” OR “Pezoporus” OR “Phigys” OR “Platycercus” OR “Polytelis” OR “Prioniturus” OR “Prosopeia” OR “Psephotellus” OR “Psephotus” OR “Pseudeos” OR “Psittacella” OR “Psittacula” OR “Psittaculirostris” OR “Psitteuteles” OR “Psittinus” OR “Psittrichas” OR “Purpureicephalus” OR “Tanygnathus” OR “Trichoglossus” OR “Vini” OR “Nestor” OR “Strigops” OR “Pterocles” OR “Syrrhaptes” OR “Rhea” OR “Aptenodytes” OR “Eudyptes” OR “Eudyptula” OR “Megadyptes” OR “Pygoscelis” OR “Spheniscus” OR “Aegolius” OR “Asio” OR “Athene” OR “Bubo” OR “Glaucidium” OR “Ketupa” OR “Lophostrix” OR “Megascops” OR “Micrathene” OR “Ninox” OR “Otus” OR “Pseudoscops” OR “Psiloscops” OR “Pulsatrix” OR “Sceloglaux” OR “Scotopelia” OR “Strix” OR “Surnia” OR “Xenoglaux” OR “Phodilus” OR “Tyto” OR “Aepyornis” OR “Mullerornis” OR “Struthio” OR “Anhinga” OR “Fregata” OR “Leucocarbo” OR “Microcarbo” OR “Nannopterum” OR “Phalacrocorax” OR “Morus” OR “Sula” OR “Crypturellus” OR “Eudromia” OR “Nothocercus” OR “Nothoprocta” OR “Nothura” OR “Rhynchotus” OR “Tinamotis” OR “Tinamus” OR “Apalharpactes” OR “Apaloderma” OR “Harpactes” OR “Pharomachrus” OR “Trogon” OR “Tetrastes” OR “Hesperiphona”) AND (“experiment*” OR “manipulat*”)))>

The search was also conducted on SCOPUS using Advance Search Option and Title Abstract and Keyword (TITLE-ABS-KEY) on the same dates using the string

<TITLE-ABS-KEY (((“green*” OR “herb*” OR “aromatic*”) AND “nest*” AND (“bird*” OR “aves” OR “avian” OR “ornithol*” OR “passerine*” OR “passeriform*” OR “songbird*” OR “Accipiter” OR “Aegypius” OR “Aquila” OR “Aviceda” OR “Busarellus” OR “Butastur” OR “Buteo” OR “Buteogallus” OR “Chondrohierax” OR “Circaetus” OR “Circus” OR “Clanga” OR “Elanoides” OR “Elanus” OR “Gampsonyx” OR “Geranoaetus” OR “Geranospiza” OR “Gypaetus” OR “Gypohierax” OR “Gyps” OR “Haliaeetus” OR “Haliastur” OR “Harpagus” OR “Harpia” OR “Hieraaetus” OR “Ictinaetus” OR “Ictinia” OR “Kaupifalco” OR “Leptodon” OR “Leucopternis” OR “Lophotriorchis” OR “Milvus” OR “Morphnarchus” OR “Morphnus” OR “Necrosyrtes” OR “Neophron” OR “Nisaetus” OR “Parabuteo” OR “Pernis” OR “Pithecophaga” OR “Polemaetus” OR “Pseudastur” OR “Rostrhamus” OR “Rupornis” OR “Sarcogyps” OR “Spilornis” OR “Spizaetus” OR “Stephanoaetus” OR “Terathopius” OR “Torgos” OR “Trigonoceps” OR “Cathartes” OR “Coragyps” OR “Gymnogyps” OR “Sarcoramphus” OR “Vultur” OR “Pandion” OR “Sagittarius” OR “Aix” OR “Alopochen” OR “Amazonetta” OR “Anas” OR “Anser” OR “Asarcornis” OR “Aythya” OR “Branta” OR “Bucephala” OR “Cairina” OR “Callonetta” OR “Cereopsis” OR “Chen” OR “Chenonetta” OR “Chloephaga” OR “Clangula” OR “Coscoroba” OR “Cyanochen” OR “Cygnus” OR “Dendrocygna” OR “Heteronetta” OR “Histrionicus” OR “Hymenolaimus” OR “Lophodytes” OR “Lophonetta” OR “Malacorhynchus” OR “Mareca” OR “Marmaronetta” OR “Melanitta” OR “Merganetta” OR “Mergellus” OR “Mergus” OR “Neochen” OR “Netta” OR “Nettapus” OR “Nomonyx” OR “Oxyura” OR “Plectropterus” OR “Polysticta” OR “Pteronetta” OR “Sarkidiornis” OR “Sibirionetta” OR “Somateria” OR “Spatula” OR “Tachyeres” OR “Tadorna” OR “Thalassornis” OR “Anhima” OR “Chauna” OR “Anseranas” OR “Aegotheles” OR “Aerodramus” OR “Aeronautes” OR “Apus” OR “Chaetura” OR “Collocalia” OR “Cypseloides” OR “Cypsiurus” OR “Hirundapus” OR “Panyptila” OR “Streptoprocne” OR “Tachornis” OR “Tachymarptis” OR “Hemiprocne” OR “Abeillia” OR “Adelomyia” OR “Aglaeactis” OR “Aglaiocercus” OR “Amazilia” OR “Androdon” OR “Anopetia” OR “Anthocephala” OR “Anthracothorax” OR “Archilochus” OR “Atthis” OR “Augastes” OR “Avocettula” OR “Basilinna” OR “Boissonneaua” OR “Calliphlox” OR “Calypte” OR “Campylopterus” OR “Chaetocercus” OR “Chalcostigma” OR “Chalybura” OR “Chlorestes” OR “Chlorostilbon” OR “Chrysolampis” OR “Chrysuronia” OR “Clytolaema” OR “Coeligena” OR “Colibri” OR “Cyanophaia” OR “Cynanthus” OR “Discosura” OR “Doricha” OR “Doryfera” OR “Elvira” OR “Ensifera” OR “Eriocnemis” OR “Eugenes” OR “Eulampis” OR “Eulidia” OR “Eupetomena” OR “Eupherusa” OR “Eutoxeres” OR “Florisuga” OR “Glaucis” OR “Goethalsia” OR “Goldmania” OR “Haplophaedia” OR “Heliactin” OR “Heliangelus” OR “Heliodoxa” OR “Heliomaster” OR “Heliothryx” OR “Hylocharis” OR “Juliamyia” OR “Klais” OR “Lafresnaya” OR “Lampornis” OR

“Lamprolaima” OR “Lepidopyga” OR “Lesbia” OR “Leucippus” OR “Leucochloris” OR “Lophornis” OR “Mellisuga” OR “Metallura” OR “Microchera” OR “Myrmia” OR “Myrtis” OR “Ocreatus” OR “Opisthoprora” OR “Oreonympha” OR “Oreotrochilus” OR “Orthorhyncus” OR “Oxypogon” OR “Panterpe” OR “Patagona” OR “Phaeochroa” OR “Phaethornis” OR “Phlogophilus” OR “Polyonymus” OR “Polytmus” OR “Pterophanes” OR “Ramphodon” OR “Ramphomicron” OR “Rhodopis” OR “Sappho” OR “Schistes” OR “Selasphorus” OR “Sephanoides” OR “Stephanoxis” OR “Sternoclyta” OR “Taphrospilus” OR “Thalurania” OR “Thaumastura” OR “Threnetes” OR “Topaza” OR “Trochilus” OR “Urochroa” OR “Urosticte” OR “Apteryx” OR “Anthracoceros” OR “Buceros” OR “Bycanistes” OR “Lophoceros” OR “Penelopides” OR “Rhabdotorrhinus” OR “Rhyticeros” OR “Tockus” OR “Bucorvus” OR “Phoeniculus” OR “Rhinopomastus” OR “Upupa” OR “Antrostomus” OR “Caprimulgus” OR “Chordeiles” OR “Eleothreptus” OR “Eurostopodus” OR “Hydropsalis” OR “Lurocalis” OR “Lyncornis” OR “Nyctidromus” OR “Nyctiphrynus” OR “Nyctipolus” OR “Nyctiprogne” OR “Phalaenoptilus” OR “Setopagis” OR “Systellura” OR “Uropsalis” OR “Nyctibius” OR “Batrachostomus” OR “Podargus” OR “Steatornis” OR “Cariama” OR “Casuarius” OR “Dromaius” OR “Aethia” OR “Alca” OR “Alle” OR “Brachyramphus” OR “Cepphus” OR “Cerorhinca” OR “Fratercula” OR “Pinguinus” OR “Ptychoramphus” OR “Synthliboramphus” OR “Uria” OR “Burhinus” OR “Anarhynchus” OR “Charadrius” OR “Elseyornis” OR “Erythrogonys” OR “Hoploxypterus” OR “Oreopholus” OR “Peltohyas” OR “Phegornis” OR “Pluvialis” OR “Thinornis” OR “Vanellus” OR “Chionis” OR “Dromas” OR “Cursorius” OR “Glareola” OR “Rhinoptilus” OR “Stiltia” OR “Haematopus” OR “Actophilornis” OR “Hydrophasianus” OR “Irediparra” OR “Jacana” OR “Metopidius” OR “Microparra” OR “Anous” OR “Chlidonias” OR “Chroicocephalus” OR “Creagrus” OR “Gelochelidon” OR “Gygis” OR “Hydrocoloeus” OR “Hydroprogne” OR “Ichthyaetus” OR “Larosterna” OR “Larus” OR “Leucophaeus” OR “Onychoprion” OR “Pagophila” OR “Phaetusa” OR “Rhodostethia” OR “Rissa” OR “Rynchops” OR “Sterna” OR “Sternula” OR “Thalasseus” OR “Xema” OR “Pedionomus” OR “Pluvianellus” OR “Pluvianus” OR “Himantopus” OR “Recurvirostra” OR “Nycticryphes” OR “Rostratula” OR “Actitis” OR “Arenaria” OR “Bartramia” OR “Calidris” OR “Coenocorypha” OR “Gallinago” OR “Limnodromus” OR “Limosa” OR “Lymnocryptes” OR “Numenius” OR “Phalaropus” OR “Scolopax” OR “Tringa” OR “Xenus” OR “Stercorarius” OR “Attagis” OR “Thinocorus” OR “Turnix” OR “Ciconia” OR “Ephippiorhynchus” OR “Jabiru” OR “Leptoptilos” OR “Mycteria” OR “Colius” OR “Urocolius” OR “Alectroenas” OR “Alopecoenas” OR “Caloenas” OR “Chalcophaps” OR “Claravis” OR “Columba” OR “Columbina” OR “Didunculus” OR “Drepanoptila” OR “Ducula” OR “Ectopistes” OR “Gallicolumba” OR “Geopelia” OR “Geophaps” OR “Geotrygon” OR “Goura” OR “Gymnophaps” OR “Hemiphaga” OR “Henicophaps” OR “Leptotila” OR “Leptotrygon” OR “Leucosarcia” OR “Lopholaimus” OR “Macropygia” OR “Metriopelia” OR “Ocyphaps” OR “Oena” OR “Otidiphaps” OR “Patagioenas” OR “Petrophassa” OR “Pezophaps” OR “Phapitreron” OR “Phaps” OR “Ptilinopus” OR “Raphus” OR “Reinwardtoena” OR “Spilopelia” OR “Streptopelia” OR “Treron” OR “Trugon” OR “Turacoena” OR “Turtur” OR “Uropelia” OR “Zenaida” OR “Zentrygon” OR “Actenoides” OR “Alcedo” OR

“Caridonax” OR “Ceryle” OR “Ceyx” OR “Chloroceryle” OR “Cittura” OR “Corythornis” OR “Dacelo” OR “Halcyon” OR “Ispidina” OR “Lacedo” OR “Megaceryle” OR “Melidora” OR “Syma” OR “Tanysiptera” OR “Todiramphus” OR “Atelornis” OR “Brachypteracias” OR “Geobiastes” OR “Coracias” OR “Eurystomus” OR “Merops” OR “Nyctyornis” OR “Baryphthengus” OR “Electron” OR “Eumomota” OR “Hylomanes” OR “Momotus” OR “Todus” OR “Cacomantis” OR “Carpococcyx” OR “Centropus” OR “Cercococcyx” OR “Chrysococcyx” OR “Clamator” OR “Coccycua” OR “Coccyzus” OR “Coua” OR “Crotophaga” OR “Cuculus” OR “Dasylophus” OR “Dromococcyx” OR “Eudynamys” OR “Geococcyx” OR “Guira” OR “Hierococcyx” OR “Morococcyx” OR “Neomorphus” OR “Pachycoccyx” OR “Phaenicophaeus” OR “Piaya” OR “Rhinortha” OR “Scythrops” OR “Surniculus” OR “Tapera” OR “Urodynamis” OR “Zanclostomus” OR “Dinornis” OR “Anomalopteryx” OR “Emeus” OR “Euryapteryx” OR “Eurypyga” OR “Rhynochetos” OR “Caracara” OR “Daptrius” OR “Falco” OR “Herpetotheres” OR “Ibycter” OR “Micrastur” OR “Microhierax” OR “Milvago” OR “Phalcoboenus” OR “Polihierax” OR “Spiziapteryx” OR “Aburria” OR “Chamaepetes” OR “Crax” OR “Mitu” OR “Nothocrax” OR “Oreophasis” OR “Ortalis” OR “Pauxi” OR “Penelope” OR “Penelopina” OR “Pipile” OR “Alectura” OR “Megapodius” OR “Acryllium” OR “Guttera” OR “Numida” OR “Callipepla” OR “Colinus” OR “Cyrtonyx” OR “Dendrortyx” OR “Odontophorus” OR “Oreortyx” OR “Philortyx” OR “Ptilopachus” OR “Rhynchortyx” OR “Alectoris” OR “Ammoperdix” OR “Arborophila” OR “Argusianus” OR “Bambusicola” OR “Bonasa” OR “Caloperdix” OR “Centrocercus” OR “Chrysolophus” OR “Coturnix” OR “Crossoptilon” OR “Dendragapus” OR “Excalfactoria” OR “Falcipennis” OR “Francolinus” OR “Gallus” OR “Haematortyx” OR “Ithaginis” OR “Lagopus” OR “Lerwa” OR “Lophophorus” OR “Lophura” OR “Lyrurus” OR “Meleagris” OR “Pavo” OR “Peliperdix” OR “Perdix” OR “Phasianus” OR “Polyplectron” OR “Pternistis” OR “Pucrasia” OR “Rhizothera” OR “Rollulus” OR “Scleroptila” OR “Syrmaticus” OR “Tetrao” OR “Tetraogallus” OR “Tetraophasis” OR “Tragopan” OR “Tympanuchus” OR “Gavia” OR “Aramus” OR “Anthropoides” OR “Antigone” OR “Balearica” OR “Bugeranus” OR “Grus” OR “Leucogeranus” OR “Heliornis” OR “Psophia” OR “Aenigmatolimnas” OR “Amaurolimnas” OR “Amaurornis” OR “Anurolimnas” OR “Aramides” OR “Atlantisia” OR “Coturnicops” OR “Crex” OR “Dryolimnas” OR “Eulabeornis” OR “Fulica” OR “Gallicrex” OR “Gallinula” OR “Gallirallus” OR “Laterallus” OR “Lewinia” OR “Micropygia” OR “Neocrex” OR “Nesoclopeus” OR “Paragallinula” OR “Pardirallus” OR “Porphyrio” OR “Porphyriops” OR “Porzana” OR “Rallicula” OR “Rallina” OR “Rallus” OR “Tribonyx” OR “Canirallus” OR “Sarothrura” OR “Leptosomus” OR “Corythaeola” OR “Corythaixoides” OR “Crinifer” OR “Musophaga” OR “Tauraco” OR “Opisthocomus” OR “Afrotis” OR “Ardeotis” OR “Chlamydotis” OR “Neotis” OR “Otis” OR “Tetrax” OR “Acanthisitta” OR “Pachyplichas” OR “Traversia” OR “Xenicus” OR “Acanthiza” OR “Acanthornis” OR “Aethomyias” OR “Aphelocephala” OR “Calamanthus” OR “Gerygone” OR “Hylacola” OR “Neosericornis” OR “Oreoscopus” OR “Origma” OR “Pachycare” OR “Pycnoptilus” OR “Pyrrholaemus” OR “Sericornis” OR “Smicrornis” OR “Acrocephalus” OR “Arundinax” OR “Calamonastides” OR “Hippolais” OR “Iduna” OR “Nesillas” OR “Aegithalos” OR “Leptopoecile” OR “Psaltriparus” OR “Aegithina” OR “Alaemon” OR

