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Photo: Howard P. Nelson

A Special Issue on the Status of Caribbean Forest Endemics

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The role of a regional journal as a depository for valuable ornithological data as demonstrated by Caribbean forest endemic birds

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Abstract Regional journals publish valuable ecological data, but this importance is often undervalued due to the drive for impact factor and citations in academia. Using Caribbean forest endemic species as a case study, the current review (n = 1,007 studies) examined key characteristics of studies published in the *Journal of Caribbean Ornithology* (JCO), compared to all other journals (AOJ) cited in Web of Science. Important findings included the unique subject strengths of JCO, such as proportionately more ($p < 0.0001$) distribution and abundance research papers on Caribbean forest endemic species published in JCO compared to those in AOJ. Research effort in JCO also showed clear geographic patterns, with a significantly higher representation of Cuban ornithological research in JCO than in AOJ ($p < 0.001$). Although regional authorship made a significant contribution to JCO ($p < 0.001$), there was a significant decrease over time in regional first authorship in JCO ($F = 7.53$, $r^2 = 0.26$, df = 18, $p = 0.013$) and in AOJ ($F = 12.16$, $r^2 = 0.38$, df = 20, $p = 0.002$), suggesting that Caribbean ornithology remains dominated by non-resident scientists. This peer-reviewed, multi-lingual, regional journal provides a valuable, low-cost conduit for the publication of region-specific ornithological data. Given the paucity of data for Caribbean endemic birds, the need to disseminate scientific information at multiple levels, and the growing importance of evidence-based decision-making for conservation, JCO provides a meaningful outlet as a regional data repository and for practitioner-perspective publications.

Keywords Caribbean, conservation, endemic, forest-dependent, research effort

Resumen El papel de una revista regional como repositorio de importantes datos ornitológicos como lo demuestran las aves de bosque endémicas del Caribe—Las revistas regionales publican importantes datos ecológicos, pero esta importancia es subestimada generalmente en la academia por la motivación del factor de impacto y las citas. El siguiente análisis (n = 1.007 estudios) examina las características claves de los estudios publicados en el *Journal of Caribbean Ornithology* (JCO) comparado con otras revistas (AOJ) citadas en la Web of Science y utiliza como caso de estudio las aves de bosque endémicas del Caribe. Dentro de los resultados importantes se incluyeron los singulares puntos fuertes del JCO, tales como una proporción significativamente mayor ($p < 0{,}0001$) de artículos de investigación sobre distribución y abundancia de especies de bosque endémicas en el JCO en comparación con AOJ. Los esfuerzos de investigación en el JCO también muestran patrones geográficos claros, con una representación significativamente mayor de investigaciones ornitológicas cubanas en el JCO que en AOJ ($p < 0{,}001$). Aunque la autoría regional representa una contribución significativa al JCO ($p < 0{,}001$), existió una disminución en el tiempo significativa en la autoría principal regional en el JCO ($F = 7{,}53$, $r^2 = 0{,}26$, gl = 18, $p = 0{,}013$) y en AOJ ($F = 12{,}16$, $r^2 = 0{,}38$, gl = 20, $p = 0{,}002$), lo que sugiere que la ornitología en el Caribe permanece dominada por científicos no residentes. Esta revista regional, multilingüe y arbitrada proporciona una vía valiosa y de bajo costo para la publicación de datos ornitológicos específicos de la región. Dada la escasez de datos para las aves endémicas del Caribe, la necesidad de difundir información científica a múltiples niveles y la importancia creciente de la toma de decisiones para la conservación basadas en evidencias, el JCO ofrece una salida significativa como repositorio de datos regional y para publicaciones con perspectivas profesionales.

Palabras clave bosque-dependiente, Caribe, conservación, endémicas, esfuerzo de investigación

Résumé Le rôle d'une revue régionale en tant que dépôt de données ornithologiques précieuses, comme en témoignent les oiseaux endémiques des forêts des Caraïbes—Les revues régionales publient de précieuses données écologiques, mais cette importance est souvent sous-évaluée en raison du besoin du facteur d'impact et des citations dans le monde universitaire. En utilisant les espèces endémiques des forêts des Caraïbes comme un étude de cas, l'examen actuel (n = 1.007 études) a examiné les principales caractéristiques des études publiées dans *Journal of Caribbean Ornithology* (JCO), par rapport à toutes les autres revues (AOJ) citées dans Web of Science. Les résultats importants comprenaient les sujets d'étude uniques

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(et le point fort) de JCO, comme proportionnellement plus (p < 0,0001) articles de recherche sur la distribution et l'abondance des espèces endémiques de la forêt des Caraïbes publiées dans JCO par rapport à ceux de AOJ. L'effort de recherche dans JCO a également montré des motifs géographiques clairs, avec une représentation nettement plus élevée de la recherche ornithologique cubaine dans JCO que dans AOJ (p < 0,001). Bien que la paternité régionale ait contribué de manière significative à JCO (p < 0,001), il y a eu une diminution significative au fil du temps dans la paternité première régionale dans JCO (F = 7,53, r^2 = 0,26, df = 18, p = 0,013) et dans AOJ (F = 12,16, r^2 = 0,38, df = 20, p = 0,002), suggérant que l'ornithologie des Caraïbes reste dominée par des scientifiques non résidents. Cette revue régionale et multilingue évaluée par des pairs fournit un canal précieux à coûts réduits pour la publication de données ornithologiques spécifiques à la région. Compte tenu de la pénurie de données pour les oiseaux endémiques des Caraïbes, de la nécessité de diffuser l'information scientifique à plusieurs niveaux et de l'importance croissante de la prise de décisions factuelle pour la conservation, JCO fournit une exutoire significative en tant que dépôt régional de données et pour des publications dans la perspective des practiciens.

Mots clés Caraïbe, conservation, dépendent de la forêt, effort de recherche, endémique

Many international ornithological journals are moving away from publishing valuable natural history data (Freile *et al.* 2014). However, the increasing number of regional ornithological journals (Bautista and Pantoja 2000) have the potential to fill this role, and indeed, much useful ornithological data are published in such journals (Mugica *et al.* 2012, Freile *et al.* 2014). Globally, regional journals make an important contribution to scientific knowledge across all disciplines (Stergiou and Tsikliras 2006, Tijssen 2007, Mugica *et al.* 2012, Packer 2014). Yet, the pressure in academia to publish in high impact factor journals (Lawrence 2008) causes regional journals to be undervalued (Tijssen *et al.* 2006, Packer 2014). Such journals tend not to be cited in major citation indices and thus their low international visibility means that they are not highly citable (Tijssen 2007). This low citability reduces the incentive for researchers to publish in regional journals. The lack of visibility also leads to the underrepresentation of scientific effort (Stergiou and Tsikliras 2006, Tijssen *et al.* 2006) and thus to a potential geographic bias in the reporting of ecological data.

