UNIVERSIDADE FEDERAL DE ALAGOAS – UFAL
INSTITUTO DE CIÊNCIAS BIOLÓGICAS E DA SAÚDE
Programa de Pós-Graduação em Diversidade Biológica e Conservação nos Trópicos/PPG-DIBICT

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A PRODUÇÃO DE CONHECIMENTO E A CONSERVAÇÃO DAS AVES NEOTROPICAIS: o caso das espécies silvestres, endêmicas e ameaçadas de extinção

Maceió, Estado de Alagoas
Maio/2021

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Dissertação apresentada ao Programa de Pós-Graduação em Diversidade Biológica e Conservação nos Trópicos, Instituto de Ciências Biológicas e da Saúde da Universidade Federal de Alagoas, como requisito para obtenção do grau de Mestre em CIÊNCIAS BIOLÓGICAS na área da Biodiversidade.

Orientador: Profº. Drº. Márcio Amorim Efe

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Maio/2021

Catalogação na fonte
Universidade Federal de Alagoas
Biblioteca Central
Bibliotecário Jone Sidney Alves de Oliveira – CRB4 - 1485

C129p Café, Keyla Juliana Santos Bertolino.
A produção de conhecimento e a conservação das aves Neotropicais: o caso das espécies silvestres, endêmicas e ameaçadas de extinção / Keyla Juliana Santos Bertolino Café. – 2021.
276 f.

Orientadora: Profo. Dro. Márcio Amorim Efe.
Dissertação (Mestrado em Diversidade Biológica e Conservação nos Trópicos) – Universidade Federal de Alagoas. Instituto de Ciências Biológicas e da Saúde. Maceió, 2021.

Bibliografia: f. 85 - 91.
Anexos: f. 94 - 276.

1. Biodiversidade. 2. Conservação – Aves. 3. Região Neotropical 4. Espécies Silvestres – Endêmicas. I. Título.

CDU: 574.1:598.2

Folha de aprovação

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Dissertação aprovada em 06 de abril de 2021.

Drª Presidente –Márcio Amorim Efe/UFAL
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MACEIÓ - AL
Abril/2021

À minha mãe, que faz tudo parecer possível e aos meus filhos, que me fazem acreditar.

AGRADECIMENTOS

A minha mãe, irmãos, tias e primas que, mesmos afastados pela quarentena, com suas palavras de apoio me seguraram pelas mãos, e aos meus filhos, Pedro, Maria Julia e Bruno que nunca me deixam desistir.

Aos amigos que conquistei nesta jornada e que me dedicaram sua atenção, conselhos, risos e lágrimas nos altos e baixos que a vida nos dá.

Aos professores Marcos Vital, Richard Ladle, João Campos e João Nabout por todas as contribuições que foram essenciais para a realização deste trabalho.

Ao meu orientador professor Márcio Amorim Efe por toda a paciência e dedicação, e ao LABECAN pelo acolhimento e aprendizagem.

A todos os professores do Programa de Pós-Graduação em Diversidade Biológica e Conservação nos Trópicos (PPG-DIBICT) da Universidade Federal de Alagoas, por todo o tempo dedicado em minha formação.

Aos membros titulares da banca examinadora da dissertação por terem aceitado enriquecer esse trabalho com suas colocações.

Um agradecimento muito especial a Julliene (secretária do PPG), que desde o início me auxiliou pacientemente na resolução das burocracias.

E a CAPES, Coordenadoria de Aperfeiçoamento de Pessoal de Nível Superior, pelo apoio financeiro.

Muito obrigada!

“Se eu vi mais longe, foi por estar sobre ombros de gigantes.”

Isaac Newton (1675)

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RESUMO

O conhecimento sobre a biodiversidade é essencial para direcionar ações de conservação eficientes. No entanto, na região Neotropical existe carência de informações e financiamentos voltados às espécies ameaçadas e à conservação da biodiversidade, sendo necessário direcionar os poucos recursos existentes e as estratégias com mais eficiência para os grupos e ações mais prioritárias. Sendo assim, é importante conhecer quais são esses grupos. Dentro do grupo das aves, existem lacunas de conhecimento principalmente para as espécies silvestres endêmicas e ameaçadas de extinção. No primeiro artigo, submetido à revista *Ornithology Research* e intitulado "*Are globally threatened, endemic landbirds species conservation priorities in Brazil? A Systematic Review*", avaliamos o conhecimento produzido sobre as aves terrestres endêmicas e globalmente ameaçadas no Brasil que identificamos usando os 'Perfis de país' do banco de dados da BirdLife International. A produção científica foi obtida usando o banco de dados bibliométrico SCOPUS entre 1870 e 2019. Identificamos um total de 93 espécies de aves terrestres endêmicas brasileiras classificadas pela União Internacional para Conservação da Natureza como ameaçadas. A produção científica foi fortemente distorcida, com 10 espécies associadas a quase metade (49,59%) de todos os documentos publicados e 16 espécies ainda não associadas a nenhum documento publicado na base de dados. O número de documentos aumentou significativamente a partir de 2005. A análise de palavras-chave indica que os estudos publicados cobrem uma ampla gama de tópicos, embora haja uma falta de informações para apoiar a tomada de decisões de conservação. Concluímos que mais pesquisas sobre aves terrestres endêmicas e globalmente ameaçadas no Brasil são necessárias com urgência. O desconhecimento dessas espécies pode comprometer o desenvolvimento de ações efetivas de conservação e recomendamos um maior investimento em pesquisas direcionadas a essas espécies. No segundo artigo intitulado "Conhecimento produzido versus conhecimento necessário: as lacunas de conhecimento e o impacto da IUCN na conservação de aves silvestres neotropicais endêmicas e ameaçadas" buscamos avaliar a relação entre o conhecimento produzido e o conhecimento necessário à conservação dessas espécies. Para isso extraímos informações da literatura, de bancos de dados digitais e da lista vermelha da IUCN. Métricas referentes à raridade e visibilidade das espécies e capacidade de pesquisa dos países foram analisadas para identificar os fatores que influenciam nas publicações. Identificamos 689 tipos de documentos sem repetição sobre 250 espécies de aves silvestres neotropicais ameaçadas e endêmicas. A produção científica sobre esse grupo não acompanhou a tendência global de crescimento e permaneceu muito baixo com a maioria das espécies (90%) tendo menos de cinco documentos publicados. Somente 25% das espécies foram responsáveis por mais de 70% dos estudos indexados e, em contrapartida, 65 espécies não foram associadas a nenhum documento indexado. As principais características que influenciaram a produção do conhecimento sobre o grupo foram o tamanho corporal e a visibilidade cultural. Além disso, a rede de colaboração entre os autores também amplia a capacidade de pesquisa dos países. Usando as palavras-chave apontadas nos documentos, os temas mais estudados foram: características das espécies (26,56%), interações ecológicas (24,38%), genética (14,08%), conservação (11,04%), evolução (10,74), parasitas (9,08%), gestão de Unidades de Conservação (8,71%), ameaças (7,98%) e distribuição (7,40%). Nas ações propostas pela IUCN são indicados como prioritários a criação e ampliação das áreas protegidas (78,4%), estudos para conhecer a distribuição (56,8%), abundância (42,4%), requerimentos ecológicos (38.8%). As ameaças mais citadas pela IUCN foram a perda e degradação de habitat (92,4%), caça (12,4%), comércio ilegal (9,2%), espécies exóticas invasoras (8,8%), mudança climática (8,4%), distúrbios provocados pelo gado (8%), impactos

do uso de pesticidas (6,8%) e o impacto dos parasitas (5,6%). Concluímos que diante da urgência em salvar as espécies, as lacunas Eltoniana, Prestoniana e Hutchinsoniana sobre essas espécies precisam ser preenchidas e para isso, o aumento do interesse dos pesquisadores e a ampliação dos financiamentos para projetos de pesquisa direcionados a esses temas e espécies parece ser o único caminho viável para muitas aves silvestres endêmicas e ameaçadas da região Neotropical.

ABSTRACT

Knowledge about biodiversity is essential to direct efficient conservation actions. However, in the Neotropical region there is a lack of financing and resources aimed at the conservation of biodiversity, making it necessary to direct the few existing resources to the most priority groups and actions. Therefore, it is important to know these groups are. Within the group of birds, there are knowledge gaps mainly for endemic and endangered wild species. In the first article, submitted to the journal Ornithology Research and entitled “Are globally threatened, endemic landbirds species conservation priorities in Brazil? The Systematic Review ”, we evaluated endemic and globally threatened terrestrial birds in Brazil that we identified using the‘ Country profiles ’from the BirdLife International database. Scientific production in the form of published documents was identified using the SCOPUS bibliometric database between 1870 and 2019. We identified a total of 93 species of Brazilian endemic terrestrial birds classified by the International Union for Conservation of Nature as endangered. Scientific production was strongly distorted, with 10 species associated with almost half (49.59%) of all published documents and 16 species not yet associated with any document published in the database. The number of documents increased as of 2005. Keyword analysis indicates that the studies cover a wide range of types, although there is a lack of information to support conservation decision-making. We conclude that more research on endemic and globally threatened terrestrial birds in Brazil is urgently required. The lack of knowledge about these species can compromise the development of effective conservation actions and we recommend a greater investment in research aimed at these species. In the second article entitled “Knowledge produced versus necessary knowledge: the knowledge gaps and the impact of IUCN on the conservation of endemic and endangered neotropical wild birds” we seek to assess the relationship between the knowledge produced and the knowledge necessary for the conservation of these species. For that, we extracted information from literature, from digital databases and from the IUCN red list. Metrics related to species rarity and visibility and countries' research capacity were analyzed to identify the factors that influence publications. We identified 689 types of documents without repetition about 250 species of endangered and endemic neotropical wild birds. Scientific production on this group has not kept up with the global growth trend and has remained very low with most species (90%) having less than five published documents. Only 25% of the species were responsible for more than 70% of the indexed studies and, in contrast, 65 species were not associated with any indexed document. The main characteristics that influenced the production of knowledge about the group were body size and cultural visibility. In addition, the collaboration network between the authors also expands the research capacity of the countries. Using the keywords pointed out in the documents, the most studied themes were: species characteristics (26.56%), ecological interactions (24.38%), genetics (14.08%), conservation (11.04%), evolution (10.74), parasites (9.08%), management of Conservation Units (8.71%), threats (7.98%) and distribution (7.40%). In the actions proposed by IUCN, the creation and expansion of

protected areas (78.4%), studies on distribution (56.8%), abundance (42.4%), ecological requirements (38.8%) are indicated as priorities. The threats most cited by the IUCN were habitat loss and degradation (92.4%), hunting (12.4%), illegal trade (9.2%), invasive alien species (8.8%), climate change (8.4%), disturbances caused by cattle (8%), impacts of the use of pesticides (6.8%) and the impact of parasites (5.6%). Concluímos que diante da urgência para salvar as espécies, as lacunas eltoniana, prestoniana e hutchinsoniana sobre essas espécies precisam ser preenchidas e, para isso, o aumento do interesse dos pesquisadores e a ampliação do financiamento para projetos de pesquisa direcionados a esses temas e espécies parece ser o único caminho viável para muitas aves selvagens endêmicas e ameaçadas de extinção na região Neotropical.

1 APRESENTAÇÃO

No mundo, cerca de 1.500 espécies de aves estão ameaçadas de extinção (IUCN, 2020) e a cada revisão da Lista Vermelha de Espécies ameaçadas, o estado de conservação das aves continua a piorar (Birdlife InternationaL 2017). Sabemos que para reverter essa tendência é necessário desenvolver estratégias eficientes de conservação, as quais precisam ser garantidas por recursos financeiros. No entanto, esses recursos são geralmente escassos e precisam ser gastos onde são mais eficientes (Toledo & Castillo, 1999; Cornwall, 2018). Sobretudo na região neotropical, uma das áreas com maior prioridade de pesquisa e conservação (Buechley, 2019), onde o baixo financiamento em pesquisas e os poucos recursos tecnológicos são insuficientes para alcançar a conservação das espécies (Rodrigues et al., 2006). Assim, torna-se importante identificar quais as ações e espécies prioritárias. Além disso, estratégias de conservação eficazes precisam ser baseadas em conhecimentos científicos (Scott & Csuti, 1997; Sodhi & Ehrlich, 2010; Cook et al., 2010).

Neste trabalho investigamos a tendência da produção científica sobre espécies de aves silvestres endêmicas globalmente ameaçadas de extinção na região Neotropical, avaliando a quantidade e a qualidade do conhecimento publicado no contexto de apoio a intervenções de conservação e manejo. Para tal, a dissertação foi dividida em dois artigos.

No primeiro artigo, submetido à revista Ornithology Research e intitulado “Are globally threatened, endemic landbirds species conservation priorities in Brazil? A Systematic Review”. O objetivo foi analisar a produção científica no Brasil, avaliando a quantidade e a qualidade do conhecimento publicado no contexto de apoio a intervenções de conservação e manejo.

No segundo artigo intitulado “Conhecimento produzido versus conhecimento necessário: as lacunas de conhecimento e o impacto da IUCN na conservação de aves silvestres neotropicais endêmicas e ameaçadas” o objetivo foi avaliar o conhecimento produzido e seu impacto na conservação e discutir a relação entre o conhecimento produzido e o conhecimento indicado pela IUCN como necessário à conservação das espécies, assim como identificar lacunas e vieses nas publicações.

Este trabalho também conta com um banco de dados com informações sobre todas as espécies estudadas.