"Alauda" OR "Alaudala" OR "Ammomanes" OR "Calandrella" OR "Calendulauda" OR "Chersomanes" OR "Eremophila" OR "Eremopterix" OR "Galerida" OR "Lullula" OR "Melanocorypha" OR "Mirafra" OR "Pinarocorys" OR "Spizocorys" OR "Artamus" OR "Gymnorhina" OR "Melloria" OR "Bombycilla" OR "Buphagus" OR "Calcarius" OR "Plectrophenax" OR "Rhynchophanes" OR "Callaeas" OR "Heteralocha" OR "Philesturnus" OR "Calyptophilus" OR "Campephaga" OR "Ceblepyris" OR "Coracina" OR "Edolisoma" OR "Lalage" OR "Malindangia" OR "Pericrocotus" OR "Amaurospiza" OR "Cardinalis" OR "Caryothraustes" OR "Chlorothraupis" OR "Cyanocompsa" OR "Cyanoloxia" OR "Granatellus" OR "Habia" OR "Passerina" OR "Periporphyrus" OR "Pheucticus" OR "Piranga" OR "Spiza" OR "Certhia" OR "Salpornis" OR "Abroscopus" OR "Cettia" OR "Horornis" OR "Phyllergates" OR "Tesia" OR "Urosphena" OR "Chloropsis" OR "Cinclus" OR "Apalis" OR "Artisornis" OR "Camaroptera" OR "Cisticola" OR "Eremomela" OR "Heliolais" OR "Hypergerus" OR "Neomixis" OR "Oreolais" OR "Orthotomus" OR "Phragmacia" OR "Poliolais" OR "Prinia" OR "Schistolais" OR "Urolais" OR "Urorhipis" OR "Climacteris" OR "Cormobates" OR "Conopophaga" OR "Struthidea" OR "Aphelocoma" OR "Calocitta" OR "Cissa" OR "Coloeus" OR "Corvus" OR "Cyanocitta" OR "Cyanocorax" OR "Cyanolyca" OR "Cyanopica" OR "Dendrocitta" OR "Garrulus" OR "Gymnorhinus" OR "Nucifraga" OR "Perisoreus" OR "Pica" OR "Platylophus" OR "Podoces" OR "Psilorhinus" OR "Ptilostomus" OR "Pyrrhocorax" OR "Urocissa" OR "Ampelioides" OR "Ampelion" OR "Carpornis" OR "Cephalopterus" OR "Conioptilon" OR "Cotinga" OR "Doliornis" OR "Gymnoderus" OR "Haematoderus" OR "Lipaugus" OR "Perissocephalus" OR "Phoenicircus" OR "Phytotoma" OR "Pipreola" OR "Porphyrolaema" OR "Procnias" OR "Pyroderus" OR "Querula" OR "Rupicola" OR "Snowornis" OR "Xipholena" OR "Zaratornis" OR "Dasyornis" OR "Dicaeum" OR "Prionochilus" OR "Dicrurus" OR "Donacobius" OR "Dulus" OR "Emberiza" OR "Amadina" OR "Amandava" OR "Cryptospiza" OR "Erythrura" OR "Estrilda" OR "Euodice" OR "Euschistospiza" OR "Lagonosticta" OR "Lonchura" OR "Mandingoa" OR "Neochmia" OR "Nesocharis" OR "Nigrita" OR "Ortygospiza" OR "Parmoptila" OR "Pyrenestes" OR "Pytilia" OR "Spermophaga" OR "Stagonopleura" OR "Taeniopygia" OR "Uraeginthus" OR "Calyptomena" OR "Cymbirhynchus" OR "Eurylaimus" OR "Psarisomus" OR "Serilophus" OR "Smithornis" OR "Chamaeza" OR "Formicarius" OR "Acanthis" OR "Agraphospiza" OR "Akialoa" OR "Bucanetes" OR "Carduelis" OR "Carpodacus" OR "Chloris" OR "Chlorodrepanis" OR "Chlorophonia" OR "Chrysocorythus" OR "Coccothraustes" OR "Crithagra" OR "Drepanis" OR "Eophona" OR "Euphonia" OR "Fringilla" OR "Haemorhous" OR "Hemignathus" OR "Himatione" OR "Leucosticte" OR "Linaria" OR "Linurgus" OR "Loxia" OR "Loxioides" OR "Loxops" OR "Magumma" OR "Melamprosops" OR "Oreomystis" OR "Paroreomyza" OR "Pinicola" OR "Procarduelis" OR "Pseudonestor" OR "Psittirostra" OR "Pyrrhoplectes" OR "Pyrrhula" OR "Rhodopechys" OR "Rhodospiza" OR "Serinus" OR "Spinus" OR "Telespiza" OR "Anabacerthia" OR "Anabazenops" OR "Ancistrops" OR "Anumbius" OR "Aphrastura" OR "Asthenes" OR "Automolus" OR "Berlepschia" OR "Campylorhamphus" OR "Certhiasomus" OR "Certhiaxis" OR "Cinclodes" OR "Clibanornis" OR "Coryphistera" OR "Cranioleuca" OR "Deconychura" OR "Dendrexetastes" OR "Dendrocincla" OR "Dendrocolaptes" OR "Dendroplex" OR

“Drymornis” OR “Drymotoxeres” OR “Furnarius” OR “Geocerthia” OR “Geositta” OR “Glyphorynchus” OR “Heliobletus” OR “Hellmayrea” OR “Hylexetastes” OR “Lepidocolaptes” OR “Leptasthenura” OR “Limnoctites” OR “Limnornis” OR “Lochmias” OR “Margarornis” OR “Mazaria” OR “Megaxenops” OR “Metopothrix” OR “Microxenops” OR “Nasica” OR “Ochetorhynchus” OR “Phacellodomus” OR “Philydor” OR “Phleocryptes” OR “Premnoplex” OR “Premnornis” OR “Pseudasthenes” OR “Pseudocolaptes” OR “Pseudoseisura” OR “Pygarrhichas” OR “Roraimia” OR “Schoeniophylax” OR “Sclerurus” OR “Sittasomus” OR “Spartonoica” OR “Sylviorthorhynchus” OR “Synallaxis” OR “Syndactyla” OR “Tarphonomus” OR “Thripadectes” OR “Thripophaga” OR “Upucerthia” OR “Xenerpestes” OR “Xenops” OR “Xiphocolaptes” OR “Xiphorhynchus” OR “Grallaria” OR “Grallaricula” OR “Hylopezus” OR “Myrmothera” OR “Alopochelidon” OR “Atticora” OR “Cecropis” OR “Delichon” OR “Haplochelidon” OR “Hirundo” OR “Neochelidon” OR “Notiochelidon” OR “Orochelidon” OR “Petrochelidon” OR “Phedina” OR “Progne” OR “Psalidoprocne” OR “Pseudhirundo” OR “Pseudochelidon” OR “Ptyonoprogne” OR “Riparia” OR “Stelgidopteryx” OR “Tachycineta” OR “Hyliota” OR “Hypocolius” OR “Agelaioides” OR “Agelaius” OR “Agelasticus” OR “Amblycercus” OR “Amblyramphus” OR “Anumara” OR “Cacicus” OR “Chrysomus” OR “Curaeus” OR “Dives” OR “Dolichonyx” OR “Euphagus” OR “Gnorimopsar” OR “Gymnomystax” OR “Hypopyrrhus” OR “Icterus” OR “Lampropsar” OR “Leistes” OR “Macroagelaius” OR “Molothrus” OR “Nesopsar” OR “Oreopsar” OR “Psarocolius” OR “Pseudoleistes” OR “Quiscalus” OR “Sturnella” OR “Xanthocephalus” OR “Xanthopsar” OR “Icteria” OR “Ifrita” OR “Irena” OR “Corvinella” OR “Eurocephalus” OR “Lanius” OR “Actinodura” OR “Argya” OR “Garrulax” OR “Grammatoptila” OR “Heterophasia” OR “Ianthocincla” OR “Laniellus” OR “Leiothrix” OR “Liocichla” OR “Minla” OR “Pterorhinus” OR “Trochalopteron” OR “Turdoides” OR “Bradypterus” OR “Cincloramphus” OR “Helopsaltes” OR “Locustella” OR “Megalurus” OR “Poodytes” OR “Machaerirhynchus” OR “Graueria” OR “Hylia” OR “Macrosphenus” OR “Melocichla” OR “Sylvietta” OR “Chlorophoneus” OR “Dryoscopus” OR “Laniarius” OR “Malaconotus” OR “Nilaus” OR “Rhodophoneus” OR “Tchagra” OR “Telophorus” OR “Amytornis” OR “Chenorhamphus” OR “Clytomyias” OR “Malurus” OR “Stipiturus” OR “Melampitta” OR “Melanocharis” OR “Oedistoma” OR “Toxorhamphus” OR “Melanopareia” OR “Acanthagenys” OR “Acanthorhynchus” OR “Anthochaera” OR “Anthornis” OR “Caligavis” OR “Entomyzon” OR “Epthianura” OR “Glycifohia” OR “Gymnomyza” OR “Lichmera” OR “Manorina” OR “Melidectes” OR “Melilestes” OR “Meliphaga” OR “Melipotes” OR “Melithreptus” OR “Myzomela” OR “Nesoptilotis” OR “Philemon” OR “Phylidonyris” OR “Prosthemadera” OR “Ptiloprora” OR “Ptilotula” OR “Pycnopygius” OR “Timeliopsis” OR “Xanthotis” OR “Menura” OR “Allenia” OR “Cinclocerthia” OR “Dumetella” OR “Margarops” OR “Melanoptila” OR “Melanotis” OR “Mimus” OR “Oreoscoptes” OR “Ramphocinclus” OR “Toxostoma” OR “Lamprospiza” OR “Mitrospingus” OR “Moho” OR “Mohoua” OR “Arses” OR “Carterornis” OR “Clytorhynchus” OR “Grallina” OR “Hypothymis” OR “Monarcha” OR “Myiagra” OR “Symposiachrus” OR “Terpsiphone” OR “Trochocercus” OR “Anthus” OR “Macronyx” OR “Motacilla” OR “Alethe” OR “Anthipes” OR “Brachypteryx” OR “Calliope” OR “Campicoloides” OR “Cercotrichas” OR “Chamaetylas”