Typically, the research needs of developing countries do not translate into the highly citable studies accepted by international journals. Regional journals can capitalize on these data, especially since these publications tend to be more accessible to local practitioners and policy makers (Mammides *et al.* 2016). Regional journals provide an important avenue for ecological studies which may be sufficiently robust and important for local management, but suffer from lack of novelty, or are not perceived as having wider global relevance (Meffe 2006, Stergiou and Tsikliras 2006, Lawrence 2008, Primack 2009, Griffiths and Dos Santos 2012). Indeed, journal impact factor is not necessarily a predictor of data quality, with manuscript acceptance in high-ranking journals tending to be based on the originality of methods or conclusions (Barto and Rillig 2012). Studies appropriate for publication in regional journals include natural history and status reports, pilot or descriptive studies, and studies of rare species that are often associated with small sample sizes. Failing to make these data available to the research and management community could lead to errors in research choice and subsequent decision-making.

Despite a general increase in Neotropical ornithological research, the contribution from the insular Caribbean to Neotropical publications remains markedly low (Freile *et al.* 2014). The *Journal of Caribbean Ornithology* (JCO; formerly known as *El Pitirre* from 1988 to 2002) is published by BirdsCaribbean (formerly the Society of Caribbean Ornithology and the Society for the Conservation and Study of Caribbean Birds), the largest ornithological conservation organization in the Caribbean. This subject-specific and regional peer-reviewed journal offers an opportunity for authors of scientific or conservation studies on Caribbean birds to publish their valuable ornithological data. Its position as the main regional ornithological journal allows it to leverage expertise from across the Americas to ensure rigorous evaluation of papers accepted for publication in the journal.

In this paper, we explore some key differences in the focus of JCO compared to other Web of Science–referenced journals, and explore JCO's role as a regional ornithological resource. A recent review of published literature on Caribbean forest-dependent endemic birds (E.S. Devenish-Nelson *et al.* unpubl. data) found that JCO was a significant contributor to the publication of research effort on these important species. Here, we present an analysis of the role of JCO for publishing data on Caribbean birds, using forest-dependent endemic species as a case study. Specifically, we focus on subject and geographic strengths of the journal. We then discuss the implications of these findings for the future of JCO more broadly.

Methods

Research Effort

A review of research effort on Caribbean forest endemic birds was conducted between 9 June and 20 July 2016 using Web of Science (WoS). The search period, 1995 to 2016, covered all years since the first research paper on Caribbean forest endemic birds in JCO. In this review, JCO refers to all volumes since 1995. WoS is the leading global repository for academic journals (Thomson Reuters 2017); the institutional subscription used in this review for the 'All Databases' option on WoS included 11 citation indices (Web of Science Core Collection, BIOSIS Citation Index, Current Contents Connect, Data Citation Index, Derwent Innovations Index, FSTA—the food science resource, KCI-Korean Journal Database, MEDLINE, Russian Science Citation Index, SciELO Citation Index, and Zoological Record). A key citation index included in WoS is Zoological Record, the longest-running comprehensive database of zoological literature, which includes literature such as books and meeting reports that meet objec-

tive evaluation criteria (Thomson Reuters 2017), and in which JCO is indexed.

Searches were performed on WoS using full scientific names and all synonyms. For each study, the title and abstract were reviewed to assess its relevance for inclusion in the analyses. If a study pertained to multiple species, it was recorded for each species individually. Nomenclature of Caribbean forest endemic birds followed the American Ornithologists' Union 7th edition *Check-list of North American Birds* (AOU 1998) and subsequent supplements (checklist.aou.org). All resident and breeding island endemics were included in the search, as well as regional (near) endemics (those shared by neighboring islands; Miller and Miller 2001). All Caribbean endemic birds with a classification of 'low forest dependency' or higher on the BirdLife Data Zone (BirdLife International 2017) were included in this review. Consistent with the BirdsCaribbean (2017) definition, the Caribbean was defined in this review as all islands within the Caribbean Basin, including the offshore islands of South America (e.g., San Andres), Bermuda, Bahamas, and Trinidad and Tobago.

Bibliographic Bias

A Pearson correlation was conducted to determine whether those species receiving attention in JCO matched those in all other journals (AOJ) in WoS. To determine whether JCO was an effective indicator of research effort compared to other citation index or journal sources, the difference between the mean number of studies published per species in JCO and AOJ was determined using a paired Wilcoxon rank-sum two-sided test. These data were standardized by dividing the number of studies per species by the total number of studies for each bibliographic source (JCO or AOJ). Given the importance of ornithological journals for avian researchers (Struik 2008, Freile *et al.* 2014), research effort, determined as the proportion of all studies in each ornithological journal, was compared among these publications using a G-test. Pearson residuals (r = [observed – expected]/[√expected]) were used to determine differences in expected and observed frequencies of studies in these ornithological publications. Similarly, the contribution of JCO compared to that of all research effort from Zoological Record was recorded as an indication of the importance of JCO output in this citation index.

Temporal and Subject Biases

The year of publication was recorded for all studies and temporal change in research effort was determined using linear regression. Studies were also classified according to their relevance to 12 data categories (Table 1). This categorical classification of the research is based on similar studies (Bautista and Pantoja 2000, Mugica *et al.* 2012, Freile *et al.* 2014), and despite its potential subjectivity, can be useful as a broad indication of subjects covered by research effort. To determine whether there was a bias in the subject focus of JCO compared to AOJ, a Fisher exact test was used, due to small sample sizes, to test the number of studies in each data category as a proportion of the total research effort in each source.

Geographic and Author Biases

Research effort is often determined by researcher or species location (de Lima *et al.* 2011). Thus, geographic bias in the number of studies for each country as a proportion of the total research effort between JCO and AOJ was determined using a G-test. In this analysis, country-specific publications included those of island endemics only, while publications on regional endemics were combined in a single 'regional' category. Thus, results need to be interpreted in light of the potential underrepresentation of research effort per country, and overrepresentation in the regional endemic category.

Insight into underlying patterns of research effort can be gained through authorship origin (Calver *et al.* 2010, Mammides *et al.* 2016), which is especially pertinent given the historically high number of international ornithologists working in the Caribbean (Wallace 2004, Levy 2008). To determine whether there was a difference in the relative contribution of locally based authors between JCO and AOJ, each study was classified according to the institutional origin of the first author, the number of authors per study, and the proportion of all regionally based authors. Differences in the first authorship category were determined using a G-test and within the latter two other authorship categories using a two-sample t-test. The institutional origin of the first author was determined, following similar studies (Calver *et al.* 2010, Freile *et al.* 2014), by assigning the institution of author affiliation to either the 'regional' category, defined as an institution within the insular Caribbean, or to the 'international' category, representing all other institutions. The first affiliation listed was used for authors with multiple institutions. This method of defining institutional origin is not a proxy for nationality, but rather an indicator of whether research effort is driven externally or locally. Studies where authorship origin information was not available were assigned as 'unknown.' Temporal change in authorship origin was determined using linear regression. All analyses were conducted in R 3.3.1 (R Core Team 2016). Variation around mean values is indicated with ± 1 SD.