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2 BASE CONCEITUAL E REVISÃO DE LITERATURA

2.1 As aves

Aves são uma classe com cerca de 18.000 espécies (Barrowclough et al. 2016) distribuídas em todo o planeta. Sua importância ecológica vai desde a polinização e dispersão de sementes aos diferentes papéis que ocupam na teia alimentar e na manutenção do equilíbrio ambiental (IUCN, 2020; BirdLife International, 2020). Entre os vertebrados, é um dos grupos mais conhecidos (Lewinsohn & Prado, 2002) e o segundo grupo mais diversificado (ICMBio, 2018). Particularmente, na região Neotropical são conhecidas cerca de 4.425 espécies de aves, sendo 534 consideradas ameaçadas globalmente (IUCN, 2020). Destas, 250 são consideradas endêmicas e de ecossistemas terrestres. O Brasil é o país que mais se destaca com 1.862 espécies e o que possui a maior quantidade de aves silvestres endêmicas e ameaçadas de extinção, com 87 espécies (BirdLife International, 2020).

A biologia básica das aves neotropicais, no entanto, ainda é pouco conhecida (Stotz *et al*., 1996; Pyle *et al.,* 2004; Marini & Garcia, 2005; Stutchbury & Morton, 2008; Harris *et al*., 2011; Enriquez *et al.,* 2012; Monsalvo *et al.,* 2018), principalmente quando a espécie é endêmica (Mason, 1985; Robinson *et al.,* 2000; De Carvalho *et al.,* 2017). A distribuição restrita dos táxons endêmicos é reconhecidamente um fator que propicia maiores taxas de extinção se comparado com espécies não endêmicas, justamente por dependerem de ambientes específicos que vêm passando por rápidas transformações, principalmente devido a fragmentação de habitats e alterações climáticas (Brook & Balmford, 1996; Stotz *et al.,* 1996; Ribon *et al.,* 2008). Estes ambientes não são necessariamente áreas com pequenas escalas espaciais, mas são regiões geográficas com tamanhos variados e biotas únicas (Morrone, 2008).

Dependendo das necessidades ecológicas, aves florestais em áreas fragmentadas apresentam diferentes níveis de sensibilidade (Henle *et al*., 2004; Newbold *et al*., 2013; Alexandrino *et al.,*2019), variando com o grau de endemismo, status de ameaça, distribuição espacial e abundância relativa em cada área de estudo (Saunders *et al.,* 1991; Acharya & Chettri, 2012). Por suas especificidades, as aves fornecem informações importantes para ajudar a estabelecer prioridades de conservação, contribuindo para diferenciar comunidades biológicas endêmicas e avaliar as condições de uma área (Stotz *et al*., 1996). Assim, torna-se urgente a necessidade de definir e executar ações que atuem diretamente na conservação

destas espécies, melhorando seu estado de conservação e diminuindo o risco de extinção (Pinto et al. 2006; Ramos Neto 2019).

2.2 As ameaças e os esforços de conservação

Nos últimos 40 anos a perda de biodiversidade tem sido reconhecida como um problema (Albagli, 2001). Entre as principais ameaças às aves endêmicas da região Neotropical já reconhecida pela IUCN (2020), destacam-se a pressão do crescimento urbano, agricultura, produção de energia e mineração, estradas, uso de recursos biológicos, modificação do ambiente, espécies invasoras, poluição e mudanças climáticas. A perda e degradação dos habitats é a maior preocupação, pois já assumiu níveis alarmantes, na Mata Atlântica e no Cerrado brasileiro, considerados *hotspots* de biodiversidade do mundo. Klink (2005) descreve que nos últimos 35 anos, mais de 50% de cerca de dois milhões de km² do Cerrado foram transformados em pastagens e terras agrícolas para cultivo comercial.

Igualmente importante, o efeito das mudanças climáticas também vem sendo preocupante e atualmente avaliado. Em aves, já foi identificado como um fator que influência na sobrevivência dos ninhos de *Calamospiza melanocorys* (ave norte-americana) afetada pelo declínio da precipitação de verão, a qual pode reduzir a probabilidade de manterem populações estáveis a longo prazo (Skagen & Adams, 2012). Em uma população de aves selvagens tropicais da ilha Maurício Senapathi *et al*. (2011) observaram que a frequência das chuvas da primavera afeta o tempo de reprodução e têm consequências em termos de redução do sucesso reprodutivo. Estas e outras ameaças precisam ser melhor compreendidas para que venham a ser mitigadas.

Esforços focados em algumas espécies têm sido empreendidos e estão ajudando a melhorar seu estado de conservação. É o caso da arara-azul (*Anodorhynchus hyacinthinus*), que de acordo com o Instituto Arara Azul (https://www.institutoararaazul.org.br/a-arara-azul/) eram ameaçadas pela captura ilegal para o comércio nacional e internacional de aves de estimação, que foi intensa até a década de 80; a destruição do habitat, principalmente com a implantação de pastagem cultivada no Pantanal, agricultura e colonização em outras regiões; a caça e coleta de penas para artesanato indígena (no Brasil está proibida desde 2005, sendo permitido apenas para cerimônias e outros usos dentro das reservas indígenas). A estes fatores,

acrescentam-se populações pequenas, baixa taxa reprodutiva e especialização na dieta e no hábitat.

A criação de áreas protegidas, envolvimento governamental, conservação *in situ*, programa de cativeiro, melhoria do habitat, atividades de educação ambiental, pesquisas sobre a biologia da espécie, fiscalização com acompanhamento constante e soltura monitorada foram ações utilizadas com as espécies que melhoraram o estado de conservação (Stotz et al., 1996; Silveira et al., 2008; Silveira, 2009), no entanto, não existe uma receita pronta, pois cada espécie possui características biológicas distintas que precisam ser melhor entendidas para que as ações possam ser direcionadas. Além disso, a região Neotropical é carente de investimentos financeiros e recursos tecnológicos aplicados a conservação da biodiversidade (Rodríguez et al 2006). Pesquisas adiadas por falta de fundo significam oportunidades perdidas de compreensão e conservação de sistemas que nunca mais existirão (Soulé e Kohm 1989). Por isso, torna-se importante direcionar os poucos recursos existentes com mais eficiência, apoiado em bons indicadores ecológicos ou atalhos para guiar o processo de decisão (Metzger 2009), o que só é possível baseando-se em informações seguras sobre a ecologia da espécie e a situação atual da população (Ayres et al 2005; Silveira et al 2008).

2.3 A importância do conhecimento científico para a conservação

Sabemos que estratégias de conservação eficazes precisam ser baseadas em conhecimentos científicos (SCOTT & CSUTI, 1997; COOK *et al*. 2009), para se entender os reais problemas enfrentados pelas espécies e orientar ações efetivas, focando no que é prioritário e propiciando, assim, que o pouco recurso existente seja bem utilizado (Sutherland *et al*. 2004). A falta de pesquisas sobre os impactos do clima na biodiversidade tropical, por exemplo, dificulta a compreensão sobre a vulnerabilidade das espécies tropicais às mudanças em andamento e projetadas (Harris *et al*., 2011).

Quando falamos em conhecimento sobre a biodiversidade, a IUCN-União Internacional para Conservação da Natureza se destaca por reunir organizações e especialistas em um esforço combinado para conservar a natureza e acelerar a transição para o desenvolvimento sustentável (IUCN, 2020). As informações sobre as espécies ameaçadas apontadas pela IUCN podem influenciar em decisões administrativas e planejamentos, além de estimular o fomento à pesquisa (Betts et al., 2019). As ações de conservação indicadas em

seus documentos podem ser direcionadas principalmente às espécies que estão à beira da extinção (Brooke et al., 2014). No entanto, Mckenzie & Robertson (2015) ressaltam que as espécies populosas e amplamente distribuídas, nativas e residentes estão recebendo mais atenção nos planos de ação para a biodiversidade e apresentam estatisticamente, maiores números de artigos e informações publicadas. Existe, no entanto, uma variação quanto a motivação da pesquisa que precisa ser melhor investigada em diferentes grupos. Além disso, a maioria das pesquisas com aves são desenvolvidas com as espécies maiores, mais visíveis e / ou carismáticas, nas regiões onde vive a maioria dos pesquisadores e onde há mais financiamento disponível (Martín-López et al., 2011, Griffiths & Dos Santos, 2012).

Apesar de Gomes (2016), comparando grupos animais diversos, concluir que a produção de conhecimento não se mostrou influenciada pela lista vermelha mas sim por fatores biológicos e sociais de exposição das espécies, Betts et al. (2019), em contrapartida, mostrou um resultado diferente quando entrevistou pesquisadores e a maioria afirmou que a lista vermelha influenciou nas suas pesquisas. Assim, é possível que essa diferença varie com o grupo estudado. De forma geral, o interesse científico em uma espécie é uma medida composta, refletindo a facilidade com que uma espécie pode ser estudada, seu valor comercial, a disponibilidade de financiamento para pesquisa, o estado de conservação da espécie, os danos ou riscos associados à sua presença, as contribuições pessoais ou interesses de cientistas individuais e o interesse público nos resultados (Bonnet et al., 2002; Brooke et al., 2014; Robertson & Mckenzie, 2015; Mckenzie & Robertson, 2015). Alguns desses e outros fatores podem ser testados para identificar padrões e vieses na pesquisa com aves silvestres endêmicas e ameaçadas de extinção na região Neotropical.

Além das ameaças (Frick et al., 2019), seus efeitos sobre o declínio das espécies (Caughley 1994; Sutherland et al., 2007) e as estratégias eficazes para minimizá-las (Dias et al., 2019), as lacunas no conhecimento sobre requerimentos ecológicos precisam ser cuidadosamente reconhecidas e quantificadas (Hortal et al., 2105). A falta de conhecimento sobre as interações das espécies e seus efeitos na sobrevivência e aptidão individual, conhecida como lacuna Eltoniana (Peterson et al. 2011), compromete a compreensão sobre os processos do ecossistema, os fatores de perda de espécies e o manejo adequado à conservação (Hortal et al. 2015; Rosado et al. 2016).

Igualmente, a falta de conhecimento sobre a história de vida e os papéis funcionais das espécies, conhecida como lacuna Hutchinsoniana (Cardoso et al. 2011) dificulta as ações *ex-situ* e a capacidade de prever as respostas às mudanças no habitat (Mokany & Ferrier, 2011). Da mesma forma, a carência de dados sobre a abundância e dinâmica populacional das espécies, conhecida como lacuna Prestoniana (Cardoso et al., 2011), fragiliza a tomada de decisão sobre o futuro das populações a médio e longo prazo.

2.4 A cienciometria como ferramenta de análise do conhecimento

Uma vez que a produção de conhecimento é fundamental para o embasamento das ações de conservação (SCOTT & CSUTI, 1997; SODHI & EHRLICH, 2010; COOK et al., 2013). A cienciometria aparece como uma das formas mais úteis para avaliar a produção científica sobre os diversos temas (Spinak,1998). Além disso, assuntos reunidos pela metodologia cienciométrica pode ajudar a analisar muitos outros aspectos da dinâmica do assunto, como organizar informações, compreender a dinâmica da informação e verificar lacunas e tendências (Leydesdorff & Milojević, 2015; Mingers & Leydesdorff, 2015). Atualmente, um aumento em estudos cienciométricos têm sido verificado em várias áreas do conhecimento (King, 2004; Carneiro et al., 2008; Nabout et al. 2012).

Particularamente em relação às aves, e todo o mundo, a maior parte da literatura ornitológica no início do século XX tratava da biologia da reprodução, dinâmica populacional e conservação biológica e manejo da vida selvagem (Bautista & Pantoja 2000). Atualmente, buscando identificar os principais temas e lacunas no conhecimento atual das aves do Pantanal, Frota *et al*. (2020) realizou uma análise cienciométrica com base em cinco plataformas de dados em que considerou 30 anos de pesquisas científicas para direcionar estudos futuros, identificando estudos científicos com temas principalmente de ecologia e conservação, porém focado em poucas espécies e ambientes. Da mesma forma, utilizando outro viés, Kullenberg & Kasperowski (2016) analisaram dois conjuntos de dados recuperados da plataforma *Web of Science* (WoS) e concluíram que pesquisas em biologia, conservação e ecologia são as que mais utilizam a Ciência Cidadã como metodologia de coleta e classificação de dados. No entanto, é importante notar que o número de estudos sobre espécies ameaçadas ainda é baixo (Ducatez & Lefebvre, 2014; Buechley et al., 2019).

Neste sentido, mapear e analisar assuntos, a partir de documentos, obras de autores ou periódicos tem se mostrado uma estratégia válida para conhecer as características e padrões

dos temas (Leydesdorff & Milojević, 2015). Entende-se, no entanto, que as motivações para a pesquisa sobre aves são muitas e variadas, levando à representação e cobertura de espécies desiguais. Além disso, como essa evidência é usada para apoiar uma ampla gama de ações de conservação, gestão e políticas, é importante que lacunas e vieses sejam identificados e compreendidos (Mckenzie & Robertson, 2015).

Desse modo, para que a análise seja bem-sucedida, deve haver fontes abrangentes e precisas de dados. Assim, as bases de dados *Scopus* e *Web of Science* (WoS) são as principais e mais abrangentes fontes de metadados de publicação (Mingers & Leydesdorff, 2015; Pranckute, 2021). Particularmente, a plataforma *Scopus* cobre 25.100 periódicos, conferências e livros desde 1788 (Pranckute, 2021) e, por isso, foi escolhida para acessarmos as publicações sobre aves.