OR “Copsychus” OR “Cossypha” OR “Cyanoptila” OR “Cyornis” OR “Enicurus” OR “Erithacus” OR “Eumyias” OR “Ficedula” OR “Fraseria” OR “Irania” OR “Larvivora” OR “Leonardina” OR “Luscinia” OR “Melaenornis” OR “Monticola” OR “Muscicapa” OR “Myiomela” OR “Myioparus” OR “Myophonus” OR “Myrmecocichla” OR “Niltava” OR “Oenanthe” OR “Phoenicurus” OR “Pogonocichla” OR “Saxicola” OR “Sheppardia” OR “Sholicola” OR “Stiphrornis” OR “Tarsiger” OR “Thamnolaea” OR “Vauriella” OR “Aethopyga” OR “Anabathmis” OR “Anthreptes” OR “Arachnothera” OR “Chalcomitra” OR “Cinnyris” OR “Cyanomitra” OR “Deleornis” OR “Hedydipna” OR “Kurochkinegramma” OR “Leptocoma” OR “Nectarinia” OR “Daphoenositta” OR “Nesospingus” OR “Nicator” OR “Notiomystis” OR “Aleadryas” OR “Oriolus” OR “Pitohui” OR “Sphecotheres” OR “Turnagra” OR “Colluricincla” OR “Falcunculus” OR “Melanorectes” OR “Pachycephala” OR “Pseudorectes” OR “Panurus” OR “Cicinnurus” OR “Diphyllodes” OR “Manucodia” OR “Paradisaea” OR “Ptiloris” OR “Paramythia” OR “Pardalotus” OR “Baeolophus” OR “Cephalopyrus” OR “Cyanistes” OR “Lophophanes” OR “Machlolophus” OR “Melaniparus” OR “Melanochlora” OR “Pardaliparus” OR “Parus” OR “Periparus” OR “Poecile” OR “Pseudopodoces” OR “Sittiparus” OR “Sylviparus” OR “Basileuterus” OR “Cardellina” OR “Catharopeza” OR “Dendroica” OR “Geothlypis” OR “Helmitheros” OR “Leiothlypis” OR “Limnothlypis” OR “Mniotilta” OR “Myioborus” OR “Myiothlypis” OR “Oporornis” OR “Oreothlypis” OR “Parkesia” OR “Protonotaria” OR “Seiurus” OR “Setophaga” OR “Vermivora” OR “Aimophila” OR “Ammodramus” OR “Amphispiza” OR “Arremon” OR “Arremonops” OR “Artemisiospiza” OR “Atlapetes” OR “Calamospiza” OR “Chlorospingus” OR “Chondestes” OR “Junco” OR “Melospiza” OR “Melozone” OR “Oreothraupis” OR “Oriturus” OR “Passerculus” OR “Passerella” OR “Peucaea” OR “Pezopetes” OR “Pipilo” OR “Pooecetes” OR “Pselliophorus” OR “Rhynchospiza” OR “Spizella” OR “Spizelloides” OR “Xenospiza” OR “Zonotrichia” OR “Carpospiza” OR “Gymnoris” OR “Hypocryptadius” OR “Montifringilla” OR “Onychostruthus” OR “Passer” OR “Petronia” OR “Pyrgilauda” OR “Alcippe” OR “Gampsorhynchus” OR “Illadopsis” OR “Jabouilleia” OR “Kenopia” OR “Laticilla” OR “Malacocincla” OR “Malacopteron” OR “Napothera” OR “Pellorneum” OR “Rimator” OR “Trichastoma” OR “Amalocichla” OR “Drymodes” OR “Eopsaltria” OR “Eugerygone” OR “Heteromyias” OR “Melanodryas” OR “Microeca” OR “Monachella” OR “Pachycephalopsis” OR “Peneoenanthe” OR “Peneothello” OR “Petroica” OR “Poecilodryas” OR “Tregellasia” OR “Peucedramus” OR “Microligea” OR “Phaenicophilus” OR “Xenoligea” OR “Phylloscopus” OR “Picathartes” OR “Antilophia” OR “Ceratopipra” OR “Chiroxiphia” OR “Chloropipo” OR “Corapipo” OR “Cryptopipo” OR “Heterocercus” OR “Ilicura” OR “Lepidothrix” OR “Machaeropterus” OR “Manacus” OR “Masius” OR “Neopelma” OR “Pipra” OR “Pseudopipra” OR “Tyranneutes” OR “Xenopipo” OR “Erythropitta” OR “Hydrornis” OR “Pitta” OR “Batis” OR “Platysteira” OR “Anaplectes” OR “Bubalornis” OR “Euplectes” OR “Malimbus” OR “Plocepasser” OR “Ploceus” OR “Quelea” OR “Sporopipes” OR “Pnoepyga” OR “Microbates” OR “Polioptila” OR “Ramphocaenus” OR “Garritornis” OR “Prunella” OR “Cinclosoma” OR “Ptilorrhoa” OR “Phainopepla” OR “Phainoptila” OR “Ptiliogonys” OR “Ailuroedus” OR “Amblyornis” OR “Ptilonorhynchus” OR “Sericulus” OR “Alophoixus” OR “Andropadus” OR “Arizelocichla”

OR “Atimastillas” OR “Baeopogon” OR “Bleda” OR “Chlorocichla” OR “Criniger” OR “Eurillas” OR “Hemixos” OR “Hypsipetes” OR “Iole” OR “Ixos” OR “Neolestes” OR “Phyllastrephus” OR “Pycnonotus” OR “Spizixos” OR “Stelgidillas” OR “Tricholestes” OR “Regulus” OR “Anthoscopus” OR “Auriparus” OR “Remiz” OR “Rhagologus” OR “Eleoscytalopus” OR “Liosceles” OR “Psilorhamphus” OR “Pteroptochos” OR “Scelorchilus” OR “Scytalopus” OR “Teledromas” OR “Rhipidura” OR “Rhodinocichla” OR “Sapayoa” OR “Sitta” OR “Spindalis” OR “Chelidorhynx” OR “Culicicapa” OR “Elminia” OR “Acridotheres” OR “Agropsar” OR “Ampeliceps” OR “Aplonis” OR “Basilornis” OR “Cinnyricinclus” OR “Creatophora” OR “Gracula” OR “Gracupica” OR “Hartlaubius” OR “Hylopsar” OR “Lamprotornis” OR “Leucopsar” OR “Mino” OR “Notopholia” OR “Onychognathus” OR “Pastor” OR “Poeoptera” OR “Rhabdornis” OR “Sarcops” OR “Scissirostrum” OR “Speculipastor” OR “Spodiopsar” OR “Streptocitta” OR “Sturnia” OR “Sturnus” OR “Chamaea” OR “Chleuasicus” OR “Chloropeta” OR “Chrysomma” OR “Conostoma” OR “Fulvetta” OR “Lioparus” OR “Paradoxornis” OR “Pseudoalcippe” OR “Psittiparus” OR “Rhopophilus” OR “Sinosuthora” OR “Suthora” OR “Sylvia” OR “Teretistris” OR “Akletos” OR “Ampelornis” OR “Aprositornis” OR “Batara” OR “Cercomacra” OR “Cercomacroides” OR “Cymbilaimus” OR “Dichrozona” OR “Drymophila” OR “Dysithamnus” OR “Epinecrophylla” OR “Euchrepomis” OR “Formicivora” OR “Frederickena” OR “Gymnocichla” OR “Gymnopithys” OR “Hafferia” OR “Herpsilochmus” OR “Hylophylax” OR “Hypocnemis” OR “Hypocnemoides” OR “Hypoedaleus” OR “Isleria” OR “Mackenziaena” OR “Megastictus” OR “Microrhopias” OR “Myrmeciza” OR “Myrmelastes” OR “Myrmoborus” OR “Myrmochanes” OR “Myrmoderus” OR “Myrmophylax” OR “Myrmorchilus” OR “Myrmornis” OR “Myrmotherula” OR “Neoctantes” OR “Oneillornis” OR “Percnostola” OR “Phaenostictus” OR “Phlegopsis” OR “Pithys” OR “Poliocrania” OR “Pygiptila” OR “Pyriglena” OR “Rhegmatorhina” OR “Rhopias” OR “Rhopornis” OR “Sakesphorus” OR “Sciaphylax” OR “Sclateria” OR “Sipia” OR “Taraba” OR “Thamnistes” OR “Thamnomanes” OR “Thamnophilus” OR “Willisornis” OR “Xenornis” OR “Anisognathus” OR “Bangsia” OR “Buthraupis” OR “Calochaetes” OR “Catamblyrhynchus” OR “Catamenia” OR “Charitospiza” OR “Chlorochrysa” OR “Chlorophanes” OR “Chlorornis” OR “Chrysothlypis” OR “Cissopis” OR “Cnemoscopus” OR “Coereba” OR “Compsospiza” OR “Compsothraupis” OR “Conirostrum” OR “Conothraupis” OR “Coryphospingus” OR “Creurgops” OR “Cyanerpes” OR “Cyanicterus” OR “Cypsnagra” OR “Dacnis” OR “Delothraupis” OR “Diglossa” OR “Diuca” OR “Dolospingus” OR “Donacospiza” OR “Dubusia” OR “Emberizoides” OR “Embernagra” OR “Eucometis” OR “Euneornis” OR “Geospiza” OR “Gubernatrix” OR “Haplospiza” OR “Hemispingus” OR “Hemithraupis” OR “Heterospingus” OR “Incaspiza” OR “Iridophanes” OR “Iridosornis” OR “Lanio” OR “Lophospingus” OR “Loxigilla” OR “Loxipasser” OR “Melanodera” OR “Melanospiza” OR “Melopyrrha” OR “Nemosia” OR “Nephelornis” OR “Oreomanes” OR “Oryzoborus” OR “Parkerthraustes” OR “Paroaria” OR “Phrygilus” OR “Piezorina” OR “Pipraeidea” OR “Poospiza” OR “Pyrrhocoma” OR “Ramphocelus” OR “Rhodospingus” OR “Saltator” OR “Saltatricula” OR “Schistochlamys” OR “Sericossypha” OR “Sicalis” OR “Sporophila” OR “Stephanophorus” OR “Tachyphonus” OR “Tangara” OR “Tersina” OR

“Thlypopsis” OR “Thraupis” OR “Tiaris” OR “Trichothraupis” OR “Volatinia” OR “Wetmorethraupis” OR “Xenodacnis” OR “Xenospingus” OR “Tichodroma” OR “Macronus” OR “Pomatorhinus” OR “Spelaeornis” OR “Stachyridopsis” OR “Stachyris” OR “Iodopleura” OR “Laniisoma” OR “Laniocera” OR “Myiobius” OR “Onychorhynchus” OR “Oxyruncus” OR “Pachyramphus” OR “Schiffornis” OR “Terenotriccus” OR “Tityra” OR “Xenopsaris” OR “Campylorhynchus” OR “Cantorchilus” OR “Catherpes” OR “Cinnycerthia” OR “Cistothorus” OR “Cyphorhinus” OR “Henicorhina” OR “Microcerculus” OR “Odontorchilus” OR “Pheugopedius” OR “Salpinctes” OR “Thryomanes” OR “Thryophilus” OR “Thryothorus” OR “Troglodytes” OR “Uropsila” OR “Catharus” OR “Cichlopsis” OR “Entomodestes” OR “Geokichla” OR “Hylocichla” OR “Ixoreus” OR “Myadestes” OR “Neocossyphus” OR “Ridgwayia” OR “Sialia” OR “Stizorhina” OR “Turdus” OR “Zoothera” OR “Agriornis” OR “Alectrurus” OR “Anairetes” OR “Aphanotriccus” OR “Arundinicola” OR “Atalotriccus” OR “Attila” OR “Camptostoma” OR “Capsiempis” OR “Casiornis” OR “Cnemarchus” OR “Cnemotriccus” OR “Cnipodectes” OR “Colonia” OR “Colorhamphus” OR “Conopias” OR “Contopus” OR “Corythopis” OR “Culicivora” OR “Deltarhynchus” OR “Elaenia” OR “Empidonax” OR “Empidonomus” OR “Euscarthmus” OR “Fluvicola” OR “Griseotyrannus” OR “Gubernetes” OR “Hemitriccus” OR “Heteroxolmis” OR “Hirundinea” OR “Hymenops” OR “Inezia” OR “Knipolegus” OR “Lathrotriccus” OR “Legatus” OR “Leptopogon” OR “Lessonia” OR “Lophotriccus” OR “Machetornis” OR “Mecocerculus” OR “Megarynchus” OR “Mionectes” OR “Mitrephanes” OR “Muscigralla” OR “Muscisaxicola” OR “Myiarchus” OR “Myiodynastes” OR “Myiopagis” OR “Myiophobus” OR “Myiornis” OR “Myiotheretes” OR “Myiotriccus” OR “Myiozetetes” OR “Neopipo” OR “Neoxolmis” OR “Nephelomyias” OR “Ochthoeca” OR “Ochthornis” OR “Oncostoma” OR “Ornithion” OR “Phaeomyias” OR “Philohydor” OR “Phyllomyias” OR “Phylloscartes” OR “Piprites” OR “Pitangus” OR “Platyrinchus” OR “Poecilotriccus” OR “Pogonotriccus” OR “Polioxolmis” OR “Polystictus” OR “Pseudelaenia” OR “Pseudocolopteryx” OR “Pseudotriccus” OR “Pyrocephalus” OR “Pyrrhomyias” OR “Ramphotrigon” OR “Rhynchocyclus” OR “Rhytipterna” OR “Satrapa” OR “Sayornis” OR “Serpophaga” OR “Silvicultrix” OR “Sirystes” OR “Stigmatura” OR “Sublegatus” OR “Suiriri” OR “Tachuris” OR “Taeniotriccus” OR “Todirostrum” OR “Tolmomyias” OR “Tumbezia” OR “Tyrannopsis” OR “Tyrannulus” OR “Tyrannus” OR “Uromyias” OR “Xenotriccus” OR “Xolmis” OR “Zimmerius” OR “Urocynchramus” OR “Artamella” OR “Calicalicus” OR “Cyanolanius” OR “Euryceros” OR “Falculea” OR “Hypositta” OR “Leptopterus” OR “Mystacornis” OR “Newtonia” OR “Oriolia” OR “Philentoma” OR “Prionops” OR “Pseudobias” OR “Schetba” OR “Tephrodornis” OR “Tylas” OR “Vanga” OR “Xenopirostris” OR “Anomalospiza” OR “Vidua” OR “Cyclarhis” OR “Erpornis” OR “Hylophilus” OR “Pteruthius” OR “Vireo” OR “Vireolanius” OR “Zeledonia” OR “Apalopteron” OR “Dasycrotapha” OR “Heleia” OR “Lophozosterops” OR “Sterrhoptilus” OR “Yuhina” OR “Zosterops” OR “Zosterornis” OR “Agamia” OR “Ardea” OR “Ardeola” OR “Botaurus” OR “Bubulcus” OR “Butorides” OR “Cochlearius” OR “Dupetor” OR “Egretta” OR “Gorsachius” OR “Ixobrychus” OR “Nyctanassa” OR “Nycticorax” OR “Pilherodius” OR “Syrigma” OR “Tigriornis” OR “Tigrisoma” OR “Zebrilus” OR “Balaeniceps” OR “Pelecanus” OR “Scopus” OR “Bostrychia”