Results

A total of 168 Caribbean forest endemic bird species were identified for inclusion in this analysis. In total, 1,371 studies from both AOJ and JCO were included in the initial literature review; but 9% (n = 121) of the results were classified as 'not relevant' (e.g., studies with an incidental reference to a species) and removed from all further analyses. None of these results were from JCO. The proportion of records recorded as 'data files' was 18% (n = 243), all from AOJ. This category was also removed from further analyses since the information in these files would be represented by the accompanying full papers. Seventy-two of the studies identified in the literature review were full research papers published in JCO that were identified through a direct search of JCO but not returned by the WoS search. Thus, the total research effort in JCO includes these 72 records, but they are not reflected in the Zoological Record output. Of the final studies included from these sources, JCO contributed 16% to all published studies (n = 1,007; Table 2, Appendix 1).

In AOJ, 89% of all endemic species were referenced at least once, and 53% were referenced in JCO; when combining all results this increased to 92% (Appendix 1). The mean number of studies per species found in AOJ was 5.03 (± 8.14) and 0.96 (± 1.28) in JCO (Appendix 1). There was a significant correlation between the number of papers published per species in JCO and

Table 1. Data categories used to classify research effort output into broad subject areas, including results of Fisher exact tests to determine the difference in the number of studies in each data category as a proportion of the total research effort between JCO and AOJ.

Data Category	Proportion of Total JCO (*n*)	Proportion of Total AOJ (*n*)	Fisher Test (*p*-value)	Definition	Examples
Population estimates	0.00 (0)	0.02 (15)	0.147	Estimate of the size of a population	Census surveys Indirect counts
Distribution and abundance	0.31 (51)	0.11 (94)	< 0.0001	Spatial occurrence or abundance	Presence record Population density Number of individuals
Demography	0.06 (9)	0.05 (44)	0.848	Measurement of individual survival, and the production of offspring and its timing	Survival Clutch size Age at first reproduction
Ecology	0.15 (25)	0.13 (112)	0.622	Resource use, intra- and inter-specific interactions, interactions with environment	Habitat use Predator-prey interactions Diet
Behavior	0.09 (15)	0.07 (58)	0.326	Spatial and temporal activities, or patterns of interaction with conspecifics	Territoriality Foraging behavior Vocalization behavior
Taxonomy and phylogeny	0.10 (16)	0.10 (85)	0.966	Measures of evolutionary history	Taxonomic revisions Evolutionary distinctiveness
Genetics	0.09 (15)	0.13 (106)	0.354	Structure and function of genes at a molecular level, genetic traits of ecological significance	Genetic mating systems Evolutionary relatedness Historical demography
Morphology and physiology	0.02 (4)	0.05 (42)	0.217	Measurable phenotypic characteristics and the physical and biochemical processes involved in animal functioning	Body mass Tail length Basal metabolic rate
Threats and conservation actions	0.12 (19)	0.13 (111)	0.799	Anthropogenic processes that directly affect survival and fecundity, or that modify or destroy habitat; conservation efforts implemented for species or habitat protection	Anthropogenic threats Protected area management In-situ management
Disease	0.00 (0)	0.07 (57)	< 0.0001	Metrics of micro and macro parasite infection	Occurrence records Transmission rates Treatment of pathogens
Palaeontology	0.05 (8)	0.01 (8)	0.002	Records of species existing prior to the start of the Holocene	Fossil records
Captive studies	0.01 (1)	0.13 (113)	< 0.0001	Metrics of individuals in captivity	Behavior, demography, and physiology of captive individuals

Table 2. Summary of geographic research effort on Caribbean forest endemic birds in JCO and AOJ during 1995–2016.

Country/Island	Number of Forest-Dependent Endemic Species[a]	Number of Studies per Endemic Species per Country (*N* Papers)	
		JCO	AOJ
Barbados	1	1.00 (1)	8.00 (8)
Barbuda	1	0.00 (0)	0.00 (0)
Cayman Islands	1	0.00 (0)	1.00 (1)
Grenada	1	0.00 (0)	5.00 (5)
Guadeloupe	1	1.00 (1)	4.00 (4)
Martinique	1	0.00 (0)	4.00 (4)
Montserrat	1	0.00 (0)	17.00 (17)
San Andres	1	0.00 (0)	3.00 (3)
Trinidad	1	0.00 (0)	7.00 (7)
Dominica	2	4.00 (8)	9.00 (18)
St. Vincent	2	2.00 (4)	11.00 (22)
Bahamas	4	0.50 (2)	2.50 (10)
St. Lucia	5	0.40 (2)	5.00 (25)
Puerto Rico	16	0.88 (14)	7.31 (117)
Hispaniola	28	0.82 (23)	5.86 (164)
Cuba	23	1.39 (32)	2.52 (58)
Jamaica	29	0.41 (12)	2.72 (79)
Regional	50	1.26 (63)	6.06 (303)

[a]Only single island endemics included for each country/island.

AOJ (r = 0.41, p < 0.001), and no significant difference between the standardized number of papers published per species (Wilcoxon W = 6522, p = 0.394). Sixty-three publications were classified as ornithological journals, among which the frequency of research effort differed significantly (G = 1231, df = 62, p < 0.0001). Across the final search results, 53% (n = 531) of research output was in these 63 ornithological publications, to which JCO made a disproportionately large contribution (31%; Fig. 1). Search results from Zoological Record comprised 85% (n = 851) of all research output, and of this, JCO contributed 11% (n = 90).

Research effort slightly increased over time in AOJ (F = 1.16, r^2 = 0.06, df = 20, p = 0.294) and decreased over time in JCO (F = 3.53, r^2 = 0.16, df = 18, p = 0.077), but neither relationship was significant. Notable biases of subjects published in JCO compared to AOJ included a significantly higher proportion of studies on distribution and abundance and a significantly lower proportion of studies on disease and captive studies in JCO than in AOJ (Table 1).

Availability of author institution origin and proportion information varied in both AOJ and JCO, thus studies with no data on a particular authorship category were omitted from these analyses. There was no significant difference (t = −0.04, df = 215.45, p = 0.966) in the mean number of authors per study between JCO (mean = 3.44 ± 3.11) and AOJ (mean = 3.45 ± 2.85). The proportion of all studies in which the first author was regionally based was significantly higher (G = 16.07, p < 0.001) in JCO (regional proportion = 0.38, n = 162) compared to AOJ (regional proportion = 0.22, n = 845). Further, the proportion of local authors per study was also significantly higher (t = 6.56, df = 204.90, p < 0.001) in JCO (mean = 0.47 ± 0.45, n = 162) than in AOJ (mean = 0.22 ± 0.37, n = 845). There was a significant temporal decrease in regional (F = 7.53, r^2 = 0.26, df = 18, p = 0.013) but not international (F = 0.44, r^2 = 0.02, df = 18, p = 0.514) first authorship in JCO, while there was a significant increase in international (F = 8.90, r^2 = 0.31, df = 20, p = 0.007) and decrease in regional (F = 12.16, r^2 = 0.38, df = 20, p = 0.002) first authorship in AOJ. There was no significant change over time in the proportion of local authors in either JCO (F = 3.22, r^2 = 0.02, df = 158, p = 0.075) or in AOJ (F = 0.21, r^2 = 0.0004, df = 504, p = 0.644).