Portanto, o objetivo deste trabalho foi investigar a tendência da produção científica sobre espécies de aves silvestres endêmicas globalmente ameaçadas de extinção na região Neotropical e no Brasil, país de maior biodiversidade, avaliando a quantidade e a qualidade do conhecimento publicado no contexto de apoio a intervenções de conservação e manejo. Para tal, a dissertação encontra-se dividida em dois artigos.

No primeiro artigo, submetido à revista *Ornithology Research* e intitulado "*Are globally threatened, endemic landbirds species conservation priorities in Brazil? A Systematic Review*". O objetivo foi analisar a produção científica sobre espécies endêmicas de aves silvestres globalmente ameaçadas no Brasil, avaliando a quantidade e a qualidade do conhecimento publicado no contexto de apoio a intervenções de conservação e manejo.

No segundo artigo intitulado "Conhecimento produzido versus conhecimento necessário: as lacunas de conhecimento e o impacto da IUCN na conservação de aves silvestres neotropicais endêmicas e ameaçadas" o objetivo foi avaliar o conhecimento produzido e seu impacto na conservação de aves silvestres neotropicais globalmente ameaçadas e endêmicas e discutir a relação entre o conhecimento produzido e o conhecimento indicado pela IUCN como necessário à conservação das espécies.

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3 Are globally threatened, endemic landbirds conservation priorities in Brazil? A Systematic Review**

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ABSTRACT

Globally, about 1,500 bird species are considered threatened and the overall conservation status of most species continues to deteriorate. In addition, many endemic birds that inhabit rapidly changing environments also require urgent conservation efforts. Understanding the problems faced by these species, guiding effective conservation actions, and optimizing the use of limited resource is therefore a priority. Effective conservation strategies need to be based on scientific knowledge, so systematically assessing scientific production can help identify species whose conservation may be compromised by limited knowledge. Here, we assess endemic, globally threatened landbirds in Brazil that we identified using the 'Country Profiles' of the BirdLife International's database. Scientific production in the form of published documents were identified using the SCOPUS bibliometric database between 1870 and 2019. We identified a total of 93 Brazilian endemic landbird species categorized by the International Union for Conservation of Nature as threatened. Scientific production was strongly skewed, with 10 species associated with almost half (49.59%) of all published documents, and 16 species not yet associated with any published document in the database. The number of documents increased significantly from 2005. Keyword analysis indicates that published studies cover a wide range of topics, although there is a lack of information to support conservation decision-making. We conclude that more research on endemic, globally threatened landbirds in Brazil is urgently required. Lack of knowledge of these species is likely to compromise the development of effective conservation actions and we recommend greater investment in targeted research on these species.

KEYWORDS scientometrics, Brazilian ornithology, Brazilian scientific production, ornithological research trends, ornithological research gaps

DECLARATION

Conflicts of interest: The authors declare no conflict of interest.

**Artigo submetido à revista Ornithology Research

Funding: This paper is part of the M.Sc., dissertation of K.J.S.B.C., supported by scholarship No. 88882.452192/2019-1, granted by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES)

Authors' contributions K.J.S.B.C. and M.A.E. conceived the idea, design the collected data and analyzed the data; L.M.S.O and M.V.C.V analyzed the data; all the authors authored or reviewed drafts of the paper and approved the final draft.

INTRODUCTION

Birds are one of the best-known vertebrate classes (Lewinsohn and Prado 2002) and are therefore an excellent means through which to 'take the pulse' of the planet (BirdLife International 2020). For example, information on the abundance and distribution of bird species has been instrumental in setting conservation priorities (Guisan et al. 2013; Baker et al. 2018). Endemic (geographically localized) birds are particularly important indicators, since they have higher extinction rates compared to non-endemic species and are frequently restricted to environments that are undergoing rapid transformations due to human actions (Ribon et al. 2003). These characteristics make them particularly important species for establishing key conservation actions (Burlakova et al. 2011) and defining priority areas for protection (Loyola et al. 2007).

Around 1,500 bird species worldwide are threatened with extinction (IUCN 2019) and over the years the situation of most species has become increasingly critical (Marini and Garcia 2005; BirdLife International 2018). The development of effective conservation strategies for these species depends, to a certain extent, on the availability and quality of scientific knowledge (Scott and Csuti 1997; Cook et al. 2009; Doi and Takahara 2016). Such

information can be used to increase understanding of the complex problems faced by these species, to guide effective actions, and to prioritize limited resources to support sites, species and management actions (McCarthy et al. 2012). Despite the clear importance of scientific information, many bird species, especially those with small populations, are still poorly known (Marini and Garcia 2005). It has been estimated that as much as 77% of the data sources used for conservation management are ‘anecdotal’ and only 2% are based on verifiable scientific evidence (Sutherland et al. 2004).

In this context it is clearly useful to understand the ‘landscape’ of ornithological research, distinguishing which species are well studied from those that are poorly known and which may be more vulnerable due to the difficulties of identifying and implementing effective conservation actions. Specifically, we need to quantify the temporal, spatial and thematic distribution of scientific knowledge about the threatened and geographically localized bird species (Bautista and Pantoja 2000). In this way, it will be possible to better guide future studies and to increase our understanding of trends and gaps in knowledge production (Nabout et al. 2012; Borges et al. 2015).

The quantitative study of scientific knowledge is termed ‘scientometrics’ (Spinak 1996), and its tools and methods are well suited to studying trends in publications about threatened and endemic bird species (Moreno-Opo and Margalida 2014; Yarwood et al. 2014). Such information can potentially be used to support a wide range of conservation, management and policy actions, and to identify gaps and biases (Mckenzie and Robertson 2015). The objective of this work was to analyze scientific production on endemic, globally threatened landbird species in Brazil, evaluating the quantity and quality of published knowledge in the context of supporting conservation interventions and management.

MATERIAL AND METHODS

Endemic, globally threatened Brazilian landbirds were selected using the 'Country Profile' of BirdLife's data zone (BirdLife International 2019). Published documents (including inventories) relating to these species for the years 1870 and 2019 were then collected in the SCOPUS database using the following search terms: i) the scientific name of the species (including synonyms), and; ii) the common name in English (available on the Avibase platform - https://avibase.bsc-eoc.org/avibase.jsp). Retrieved documents were downloaded in BibTeX format containing the following information: (i) authors; (ii) document title; (iii) year; (iv) journal title (v) source & document type (e.g. papers, notes, reviews, letters, erratum, book chapter); (vi) affiliations; (vii) publisher; (viii) abstract; (ix) index keywords.

Publications were collated and analyzed in Microsoft Excel® and R software (R Development Core Team 2020) using bibliometrix package (Aria and Cuccurullo 2017). This package allowed quantification of the number of publications related to each species, the number of papers published per year and the frequency of each keyword used in the papers. The total number of papers published each year was analyzed by a simple linear regression, using the year as an explanatory variable, to identify the possible pattern of total paper increase through time. To place the growth patterns of published documents in a more general context, we calculated the average percentage increase in the number of documents in relation to the results of a search on SCOPUS for [Birds OR Bird OR Aves], including results from all countries, hence giving a relative number of papers. In order to identify possible patterns of keywords usage through time, we also summarized the total keyword frequency per year and used these results to perform a Principal Component Analysis (PCA) using vegan package (Oksanen et al. 2013). Since there is no standard for keywords usage between different

authors and journals, we manually checked all of them and replaced each keyword with a broader term (e.g., replacing species names with the corresponding Order – Appendix 1).

In addition to the keywords, we analyzed titles and abstracts to identify publications with topics directly applied or applicable to conservation. Studies dealing with the ecology, reproduction and development of individuals were considered, in addition to population studies, studies to clarify the distribution, actions aimed at protecting areas, creating new protected areas and environmental education.

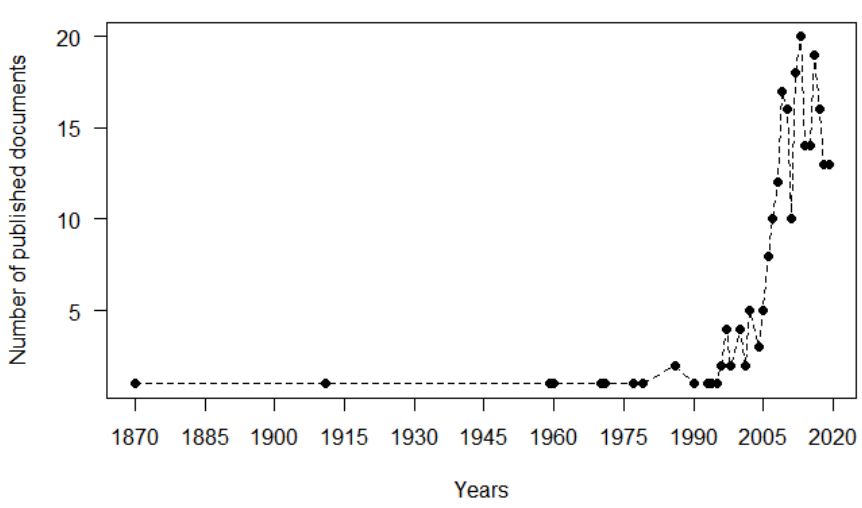
RESULTS

Brazil has 93 endemic, globally threatened landbird species (Appendix 2). As a result of searching the SCOPUS database we identified and retrieved 241 published documents (224 papers, eight notes, four reviews, two letters, two erratum and one book chapter) until 2019. All published documents were used in the analysis.

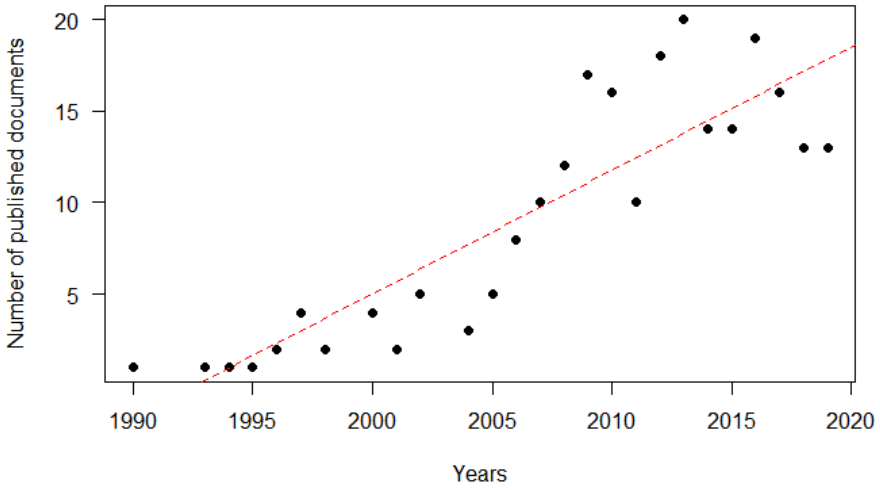
We observed high levels of taxonomic bias. Our results show that 10 species are responsible for 49.59% of all research: the most studied species were *Guaruba guarouba* (23 published documents) *Crax blumenbachii* (18 published documents) and *Anodorhynchus leari* (14 published documents). However, 16 species were not associated with any published documents indexed in the database (Appendix 2), including *Columbina cyanopis*, which are classified as critically endangered and other species, such as *Amazona diadema*, *Formicivora erythronotos*, *Rhopornis ardesiacus*, *Automolus lammi*, *Cranioleuca muelleri*, *Iodopleura pipra* and *Phylloscartes beckeri*, that are classified as endangered. Among the species without published studies are also those considered Vulnerable *Celeus tinnunculus*, *Hemitriccus mirandae*, *Myrmotherula minor*, *Myrmotherula urosticta*, *Neopelma aurifrons*, *Pionus reichenowi*, *Tangara fastuosa* and *Touit surdus*.

Scientific production remained low (an average of 1.1 published documents per year, excluding years with no publications) between 1870 and 1990 (Fig 1a). However, there was a statistically significant increase from 1990 to 2019 ($p<0.001$, $R^2=0,768$), with an average of 0.67 more published documents each year (Fig 1b). Finally, when we analyzed the relative number of publications (i.e., the number of papers found with our search terms comparing with the total output of bird research) with a simple linear regression, we still find a statistically significant increase in the same period, with an average increase of 0.41 more published documents per year (relative to each 10,000 documents on birds), although the relationship is weaker ($p<0.001$, $R^2=0.446$) (Figure 1c).a

a



b



c

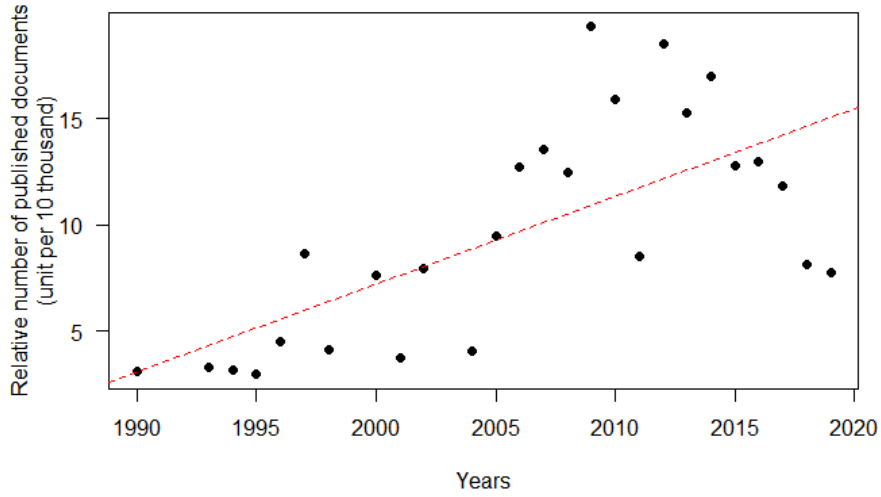


Fig 1 Total number of published documents about endemic, globally threatened Brazilian landbirds indexed in SCOPUS between 1870 and 2019 (a), simple linear regression of the number of publications in response of years from 1990 to 2019 (b) and simple linear regression of the relative number of publications in response to years from 1990 to 2019 (c).