OR “Eudocimus” OR “Geronticus” OR “Lophotibis” OR “Mesembrinibis” OR “Nipponia” OR “Phimosus” OR “Platalea” OR “Plegadis” OR “Pseudibis” OR “Theristicus” OR “Threskiornis” OR “Phaethon” OR “Phoeniconaias” OR “Phoenicoparrus” OR “Phoenicopterus” OR “Bucco” OR “Chelidoptera” OR “Hapaloptila” OR “Hypnelus” OR “Malacoptila” OR “Micromonacha” OR “Monasa” OR “Nonnula” OR “Notharchus” OR “Nystalus” OR “Capito” OR “Eubucco” OR “Brachygalba” OR “Galbalcyrhynchus” OR “Galbula” OR “Jacamaralcyon” OR “Jacamerops” OR “Indicator” OR “Melichneutes” OR “Melignomon” OR “Prodotiscus” OR “Buccanodon” OR “Gymnobucco” OR “Lybius” OR “Pogoniulus” OR “Stactolaema” OR “Trachyphonus” OR “Psilopogon” OR “Blythipicus” OR “Campephilus” OR “Campethera” OR “Celeus” OR “Chloropicus” OR “Chrysocolaptes” OR “Chrysophlegma” OR “Colaptes” OR “Dendrocopos” OR “Dendrocoptes” OR “Dendropicos” OR “Dinopium” OR “Dryobates” OR “Dryocopus” OR “Gecinulus” OR “Geocolaptes” OR “Jynx” OR “Leiopicus” OR “Leuconotopicus” OR “Meiglyptes” OR “Melanerpes” OR “Micropternus” OR “Mulleripicus” OR “Nesoctites” OR “Picoides” OR “Piculus” OR “Picumnus” OR “Picus” OR “Reinwardtipicus” OR “Sasia” OR “Sphyrapicus” OR “Veniliornis” OR “Yungipicus” OR “Andigena” OR “Aulacorhynchus” OR “Pteroglossus” OR “Ramphastos” OR “Selenidera” OR “Semnornis” OR “Aechmophorus” OR “Podiceps” OR “Podilymbus” OR “Poliocephalus” OR “Rollandia” OR “Tachybaptus” OR “Diomedea” OR “Phoebastria” OR “Phoebetria” OR “Thalassarche” OR “Hydrobates” OR “Oceanodroma” OR “Fregetta” OR “Garrodia” OR “Nesofregetta” OR “Oceanites” OR “Pelagodroma” OR “Aphrodroma” OR “Ardenna” OR “Bulweria” OR “Calonectris” OR “Daption” OR “Fulmarus” OR “Halobaena” OR “Macronectes” OR “Pachyptila” OR “Pagodroma” OR “Pelecanoides” OR “Procellaria” OR “Pseudobulweria” OR “Pterodroma” OR “Puffinus” OR “Thalassoica” OR “Cacatua” OR “Callocephalon” OR “Calyptorhynchus” OR “Eolophus” OR “Lophochroa” OR “Nymphicus” OR “Probosciger” OR “Alipiopsitta” OR “Amazona” OR “Anodorhynchus” OR “Ara” OR “Aratinga” OR “Bolborhynchus” OR “Brotogeris” OR “Conuropsis” OR “Cyanoliseus” OR “Cyanopsitta” OR “Deroptyus” OR “Diopsittaca” OR “Enicognathus” OR “Eupsittula” OR “Forpus” OR “Graydidascalus” OR “Guarouba” OR “Guaruba” OR “Hapalopsittaca” OR “Leptosittaca” OR “Myiopsitta” OR “Nannopsittaca” OR “Orthopsittaca” OR “Pionites” OR “Pionopsitta” OR “Pionus” OR “Poicephalus” OR “Primolius” OR “Psilopsiagon” OR “Psittacara” OR “Psittacus” OR “Pyrilia” OR “Pyrrhura” OR “Rhynchopsitta” OR “Thectocercus” OR “Touit” OR “Triclaria” OR “Agapornis” OR “Alisterus” OR “Aprosmictus” OR “Barnardius” OR “Bolbopsittacus” OR “Chalcopsitta” OR “Charmosyna” OR “Coracopsis” OR “Cyanoramphus” OR “Cyclopsitta” OR “Eclectus” OR “Eos” OR “Eunymphicus” OR “Geoffroyus” OR “Glossopsitta” OR “Lathamus” OR “Loriculus” OR “Lorius” OR “Melopsittacus” OR “Micropsitta” OR “Neophema” OR “Neopsephotus” OR “Neopsittacus” OR “Northiella” OR “Oreopsittacus” OR “Parvipsitta” OR “Pezoporus” OR “Phigys” OR “Platycercus” OR “Polytelis” OR “Prioniturus” OR “Prosopeia” OR “Psephotellus” OR “Psephotus” OR “Pseudeos” OR “Psittacella” OR “Psittacula” OR “Psittaculirostris” OR “Psitteuteles” OR “Psittinus” OR “Psittrichas” OR “Purpureicephalus” OR “Tanygnathus” OR “Trichoglossus” OR “Vini” OR “Nestor” OR “Strigops” OR “Pterocles” OR “Syrrhaptes” OR “Rhea” OR “Aptenodytes” OR “Eudyptes” OR

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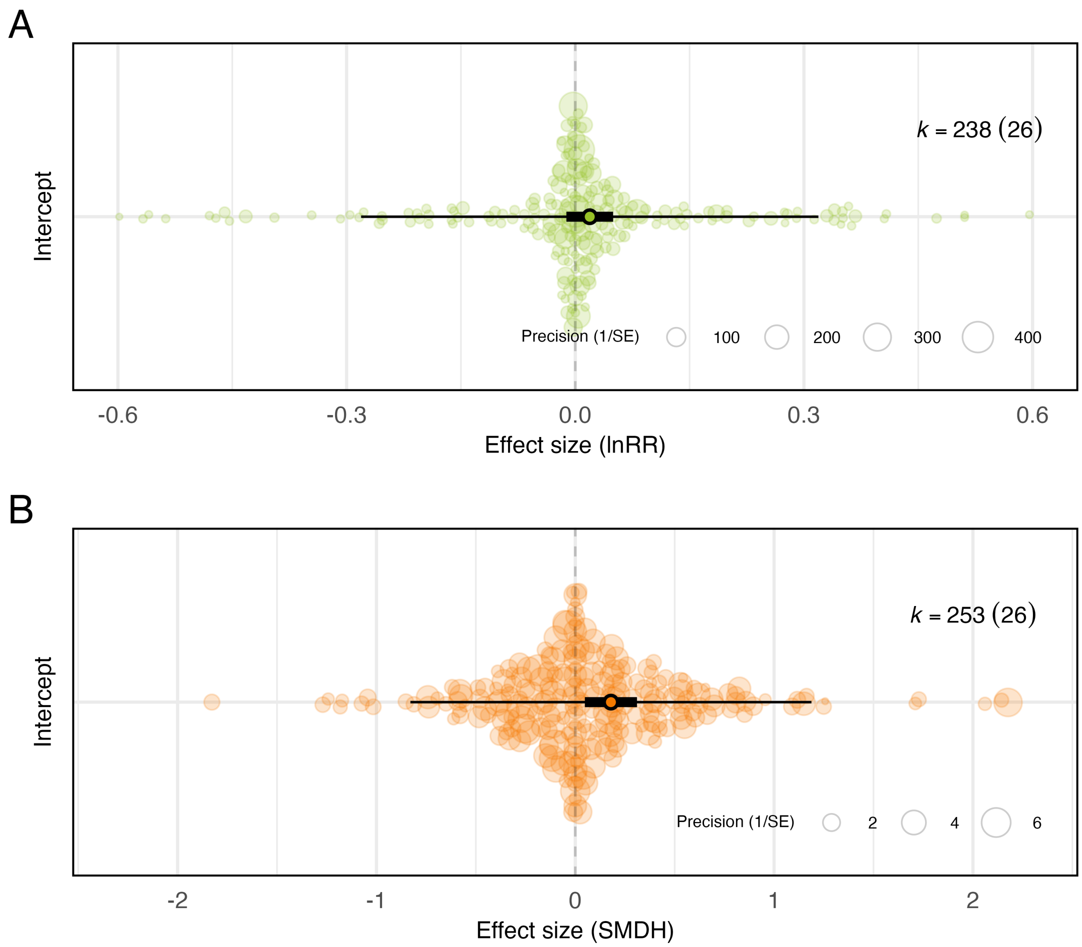

Figure 2: Overall effect of green nest material on all fitness proxies combined. The meta-analytic mean (black circle) with 95% confidence intervals (thicker bars) and prediction intervals (thinner bars) are shown along with the data points (coloured circles) scaled by precision (inverse of standard error). Results are shown as an orchard plot for the intercept-only model (A) using log response ratio (lnRR), and (B) standardised mean difference (SMD(H)). k: number of effect sizes (number of studies is shown in the brackets). X-axes are truncated for legibility, which partially explains any apparent asymmetry (complete figures in Section Figure S11).

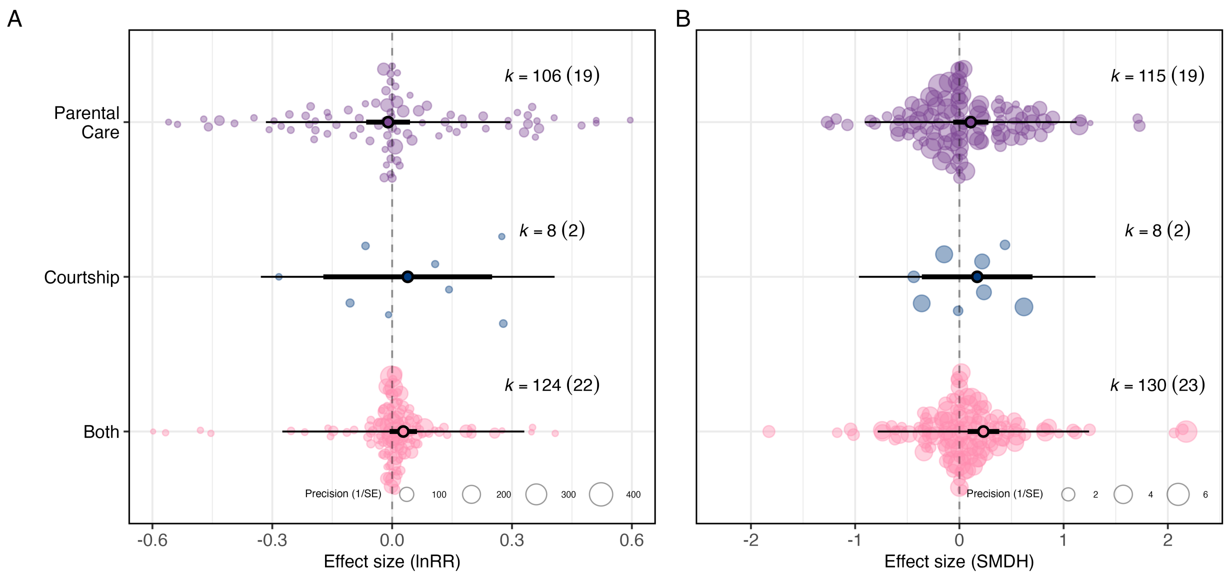

Figure 3: There is no clear evidence to favour either the courtship or the parental care hypothesis as drivers of potential fitness benefits of green nest material. Orchard plot of the multilevel meta-regression for (A) log response ratio (lnRR) and (B) standardised mean difference (SMD(H)). Mean estimates (black circles), 95% confidence intervals (thicker bars), and prediction intervals (thinner bars) are shown along with the individual data points (transparently coloured circles) scaled by precision (inverse of standard error). k: number of effect sizes (number of studies is shown in the brackets). X-axes are truncated for legibility, which partially explains any apparent asymmetry (complete figures in Section Figure S12.

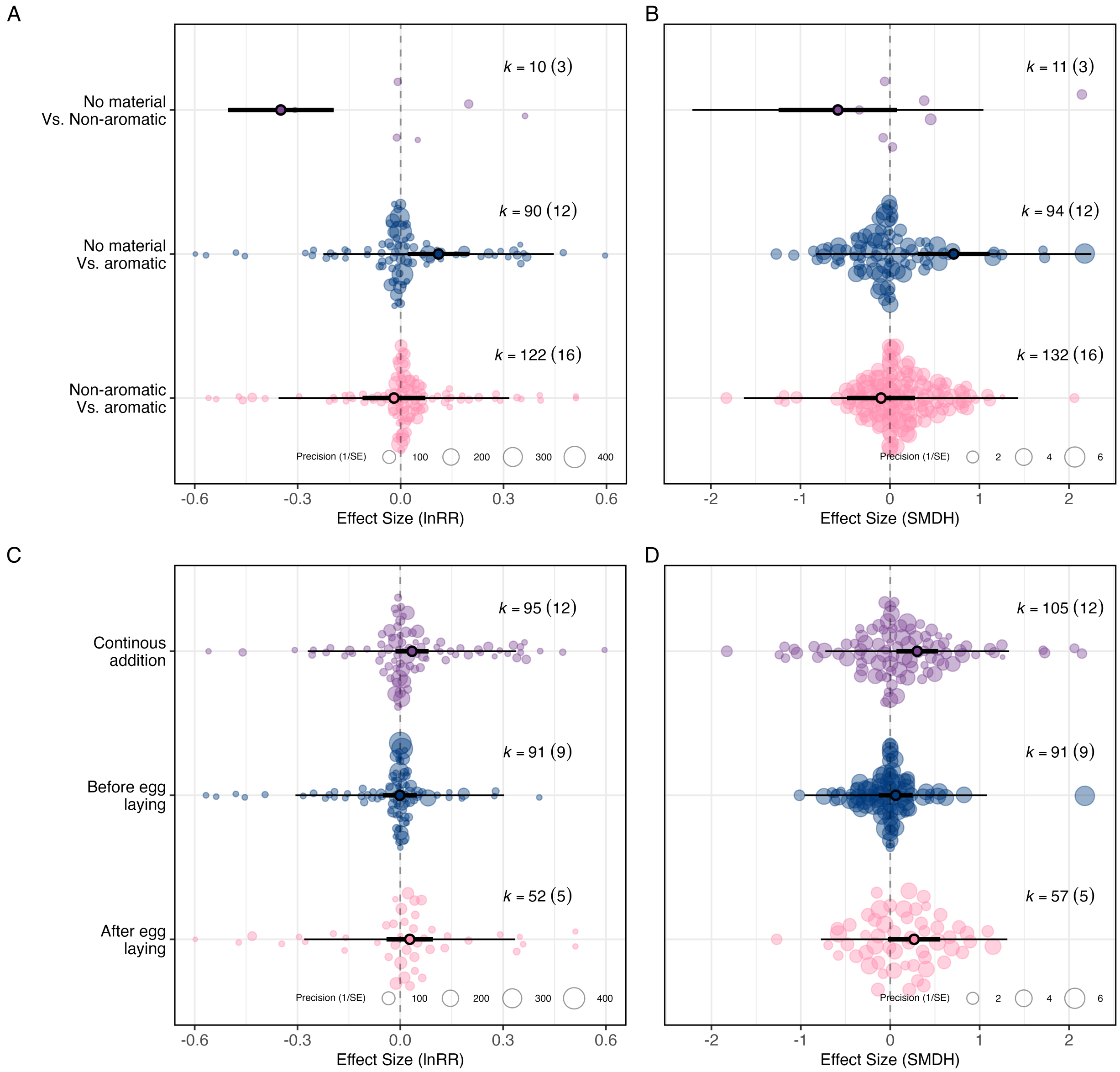

Figure 4: Experimental designs comparing nests with aromatic green nest material against nests without any green material, and those adding the material continuously, lead to the largest fitness estimates. Orchard plots of the multilevel meta-regressions showing the overall effect of green nest material depending on experimental design for (A: log response ratio (lnRR); B: standardised mean difference (SMD(H)), and time of green nest material addition (C: log response ratio (lnRR); D: standardised mean difference (SMD(H)). Mean estimates (black circles), 95% confidence intervals (thicker bars) and prediction intervals (thinner bars) are shown along the individual data points (transparently coloured circles) scaled by precision (inverse of standard error). k: number of effect sizes (number of studies is shown in the brackets). X-axes are truncated for legibility, which partially explains any apparent asymmetry (complete figures in Section Figure S13).