Differences emerged between the two data sets when exploring the relationship per country. Cuban endemic species were substantially more represented in JCO than in AOJ (Fig. 2). Conversely, Puerto Rico and Hispaniola had a significantly higher proportion of studies in AOJ than in JCO (Fig. 2). Some significant geographic differences in the proportion of regionally based first authors also exist (Fig. 3). In particular, studies of Cuban species had significantly higher regional first authorship in JCO than in AOJ, whereas regional first authorship in AOJ was significantly higher for species in Puerto Rico and Jamaica, than in JCO (Fig. 3).

Discussion

Bibliographic Strengths and Temporal Patterns of JCO

This review is the first to our knowledge to quantify the importance of a Caribbean regional journal and clearly highlights the contribution of JCO to the publication of regional ornithological data. That JCO contributed 16% of all published primary literature reviewed by this study on Caribbean forest endemic birds, demonstrates the value of this regional journal and validates the indexing of this journal in Zoological Record. Further, the greater rate of publication in JCO over recognized international ornithological journals such as *Ornitología Neotropical* and *Cotinga* (Freile *et al.* 2014) establishes it as the leading ornithological journal for regional research effort.

The opposing but non-significant trends in research effort over time between the two bibliographic sources is consistent with minimal growth in ornithological research effort across some smaller Neotropical countries (Freile *et al.* 2014). However, in general, the lack of significant trends for research effort in JCO and AOJ for Caribbean forest endemic birds does not show the increase reported in Neotropical ornithological literature (Freile *et al.* 2014). Yet, Latin American and Caribbean research remains poorly represented in the international literature (Fazey *et al.* 2005, Cronin *et al.* 2014, Ducatez and Lefebvre 2014). This is troubling, given the global trends of increasing research output (Cronin *et al.* 2014, Ducatez and Lefebvre 2014), increasing spending on conservation and ecological research (Miller 2014), and increased research capacity in other sectors in the region (Stads and Beintema 2009). As illustrated by the Caribbean forest endemic birds used in this review, these results suggest there is a pressing need to increase the publication of Caribbean research efforts.

Subject Strengths of JCO

Differences in the subject focus of JCO and AOJ are consistent with similar database comparisons that highlight the impor-

tance of regional journals (Stergiou and Tsikliras 2006, Tijssen *et al.* 2006). Identifying areas to which a regional journal makes a valuable contribution can facilitate a journal becoming a subject-specific focal point (Carmel *et al.* 2013). The importance of JCO for distribution and abundance data largely reflects the dissemination of single-site or small-scale studies that would not represent novel approaches and thus are more difficult to publish in higher impact journals. However, with the increasing use of species distribution models (Guisan *et al.* 2013) and the growing concern for the decline of common species (Lindenmayer *et al.* 2011), these studies are a valuable source of data. It is also worth noting that the publication of pilot studies provides meaningful data for effect size, variance, and statistical distribution determination for subsequent research (Loos *et al.* 2015) on these taxa. Importantly, management decisions often rely on such regional data that are not publishable in international journals (Tijssen *et al.* 2006) and practitioners typically choose their source of information based on relevance rather than impact factor (Gossa *et al.* 2015).

The subject biases of AOJ that are not a key focus of JCO, such as captive and disease research, could be due in part to the technology and innate infrastructure biases of these subjects, which reflect the funding and logistical opportunities available to researchers from higher-income countries, who tend to be more frequently represented in international journals than those from low-income countries (Mammides *et al.* 2016). More work is required to determine whether these subject biases highlight a mismatch between the goals of international researchers and local research needs in the Caribbean (Raffaele 2004).

Geographic Strengths of JCO

Regional journals often reflect geographic variation in research output (e.g., Tijssen 2007), and similarly, ornithological research effort is often driven by complex underlying geopolitical bias (de Lima *et al.* 2011, Ducatez and Lefebvre 2014, Freile *et al.* 2014). The geographic differences between the two bibliographic sources in this review mirror regional socio-political circumstances. For instance, although Caribbean journals are now well represented in global citation indices (Collazo-Reyes *et al.* 2008), Cuban journals remain poorly represented in WoS (Arencibia-Jorge and de Moya-Anegón 2010), which could lead to underestimation of Cuban research effort in AOJ. Consistent with research effort on Cuban waterbirds being published in local or regional journals (Mugica *et al.* 2012), JCO provides an important outlet for the international publication of Cuban research on Caribbean forest endemic birds. Notably, JCO facilitated publication of Cuban research during the height of the US trade embargo of Cuba in the 1990s, when opportunities for local scientists to report on their work were greatly restricted (N. Navarro pers. comm.), and indeed, studies on Cuban endemic species in JCO were more likely to be by local Cuban research institutions than in AOJ. Future work should explore whether these results are consistent with the finding that Cuban publications in international journals are more likely to be a result of international collaborations than those in national journals (Chinchilla-Rodríguez *et al.* 2015).

The international literature tends to be dominated by a limited number of higher-income countries, but throughout lower-income countries the drive to publish in such journals is increas-