A total of 629 keywords were extracted from the articles and were replaced by 143 standardized terms (Table 1). Some items are very general and indicate more specific search patterns such as Taxonomy (n=42), conservation (n =36), distribution (n = 23), life history (n = 22), genetics (n = 22) and evolution (n = 21).

Table 1 Main researched areas investigated worldwide (number of published documents = 241) with SCOPUS indexed publications between 1870 and 2019, on endemic, threatened Brazilian landbird species

Terms	Freq
LOCAL	192
PSITTACIFORMES	101
PASSERIFORMES	95
METHOD	74
GROUP	66
TAXONOMY	42
CONSERVATION	36
GALLIFORMES	25
DISTRIBUTION	23
GENETIC	22
LIFE HISTORY	22
EVOLUTION	21
BEHAVIOR	19
BREEDING	19
PICIFORMES	19
HEALTH	18
PARASITES	18
POPULATION	18
KNOWLEDGE	14
MORPHOLOGY	14
THREATS	14
MANAGEMENT	13
PROTECTED AREA	12
BIOTA	11
DIET	10
VETERINARY	10
BIOGEOGRAPHY	9
ACCIPITRIFORMES	7
HABITAT	6
APODIFORMES	5
GRUIFORMES	5
UNDEFINED	5
AUTHOR	2
CAPRIMULGIFORMES	2
CHARADRIIFORMES	2
SEED DISPERSAL	2
STRIGIFORMES	2
CHEMISTRY	1

Terms	Freq
COLUMBIFORMES	1
GALBULIFORMES	1
PELECANIFORMES	1

The principal component analysis using the standardized keywords frequency explained 73.38% of data variation within the first two principal components. Since many keywords have a small contribution to the ordination, we chose to display only the words with loadings that summed more than 0.75 in the first two components (Fig 3). Manual evaluation of titles and abstracts of each publication revealed that 29.38% of the indexed works are applied or directly applicable to conservation.

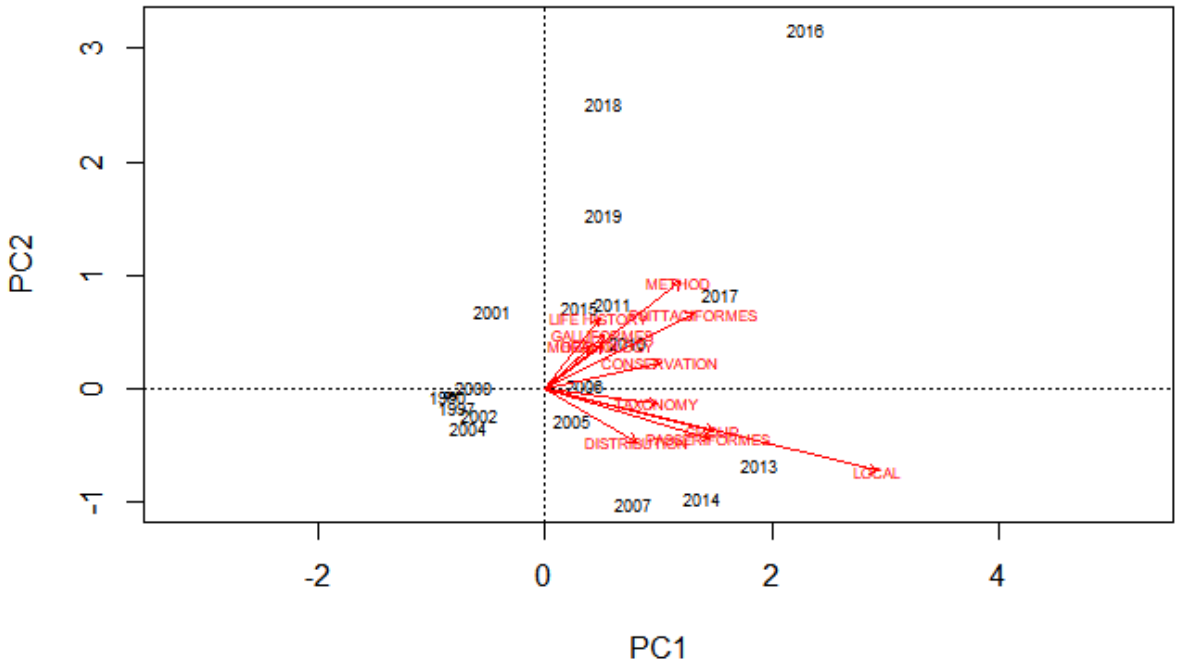


Fig 2 Ordination of keywords used per year on the analyzed papers performed by a PCA (number of published documents = 241) with SCOPUS indexed between 1870 and 2019, on endemic and threatened Brazilian landbird species. The first and second axes explain 51.92 and 12.03% of the data variation, totaling 71.23%.

DISCUSSION

Our scientometric analysis identified key research trends, as well as some significant gaps in research on endemic, threatened Brazilian landbird species. Our results show a trend of increasing research production over the years as has been reported in similar studies centered on diverse knowledge areas (King 2004; Carneiro et al. 2008; Nabout et al. 2012). However, it is important to note that despite this increasing trend (especially since 2005), the number of studies on endemic, threatened Brazilian landbird species is still low. Similar patterns have been shown across others threatened birds (Ducatez and Lefebvre 2014; Buechley et al. 2019). In the current study, most species (approximately 90%) have less than six published documents, despite the species ecological and cultural importance (Bracken and Low 2012).

Keywords help search engines identify the topics that papers cover and have been widely utilized to reveal the basic elements covered in the research (Su & Lee 2010). Moreover, these terms should broadly reflect the content of the main study. Thus, the lack of studies and knowledge about this important group of birds, verified in our analysis of these themes, is likely to compromise the development and application of efficient conservation actions. For example, studies detailing nest building or feeding behavior would be of great importance for the design of artificial nests and feeders; two efficient and low-cost conservation interventions.

The low levels of knowledge production about endemic, threatened species may be related to the inherent difficulty of finding rare species with small populations or the difficulty of access to their areas of occurrence (Kunin and Shmid 1997; Novotný and Basset 2000; Caro et al. 2011). Moreover, even if a rare species can be found and studied, the difficulties of generating sufficient data to publish the results of the study in a peer reviewed journal may deter researchers from focusing on such species (Caro 2007). Consequently, bird research is

often focused on the largest, most visible and/or “charismatic” species, in the regions where most researchers live and where there is more funding available (Martín-López et al. 2011; Griffiths and Dos Santos 2012). Such cultural impacts on research effort lead to taxonomic bias, even when species have an important role in the maintenance of ecosystem functions and contribute to the maintenance of the all ecosystem diversity (Doi and Takahara 2016).

Although there has been considerable research over the last few decades on how to conserve specific species or communities at ecosystem and global scales (Primack 1993), only a few bird species are actually well studied, such as *Guaruba guarouba*, *Crax blumenbachii*, *Amazona pretrei* and *Anodorhynchus leari*. These species are notable for being traded in Brazil and internationally (Costa et al. 2018), and are frequently the focus of conservation projects (Marini and Garcia 2005; Hammer and Watson 2012; Bernardo and Locke 2014). We also found that 60 species had less than five published documents and 16 species were not associated with any published documents indexed in the database, among them *Columbina cyanopis*, recently rediscovered and with extremely small populations (Alteff et al. 2019; Borges et al. 2019).

Globally, most ornithological literature at the beginning of the XX Century dealt with breeding biology, population dynamics and biological conservation and wildlife management (Bautista and Pantoja 2000). However, in the Brazil, our data indicates that recent studies cover a wide range of topics, with a significant proportion focused on the conservation of parrots of the Atlantic Forest and Cerrado. There were few studies that focused on ecological and life history traits, essential information to assess the vulnerability of species to extinction threats (Jennings et al. 1998; Ferguson and Lariviere 2002). Such a lack of basic ecological information further limits evidence-based assessment of management options in conservation efforts (Cisneros-Mata et al. 1995). Such feedback between evidence and actions maintains a

vicious cycle which hinders the effective protection of species, decreases the value of conservation research, and potentially diverts scientific efforts and funds to other areas (Doi and Takahara 2016). As with other disciplines, economics and the availability of research funds is important for increasing the scientific production in conservation/ecological fields (Doi and Takahara 2016). In this context, the financial crisis in Brazil has been severely affecting the support for science in general (Barbuy 2018), and the conservation of biodiversity in particular.

It should be noted that we are relying on published and indexed works in the Scopus database, however, there may be publications indexed in other databases or even without being indexed. In addition, there are recently elevated species for the species category that may have their number of articles underestimated, but with important information about them in articles where they appear as a subspecies.

Our database indicates that the Atlantic forest and the Cerrado are the biomes where most studies took place. This might be related to the fact that Atlantic Forest and Cerrado are biodiversity hotspots (Myers et al. 2000), and, are therefore, priority areas for conservation research. Since field studies are always costly in time and resources, they will always be in limited supply (Doi and Takahara 2016; Santos 2018; Escobar 2019). It is therefore necessary to increase investment in long-term research and priority themes, thereby maximizing research effort on endemic, globally threatened species.

In conclusion, we show an increasing trend of research on endemic, threatened landbird species in Brazil, though the volume of studies is still very low and they are clearly not a research priority, even among conservation scientists. Only 10 species are responsible for almost half of all published research and we clearly still lack information on basic biology and ecology for many species in this group. Studies in our database covered a wide range of

topics, but many lack pertinent information to support decision-making on management and conservation. The lack of knowledge about this group compromises the effective conservation of these species and it should be a policy priority to increase research effort of national researchers.

ACKNOWLEDGMENTS

We thank Richard J. Ladle for comments on our results and for proof-reading this manuscript.

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Appendix1: List and frequency of keywords indicated by the authors of published documents on endemic and endangered wild birds globally in Brazil and themes from the broad areas of conservation science to which they have been associated.

Keyword	Freq	terms
ACCIPITRIDAE	1	ACCIPITRIFORMES
EAGLES	1	ACCIPITRIFORMES
HEALTH STATUS	1	ACCIPITRIFORMES
LEPTODON FORBESI	2	ACCIPITRIFORMES
LEPTOSPIROSIS	1	ACCIPITRIFORMES
LEUCOPTERNIS LACERNULATA	1	ACCIPITRIFORMES
P LONGUEMAREUS AETHOPYGA	1	APODIFORMES
PHAETHORNIS AETHOPYGA	1	APODIFORMES
PHAETHORNITHINAE	1	APODIFORMES
TROCHILIDAE	2	APODIFORMES
FÉLIX DE AZARA	1	AUTHOR
M H K LICHTENSTEIN	1	AUTHOR
ABNORMAL BEHAVIOR	1	BEHAVIOR
ADAPTATION	1	BEHAVIOR
ANIMAL BEHAVIOR	1	BEHAVIOR
ANIMAL BEHAVIOUR	1	BEHAVIOR
BEHAVIOR CHANGE	1	BEHAVIOR
ECOLOGICAL SEGREGATION	1	BEHAVIOR
FEATHER DAMAGING BEHAVIOR	1	BEHAVIOR
FEATHER PLUCKING	1	BEHAVIOR
FLOCKING PATTERNS	1	BEHAVIOR
FORAGING	1	BEHAVIOR
FORAGING ECOLOGY	1	BEHAVIOR
FORAGING STRATEGIES	1	BEHAVIOR
INDIGENOUS LANDS	1	BEHAVIOR
LEAR S MACAW	2	BEHAVIOR
REPRODUCTIVE BEHAVIOR	1	BEHAVIOR
RESOURCE PARTITIONING	1	BEHAVIOR
SELF COMPATIBILITY	1	BEHAVIOR
FEEDING BEHAVIOR	1	BEHAVIOR
AMAZONIAN BIOGEOGRAPHY	1	BIOGEOGRAPHY
BIOGEOGRAPHY	4	BIOGEOGRAPHY
GEOGRAPHIC BARRIERS	1	BIOGEOGRAPHY
PALEOGEOGRAPHY	1	BIOGEOGRAPHY
PLEISTOCENE	1	BIOGEOGRAPHY
PLIO PLEISTOCENE	1	BIOGEOGRAPHY
A PLATYCERI	1	BIOTA
APE	1	BIOTA
BAMBOO	1	BIOTA