Multilevel Meta Regressions for Exploratory Analyses												
	lnRR						SMDH					
Level	**Estimate**	**P-val**	**95% CI**	**95% PI**	**k**	**n**	**Estimate**	**P-val**	**95% CI**	**95% PI**	**k**	**n**
1. Experimental Design												
Non-aromatic vs. Aromatic	-0.019	0.677	[-0.111, 0.072]	[-0.356, 0.317]	122	16	-0.100	0.606	[-0.479, 0.280]	[-1.632, 1.432]	132	16
No added material vs. Aromatic	0.111	**0.016**	[0.021, 0.200]	[-0.225, 0.446]	90	12	0.712	**0.001**	[0.309, 1.114]	[-0.826, 2.250]	94	12
No added material vs. Non-aromatic	-0.349	**<0.001**	[-0.504, -0.195]	[-0.708, 0.009]	10	3	-0.581	0.085	[-1.244, 0.081]	[-2.207, 1.044]	11	3
2. Time of GNM Addition												
After egg hatching	0.028	0.425	[-0.040, 0.095]	[-0.280, 0.335]	52	5	0.267	0.072	[-0.024, 0.559]	[-0.775, 1.310]	57	5
Before egg hatching	-0.002	0.948	[-0.051, 0.048]	[-0.306, 0.303]	91	9	0.061	0.531	[-0.130, 0.251]	[-0.958, 1.080]	91	9
Continously through nesting phase	0.034	0.165	[-0.014, 0.083]	[-0.270, 0.338]	95	12	0.302	**0.011**	[0.069, 0.534]	[-0.726, 1.329]	105	12
3. Bird Species												
Buteo buteo	-0.109	0.724	[-0.714, 0.497]	[-0.844, 0.626]	9	1	-0.251	0.732	[-1.691, 1.189]	[-2.263, 1.761]	9	1
Cyanistes caeruleus	0.006	0.969	[-0.288, 0.299]	[-0.504, 0.515]	68	10	0.087	0.866	[-0.926, 1.100]	[-1.646, 1.819]	74	10
Parus major	-0.037	0.815	[-0.347, 0.273]	[-0.556, 0.482]	19	1	0.651	0.275	[-0.521, 1.822]	[-1.178, 2.480]	22	1
Passer cinnamomeus	0.228	0.192	[-0.115, 0.570]	[-0.312, 0.767]	6	1	0.955	0.193	[-0.485, 2.396]	[-1.057, 2.968]	6	1
Sturnus unicolor	-0.011	0.941	[-0.308, 0.286]	[-0.523, 0.500]	44	5	0.069	0.896	[-0.967, 1.105]	[-1.676, 1.815]	45	5
Sturnus vulgaris	0.039	0.794	[-0.255, 0.333]	[-0.471, 0.549]	83	6	0.279	0.590	[-0.742, 1.300]	[-1.457, 2.016]	84	6
Tachycineta bicolor	0.092	0.582	[-0.237, 0.422]	[-0.439, 0.623]	9	2	0.204	0.716	[-0.899, 1.308]	[-1.582, 1.991]	13	2
4. Trait Category												
Behaviour	0.034	0.755	[-0.179, 0.247]	[-0.339, 0.406]	8	2	0.153	0.574	[-0.382, 0.688]	[-0.993, 1.299]	8	2
Morphology	0.036	0.109	[-0.008, 0.080]	[-0.273, 0.345]	62	15	0.310	**0.002**	[0.112, 0.509]	[-0.723, 1.343]	65	15
Parasitic and Pathogen Related	-0.036	0.328	[-0.107, 0.036]	[-0.350, 0.278]	86	16	0.112	0.242	[-0.076, 0.299]	[-0.919, 1.143]	90	16
Phenology	0.004	0.965	[-0.156, 0.163]	[-0.341, 0.348]	4	3	0.081	0.779	[-0.484, 0.645]	[-1.080, 1.241]	4	3
Physiology	0.026	0.521	[-0.053, 0.105]	[-0.290, 0.342]	22	9	0.157	0.288	[-0.133, 0.448]	[-0.897, 1.212]	23	9
Reproduction	0.010	0.727	[-0.045, 0.065]	[-0.301, 0.320]	56	16	0.153	0.109	[-0.034, 0.340]	[-0.878, 1.184]	63	19
5. Parasite Type												
Arthropod	0.013	0.898	[-0.186, 0.212]	[-0.780, 0.806]	56	13	0.144	0.292	[-0.126, 0.414]	[-1.107, 1.395]	59	13
Micro-organism	-0.041	0.720	[-0.268, 0.186]	[-0.842, 0.760]	26	6	-0.025	0.890	[-0.385, 0.335]	[-1.299, 1.248]	27	6

Table 1: Results from multilevel meta-regressions testing how experimental design, timing of green nest material (GNM) addition, bird species, trait category, and parasite type influence the effect of GNM on fitness outcomes. Columns show model estimates, p-values, 95% confidence intervals (CI), 95% prediction intervals (PI), number of effect sizes (k), and number of studies (n) for both effect size metrics: log response ratio (lnRR) and standardized mean difference (SMD(H)). Statistically significant results ($p < 0.05$) are shown in bold.

Completed PRISMA-EcoEvo Checklist [39]: This checklist shows how the systematic review and meta-analysis on green nest material and fitness outcomes complies with reporting standards in ecology and evolutionary biology

Table S1

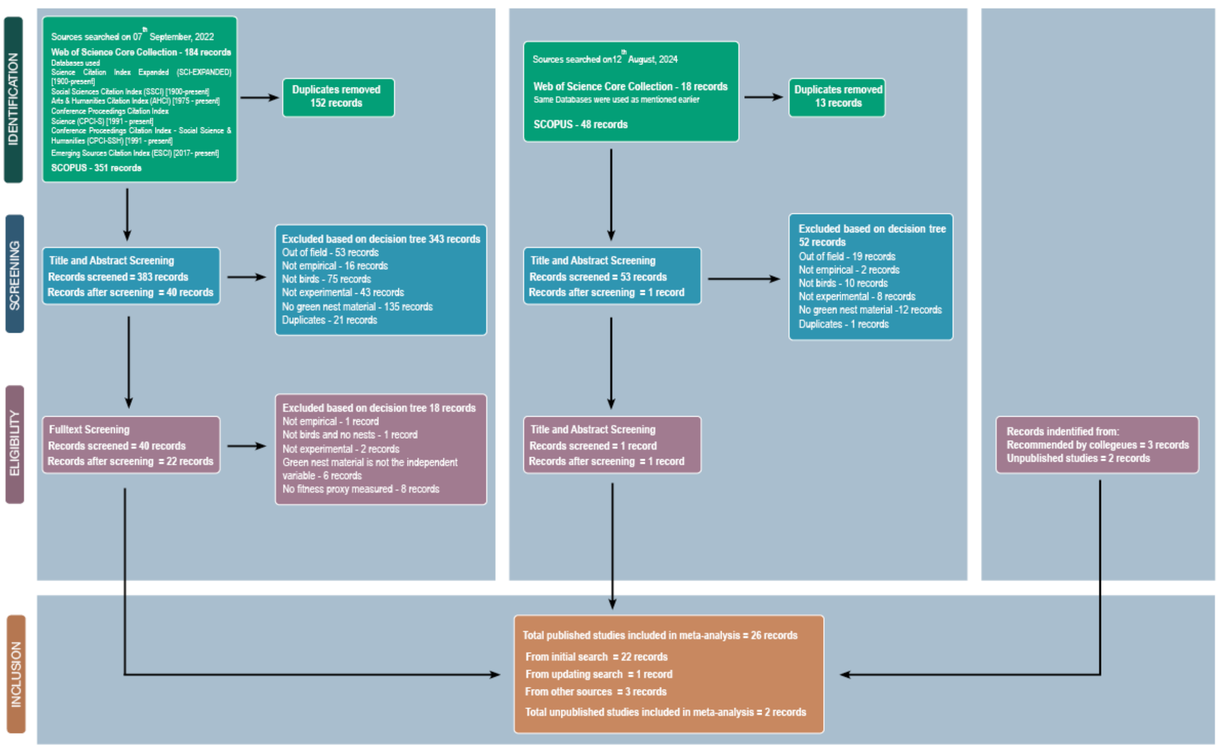

Figure S1: PRISMA flowchart illustrating the steps and number of studies included in the systematic review and meta-analysis on green nest material and fitness outcomes.

Article Title	Authors	DOI	Journal	Year of Publication
Green incubation: avian offspring benefit from aromatic nest herbs through improved parental incubation behaviour	Gwinner, Helga and Capilla-Lasheras, Pablo and Cooper, Caren and Helm, Barbara	10.1098/rspb.2018.0376	Proceedings of the Royal Society B- Biological SciencesPROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES	2018
Telomere length and dynamics of spotless starling nestlings depend on nest-building materials used by parents	Soler, Juan J. and Ruiz-Castellano, Cristina and Figuerola, Jordi and Martin-Vivaldi, Manuel and Martinez-de la Puente, Josue and Ruiz-Rodriguez, Magdalena and Tomas, Gustavo	10.1016/j.anbehav.2017.01.018	Animal Behaviour	2017
Green plants in nests reduce offspring recruitment rates in the spotless starling	Polo, Vicente and Rubalcaba, Juan G. and Veiga, Jose P.	10.1093/beheco/arv056	Behavioural Ecology	2015
Nest size and aromatic plants in the nest as sexually selected female traits in blue tits	Tomas, Gustavo and Merino, Santiago and Martinez-de la Puente, Josue and Moreno, Juan and Morales, Judith and Rivero-de Aguilar, Juan	10.1093/beheco/art015	Behavioural Ecology	2013
Interacting effects of aromatic plants and female age on nest-dwelling ectoparasites and blood-sucking flies in avian nests	Tomas, G. and Merino, S. and Martinez-de la Puente, J. and Moreno, J. and Morales, J. and Lobato, E. and Rivero-de Aguilar, J. and del Cerro, S.	10.1016/j.beproc.2012.02.003	Behavioural Ecology	2012
Experimental Addition of Green Plants to the Nest Increases Testosterone Levels in Female Spotless Starlings	Polo, Vicente and Lopez-Rull, Isabel and Gil, Diego and Veiga, Jose P.	10.1111/j.1439-0310.2009.01724.x	Ethology	2010
Aromatic plants in nests of the blue tit Cyanistes caeruleus protect chicks from bacteria	Mennerat, Adele and Mirleau, Pascal and Blondel, Jacques and Perret, Philippe and Lambrechts, Marcel M. and Heeb, Philipp	10.1007/s00442-009-1418-6	Oecologia	2009
Do female spotless starlings Sturnus unicolor adjust maternal investment according to male attractiveness?	Lopez-Rull, Isabel and Gil, Diego	10.1111/j.1600-048X.2009.04553.x	Journal of Avian Biology	2009
Aromatic plants in nests of blue tits: positive effects on nestlings	Mennerat, Adele and Perret, Philippe and Bourgault, Patrice and Blondel, Jacques and Gimenez, Olivier and Thomas, Don W. and Heeb, Philipp and Lambrechts, Marcel M.	10.1016/j.anbehav.2008.11.008	Animal Behaviour	2009
Blue tits (Cyanistes caeruleus) respond to an experimental change in the aromatic plant odour composition of their nest	Mennerat, A.	10.1016/j.beproc.2008.07.003	Behavioural Process	2008
Experimental addition of greenery reduces flea loads in nests of a non-greenery using species, the tree swallow Tachycineta bicolor	Shutler, Dave and Campbell, Adam A.	10.1111/j.2007.0908-8857.04015.x	Journal of Avian Biology	2007
European starlings: nestling condition, parasites and green nest material during the breeding season	Gwinner, H and Berger, S	10.1007/s10336-005-0012-x	Journal of Ornithology	2005
Does fresh vegetation protect avian nests from ectoparasites? An experiment with tree swallows	Dawson, RD	10.1139/Z04-076	Canadian Journal of Zoology-Revue Canadienne De Zoologie	2004
Ectoparasitism and the role of green nest material in the European Starling	Fauth, P T and Krementz, D G and Hines, J E	10.1007/BF00328399	Oecologia	1991
Aromatic plants in blue tit Cyanistes caeruleus nests: no negative effect on blood-sucking Protocalliphora blow fly larvae	Mennerat, Adele and Perret, Philippe and Caro, Samuel P. and Heeb, Philipp and Lambrechts, Marcel M.	10.1111/j.0908-8857.2008.04400.x	Journal of Avian Biology	2008