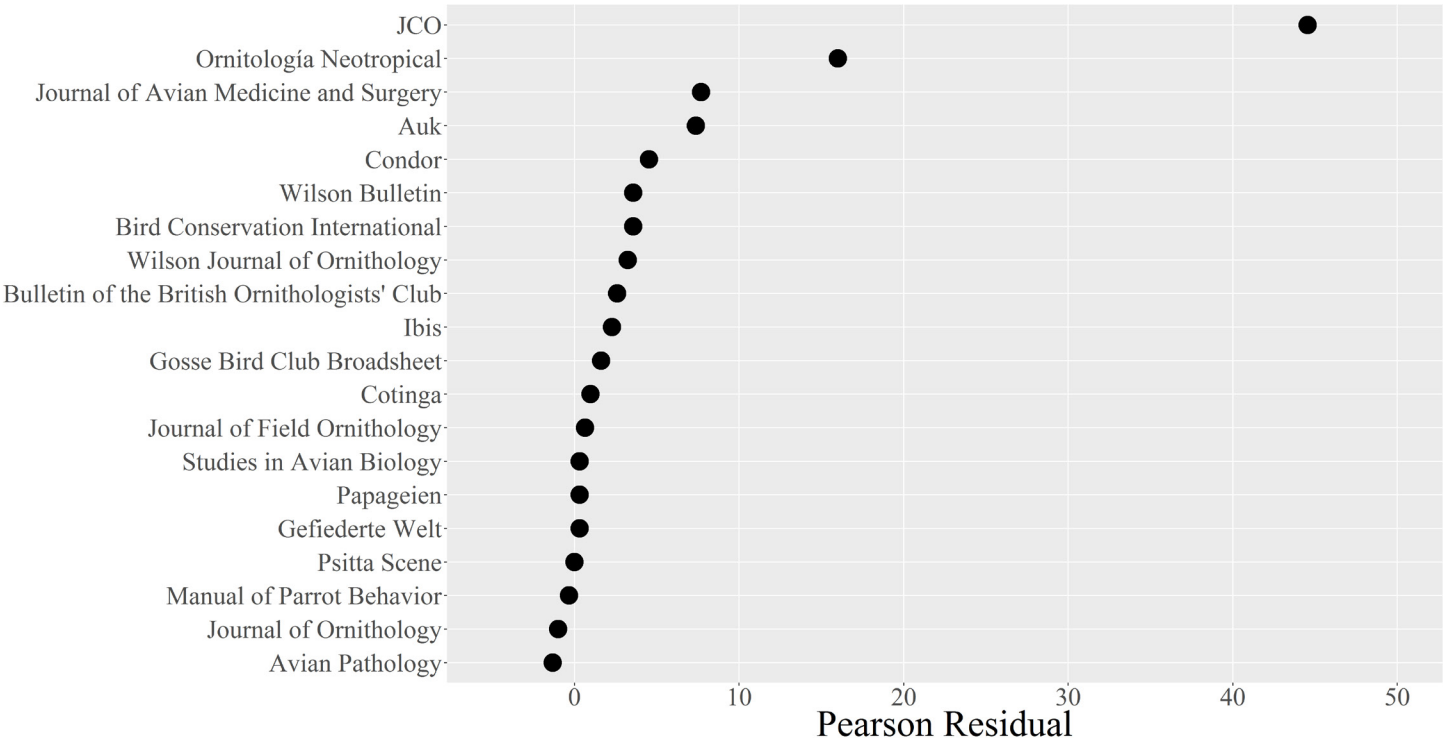

Fig. 1. Pearson residuals of the expected contribution to research effort of the 20 most cited ornithological publications. For simplicity, journal names were included as cited in WoS, and name changes (e.g., *Wilson Bulletin*, now *Wilson Journal of Ornithology*) were not accounted for.

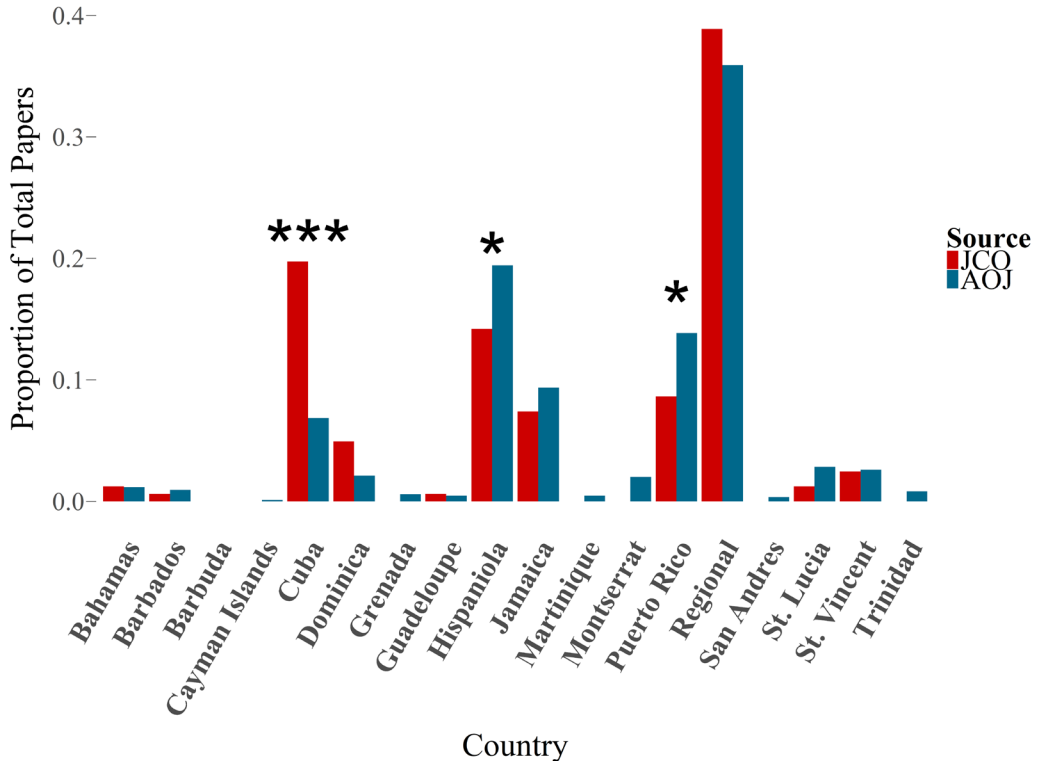

Fig. 2. Geographic bias in research effort on Caribbean forest endemic birds, showing the proportion of total papers by country for each bibliographic source. Asterisks indicate a significant difference in research effort between JCO and AOJ (*α = 0.05, **α = 0.01, and ***α = 0.001).

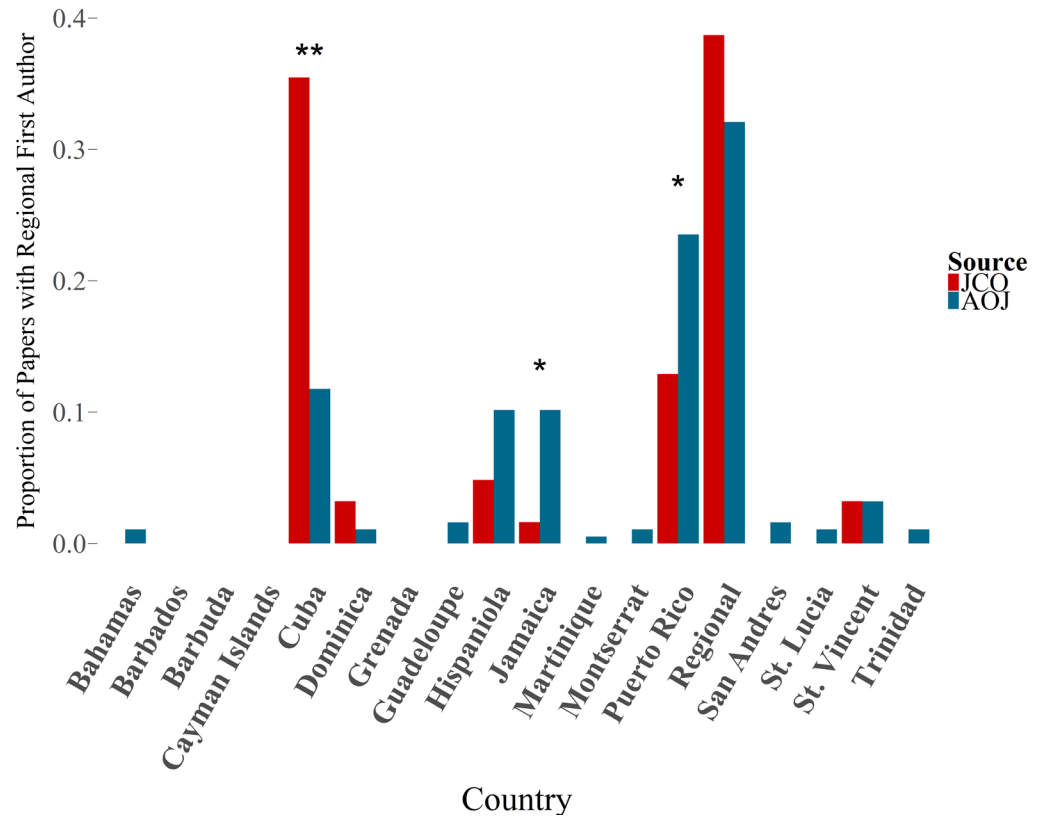

Fig. 3. Geographic bias in the institutional origin of first author, showing the proportion of total papers with a regional institution associated with the first author, per country for each bibliographic source. Asterisks indicate a significant difference in the proportion of regionally based first authors between JCO and AOJ (*α = 0.05 and **α = 0.01).