Keyword	Freq	terms
FLIES	1	BIOTA
GUADUA PANICULATA	1	BIOTA
IXODIDA	1	BIOTA
LEPIDOTHRIX	1	BIOTA
PALM TREES	1	BIOTA
SAPAJUS XANTHOSTERNOS	1	BIOTA
SNAKE BITE	1	BIOTA
WORM LIZARD	1	BIOTA
BREEDING	1	BREEDING
BREEDING BIOLOGY	2	BREEDING
BREEDING ECOLOGY	1	BREEDING
BREEDING PERIOD	1	BREEDING
COURTSHIP	1	BREEDING
EGGS	1	BREEDING
NEST	1	BREEDING
NEST SITE SELECTION	1	BREEDING
NEST SITES	1	BREEDING
NEST SURVIVAL	1	BREEDING
NESTING	1	BREEDING
NESTING BIOLOGY	1	BREEDING
NESTLING CARE	1	BREEDING
NESTLING GROWTH	1	BREEDING
NESTLINGS	1	BREEDING
NESTS	1	BREEDING
REPRODUCTION	2	BREEDING
LITTLE HERMIT	1	CAPRIMULGIFORMES
TAPAJOS HERMIT	1	CAPRIMULGIFORMES
CHROICOCEPHALUS MACULIPENNIS	1	CHARADRIIFORMES
LEAF HARVEST	1	CHARADRIIFORMES
PHENOL RED	1	CHEMISTRY
ZENAIDA AURICULATA	1	COLUMBIFORMES
BIRD CONSERVATION	1	CONSERVATION
CONSERVATION	27	CONSERVATION
CONSERVATION COSTS	1	CONSERVATION
CONSERVATION GENETICS	1	CONSERVATION
CONSERVATION INTERVENTION	1	CONSERVATION
CONSERVATION PLANNING	1	CONSERVATION
CONSERVATION UNITS	1	CONSERVATION
FEEDING AND CONSERVATION	1	CONSERVATION
MINIMUM VIABLE POPULATION	1	CONSERVATION
THREATENED SPECIES RECOVERY	1	CONSERVATION
DIET	4	DIET

Keyword	Freq	terms
FOOD ENRICHMENT	1	DIET
FRUGIVORY	2	DIET
FRUIT SIZE	1	DIET
SEED PREDATORS	1	DIET
VERTEBRATE FRUGIVORES	1	DIET
AREA OF OCCUPANCY	1	DISTRIBUTION
AVIAN INVENTORY	1	DISTRIBUTION
COEXISTENCE	1	DISTRIBUTION
DISJUNCT DISTRIBUTION	1	DISTRIBUTION
DISTRIBUTION	6	DISTRIBUTION
GEOGRAPHIC DISTRIBUTION	3	DISTRIBUTION
GEOGRAPHICAL DISTRIBUTION	1	DISTRIBUTION
INVERSE OPAL	1	DISTRIBUTION
OCCURRENCE	1	DISTRIBUTION
POTENTIAL DISTRIBUTION	2	DISTRIBUTION
RANGE EXTENSION	1	DISTRIBUTION
RECORDS OF OCCURRENCE	1	DISTRIBUTION
SPECIES DISTRIBUTION	1	DISTRIBUTION
SPECIES LIMITS	1	DISTRIBUTION
TERRITORY	1	DISTRIBUTION
AVIAN SPECIATION	1	EVOLUTION
DIVERSIFICATION	2	EVOLUTION
EVOLUTION OF PARROTS	1	EVOLUTION
HYBRID ZONE	1	EVOLUTION
HYBRIDIZATION	1	EVOLUTION
MOLECULAR PHYLOGENETICS	1	EVOLUTION
MOLECULAR SYSTEMATICS	1	EVOLUTION
NEOTROPICAL AVIAN EVOLUTION	1	EVOLUTION
PHYLOGENY	4	EVOLUTION
RECENT DIVERGENCE	1	EVOLUTION
RELICTUATION	1	EVOLUTION
SPECIATION	2	EVOLUTION
SYSTEMATICS	3	EVOLUTION
VICARIANCE	1	EVOLUTION
BUCCONIDAE	1	GALBULIFORMES
ABURRIA JACUTINGA	1	GALLIFORMES
CRACID	1	GALLIFORMES
CRACIDAE	3	GALLIFORMES
CRACIDS	6	GALLIFORMES
CRAX BLUMENBACHII	7	GALLIFORMES
CRAX FASCIOLATA	1	GALLIFORMES
CURASSOW	1	GALLIFORMES

Keyword	Freq	terms
GALLIFORMES	1	GALLIFORMES
MUTUM PINIMA	1	GALLIFORMES
PENELOPE OBSCURA	1	GALLIFORMES
RED BILLED CURASSOW	2	GALLIFORMES
ANONYMOUS NUCLEAR LOCI	1	GENETIC
BFDV	1	GENETIC
CHROMOSOMES	1	GENETIC
GENES ISS	1	GENETIC
GENETIC DIVERSITY	1	GENETIC
GENOMICS	1	GENETIC
HUNTING	2	GENETIC
KARYOTYPES	1	GENETIC
LAMPROSPIZA MELANOLEUCA	1	GENETIC
LARUS GLAUCODES	1	GENETIC
MITOCHONDRIAL DNA	2	GENETIC
MITOGENOME	2	GENETIC
NEW GENUS	1	GENETIC
NEXT GENERATION SEQUENCING	1	GENETIC
NUCLEAR DNA	1	GENETIC
POPULATION GENETICS	3	GENETIC
REPRODUCTIVE ISOLATION	1	GENETIC
AVES	4	GROUP
AVIAN	1	GROUP
AVIAN ENDEMISM	1	GROUP
AVIAN FAUNA	1	GROUP
AVIFAUNA	6	GROUP
BIODIVERSITY	2	GROUP
BIRD	2	GROUP
BIRD COMMUNITY	1	GROUP
BIRDS	15	GROUP
BIRDS OF PREY	2	GROUP
CRITICALLY ENDANGERED	1	GROUP
ENDANGERED BIRDS	1	GROUP
ENDANGERED SPECIES	9	GROUP
ENDEMIC SPECIES	3	GROUP
FALCONIFORMES	1	GROUP
NEOTROPICAL BIRDS	1	GROUP
RAPTORS	2	GROUP
THREATENED BIRD	1	GROUP
THREATENED GRASSLAND BIRDS	1	GROUP
THREATENED SPECIES	7	GROUP
WILD ANIMAL	1	GROUP

Keyword	Freq	terms
WILD BIRDS	2	GROUP
WILDLIFE	1	GROUP
NEOCREX ERYTHROPS	1	GRUIFORMES
PORZANA ALBICOLLIS	1	GRUIFORMES
PSOPHIA	1	GRUIFORMES
PSOPHIA VIRIDIS	1	GRUIFORMES
PSOPHIIDAE	1	GRUIFORMES
HABITAT FRAGMENTATION	2	HABITAT
HABITAT USE	3	HABITAT
HAWKS	1	HABITAT
ANIMAL HEALTH	1	HEALTH
ANTIBODIES	1	HEALTH
BACTERIAL RESISTANCE	1	HEALTH
CHLAMYDIOSIS	1	HEALTH
CLOACAL MICROBIOTA	1	HEALTH
CRYPTOSPORIDIUM	1	HEALTH
E COLI	1	HEALTH
ENCEPHALITIS	1	HEALTH
ESCHERICHIA COLI	2	HEALTH
HEMATOLOGY	1	HEALTH
HERPSILOCHMUS PECTORALIS	1	HEALTH
MYCOPLASMA GALLISEPTICUM	1	HEALTH
POACHING	1	HEALTH
PSEUDOMONAS AERUGINOSA	1	HEALTH
PSITTACINE BEAK AND FEATHER DISEASE	1	HEALTH
SALMONELLA SPP	1	HEALTH
VIRULENCE FACTORS	1	HEALTH
AVIAN SURVEY	1	KNOWLEDGE
COALESCENT THEORY	1	KNOWLEDGE
FLORAL BIOLOGY	1	KNOWLEDGE
HEMATOPHAGOUS ECTOPARASITES	1	KNOWLEDGE
INHAMUM	1	KNOWLEDGE
LANDSCAPE GENETICS	1	KNOWLEDGE
LOCAL BOTANICAL KNOWLEDGE	1	KNOWLEDGE
NEW RECORDS	3	KNOWLEDGE
ORNITHOLOGY	1	KNOWLEDGE
ORNITHOPHILY	1	KNOWLEDGE
PATHOLOGY	1	KNOWLEDGE
SURVEY	1	KNOWLEDGE
AUSTRAL MIGRANT	1	LIFE HISTORY
COMPETITION	1	LIFE HISTORY
ENDEMIC	1	LIFE HISTORY

Keyword	Freq	terms
FLEDGLING DESCRIPTION	1	LIFE HISTORY
LIFE HISTORY	3	LIFE HISTORY
LONGEVITY	1	LIFE HISTORY
MAXIMUM BREEDING AGE	1	LIFE HISTORY
MIGRATION	1	LIFE HISTORY
MOLT CYCLE	1	LIFE HISTORY
MUTUALISTIC INTERACTIONS	1	LIFE HISTORY
NATURAL HISTORY	3	LIFE HISTORY
PARENTAL CARE	1	LIFE HISTORY
PREDATION	2	LIFE HISTORY
SEASONALITY	1	LIFE HISTORY
SENESCENCE	1	LIFE HISTORY
STRESS	1	LIFE HISTORY
YOUNG BIRDS	1	LIFE HISTORY
AMAZON	5	LOCAL
AMAZONIA	5	LOCAL
ANAVILHANAS ARCHIPELAGO	1	LOCAL
ARAGUAIA RIVER VALLEY	1	LOCAL
ATLANTIC FOREST	15	LOCAL
ATLANTIC RAINFOREST	5	LOCAL
BAHIA	2	LOCAL
BAHIA STATE	2	LOCAL
BELÉM CENTER OF ENDEMISM	1	LOCAL
BELEM CENTER OF ENDEMISM	1	LOCAL
BIODIVERSITY HOTSPOT	1	LOCAL
BOLIVIA	1	LOCAL
BRASIL	1	LOCAL
BRAZIL	25	LOCAL
BRAZILIAN AMAZON	1	LOCAL
CAATINGA	4	LOCAL
CAMPO RUPESTRE	1	LOCAL
CAMPOS DE ALTITUDE	1	LOCAL
CAMPOS RUPESTRES	2	LOCAL
CARIRI	1	LOCAL
CEARA	1	LOCAL
CENTRAL BRAZIL	1	LOCAL
CERRADO	11	LOCAL
CERRADO BIOME	1	LOCAL
CHAPADA DIAMANTINA	2	LOCAL
CHIQUITANO	1	LOCAL
CLOUD FORESTS	1	LOCAL
CUBATAO	1	LOCAL

Keyword	Freq	terms
CZECH REPUBLIC	1	LOCAL
DECIDUOUS FOREST	1	LOCAL
DECIDUOUS FORESTS	1	LOCAL
DISTRITO FEDERAL	1	LOCAL
DOCE RIVER BASIN	1	LOCAL
DRY FOREST	1	LOCAL
DRY FORESTS	3	LOCAL
ECOTONE	1	LOCAL
ENDEMIC BIRD AREAS	1	LOCAL
ESPIRITO SANTO STATE	1	LOCAL
FERNANDO DE NORONHA	1	LOCAL
FLOOD PLAIN FOREST	1	LOCAL
FLORESTA OMBRÔFILA MISTA	1	LOCAL
GALLERY FOREST	1	LOCAL
GOIAS	2	LOCAL
GOIAS STATE	1	LOCAL
HIPPOBOSCIDAE	1	LOCAL
INTRAOCULAR PRESSURE	1	LOCAL
JURUTI	1	LOCAL
JUVENILE PLUMAGE	1	LOCAL
LIMESTONE OUTCROP	1	LOCAL
LIMESTONE OUTCROPS	1	LOCAL
LOWLAND FORESTS	1	LOCAL
LOWLANDS	1	LOCAL
MANGROVES	1	LOCAL
MARAMBAIA ISLAND	1	LOCAL
MARANHÃO	1	LOCAL
MARANHAO	1	LOCAL
MARSH	1	LOCAL
MARSHES	1	LOCAL
MINAS GERAIS	3	LOCAL
NEOTROPICAL	1	LOCAL
NEOTROPICS	4	LOCAL
NORTHEASTERN BRAZIL	3	LOCAL
PARA	1	LOCAL
PARANA	1	LOCAL
PARANA COAST	1	LOCAL
PARANA VALLEY	1	LOCAL
PARNAIBA RIVER	1	LOCAL
PERNAMBUCO	2	LOCAL
PERNAMBUCO CENTRE	1	LOCAL
PIAUÍ	1	LOCAL

Keyword	Freq	terms
PIAUI	1	LOCAL
PLANALTO DAS ARAUCARIAS	1	LOCAL
RESTINGASCRUB	1	LOCAL
RIO DE JANEIRO	2	LOCAL
RIO GRANDE DO NORTE	1	LOCAL
RIO GRANDE DO SUL	3	LOCAL
RIO NEGRO	1	LOCAL
RIVER ISLANDS	1	LOCAL
RONDONIA	1	LOCAL
RONDONIA AREA OF ENDEMISM	1	LOCAL
SÃO FRANCISCO RIVER	1	LOCAL
SANTA CATARINA	2	LOCAL
SANTOS	1	LOCAL
SAO FRANCISCO RIVER	2	LOCAL
SAO PAULO	1	LOCAL
SEMI DECIDUOUS FORESTS	1	LOCAL
SEMIDECIDUOUS FORESTS	1	LOCAL
SERGIPE	1	LOCAL
SERRA DA CAPIVARA	1	LOCAL
SERRA DA MANTIQUEIRA	1	LOCAL
SERRA DO ESPINHACO	1	LOCAL
SOUTH AMERICA	1	LOCAL
SOUTHEASTERN BRAZIL	2	LOCAL
SOUTHERN BRAZIL	2	LOCAL
TOCANTINS	5	LOCAL
TOCANTINS STATE	1	LOCAL
TROPICAL DRY FOREST	1	LOCAL
TROPICS	1	LOCAL
TYPE LOCALITY	1	LOCAL
VEGETATION STRUCTURE	1	LOCAL
VENEZUELA	1	LOCAL
WETLAND	1	LOCAL
ZOO	1	LOCAL
AWARENESS	1	MANAGEMENT
FLAGSHIP FLEET	1	MANAGEMENT
FLAGSHIP SPECIES	1	MANAGEMENT
MANAGEMENT	2	MANAGEMENT
MARKETING	1	MANAGEMENT
POTENTIAL AREAS	1	MANAGEMENT
REINTRODUCTION	5	MANAGEMENT
SOCIOECONOMIC FACTORS	1	MANAGEMENT
BANDING	1	METHOD