Figure S2: Validation of the search using our own initial library of 15 relevant articles: We validated our search strategy by testing whether it retrieved a pre-compiled set of 15 known studies on green nest material. Searches conducted successfully recovered all 15 articles (100% retrieval), confirming the effectiveness of our search query

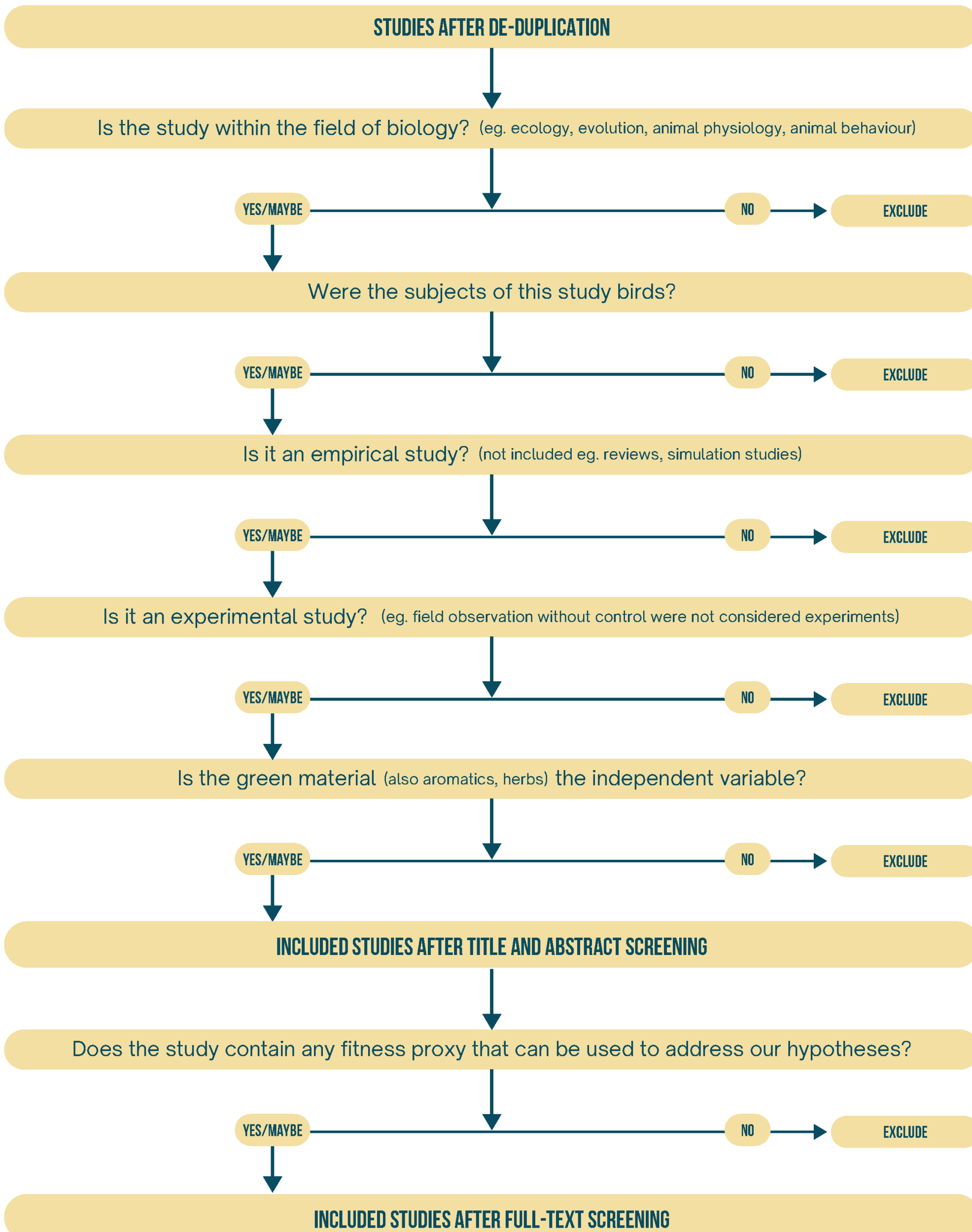

Figure S3: **Decision tree used for screening studies during title–abstract and full-text screening process:** The diagram illustrates the stepwise inclusion and exclusion criteria applied to each article during screenings. At each decision point, reviewers selected *include/uncertain* or *exclude*, following pre-registered criteria to ensure consistency.

Fitness Proxies included in the meta-analysis Proxy: Effect Sizes (Papers), * indicates the fitness proxies included only in a sensitivity analysis		
Courtship Hypothesis	Parental Care Hypothesis	Both Hypotheses
Sex Ratio*: 9 (2)	Mites: 22 (7)	Nestling Mass: 20 (9)
Females Testosterone*: 4 (2)	Bacterial Load: 20 (4)	Chick Mass: 16 (4)
Courtship Time: 3 (1)	Blowflies Number: 8 (6)	Clutch Size: 16 (8)
Male Provisioning Rate: 2 (1)	Hemoglobin Measure: 8 (5)	Number Of Nestling: 14 (10)
Male Visit: 2 (1)	Fleas Number: 6 (6)	Nestling Tarsus Length: 13 (5)
Yolk Hormones*: 2 (1)	Carnusflies Load: 5 (2)	Fledgeling Mass: 7 (2)
Male Risk Taking: 1 (1)	Scab Score: 5 (3)	Number Of Fledgling: 7 (5)
	Telomere Measure: 4 (1)	Fledgling Success: 4 (4)
	Leucocytozoon Prevalence: 3 (1)	Hatching Success: 4 (3)
	Reproductive Success: 3 (1)	Local Recruitment Probability: 4 (1)
	Bacterial Increase: 2 (1)	Body Condition Estimate: 3 (1)
	Bacterial Richness: 2 (1)	Laying Date: 3 (3)
	Blackflies Number: 2 (1)	Mouth Colouration: 3 (1)
	Midges Number: 2 (1)	Survival To Fledgeling: 3 (1)
	Nestling Immunity: 2 (2)	Chick Feather Development: 2 (1)
	Beetles: 1 (1)	Clutch Development Score*: 2 (1)
	Blowfly Parasitoids Number: 1 (1)	Nestling Wing Length: 2 (2)
	Booklice And Barklice: 1 (1)	Egg Size: 1 (1)
	Butterflies And Moths: 1 (1)	Fat Score: 1 (1)
	Clown Beetles: 1 (1)	Feeding Rate (Feeds/Hour)*: 1 (1)
	Clutch Size: 1 (1)	Fledling Tarsus-Metatarsus Lengths (Females): 1 (1)
	Flies: 1 (1)	Fledling Tarsus-Metatarsus Lengths (Males): 1 (1)
	Glucose Level*: 1 (1)	Hatching Date: 1 (1)
	Glucose Measure*: 1 (1)	Nest Mortality: 1 (1)
	Hematocrit %: 1 (1)	Percent Survived: 1 (1)
	Hemoglobin Level: 1 (1)	Survival Per Brood: 1 (1)
	Lice Scrore: 1 (1)	Survival Rate Nestling: 1 (1)
	Nestling Mass: 1 (1)	Time Spent Begging By Broods (Seconds/Hour)*: 1 (1)
	Nestling Size: 1 (1)	
	Number Of Fledgling: 1 (1)	
	Number Of Nestling: 1 (1)	
	Rove Beetles: 1 (1)	
	Skin Beetles: 1 (1)	
	Springtails: 1 (1)	
	Tick Load: 1 (1)	
	Ticks: 1 (1)	
	True Bugs: 1 (1)	
	Wasps, Bees, And Ants: 1 (1)	

Figure S4: **Summary of all fitness proxies included in the meta-analysis**: Each column represents a hypothesis tested in the dataset—Courtship Hypothesis, Parental Care Hypothesis, and Both Hypotheses (studies addressing both). Entries list each unique fitness proxy followed by the number of effect sizes (k, numbers without brackets) and unique articles (n, numbers within brackets) contributing data, formatted as Proxy: k(n). Proxies marked with an asterisk (*) were included only in sensitivity analyses and not in the main meta-analytic models.

Fitness proxies excluded from the meta-analysis			
Fitness Proxy	**Effect Sizes (k)**	**Articles (n)**	**Reason for Exclusion**
Completely excluded			
Male Mass	3	1	Variable such as adult male or adult female mass as fitness proxy is tricky. On one hand the adults could be in better condition and therefore be able to provide better parental care for the offspring and be able to live longer and reproduce next season, hence increasing their overall fitness. However, whether adult mass has direct relation with fitness is unclear.
Female Body Condition	2	1	Authors are just using female body condition to control for the effect it can have. We are excluding it and adult body condition being affected by GNM is rather tricky to interpret and describe a true direction of effect for.
Female Provisioning Rate	2	1	We will exclude this variable from all our analysis altogether. Since females add the GNM as noted by the authors, it is the male that would/should adjust their investment. One can argue female investment will be an indirect reflection of the male's investment. However, this is very indirect and the direction of this proxy in relation to the GNM addition can be argued both ways. That is, if females use GNM as an honest signal to increase male investment, their own investment would not be directly related to fitness or they would increase investment to compensate for the lack of male investment. Or it would be negatively related to fitness because they invested in bringing in the GNM as well as in higher provisioning. Therefore, we will exclude it.
Number Of Basophils	2	1	Very difficult to assign a sign of relationship. Does an increase of WBC imply better fitness or worse? We consulted several researchers in the field and there was no clear way to understand this. Therefore, we decided to exclude it. For reasons, see the discussion provided in the materials of this project
Number Of Lymphocytes	2	1	Very difficult to assign a sign of relationship. Does an increase of WBC imply better fitness or worse? We consulted several researchers in the field and there was no clear way to understand this. Therefore, we decided to exclude it. For reasons, see the discussion provided in the materials of this project
Esoinophils Of Nestlings	1	1	Very difficult to assign a sign of relationship. Does an increase of WBC imply better fitness or worse? We consulted several researchers in the field and there was no clear way to understand this. Therefore, we decided to exclude it. For reasons, see the discussion provided in the materials of this project
Heterophils Of Nestlings	1	1	Very difficult to assign a sign of relationship. Does an increase of WBC imply better fitness or worse? We consulted several researchers in the field and there was no clear way to understand this. Therefore, we decided to exclude it. For reasons, see the discussion provided in the materials of this project
Nestling Leukocytes	1	1	Very difficult to assign a sign of relationship. Does an increase of WBC imply better fitness or worse? We consulted several researchers in the field and there was no clear way to understand this. Therefore, we decided to exclude it. For reasons, see the discussion provided in the materials of this project
Wbc Measure Of Nestlings	1	1	Very difficult to assign a sign of relationship. Does an increase of WBC imply better fitness or worse? We consulted several researchers in the field and there was no clear way to understand this. Therefore, we decided to exclude it. For reasons, see the discussion provided in the materials of this project
Sensitivity-analysis only			
Sex Ratio	9	2	We will be excluding sex ratio as a fitness proxy from our main analysis. (https://onlinelibrary.wiley.com/doi/full/10.1046/j.1439-0310.2002.00843.x)
Testosterone Levels	3	1	Authors say: "As females are expected to increase their ability in intra-sexual competition for the preferred males in relation to their level of testosterone (Searcy 1988), we predict that females should increase their levels of circulating androgens when receiving high amounts of green plants into their nests.... We predict that the greenery should increase the amount of nesting interferences caused by the increase in aggressiveness between females during nest construction, laying and incubation, leading to an increase in female androgen levels." Therefore, we expect a positive relationship between testosterone and GNM. Females were measured when they started laying (second or third egg) and this measurement would then imply that the testosterone levels are increased due to mate competition so we give it a positive sign. One measure of testosterone was taken for each female and the levels of testosterone could change considerably within the duration of a day or a few days. Therefore, for consistency with other physiological measuresn like blood glucose levels, we will test this only in a sensitivity analysis.
Glucose Concentration	2	2	We will not include this in our main analysis and only do a sensitivity analysis for the flagged proxies. We do not consider glucose concentration to be a meaningful fitness proxy because 1. The blood samples of the birds were collected at random time of the day without any strict protocol for between sampling differences. Blood glucose levels could change very rapidly depending on the consumption of food and there could be great between individual variation in the population. Circadian rhythm could also influence the blood sugar levels. 2. Authors themselves call this a less robust proxy - "The level of blood glucose is considered a reverse (lower concentration of glucose is related to higher body condition) and a less robust (more variable) indicator of body condition than haemoglobin but is also useful in studies of ecophysiology"
Meandevoscore - Mean Developmental Score Of Clutch	2	1	The variable is calculated as a score that does not account for the clutch size. Authors say : "Hence, to estimate variation in incubation period, on incubation day 13 at noon we checked for hatching and early postnatal development of hatchlings. We scored each egg or hatchling as follows: egg = score 0 (assumed to hatch on the following day; retained only if eggs later hatched); wet hatchling = score 1 (assumed to have hatched on this same day); dry hatchling = score 2 (assumed to have hatched the preceding day). These data formed the basis for a combined developmental score per nest, where higher scores indicated shorter incubation"
Feeding Rate	1	1	The relation of this with fitness can be argued. A higher feeding rate can indicate better care and resource collection which might suggest higher fitness of the parents or brood. However, if feeding is high, it could also imply poor quality of food availability or compensation of poor health of the nestling.
Females' Testosterone Level	1	1	The measure is taken only once at Day 4 once incubation started. Since baseline of the hormone was not know, testosterone levels could have changed between the measures, we will only use this in a senstivity analysis.
Time Spent Begging By Broods	1	1	This is quite tricky to interpret. Begging is generally a signal that chicks are hungry and in need of care. More begging might indicate a greater demand for resources and therefore potentially less fitness in terms of immediate brood condition but studies also suggest that begging intensity is an evolved behaviour to maximise parental care and could imply it is not related to fitness but rather a strategy to elicit care.
Yolk Log A4	1	1	We do not consider yolk hormones as a good proxy for fitness as according to the meta-analysis on yolk hormones and fitness, they found no evidence for any effect of yolk hormones on fitness. (Lucia Mentesana, Michaela Hau, Pietro B. D'Amelio, Nicolas M. Adreani, Alfredo Sánchez-Tójar. In prep.* Do egg hormones have fitness consequences in wild birds? A systematic review and meta-analysis*)
Yolk Log T	1	1	We do not consider yolk hormones as a good proxy for fitness as according to the meta-analysis on yolk hormones and fitness, they found no evidence for any effect of yolk hormones on fitness. (Lucia Mentesana, Michaela Hau, Pietro B. D'Amelio, Nicolas M. Adreani, Alfredo Sánchez-Tójar. In prep.* Do egg hormones have fitness consequences in wild birds? A systematic review and meta-analysis*)

Figure S5: **Summary of fitness proxies completely removed from the meta-analysis or used only in sensitivity analyses**: Fitness proxies were excluded when they could not be assigned a consistent directional link to fitness or when the literature on the validity of a proxy for fitness is highly debated. "Completely excluded" proxies were omitted from all models, whereas "Sensitivity-analysis only" proxies were tested separately to evaluate the robustness of the meta-analytic results. Values denote the number of effect sizes (k) and number of studies (n) for each proxy.