ing (Mammides *et al.* 2016). AOJ accounted for significantly more research effort than JCO for Puerto Rico and Hispaniola. This is likely driven by the availability of funding, strength of local universities, and in the case of Puerto Rico, legal conservation mandates for this US territory (Tossas 2004, Latta 2012), as well as the universal incentive for academics to publish in higher impact journals to ensure continued funding (Lawrence 2008). International institutions are also more likely to publish on Puerto Rican and Hispaniolan species, reflecting long-standing ornithological relationships with foreign researchers in these countries and the availability of US funding (Levy 2008). Further analyses are required to determine the relationship between funding and research effort in the Caribbean.

It should also be noted that we recognize that there are many national-level publications not listed in citation indices that may or may not be peer reviewed, but in which much valuable data on Caribbean forest birds is located (e.g., *Ciencia* and *Miscelláneas Zoológicas*). These remain important local repositories of research effort on Caribbean birds, and while here we limit our review to the major citation indices, we recognize that this approach likely underestimates research effort on this group.

The importance of multi-lingual publishing is widely recognized for many regional journals (Packer 2014, Chinchilla-Rodríguez *et al.* 2015). In this light, a strength of JCO is its accommodation of linguistic diversity in the Caribbean with the opportunity to publish in English, Spanish, and French. Indeed, the higher proportion of Cuban publications in JCO may reflect this multi-lingual capacity; although English is the predominant language of publication among regional Spanish-speaking researchers, Spanish is the preferred language of publication for Cuban researchers (Collazo-Reyes *et al.* 2008, Chinchilla-Rodríguez *et al.* 2015). Further, publication in a native language is likely to narrow the research-implementation gap (Gossa *et al.* 2015), and in the case of JCO, increases access for natural resource practitioners across the non-English speaking Caribbean.

Authorship Strengths of JCO

Although locally driven research effort has increased over time globally, authors located in developing country institutions remain underrepresented in the international conservation literature (Fazey *et al.* 2005, Mammides *et al.* 2016). While the mean number of authors in both sources is consistent with other studies of ornithological literature (Bautista and Pantoja 2000), the differences in authorship origin between JCO and AOJ clearly reflect this geographic bias. However, JCO has substantially fewer resident authors compared to Neotropical ornithology publications in *Ornitología Neotropical* (Freile *et al.* 2014). Indeed, it appears that the domination of Caribbean ornithology by non-residents (Levy 2008) is actually increasing, often with relatively little regional participation. Although using the author institution metric does not reflect those Caribbean nationals working in international institutions, and vice versa, these results point to the presence of few (or no) trained ornithologists in many islands (Levy 2008, Latta 2012) and the 'brain drain' that is reported in the region (Watts and Wandesforde-Smith 2006). This lack of regional capacity, as reflected in the wider Neotropics by the lack of advanced degrees in conservation biology (Mendez *et al.* 2007), is of concern, especially since it is often suggested that higher levels of local collaboration can result in increased buy-in from local decision makers (Gossa *et al.* 2015).

Regional journals strive to encourage publications by locally based authors by improving scientific rigor, multi-lingual publication, online access, and regional databases (Stergiou and Tsikliras 2006, Tijssen *et al.* 2006, Struik 2008, Packer 2014). The relatively low cost of publication in JCO, acceptance of article types from original research to field observations, rigorous peer review, and multi-lingual publishing options mean that JCO could be a driving force in ornithology for regional researchers. Indeed, using bibliometrics appropriate for evaluating local journals, such as participation of international authors, open access, and citation index referencing (Tijssen 2007, Calver *et al.* 2010), JCO should be regarded as an 'internationally recognized regional journal' (Meffe 2006).

Importance of JCO

JCO represents a unique depository of information for conservation practitioners and researchers, as illustrated by the publication of 16% of primary research effort on Caribbean forest endemic birds included in this study. By accepting scientifically rigorous studies, JCO meets a core objective of research publications by contributing to scientific knowledge so that others can learn from and build on it, which is often lost in the 'publish or perish' imperative (Lawrence 2008). While the success of citizen science initiatives such as eBird (Sullivan *et al.* 2009) could mean fewer future publications purely on species distributions, the strength of JCO remains its outlet for conservation-specific publications. In particular, JCO offers a critical outlet for the regional publication of Cuban ornithological research and conservation. JCO is also well placed to promote studies that have critical value for conservation management but limited publication worthiness in international journals (Meffe 2006). One such critical area is population size studies, as highlighted by the low number of Caribbean forest endemic species with such estimates (E.S. Devenish-Nelson *et al.* unpubl. data). In this way, JCO can play a key regional role given the increasing call for conservation evidence to guide decision-making (Dicks *et al.* 2014). A further advantage of JCO is that it is open access, which is critically important for disseminating information to conservation practitioners and researchers (Struik 2008, Gossa *et al.* 2015) in a region where there is often limited or no access to subscription-based publications. Local amateur ornithologists contribute substantially to our knowledge of Caribbean birds (Wardle *et al.* 2004, Wunderle 2008) and JCO has historically been supportive of disseminating such contributions. Awareness continues to grow that successful conservation requires improved dialogue among conservation professionals, amateurs, and researchers, which includes dissemination of research at multiple levels (Struik 2008, Gossa *et al.* 2015). As a successful regional journal, JCO could act as a broadly accessible repository for such research and promote practitioner-perspective contributions, as a first step towards critical analyses for evidence-based decision-support tools in conservation.

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Appendix 1. Summary of research effort on Caribbean forest endemic birds in JCO and AOJ during 1995–2016.