Keyword	Freq	terms
BAYESIAN DATING	1	METHOD
BIOMOD	1	METHOD
BIRD BANDING	2	METHOD
BIRD CENSUS	1	METHOD
BIRD SURVEY	2	METHOD
CAMERA TRAP	1	METHOD
CAMERA TRAPPING	1	METHOD
CAPTIVITY	1	METHOD
CONNECTION REDUNDANCY	1	METHOD
CONTROL REGION	1	METHOD
CROSS AMPLIFICATION	1	METHOD
DETECTABILITY	1	METHOD
DISTANCE SAMPLING	1	METHOD
ECOLOGICAL NICHE MODELING	1	METHOD
ELISA	1	METHOD
ENSEMBLE FORECASTING	1	METHOD
ENZYME LINKED IMMUNOSORBENT ASSAY	1	METHOD
ESTHESIOMETRY	1	METHOD
FEEDING BOUTS	1	METHOD
FLOWERING PHENOLOGY	1	METHOD
GENETIC MARKER	1	METHOD
GENETIC PEDIGREES	1	METHOD
HIGHLANDS	1	METHOD
ICTERIDAE	1	METHOD
INVENTORY	5	METHOD
IRIDESCENCE	1	METHOD
LINE TRANSECT	1	METHOD
LINEAR TRANSECT	1	METHOD
LONGIPES CLADE	1	METHOD
MARK	1	METHOD
MARK SOFTWARE	1	METHOD
MICROSATELLITE	1	METHOD
MICROSATELLITES	3	METHOD
MINISATELLITES	1	METHOD
MIST NETS	1	METHOD
MITO NUCLEAR DISCORDANCE	1	METHOD
MOLECULAR MARKERS	2	METHOD
ND2	1	METHOD
NGS	1	METHOD
NICHE MODELING	1	METHOD
NICHE OVERLAP	1	METHOD
PARENTAGE ANALYSIS	1	METHOD

Keyword	Freq	terms
PATERNITY EXCLUSION	1	METHOD
PCR	2	METHOD
POINT COUNTS	1	METHOD
POST RELEASE MONITORING	2	METHOD
PSEUDO CONTROL REGION	2	METHOD
QUANTITATIVE POLYMERASE CHAIN REACTION	1	METHOD
RADIO TELEMETRY	2	METHOD
RADIO TRANSMITTERS	1	METHOD
RADIOTELEMETRY	1	METHOD
REFERENCE VALUES	1	METHOD
REMOTE SENSING	1	METHOD
SIMPLE SEQUENCE REPEAT	1	METHOD
SPATIAL SCALE	1	METHOD
SPECIES AREA RELATIONSHIP	1	METHOD
SPECIES RICHNESS	1	METHOD
STR MARKERS	1	METHOD
SURVIVAL PROBABILITY	1	METHOD
ULTRASOUND	1	METHOD
ANATOMY	1	MORPHOLOGY
ANIMAL COLORATION	1	MORPHOLOGY
CREST DISPLAY	1	MORPHOLOGY
EYE	1	MORPHOLOGY
IRON	1	MORPHOLOGY
KAEMPFER S WOODPECKER	1	MORPHOLOGY
LIVER	1	MORPHOLOGY
MORPHOLOGY	1	MORPHOLOGY
MORPHOMETRY	1	MORPHOLOGY
ORNAMENTATION	1	MORPHOLOGY
PHYSIOLOGICAL PARAMETERS	1	MORPHOLOGY
SEXUAL DIMORPHISM	1	MORPHOLOGY
STRUCTURAL COLOR	1	MORPHOLOGY
SUBOSCINES	1	MORPHOLOGY
AMBLYOMMA	1	PARASITES
AMBLYOMMA AURICULARIUM	1	PARASITES
AMBLYOMMA DUBITATUM	1	PARASITES
AMBLYOMMAGEAYI	1	PARASITES
ASCARIDIA HERMAPHRODITA	1	PARASITES
ASTIGMATA	1	PARASITES
FEATHER MITES	1	PARASITES
HEMITRICCUS FURCATUS	1	PARASITES
HEMOSIDEROSIS	1	PARASITES
HOLOTYPE	1	PARASITES

Keyword	Freq	terms
IXODIDAE	1	PARASITES
JACAREPAGUA	1	PARASITES
ORNITHOCORY	1	PARASITES
ORNITHODOROS KOHLSI	1	PARASITES
PARATANAISIA BRAGAI	1	PARASITES
PARATANAISIA ROBUSTA	1	PARASITES
PTERODECTINAE	1	PARASITES
TREMATODE	1	PARASITES
ANTILOPHIA BOKERMANNI	4	PASSERIFORMES
ARARIPE MANAKIN	4	PASSERIFORMES
BAHIA TAPACULO	1	PASSERIFORMES
BLACKBIRD	1	PASSERIFORMES
BOA NOVA	2	PASSERIFORMES
BOA NOVA TAPACULO	2	PASSERIFORMES
CALYPTURA CRISTATA	1	PASSERIFORMES
CARPORNIS CUCULLATA	1	PASSERIFORMES
CERCOMACRA BRASILIANA	1	PASSERIFORMES
CHERRY THROATED TANAGER	1	PASSERIFORMES
CLYTOCTANTES	1	PASSERIFORMES
CONTOPUS NIGRESCENS	1	PASSERIFORMES
COTINGIDAE	1	PASSERIFORMES
CURAEUS FORBESI	1	PASSERIFORMES
DELTA AMACURO SOFTTAIL	1	PASSERIFORMES
DYSITHAMNUS	1	PASSERIFORMES
ELAENIA RIDLEYANA	1	PASSERIFORMES
FORMICIVORA	1	PASSERIFORMES
FURNARIIDAE	1	PASSERIFORMES
GREY WINGED COTINGA	1	PASSERIFORMES
HERPSILOCHMUS SELLOWI	1	PASSERIFORMES
HETEROPHIL LYMPHOCYTE RATIO	1	PASSERIFORMES
HYPER DOMINANCE	1	PASSERIFORMES
INCUBATION BEHAVIOR	1	PASSERIFORMES
LANDSCAPE ECOLOGY	1	PASSERIFORMES
LEPIDOTHRIX VILASBOASI	1	PASSERIFORMES
LEPTODON CAYANENSIS	1	PASSERIFORMES
MANAKIN	1	PASSERIFORMES
MARSH ANTWREN	2	PASSERIFORMES
MARSH TAPACULO	1	PASSERIFORMES
MINAS GERAIS TYRANNULET	1	PASSERIFORMES
MYRMECIZA	1	PASSERIFORMES
MYRMOTHERULA SNOWI	1	PASSERIFORMES
NEMOSIA ROUREI	1	PASSERIFORMES

Keyword	Freq	terms
ONYCHORHYNCHUS CORONATUS	1	PASSERIFORMES
ORANGE BELLIED ANTWREN	1	PASSERIFORMES
OSCINES	1	PASSERIFORMES
PASSER DOMESTICUS	1	PASSERIFORMES
PASSERIFORMES	3	PASSERIFORMES
PHILYDOR NOVAESI	1	PASSERIFORMES
PHYLLOSCARTES CECILIAE	1	PASSERIFORMES
PHYLLOSCARTES ROQUETTEI	3	PASSERIFORMES
PIPRA TYRANULUS	1	PASSERIFORMES
PIPRIDAE	3	PASSERIFORMES
PLATYRINCHIDAE	1	PASSERIFORMES
RHINOCRYPTIDAE	1	PASSERIFORMES
RONDONIA BUSHBIRD	1	PASSERIFORMES
ROYAL FLYCATCHER	1	PASSERIFORMES
S IRAIENSIS	1	PASSERIFORMES
S NOVACAPITALIS	1	PASSERIFORMES
S SPELUNCAE	1	PASSERIFORMES
SCYTALOPUS	3	PASSERIFORMES
SCYTALOPUS GONZAGAI	2	PASSERIFORMES
SCYTALOPUS IRAIENSIS	2	PASSERIFORMES
SPOROPHILA BELTONI	1	PASSERIFORMES
SPOROPHILA SCHISTACEA	1	PASSERIFORMES
STYMPHALORNIS	1	PASSERIFORMES
STYMPHALORNIS ACUTIROSTRIS	1	PASSERIFORMES
SYNALLAXIS INFUSCATA	1	PASSERIFORMES
SYNALLAXIS RUFICAPILLA	1	PASSERIFORMES
SYNALLAXIS WHITNEYI	1	PASSERIFORMES
TAPACULO	1	PASSERIFORMES
TERENURA SICKI	2	PASSERIFORMES
THAMNOPHILIDAE	5	PASSERIFORMES
THRAUPIS CYANOPTERA	1	PASSERIFORMES
THRIPOPHAGA AMACURENSIS	1	PASSERIFORMES
THRUSHES	1	PASSERIFORMES
TIJUCA CONDITA	1	PASSERIFORMES
TYPICAL ANTBIRDS	1	PASSERIFORMES
TYRANT FLYCATCHERS	1	PASSERIFORMES
VIREO GRACILIROSTRIS	1	PASSERIFORMES
BUBULCUS IBIS	1	PELECANIFORMES
CELEUS	1	PICIFORMES
CELEUS OBRIENI	7	PICIFORMES
CELEUS SPECTABILIS	1	PICIFORMES
CELEUS TORQUATUS	1	PICIFORMES

Keyword	Freq	terms
KARYOTYPE	1	PICIFORMES
NEOTROPICAL WOODPECKERS	1	PICIFORMES
PICIDAE	1	PICIFORMES
PICUMNUS EXILIS	1	PICIFORMES
RAMPHASTIDAE	1	PICIFORMES
RAMPHASTOS	1	PICIFORMES
RHAMPHASTIDAE	1	PICIFORMES
TOUCANS	1	PICIFORMES
VENILIORNIS MACULIFRONS	1	PICIFORMES
ABUNDANCE	3	POPULATION
COMPOSITION	1	POPULATION
DENSITY	3	POPULATION
EFFECTIVE POPULATION SIZE	1	POPULATION
MALE FEMALE RATIO	1	POPULATION
POPULATION	3	POPULATION
POPULATION ABUNDANCE	1	POPULATION
POPULATION SIZES	1	POPULATION
POPULATION STRUCTURE	1	POPULATION
POPULATION STUDIES	1	POPULATION
POPULATION VIABILITY	1	POPULATION
SPECIES ABUNDANCE	1	POPULATION
AMANA NATIONAL FOREST	2	PROTECTED AREA
ESPINHAÇO RANGE	1	PROTECTED AREA
ESPINHACO	1	PROTECTED AREA
ESPINHACO RANGE	2	PROTECTED AREA
INFORMATION GAPS	1	PROTECTED AREA
NATIONAL PARK	1	PROTECTED AREA
PROTECTED AREA	1	PROTECTED AREA
PROTECTED AREAS	1	PROTECTED AREA
RESERVA BIOLOGICA DO GURUPI	1	PROTECTED AREA
YACAMBU NATIONAL PARK	1	PROTECTED AREA
AMAZONA	1	PSITTACIFORMES
AMAZONA AESTIVA	1	PSITTACIFORMES
AMAZONA AMAZONICA	1	PSITTACIFORMES
AMAZONA PRETREI	4	PSITTACIFORMES
AMAZONA VINACEA	1	PSITTACIFORMES
ANODORHYNCHUS GLAUCUS	1	PSITTACIFORMES
ANODORHYNCHUS HYACINTHINUS	2	PSITTACIFORMES
ANODORHYNCHUS LEARI	3	PSITTACIFORMES
ARA ARARAUNA	1	PSITTACIFORMES
ARARAJUBA	1	PSITTACIFORMES
ARATINGA	1	PSITTACIFORMES

Keyword	Freq	terms
ARATINGA ACUTICAUDATA	1	PSITTACIFORMES
ARATINGA JANDAYA	1	PSITTACIFORMES
ARINI	3	PSITTACIFORMES
BLUE AND GOLD MACAW	1	PSITTACIFORMES
BLUE CROWNED CONURE	1	PSITTACIFORMES
BLUE HEADED MACAW	1	PSITTACIFORMES
BLUE WINGED MACAW	1	PSITTACIFORMES
BRAZILIAN PSITTACINE FAUNA	1	PSITTACIFORMES
BROWN BACKED PARROTLET	1	PSITTACIFORMES
GÊNERO AMAZONA	1	PSITTACIFORMES
GOLDEN CONURE	3	PSITTACIFORMES
GUAROUBA	1	PSITTACIFORMES
GUAROUBA GUAROUBA	2	PSITTACIFORMES
GUARUBA GUAROUBA	5	PSITTACIFORMES
HABITAT	2	PSITTACIFORMES
LECTOTYPE	2	PSITTACIFORMES
MACAW	2	PSITTACIFORMES
PARAKEETS	1	PSITTACIFORMES
PARROT	2	PSITTACIFORMES
PARROTS	3	PSITTACIFORMES
PARROTS PSITTACIFORMES	1	PSITTACIFORMES
PEARLY PARAKEET	1	PSITTACIFORMES
PIONUS FUSCUS	1	PSITTACIFORMES
PROPYRRHURA MARACANA	1	PSITTACIFORMES
PSITTACARA LEUCOPHTHALMUS	1	PSITTACIFORMES
PSITTACIDAE	10	PSITTACIFORMES
PSITTACIFORMES	10	PSITTACIFORMES
PSITTACINE	3	PSITTACIFORMES
PSITTACINE BIRDS	1	PSITTACIFORMES
PSITTACINES	2	PSITTACIFORMES
PYRRHURA	3	PSITTACIFORMES
PYRRHURA LEPIDA	1	PSITTACIFORMES
PYRRHURA LEUCOTIS	1	PSITTACIFORMES
PYRRHURA PALLESCENS	2	PSITTACIFORMES
PYRRHURA PFRIMERI	2	PSITTACIFORMES
PYRRHURA SNETHLAGEAE	2	PSITTACIFORMES
RED BROWED AMAZON	1	PSITTACIFORMES
RED FRONTED MACAW	1	PSITTACIFORMES
RED SPECTACLED AMAZON	2	PSITTACIFORMES
RED TAILED AMAZON	1	PSITTACIFORMES
WHITE EARED PARAKEET	1	PSITTACIFORMES
YELLOW HEADED AMAZON	1	PSITTACIFORMES