Request for data for meta-analysis on green nest material in birds

Recipients

Request for data for meta-analysis on green nest material in birds

Dear XXX,

We are a research team from Bielefeld University and are reaching out to you because we are conducting a systematic review and meta-analysis on the adaptive value of incorporating green nest material in birds. Our search identified 27 articles with relevant data for our meta-analysis, including your study "Title of the published article, Year of Publication"

However, to be able to include it and cite it in our meta-analysis we would need your assistance with the following information from such study:

- AAA Fitness proxy (mean, SE or SD and sample size of treatment and control)
- BBB Fitness proxy (mean, SE or SD and sample size of treatment and control)
- CCC Fitness proxy (mean, SE or SD and sample size of treatment and control)

If you want to hear more about the project, please, get in touch with us and we will be happy to share the entire pre-registered plan.

Additionally, if you have any unpublished experimental data that could be used to test the adaptive value of green nest material in birds, we would be very grateful if you could share it with us. Please, be aware that unfortunately, we cannot offer co-authorship at this time.

We are finalising our analyses in about two weeks, so we would need the requested information, and any unpublished data you might be willing to share with us before then. Should you need extra time, please, do let us know as soon as possible.

Do not hesitate to contact us if you have any questions.
Thank you very much in advance for your time.

Best regards,
Tuba Rizvi (PhD student)

Shreya Dimri (PhD student)
Julio M. G. Segovia (Postdoctoral fellow)
Alfredo Sánchez-Tójar (Principal Investigator)

Figure S6: **Standardized email template sent to all the authors whose article was included in the meta-analysis**: In cases where we needed the incomplete information, the fitness proxies of interest were mentioned. In all cases, we requested for any unpublished experimental data that could be used for the purpose of our meta-analysis

7.8. Description of Unpublished studies

Figure S7

Complete list of variables extracted from each study: comprehensive overview of all variables recorded during data extraction.

Figure S8

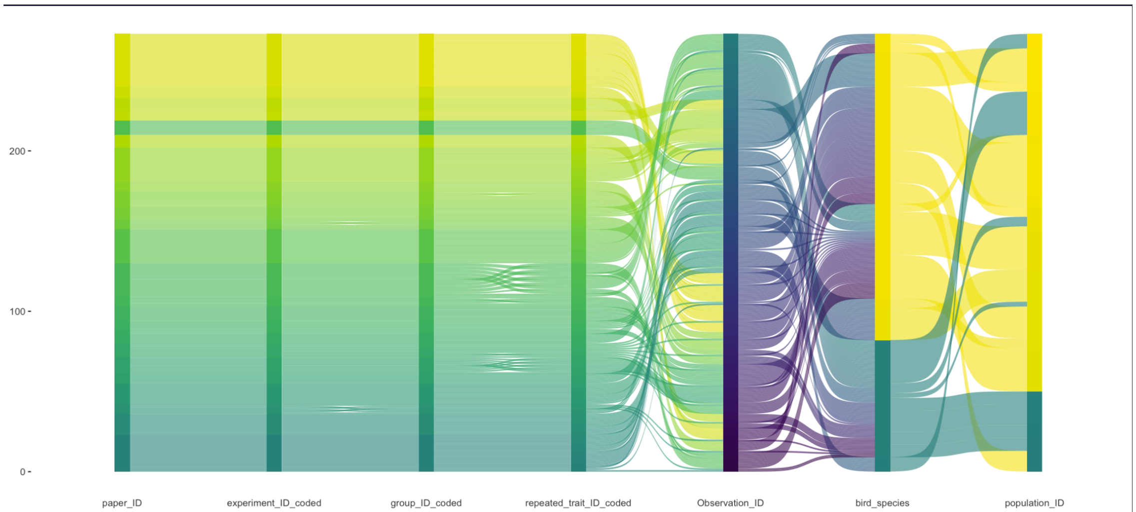

Figure S9: **Alluvial plot showing the overlap among random effects extracted for the meta-analytic dataset:** Each vertical bar represents a random-effect term i.e. Paper ID (28 levels), Experiment ID (48), Group ID (52), Repeated Trait ID (225), Observation ID (273), Bird Species (7), and Population ID (20). Connections between bars indicate shared values across levels. The figure shows that Experiment ID and Group ID were nearly identical, and that Repeated Trait ID had many levels almost as many as the Observation ID, and Repeated Trait ID was excluded from the final models. In contrast, Population ID captured additional clustering across studies and was therefore added to the random effects (not pre-registered).

Sensitivity to sampling correlation (ρ)

Results for lnRR and SMD(H) Meta-analytic models

				95% CI						
ρ	Overall effect	SE	p	CI low	CI high	LogLik	AIC	BIC	AICc	Effect.size
0.2	0.0168	0.0131	0.198	−0.0088	0.0424	−15.5399	43.0798	63.8881	43.4450	lnRR
0.3	0.0186	0.0138	0.180	−0.0086	0.0457	−17.4753	46.9505	67.7589	47.3157	lnRR
0.5	0.0190	0.0156	0.222	−0.0115	0.0495	−26.0231	64.0462	84.8546	64.4114	lnRR
0.7	0.0147	0.0181	0.416	−0.0207	0.0501	−43.3232	98.6464	119.4548	99.0117	lnRR
0.8	0.0086	0.0203	0.670	−0.0311	0.0483	−58.3988	128.7976	149.6060	129.1628	lnRR
0.2	0.1330	0.0501	0.008	0.0349	0.2311	−297.6150	607.2301	628.4066	607.5729	SMD(H)
0.3	0.1479	0.0556	0.008	0.0390	0.2568	−304.1710	620.3420	641.5186	620.6849	SMD(H)
0.5	0.1793	0.0665	0.007	0.0489	0.3098	−324.4948	660.9896	682.1661	661.3324	SMD(H)
0.7	0.2560	0.1180	0.030	0.0248	0.4872	−355.0793	722.1585	743.3351	722.5014	SMD(H)
0.8	0.2936	0.1508	0.051	−0.0019	0.5891	−372.2800	756.5600	777.7365	756.9028	SMD(H)

Figure S10: **Sensitivity of overall effect estimates to the assumed sampling correlation ( ):** The table shows model estimates of the overall effect, standard errors (SE), p-values, 95% confidence intervals (CI), and fit statistics (log-likelihood, AIC, BIC, and AICc) across a range of assumed sampling correlations ( ) used for the variance-covariance matrices.

Summary of Sensitivity Analyses for lnRR and SMD(H) Intercept-only models							
Effect Size	**Data used in model**	**Estimate**	**95% CI**	**95% PI**	**P-value**	**k (No. of Effect Sizes)**	**n (No. of Studies)**
lnRR	Including published data only	0.020	[-0.013, 0.052]	[-0.290, 0.329]	0.230	221	24
lnRR	Excluding Experimental Design Non-Aromatic Vs. No added material	0.027	[-0.009, 0.063]	[-0.203, 0.256]	0.147	228	26
lnRR	Including flagged proxies	0.024	[-0.006, 0.053]	[-0.272, 0.319]	0.113	259	28
lnRR	Without those cases where author reported no effect of the treatment	0.019	[-0.013, 0.050]	[-0.291, 0.328]	0.238	222	26
lnRR	Including flagged proxies and without the cases with no effect of the treatment	0.024	[-0.006, 0.054]	[-0.280, 0.328]	0.121	243	28
lnRR	Excluding effect sizes where lnRR failed Geary's Test	0.029	[-0.003, 0.060]	[-0.271, 0.328]	0.074	182	26
SMD(H)	Including published data only	0.192	[0.056, 0.327]	[-0.849, 1.232]	0.006	235	24
SMD(H)	Excluding Experimental Design Non-Aromatic Vs. No added material	0.148	[0.019, 0.278]	[-0.816, 1.112]	0.025	242	26
SMD(H)	Including flagged proxies	0.191	[0.067, 0.315]	[-0.798, 1.181]	0.003	274	28
SMD(H)	Without those cases where author reported no effect of the treatment	0.186	[0.048, 0.324]	[-0.896, 1.268]	0.008	237	26
SMD(H)	Including flagged proxies and without the cases with no effect of the treatment	0.199	[0.069, 0.329]	[-0.854, 1.251]	0.003	258	28
SMDH	Without the cases where SMDH was calculated from inferential statistics	0.179	[0.044, 0.314]	[-0.856, 1.215]	0.009	245	26

Table S2

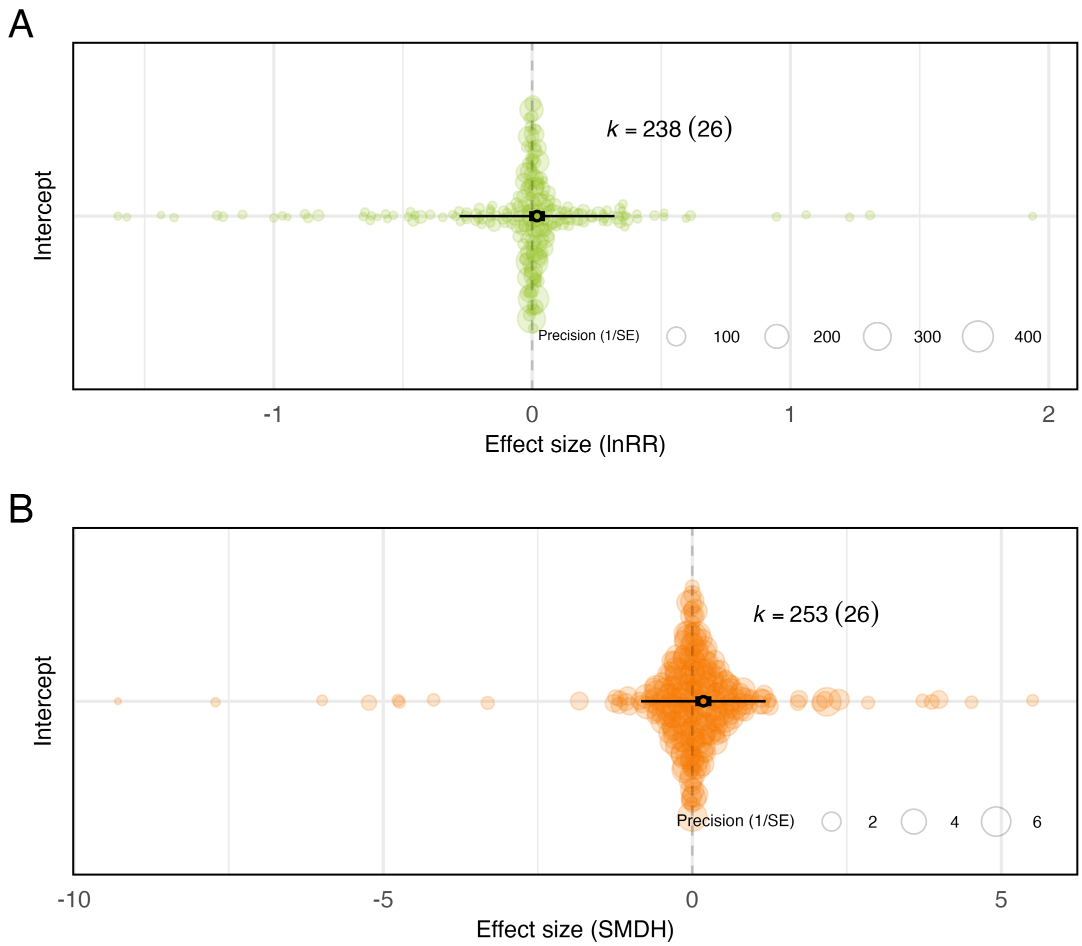

Figure S11: Overall effect of green nest material on all fitness proxies combined. The meta-analytic mean (black circle) with 95% confidence intervals (thicker bars) and prediction intervals (thinner bars) are shown along with the data points (coloured circles) scaled by precision (inverse of standard error). Results are shown as an orchard plot for the intercept-only model (A) using log response ratio (lnRR), and (B) standardised mean difference (SMD(H)). k: number of effect sizes (number of studies is shown in the brackets).

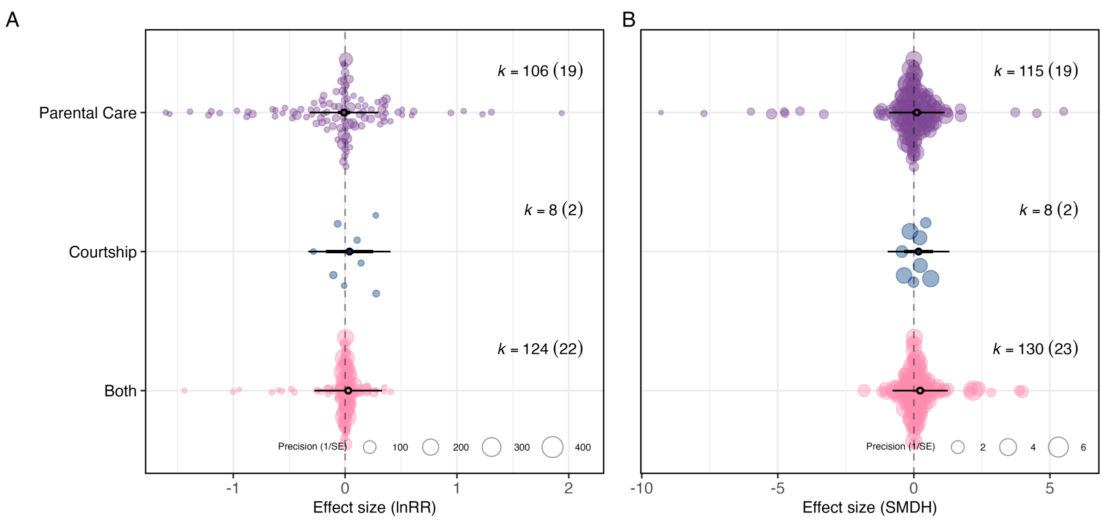

Figure S12: There is no clear evidence to favour either the courtship or the parental care hypothesis as drivers of potential fitness benefits of green nest material. Orchard plot of the multilevel meta-regression for (A) log response ratio (lnRR) and (B) standardised mean difference (SMD(H)). Mean estimates (black circles), 95% confidence intervals (thicker bars), and prediction intervals (thinner bars) are shown along with the individual data points (transparently coloured circles) scaled by precision (inverse of standard error). k: number of effect sizes (number of studies is shown in the brackets).