Family	Species	Country/Island	Number of Studies in JCO	Number of Studies in AOJ
Cracidae	Trinidad Piping-Guan (*Pipile pipile*)	Trinidad	0	7
Columbidae	Scaly-naped Pigeon (*Patagioenas squamosa*)	Regional	3	14
	Plain Pigeon (*P. inornata*)	Regional	3	11
	Ring-tailed Pigeon (*P. caribaea*)	Jamaica	0	0
	Blue-headed Quail-Dove (*Starnoenas cyanocephala*)	Cuba	1	4
	Crested Quail-Dove (*Geotrygon versicolor*)	Jamaica	0	1
	Gray-fronted Quail-Dove (*G. caniceps*)	Cuba	1	3
	White-fronted Quail-Dove (*G. leucometopia*)	Hispaniola	0	0
	Key West Quail-Dove (*G. chrysia*)	Regional	0	3
	Bridled Quail-Dove (*G. mystacea*)	Regional	2	5
	Grenada Dove (*Leptotila wellsi*)	Grenada	0	5
Cuculidae	Chestnut-bellied Cuckoo (*Coccyzus pluvialis*)	Jamaica	0	1
	Bay-breasted Cuckoo (*C. rufigularis*)	Hispaniola	0	1
	Jamaican Lizard-Cuckoo (*C. vetula*)	Jamaica	0	0
	Puerto Rican Lizard-Cuckoo (*C. vieilloti*)	Puerto Rico	0	1
	Great Lizard-Cuckoo (*C. merlini*)	Regional	0	0
	Hispaniolan Lizard-Cuckoo (*C. longirostris*)	Hispaniola	1	2
Caprimulgidae	Jamaican Pauraque (*Siphonorhis americana*)	Jamaica	0	0
	Least Pauraque (*S. brewsteri*)	Hispaniola	0	2
	Greater Antillean Nightjar (*Antrostomus cubanensis*)	Regional	0	3
	Puerto Rican Nightjar (*A. noctitherus*)	Puerto Rico	1	4
Apodidae	Lesser Antillean Swift (*Chaetura martinica*)	Regional	0	0
Trochilidae	Antillean Mango (*Anthracothorax dominicus*)	Regional	1	4
	Green Mango (*A. viridis*)	Puerto Rico	0	3
	Jamaican Mango (*A. mango*)	Jamaica	1	2

Appendix 1. cont.

Family	Species	Country/Island	Number of Studies in JCO	Number of Studies in AOJ
Trochilidae	Purple-throated Carib (*Eulampis jugularis*)	Regional	0	17
	Green-throated Carib (*E. holosericeus*)	Regional	0	6
	Bahama Woodstar (*Calliphlox evelynae*)	Regional	1	4
	Inagua Woodstar (*C. lyrura*)	Bahamas	0	0
	Vervain Hummingbird (*Mellisuga minima*)	Regional	2	4
	Bee Hummingbird (*M. helenae*)	Cuba	3	5
	Cuban Emerald (*Chlorostilbon ricordii*)	Regional	2	0
	Hispaniolan Emerald (*C. swainsonii*)	Hispaniola	0	0
	Puerto Rican Emerald (*C. maugaeus*)	Puerto Rico	0	4
	Blue-headed Hummingbird (*Cyanophaia bicolor*)	Regional	0	2
	Antillean Crested Hummingbird (*Orthorhyncus cristatus*)	Regional	2	10
	Streamertail (*Trochilus polytmus*)	Jamaica	1	17
Procellariidae	Black-capped Petrel (*Pterodroma hasitata*)	Regional	4	19
Accipitridae	Gundlach's Hawk (*Accipiter gundlachi*)	Cuba	1	4
	Cuban Black Hawk (*Buteogallus gundlachii*)	Cuba	0	2
	Ridgway's Hawk (*Buteo ridgwayi*)	Hispaniola	1	9
Tytonidae	Ashy-faced Owl (*Tyto glaucops*)	Hispaniola	0	9
Strigidae	Puerto Rican Screech-Owl (*Megascops nudipes*)	Puerto Rico	0	4
	Bare-legged Owl (*Margarobyas lawrencii*)	Cuba	1	1
	Cuban Pygmy-Owl (*Glaucidium siju*)	Cuba	0	3
	Jamaican Owl (*Pseudoscops grammicus*)	Jamaica	1	1
Trogonidae	Cuban Trogon (*Priotelus temnurus*)	Cuba	3	1
	Hispaniolan Trogon (*Priotelus roseigaster*)	Hispaniola	0	1
Todidae	Cuban Tody (*Todus multicolor*)	Cuba	7	1
	Broad-billed Tody (*T. subulatus*)	Hispaniola	1	4
	Narrow-billed Tody (*T. angustirostris*)	Hispaniola	1	2
	Jamaican Tody (*T. todus*)	Jamaica	1	5
	Puerto Rican Tody (*T. mexicanus*)	Puerto Rico	2	6
Picidae	Antillean Piculet (*Nesoctites micromegas*)	Hispaniola	0	1
	Guadeloupe Woodpecker (*Melanerpes herminieri*)	Guadeloupe	1	4
	Puerto Rican Woodpecker (*M. portoricensis*)	Puerto Rico	0	5
	Hispaniolan Woodpecker (*M. striatus*)	Hispaniola	0	1
	Jamaican Woodpecker (*M. radiolatus*)	Jamaica	1	0
	West Indian Woodpecker (*M. superciliaris*)	Regional	1	3
	Cuban Green Woodpecker (*Xiphidiopicus percussus*)	Cuba	2	3
	Fernandina's Flicker (*Colaptes fernandinae*)	Cuba	1	4
Psittacidae	Cuban Parakeet (*Psittacara euops*)	Cuba	2	6
	Hispaniolan Parakeet (*P. chloropterus*)	Hispaniola	2	4
	Cuban Parrot (*Amazona leucocephala*)	Regional	8	32
	Yellow-billed Parrot (*A. collaria*)	Jamaica	2	6
	Hispaniolan Parrot (*A. ventralis*)	Hispaniola	3	78
	Puerto Rican Parrot (*A. vittata*)	Puerto Rico	2	44
	Black-billed Parrot (*A. agilis*)	Jamaica	2	8
	Red-necked Parrot (*A. arausiaca*)	Dominica	4	9
	St. Lucia Parrot (*A. versicolor*)	St. Lucia	2	16
	St. Vincent Parrot (*A. guildingii*)	St. Vincent	3	21
	Imperial Parrot (*A. imperialis*)	Dominica	4	9
Tyrannidae	Jamaican Elaenia (*Myiopagis cotta*)	Jamaica	0	2
	Greater Antillean Elaenia (*Elaenia fallax*)	Regional	0	2
	Cuban Pewee (*Contopus caribaeus*)	Regional	2	4
	Jamaican Pewee (*C. pallidus*)	Jamaica	0	1
	Hispaniolan Pewee (*C. hispaniolensis*)	Hispaniola	0	1
	Lesser Antillean Pewee (*C. latirostris*)	Regional	0	0

Appendix 1. cont.