Keyword	Freq	terms
ENDOZOOCHOROUS SEED DISPERSAL	1	SEED DISPERSAL
STOMATOCHORY	1	SEED DISPERSAL
GLAUCIDIUM	1	STRIGIFORMES
STRIGIDAE	1	STRIGIFORMES
ACOUSTIC COMMUNICATION	1	TAXONOMY
BIRD RECORDS	1	TAXONOMY
BIRDSONG	1	TAXONOMY
CLASSIFICATION	1	TAXONOMY
DIFFERENCES	1	TAXONOMY
ENGLISH NAME	2	TAXONOMY
MUSEUM SPECIMEN	1	TAXONOMY
NEOTYPE	1	TAXONOMY
NEW SPECIES	5	TAXONOMY
NOMENCLATURE	1	TAXONOMY
SPECIES TREE	1	TAXONOMY
SYNONYM	2	TAXONOMY
SYNONYMY	2	TAXONOMY
TAXONOMIC REVISION	1	TAXONOMY
TAXONOMY	13	TAXONOMY
VOCALIZATION	3	TAXONOMY
VOCALIZATIONS	4	TAXONOMY
ZOOLOGICAL NOMENCLATURE	1	TAXONOMY
BOA ESPERANCA DAM	1	THREATS
CLIMATE CHANGE	1	THREATS
DEFORESTATION	1	THREATS
EXTINCTION RISK	1	THREATS
FOREST FRAGMENTATION	2	THREATS
FRAGMENTATION	1	THREATS
HABITAT LOSS	2	THREATS
HABITAT PREFERENCE	1	THREATS
HYBRID SPECIATION	1	THREATS
HYLOPEZUS NATTERERI	1	THREATS
LOCAL EXTINCTION	1	THREATS
SEDIMENT INGESTION	1	THREATS
ADMIXTURE	1	UNDEFINED
BLACK WATER	1	UNDEFINED
BRILLIANT WHITE	1	UNDEFINED
IUTA	1	UNDEFINED
REWARDS	1	UNDEFINED
ANIMAL WELFARE	1	VETERINARY
ENVENOMATION	1	VETERINARY
INTROGRESSION	1	VETERINARY

Keyword	Freq	terms
MASSAGE TECHNIQUE	1	VETERINARY
RADIOGRAPHIC EXAM	1	VETERINARY
SEMEN ANALYSIS	1	VETERINARY
SEMEN COLLECTION	1	VETERINARY
SEROLOGY	1	VETERINARY
VALVULAR ENDOCARDITIS	1	VETERINARY
WELFARE	1	VETERINARY

Appendix 2: Endemic and endangered wild bird species across Brazil classified by number of publications

Scientific name	Order	Family	Global IUCN Red List Category	Number of studies
Guaruba guarouba	Psittaciformes	Psittacidae (Parrots)	VU	23
Crax blumenbachii	Galliformes	Cracidae (Guans, Chachalacas, Curassows)	EN	20
Anodorhynchus leari	Psittaciformes	Psittacidae (Parrots)	EN	14
Amazona pretrei	Psittaciformes	Psittacidae (Parrots)	VU	12
Celeus obrieni	Piciformes	Picidae (Woodpeckers)	VU	11
Formicivora paludicola	Passeriformes	Thamnophilidae (Antbirds)	CR	10
Penelope jacucaca	Galliformes	Cracidae (Guans, Chachalacas, Curassows)	VU	8
Phylloscartes roquettei	Passeriformes	Tyrannidae (Tyrant-flycatchers)	EN	8
Amazona rhodocorytha	Psittaciformes	Psittacidae (Parrots)	VU	8
Antilophia bokermanni	Passeriformes	Pipridae (Manakins)	CR	7
Pyrrhura lepida	Psittaciformes	Psittacidae (Parrots)	VU	6
Buteogallus lacernulatus	Accipitriformes	Accipitridae (Hawks, Eagles)	VU	6
Leptodon forbesi	Accipitriformes	Accipitridae (Hawks, Eagles)	EN	5
Herpsilochmus pectoralis	Passeriformes	Thamnophilidae (Antbirds)	VU	5
Lepidothrix iris	Passeriformes	Pipridae (Manakins)	VU	5
Penelope ochrogaster	Galliformes	Cracidae (Guans, Chachalacas, Curassows)	VU	5
Pyrrhura cruentata	Psittaciformes	Psittacidae (Parrots)	VU	5
Scytalopus novacapitalis	Passeriformes	Rhinocryptidae (Tapaculos)	EN	4
Calyptura cristata	Passeriformes	Tyrannidae (Tyrant-flycatchers)	CR	4
Lepidothrix vilasboasi	Passeriformes	Pipridae (Manakins)	VU	4
Pyrilia vulturina	Psittaciformes	Psittacidae (Parrots)	VU	4
Pyrrhura leucotis	Psittaciformes	Psittacidae (Parrots)	VU	4
Psophia dextralis	Gruiformes	Psophiidae (Trumpeters)	EN	4
Ramphastos ariel	Piciformes	Ramphastidae (Toucans)	EN	3
Touit melanonotus	Psittaciformes	Psittacidae (Parrots)	VU	3
Carpornis melanocephala	Passeriformes	Cotingidae (Cotingas)	VU	3
Elaenia ridleyana	Passeriformes	Tyrannidae (Tyrant-flycatchers)	VU	3
Formicivora grantsaui	Passeriformes	Thamnophilidae (Antbirds)	EN	3
Lipaugus conditus	Passeriformes	Cotingidae (Cotingas)	VU	3
Nemosia rourei	Passeriformes	Thraupidae (Tanagers)	CR	3
Pyrrhura pfrimeri	Psittaciformes	Psittacidae (Parrots)	EN	3
Scytalopus gonzagai	Passeriformes	Rhinocryptidae (Tapaculos)	EN	3
Scytalopus iraiensis	Passeriformes	Rhinocryptidae (Tapaculos)	EN	3
Sporophila beltoni	Passeriformes	Thraupidae (Tanagers)	VU	3
Synallaxis infuscata	Passeriformes	Furnariidae (Ovenbirds)	EN	3
Tangara peruviana	Passeriformes	Thraupidae (Tanagers)	VU	2
Terenura sicki	Passeriformes	Thamnophilidae (Antbirds)	CR	2
Xiphocolaptes falcirostris	Passeriformes	Furnariidae (Ovenbirds)	VU	2
Acrobatornis fonsecai	Passeriformes	Furnariidae (Ovenbirds)	VU	2
Anumara forbesi	Passeriformes	Icteridae (New World blackbirds)	EN	2

Scientific name	Order	Family	Global IUCN Red List Category	Number of studies
Cercomacra ferdinandi	Passeriformes	Thamnophilidae (Antbirds)	VU	2
Cichlopsis leucogenys	Passeriformes	Turdidae (Thrushes)	EN	2
Clytoctantes atrogularis	Passeriformes	Thamnophilidae (Antbirds)	VU	2
Conothraupis mesoleuca	Passeriformes	Thraupidae (Tanagers)	EN	2
Glaucidium mooreorum	Strigiformes	Strigidae (Typical Owls)	CR	2
Hemitriccus furcatus	Passeriformes	Tyrannidae (Tyrant-flycatchers)	VU	2
Herpsilochmus pileatus	Passeriformes	Thamnophilidae (Antbirds)	VU	2
Malacoptila minor	Galbuliformes	Bucconidae (Puffbirds)	EN	2
Merulaxis stresemanni	Passeriformes	Rhinocryptidae (Tapaculos)	CR	2
Myrmoderus ruficauda	Passeriformes	Thamnophilidae (Antbirds)	EN	2
Myrmotherula klagesi	Passeriformes	Thamnophilidae (Antbirds)	VU	2
Myrmotherula snowi	Passeriformes	Thamnophilidae (Antbirds)	CR	2
Penelope pileata	Galliformes	Cracidae (Guans, Chachalacas, Curassows)	VU	2
Pteroglossus bitorquatus	Piciformes	Ramphastidae (Toucans)	EN	2
Pyriglena atra	Passeriformes	Thamnophilidae (Antbirds)	EN	2
Pyrrhura griseipectus	Psittaciformes	Psittacidae (Parrots)	EN	2
Pyrrhura snethlageae	Psittaciformes	Psittacidae (Parrots)	VU	2
Rhegmatorhina gymnops	Passeriformes	Thamnophilidae (Antbirds)	VU	2
Pyrrhura amazonum	Psittaciformes	Psittacidae (Parrots)	EN	2
Sclerurus cearensis	Passeriformes	Furnariidae (Ovenbirds)	VU	1
Thalurania watertonii	Apodiformes	Trochilidae (Hummingbirds)	EN	1
Xipholena atropurpurea	Passeriformes	Cotingidae (Cotingas)	VU	1
Cotinga maculata	Passeriformes	Cotingidae (Cotingas)	EN	1
Crax pinima	Galliformes	Cracidae (Guans, Chachalacas, Curassows)	CR	1
Dendrocolaptes hoffmannsi	Passeriformes	Furnariidae (Ovenbirds)	VU	1
Dysithamnus plumbeus	Passeriformes	Thamnophilidae (Antbirds)	VU	1
Eleoscytalopus psychopompus	Passeriformes	Rhinocryptidae (Tapaculos)	EN	1
Glaucis dohrnii	Apodiformes	Trochilidae (Hummingbirds)	EN	1
Hemitriccus kaempferi	Passeriformes	Tyrannidae (Tyrant-flycatchers)	VU	1
Jacamaralcyon tridactyla	Galbuliformes	Galbulidae (Jacamars)	VU	1
Onychorhynchus swainsoni	Passeriformes	Tityridae (Tityras and allies)	VU	1
Phaethornis aethopygus	Apodiformes	Trochilidae (Hummingbirds)	VU	1
Phylloscartes ceciliae	Passeriformes	Tyrannidae (Tyrant-flycatchers)	CR	1
Picumnus varzeae	Piciformes	Picidae (Woodpeckers)	EN	1
Psophia obscura	Gruiformes	Psophiidae (Trumpeters)	CR	1
Scytalopus diamantinensis	Passeriformes	Rhinocryptidae (Tapaculos)	EN	1
Thripophaga macroura	Passeriformes	Furnariidae (Ovenbirds)	VU	1
Amazona diadema	Psittaciformes	Psittacidae (Parrots)	EN	0
Automolus lammi	Passeriformes	Furnariidae (Ovenbirds)	EN	0
Celeus tinnunculus	Piciformes	Picidae (Woodpeckers)	VU	0
Columbina cyanopis	Columbiformes	Columbidae (Pigeons, Doves)	CR	0
Cranioleuca muelleri	Passeriformes	Furnariidae (Ovenbirds)	EN	0

Scientific name	Order	Family	Global IUCN Red List Category	Number of studies
Formicivora erythronotos	Passeriformes	Thamnophilidae (Antbirds)	EN	0
Hemitriccus mirandae	Passeriformes	Tyrannidae (Tyrant-flycatchers)	VU	0
Iodopleura pipra	Passeriformes	Tityridae (Tityras and allies)	EN	0
Myrmotherula minor	Passeriformes	Thamnophilidae (Antbirds)	VU	0
Myrmotherula urosticta	Passeriformes	Thamnophilidae (Antbirds)	VU	0
Neopelma aurifrons	Passeriformes	Pipridae (Manakins)	VU	0
Phylloscartes beckeri	Passeriformes	Tyrannidae (Tyrant-flycatchers)	EN	0
Pionus reichenowi	Psittaciformes	Psittacidae (Parrots)	VU	0
Rhopornis ardesiacus	Passeriformes	Thamnophilidae (Antbirds)	EN	0
Tangara fastuosa	Passeriformes	Thraupidae (Tanagers)	VU	0
Touit surdus	Psittaciformes	Psittacidae (Parrots)	VU	0

4 Conhecimento produzido versus conhecimento necessário: as lacunas de conhecimento e o impacto da IUCN na conservação de aves silvestres neotropicais endêmicas e ameaçadas **