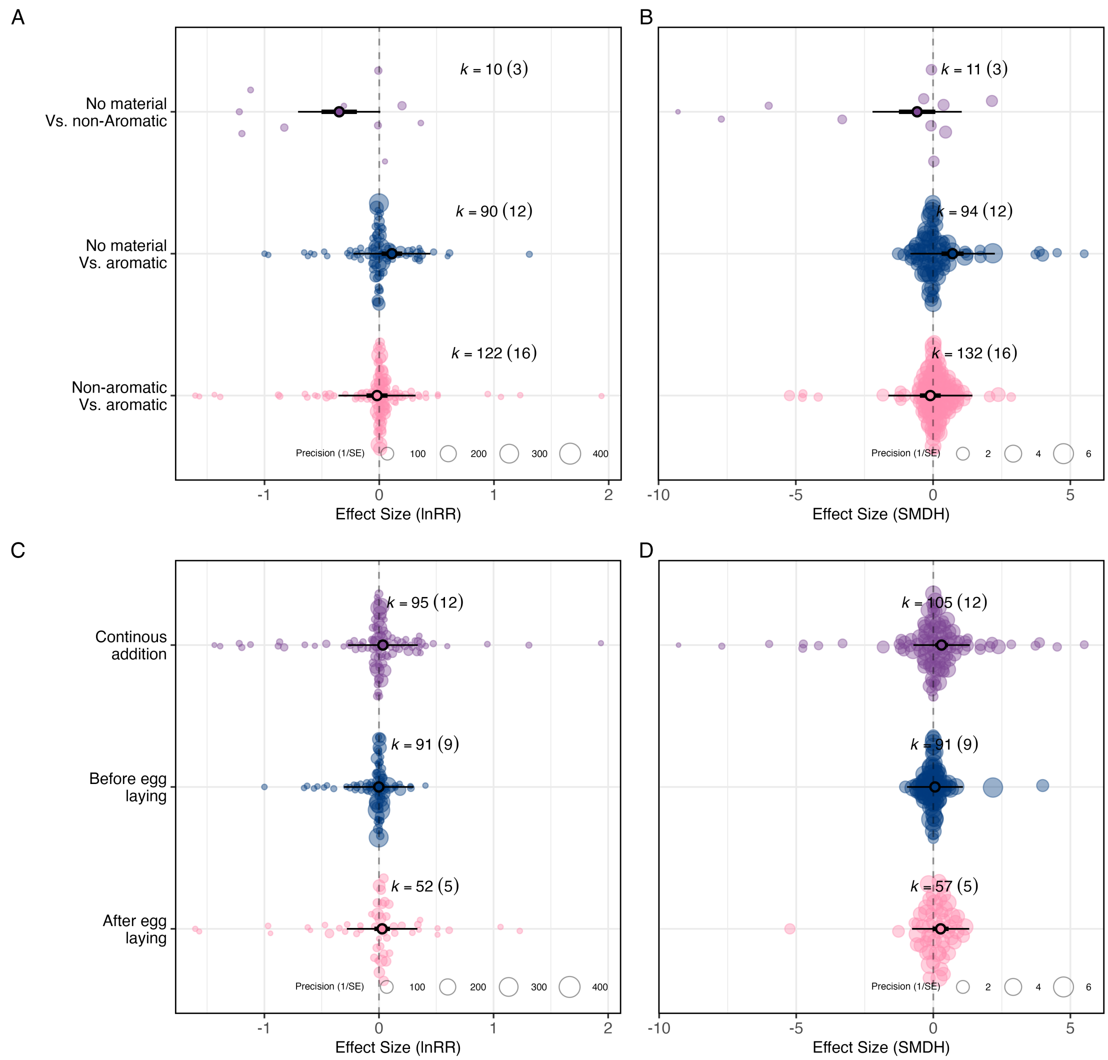

Figure S13: Experimental designs comparing nests with aromatic green nest material against nests without any green material, and those adding the material continuously, lead to the largest fitness estimates. Orchard plots of the multilevel meta-regressions showing the overall effect of green nest material depending on experimental design for (A: log response ratio (lnRR); B: standardised mean difference (SMD(H)), and time of green nest material addition (C: log response ratio (lnRR); D: standardised mean difference (SMD(H)). Mean estimates (black circles), 95% confidence intervals (thicker bars) and prediction intervals (thinner bars) are shown along the individual data points (transparently coloured circles) scaled by precision (inverse of standard error). k: number of effect sizes (number of studies is shown in the brackets).

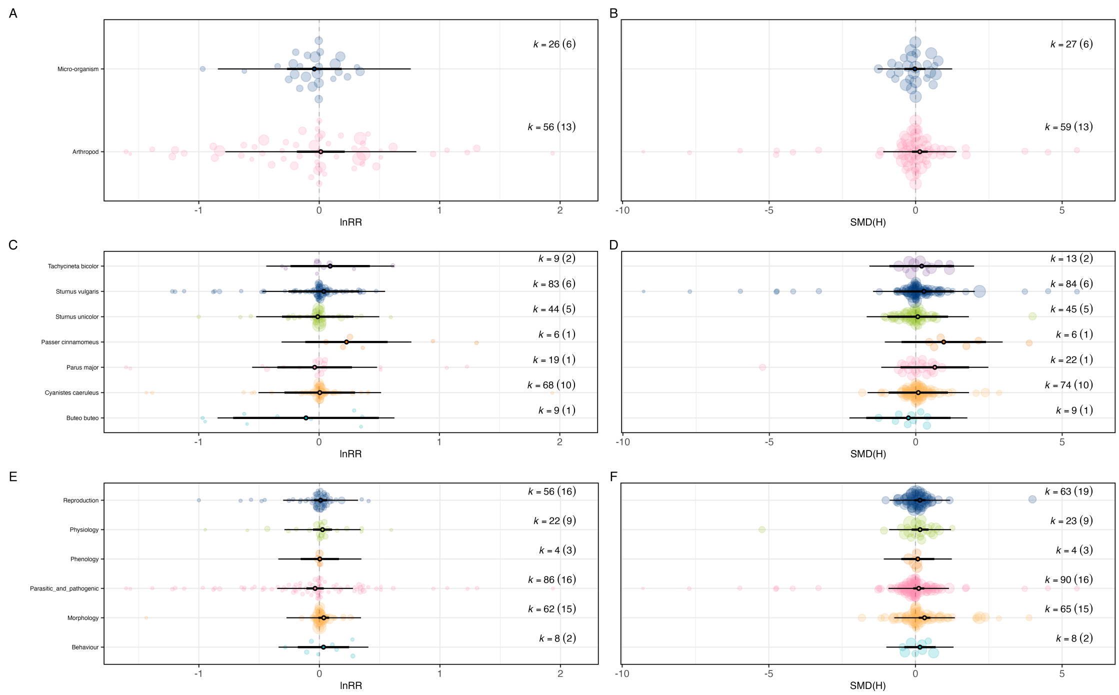

Figure S14: Orchard plot of the multilevel meta-regression for (A) log response ratio (lnRR) and (B) standardised mean difference (SMD(H)). Mean estimates (black circles), 95% confidence intervals (thicker bars), and prediction intervals (thinner bars) are shown along with the individual data points (transparently coloured circles) scaled by precision (inverse of standard error). k: number of effect sizes (number of studies is shown in the brackets).

Multilevel Meta Regressions for Risk of Bias												
	lnRR						SMDH					
Level	**Estimate**	**P-val**	**95% CI**	**95% PI**	**k**	**n**	**Estimate**	**P-val**	**95% CI**	**95% PI**	**k**	**n**
1. Blinding												
No	0.022	0.168	[-0.009, 0.053]	[-0.278, 0.322]	227	25	0.184	**0.007**	[0.051, 0.316]	[-0.828, 1.195]	242	25
Yes	-0.042	0.555	[-0.182, 0.098]	[-0.372, 0.288]	11	1	0.016	0.970	[-0.816, 0.847]	[-1.287, 1.318]	11	1
2. Random assignment to treatment												
No	0.002	0.958	[-0.080, 0.084]	[-0.309, 0.313]	22	3	0.070	0.705	[-0.292, 0.431]	[-0.999, 1.138]	28	3
Yes	0.022	0.199	[-0.011, 0.055]	[-0.280, 0.323]	216	23	0.205	**0.010**	[0.049, 0.360]	[-0.813, 1.223]	225	23
3. Partial Reporting												
No	0.021	0.205	[-0.011, 0.053]	[-0.280, 0.322]	201	22	0.196	**0.007**	[0.055, 0.337]	[-0.817, 1.209]	216	22
Yes	-0.001	0.989	[-0.110, 0.109]	[-0.320, 0.318]	37	4	0.071	0.695	[-0.286, 0.429]	[-0.994, 1.136]	37	4

Table S3

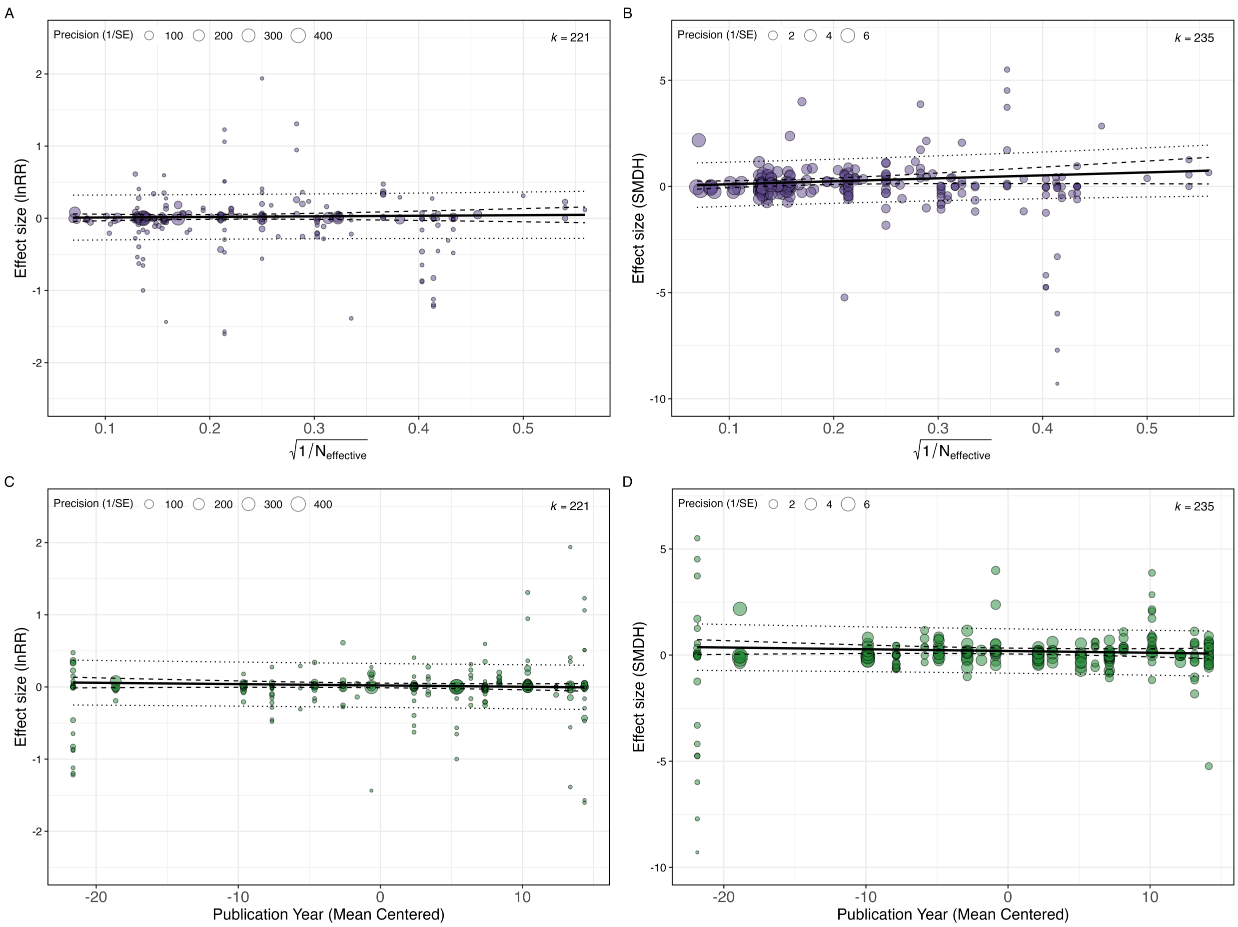

Figure S15: Tests for publication bias in the effect of green nest material on fitness outcomes. Plots show relationships between effect sizes and (A–B) the inverse of effective sample size (√1/ ff) testing for small-study effects, and (C–D) publication year (mean-centered) testing for time-lag bias, for log response ratio (lnRR, A and C) and standardized mean difference (SMD(H), B and D). Points represent individual effect sizes, scaled by precision (1/SE). Solid lines show meta-regression slopes, with 95% confidence intervals (dashed lines) and 95% prediction intervals (dotted lines). k: number of effect sizes included in each analysis.

7.16. Systematic Search Information

Figure S16