Family	Species	Country/Island	Number of Studies in JCO	Number of Studies in AOJ
Tyrannidae	Sad Flycatcher (*Myiarchus barbirostris*)	Jamaica	0	2
	Grenada Flycatcher (*M. nugator*)	Regional	1	0
	Rufous-tailed Flycatcher (*M. validus*)	Jamaica	0	1
	La Sagra's Flycatcher (*M. sagrae*)	Regional	1	3
	Stolid Flycatcher (*M. stolidus*)	Regional	0	3
	Puerto Rican Flycatcher (*M. antillarum*)	Regional	0	4
	Lesser Antillean Flycatcher (*M. oberi*)	Regional	0	0
	Loggerhead Kingbird (*Tyrannus caudifasciatus*)	Regional	2	7
	Giant Kingbird (*T. cubensis*)	Cuba	1	2
Tityridae	Jamaican Becard (*Pachyramphus niger*)	Jamaica	0	3
Vireonidae	Blue Mountain Vireo (*Vireo osburni*)	Jamaica	0	2
	Thick-billed Vireo (*V. crassirostris*)	Regional	2	4
	San Andres Vireo (*V. caribaeus*)	San Andres	0	3
	Jamaican Vireo (*V. modestus*)	Jamaica	0	5
	Cuban Vireo (*V. gundlachii*)	Cuba	0	0
	Puerto Rican Vireo (*V. latimeri*)	Puerto Rico	1	10
Corvidae	Palm Crow (*Corvus palmarum*)	Regional	2	2
	Cuban Crow (*C. nasicus*)	Cuba	1	1
	White-necked Crow (*C. leucognaphalus*)	Hispaniola	0	5
	Jamaican Crow (*C. jamaicensis*)	Jamaica	1	1
Hirundinidae	Cuban Martin (*Progne cryptoleuca*)	Cuba	0	2
	Golden Swallow (*Tachycineta euchrysea*)	Hispaniola	3	3
	Bahama Swallow (*T. cyaneoviridis*)	Bahamas	0	6
Turdidae	Cuban Solitaire (*Myadestes elisabeth*)	Cuba	2	1
	Rufous-throated Solitaire (*M. genibarbis*)	Regional	0	3
	White-eyed Thrush (*Turdus jamaicensis*)	Jamaica	0	1
	La Selle Thrush (*T. swalesi*)	Hispaniola	1	0
	White-chinned Thrush (*T. aurantius*)	Jamaica	0	3
	Red-legged Thrush (*T. plumbeus*)	Regional	3	18
	Forest Thrush (*T. lherminieri*)	Regional	0	8
Mimidae	White-breasted Thrasher (*Ramphocinclus brachyurus*)	Regional	1	10
	Scaly-breasted Thrasher (*Allenia fusca*)	Regional	2	5
	Pearly-eyed Thrasher (*Margarops fuscatus*)	Regional	2	30
	Brown Trembler (*Cinclocerthia ruficauda*)	Regional	1	2
	Gray Trembler (*C. gutturalis*)	Regional	1	2
	Bahama Mockingbird (*Mimus gundlachii*)	Regional	2	3
Fringillidae	Jamaican Euphonia (*Euphonia jamaica*)	Jamaica	0	2
	Antillean Euphonia (*E. musica*)	Regional	0	3
	Hispaniolan Crossbill (*Loxia megaplaga*)	Hispaniola	2	6
	Antillean Siskin (*Spinus dominicensis*)	Hispaniola	1	3
Parulidae	Semper's Warbler (*Leucopeza semperi*)	St. Lucia	0	2
	Whistling Warbler (*Catharopeza bishopi*)	St. Vincent	1	1
	Plumbeous Warbler (*Setophaga plumbea*)	Regional	0	2
	Elfin-woods Warbler (*S. angelae*)	Puerto Rico	0	2
	Arrowhead Warbler (*S. pharetra*)	Jamaica	0	1
	Olive-capped Warbler (*S. pityophila*)	Regional	3	3
	Bahama Warbler (*S. flavescens*)	Bahamas	1	1
	Vitelline Warbler (*S. vitellina*)	Cayman Islands	0	1
	Adelaide's Warbler (*S. adelaidae*)	Puerto Rico	1	6
	Barbuda Warbler (*S. subita*)	Barbuda	0	0
	St. Lucia Warbler (*S. delicata*)	St. Lucia	0	0
	White-winged Warbler (*Xenoligea montana*)	Hispaniola	1	4
	Green-tailed Warbler (*Microligea palustris*)	Hispaniola	2	4

Appendix 1. cont.

Family	Species	Country/Island	Number of Studies in JCO	Number of Studies in AOJ
Parulidae	Yellow-headed Warbler (*Teretistris fernandinae*)	Cuba	1	2
	Oriente Warbler (*T. fornsi*)	Cuba	3	3
Thraupidae	Lesser Antillean Tanager (*Tangara cucullata*)	Regional	0	1
	Cuban Grassquit (*Tiaris canorus*)	Regional	0	2
	Orangequit (*Euneornis campestris*)	Jamaica	2	4
	Puerto Rican Bullfinch (*Loxigilla portoricensis*)	Puerto Rico	1	9
	Greater Antillean Bullfinch (*L. violacea*)	Regional	0	9
	Lesser Antillean Bullfinch (*L. noctis*)	Regional	3	14
	Barbados Bullfinch (*L. barbadensis*)	Barbados	1	8
	Cuban Bullfinch (*Melopyrrha nigra*)	Regional	1	5
	Yellow-shouldered Grassquit (*Loxipasser anoxanthus*)	Jamaica	0	3
	St. Lucia Black Finch (*Melanospiza richardsoni*)	St. Lucia	0	3
	Lesser Antillean Saltator (*Saltator albicollis*)	Regional	0	5
Incertae sedis	Puerto Rican Tanager (*Nesospingus speculiferus*)	Puerto Rico	1	4
	Black-crowned Palm-Tanager (*Phaenicophilus palmarum*)	Hispaniola	1	7
	Gray-crowned Palm-Tanager (*P. poliocephalus*)	Hispaniola	0	1
	Western Chat-Tanager (*Calyptophilus tertius*)	Hispaniola	0	4
	Eastern Chat-Tanager (*C. frugivorus*)	Hispaniola	1	1
	Western Spindalis (*Spindalis zena*)	Regional	1	4
	Jamaican Spindalis (*S. nigricephala*)	Jamaica	0	1
	Hispaniolan Spindalis (*S. dominicensis*)	Hispaniola	0	3
	Puerto Rican Spindalis (*S. portoricensis*)	Puerto Rico	1	7
Emberizidae	Zapata Sparrow (*Torreornis inexpectata*)	Cuba	1	0
Icteridae	Red-shouldered Blackbird (*Agelaius assimilis*)	Cuba	0	7
	Tawny-shouldered Blackbird (*A. humeralis*)	Regional	0	1
	Yellow-shouldered Blackbird (*A. xanthomus*)	Puerto Rico	3	7
	Jamaican Blackbird (*Nesopsar nigerrimus*)	Jamaica	0	1
	Cuban Blackbird (*Dives atroviolaceus*)	Cuba	0	2
	Greater Antillean Grackle (*Quiscalus niger*)	Regional	4	7
	Bahama Oriole (*Icterus northropi*)	Bahamas	1	3
	Cuban Oriole (*I. melanopsis*)	Cuba	1	1
	Hispaniolan Oriole (*I. dominicensis*)	Hispaniola	2	8
	Puerto Rican Oriole (*I. portoricensis*)	Puerto Rico	1	1
	St. Lucia Oriole (*I. laudabilis*)	St. Lucia	0	4
	Montserrat Oriole (*I. oberi*)	Montserrat	0	17
	Martinique Oriole (*I. bonana*)	Martinique	0	4
	Jamaican Oriole (*I. leucopteryx*)	Jamaica	0	5

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