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Resumo

A região Neotropical abriga diversas espécies de aves silvestres endêmicas e ameaçadas de extinção globalmente e a cada avaliação da União Internacional para Conservação da Natureza (IUCN) a lista tem aumentado. A IUCN indica o conhecimento que é necessário para melhorar o estado de conservação dessas espécies. No entanto, a pesquisa científica na região tropical é limitada por diversos fatores. Dessa forma, buscamos avaliar a relação entre o conhecimento produzido e o conhecimento necessário à conservação dessas espécies. Para isso extraímos informações da literatura, de bancos de dados digitais e da lista vermelha da IUCN. Métricas referentes à raridade e visibilidade das espécies e capacidade de pesquisa dos países foram analisadas para identificar os fatores que influenciam nas publicações. Identificamos 689 tipos de documentos sem repetição sobre 250 espécies de aves silvestres neotropicais ameaçadas e endêmicas. A produção científica sobre esse grupo não acompanhou a tendência global de crescimento e permaneceu muito baixo com a maioria das espécies (90%) tendo menos de cinco documentos publicados. Somente 25% das espécies foram responsáveis por mais de 70% dos estudos indexados e, em contrapartida, 65 espécies não foram associadas a nenhum documento indexado. Os principais características que influenciaram a produção do conhecimento sobre o grupo foram o tamanho corporal a visibilidade cultural. Além disso, a rede de colaboração entre os autores também amplia a capacidade de pesquisa dos países. Usando as palavras-chave apontadas nos documentos, os temas mais estudados foram: características das espécies (26,56%), interações ecológicas (24,38%), genética (14,08%), conservação (11,04%), evolução (10,74), parasitas (9,08%), gestão de Unidades de Conservação (8,71%), ameaças (7,98%) e distribuição (7,40%). Nas ações propostas pela IUCN são indicados como prioritários a criação e ampliação das áreas protegidas (78,4%), estudos para conhecer a distribuição (56,8%), abundância (42,4%), requerimentos ecológicos (38.8%). As ameaças mais citadas pela IUCN foram a perda e degradação de habitat (92,4%), caça (12,4%), comércio ilegal (9,2%), espécies exóticas invasoras (8,8%), mudança climática (8,4%), distúrbios provocados pelo gado (8%), impactos do uso de pesticidas (6,8%) e o impacto dos parasitas (5,6%). Concluímos que diante da urgência em salvar as espécies, as lacunas Eltoniana, Prestoniana e Hutchinsoniana sobre essas espécies precisam ser preenchidas e para isso, o aumento do interesse dos pesquisadores e a ampliação dos financiamentos para projetos de pesquisa direcionados a esses temas e espécies parece ser o único caminho viável para muitas aves silvestres endêmicas e

**Artigo formatado segundo normas da revista *Studies on Neotropical Fauna and Environment,* faltando a tradução para o idioma inglês.

ameaçadas da região Neotropical.

Palavras-chave: aves endêmicas; aves ameaçadas; aves neotropicais; lacunas de conhecimento

Introdução

Aves são uma classe com cerca de 18.000 espécies (Barrowclough et al. 2016) distribuídas em todo o planeta. Atualmente, das 11.158 aves avaliadas quanto ao seu estado de conservação, 1.481 espécies estão ameaçadas de extinção e cinco delas já foram extintas na natureza (IUCN 2021). De fato, não estamos conseguindo diminuir a taxa de perda de biodiversidade (Butchart 2010). Particularmente na região Neotropical, centenas destas espécies ameaçadas são consideradas endêmicas e restritas a ambientes florestais (BirdLife Datazone 2020) sendo importantes para estabelecer prioridades de conservação (Stotz et al 1996). Assim, torna-se cada vez mais urgente definir e ampliar ações que atuem diretamente na conservação destas espécies, melhorando seu status e diminuindo o seu risco de extinção (Pinto et al. 2006; Ramos Neto 2019).

Atualmente, é crescente a preocupação com a eficácia das intervenções de conservação destacando a importância da integração entre produção de conhecimento (Ayres et al 2005; Symes et al. 2018; Buxton et al. 2021), recursos financeiros (Naidoo et al. 2006; Juffe-Bignoli et al. 2016) e políticas ambientais (McDonald et al. 2015). As informações científicas podem ser usadas para apoiar estratégias eficientes de conservação, gestão e políticas ambientais (Mckenzie & Robertson 2015) que revertam efetivamente a diminuição das populações de espécies ameaçadas (Plaza & Lambertucci 2020, Buxton et al. 2021). De fato, ultimamente, houve um incremento de produções científicas focadas nas espécies de interesse para a conservação (Hoffmann et al. 2010; McClure et al. 2018). Esse conhecimento científico tem sido relevante para o planejamento de políticas e ações de conservação para as

espécies-alvo (Pullin & Knight 2003; Dias et al 2019). No entanto, a maioria das estratégias de conservação atuais não foram baseadas em evidências científicas produzidas por experimentos ou revisões sistemáticas (Pullin & Knight 2004; Sutherland et al. 2004) comprometendo a recuperação das espécies (Metzger 2009; Akçakaya et al 2018).

Estudos, apontam que raridade (Ricketts et al. 2005; Mckenzie & Robertson 2015; Murray et al. 2015) e visibilidade das espécies (Clucas et al. 2008; Lišková & Frynta 2013; Prokop & Fančovičová 2013), bem como a capacidade de pesquisa do País (McKenzie & Robertson 2015; UNDP 2016; Nguyen et al. 2016; Rintelen et al. 2017) são os fatores que mais influenciam na construção do conhecimento e no seu uso para promoção da conservação. Além disso, as lacunas no conhecimento sobre requerimentos ecológicos precisam ser cuidadosamente reconhecidas e quantificadas (Hortal et al. 2105), assim como as ameaças (Frick et al. 2019), seus efeitos sobre o declínio das espécies (Caughley 1994; Sutherland et al. 2007) e as estratégias eficazes para minimizá-las (Dias et al. 2019).

Neste sentido, a lista vermelha de espécies ameaçadas da IUCN (União Internacional para a Conservação da Natureza) é uma ferramenta útil para as espécies em risco de extinção, pois classifica a situação atual de conservação das espécies, descreve as ameaças e indica as necessidades de pesquisa e ações necessárias para cada uma delas (Keller & Bollmann 2004; Hayward 2011; McGowan et al. 2016), sendo importante para o planejamento, gestão, monitoramento e direcionamento das estratégias de conservação (Rodrigues et al 2006; Hoffmann et al 2008; Betts et al 2019). Assim, diante do alto risco de extinção das espécies, em especial as endêmicas e ameaçadas, é crucial valorizar a Lista Vermelha como guia para a priorização das pesquisas e ações efetivas de conservação (Mace et al. 2008; Bachman et al. 2019)

Na busca pela eficiência na conservação a análise do conhecimento pode ser altamente

informativa e sensível para avaliar suas características e identificar lacunas (Moreno-Opo & Margalida 2014; Yarwood et al. 2014) e ainda mais poderosa quando associada às informações necessárias para reverter efetivamente a situação das populações de espécies ameaçadas. Esse tipo de análise permite identificar os fatores que influenciam a produção do conhecimento (Serenko 2013; Zhong et al. 2019), a tendência das pesquisas (Borges et al. 2015; Lin et al. 2019; Wyom Paul et al. 2020) e estratégias (Miguel et al. 2017; Pinto et al. 2020). Neste estudo avaliamos o conhecimento produzido e seu impacto na conservação de aves silvestres neotropicais ameaçadas e endêmicas buscando (i) conhecer as características e a quantidade das publicações sobre elas; (ii) identificar lacunas do conhecimento e como a raridade e a visibilidade das espécies e a capacidade de pesquisa dos países influenciam na produção de conhecimento sobre o grupo estudado e (iii) relacionar a produção do conhecimento com as diretrizes indicadas pela IUCN. Para isso, foram utilizados dados da literatura e bancos de dados digitais sobre as espécies, informações sobre a capacidade de pesquisa dos países e as diretrizes da IUCN. A priorização no planejamento da conservação tem sido prejudicada por várias lacunas de conhecimento reconhecidas (Hortal et al. 2015; Cottee-Jones et al. 2016). Assumindo a urgência em salvar as espécies, as lacunas Eltoniana, Prestoniana e Hutchinsoniana, podem representar um trágico futuro para muitas aves silvestres ameaçadas e endêmicas da região Neotropical.

Metodologia

As espécies de aves silvestres endêmicas e ameaçadas de extinção que ocorrem na região Neotropical foram selecionadas usando o ‘Perfil do País’ da zona de dados da BirdLife (BirdLife International 2020). Uma vez que o banco de dado só possibilita pesquisar o território total, foi incluído todo o México e excluído o sul da Flórida. Em seguida,

documentos publicados (incluindo inventários) relativos a essas espécies, entre os anos de 1870 e 2020, foram coletados no banco de dados SCOPUS usando os seguintes termos para a pesquisa: i) o nome científico da espécie (incluindo sinonímias) e ii) o nome comum em inglês (disponível na plataforma Avibase - https://avibase.bsc-eoc.org/avibase.jsp). Os documentos encontrados foram baixados no formato BibTeX e as seguintes informações foram coletadas para análise: (i) título do documento; (ii) ano; (iii) fonte e tipos de documento (por exemplo, artigos, notas, resenhas, cartas, errata, capítulo de livro); (iv) resumo; (v) autores; (vi) palavras-chave. Além disso, com intuito de criar uma linha de base sobre a produção científica global sobre aves, quantificamos as publicações indexadas na base de dados SCOPUS usando o termo de pesquisa "bird*". Todos os dados foram organizados e o i) número de publicações relacionadas às espécies e países, ii) a produção científica ao longo do tempo, iv) os temas abordados nas publicações foram analisados no Microsoft Excel® e no software R versão 4.0.5 (R Development Core Team 2021) usando os pacotes bibliometrix (Aria & Cuccurullo 2017) e dplyr (Wickham et al. 2019).

Buscando identificar as características das espécies que mais influenciam na produção de conhecimento, a raridade foi quantificada usando as métricas: (i) ano de inclusão da espécie na lista de espécies ameaçadas de extinção da IUCN; (ii) ano de descrição da espécie; (iii) número máximo de indivíduos adultos; (iv) número máximo de localidades onde a espécie ocorre e (v) extensão da ocorrência (EOO), área contida dentro do menor limite contínuo que engloba todos os pontos conhecidos, inferidos ou projetados do táxon, excluindo os casos de vagantes e visitantes (IUCN 2021). Estes dados foram compilados da lista vermelha (IUCN 2021) e encontram-se disponíveis no Anexo 1. O grau de visibilidade potencial das espécies foi quantificada pelas métricas: (i) tamanho da espécie, obtidos na lista vermelha (IUCN) e (ii) a quantidade de visualizações das espécies-alvo no banco de dados

on-line de observações de aves eBird (https://ebird.org/home) (Anexo 1). Para analisar estes dados utilizamos modelos lineares generalizados presumindo uma distribuição de erros Poisson (adequada para dados de contagem), alternando para a correção quasi-poisson ou o uso da distribuição Binomial Negativa quando necessário (no caso de sobredispersão do modelo gerado). Após a obtenção de um modelo com a distribuição adequada, realizamos um processo *backwise* de simplificação, eliminando variáveis preditoras não significativas e utilizando o valor de AIC para a escolha do modelo mais adequado.

A capacidade de pesquisa de cada País na produção do conhecimento foi quantificada com base na (i) quantidade de documentos publicados entre 1996 e 2019; (ii) quantidade de documentos publicados em ciência ambientais entre 1996 e 2019 e (iii) quantidade de instituições de pesquisa, todas obtidas na plataforma SCImagoJR; (iv) porcentagem média de investimento em pesquisa e desenvolvimento em relação ao PIB entre 1996 e 2018 calculada pelo Instituto de Estatística da UNESCO e disponibilizadas pelo Banco Mundial (https://data.worldbank.org/) e (v) rede de colaboração entre os autores obtida somando todos os autores dos trabalhos sobre as espécies-alvos de cada País (Tabela 1). Para compreender como estas variáveis podem influenciar na capacidade de pesquisa sobre as espécies ameaçadas nos países, inicialmente, avaliamos as potenciais correlações entre as variáveis preditoras utilizando o coeficiente de correlação não paramétrica de Spearman. a fim de remover variáveis redundantes e eliminar a colinearidade no modelo estatístico. Posteriormente, cada uma das variáveis foi utilizada como um preditor independente em uma análise de regressão linear simples. Para cada modelo estatístico criado, inspecionamos os resíduos visualmente em busca de desvios de normalidade e a verificamos com o teste de normalidade de Shapiro-Wilk.

Tabela 1. Distribuição dos documentos publicados e quantidade de espécies endêmicas e ameaçadas por países da região

Países	Documentos publicados entre 1996 - 2019 (SCImago)	Documentos publicados sobre Ciências Ambientais entre 1996 - 2019 (SCImago)	Porcentagem média do PIB de investimento em pesquisa e desenvolvimento 1996 - 2018 (UNESCO)	Total de autores nos documentos publicados entre 1870 e 2020	Quantidade de instituições de pesquisa (SCImago)
México	347369	25097	0.38	230	62
Costa Rica	14192	1727	0.42	36	3
Honduras	1675	156	0.04	18	0
Panamá	7941	1405	0.22	8	1
Argentina	225079	15140	0.49	1	44
Bolívia	5203	951	0.28	142	1
Brasil	1027748	61167	1.12	742	157
Chile	163593	10429	0.36	40	44
Colômbia	114495	6255	0.21	169	37
Ecuador	23889	2475	0.21	375	16
Peru	29732	2091	0.11	135	9
Venezuela	41751	2031	0.24	17	5

A tendência temporal do número de artigos sobre as espécies endêmicas e ameaçadas da região Neotropical foi avaliada levando em consideração o aumento geral no número de artigos sobre aves no mundo (Peters 1991) para isso dividimos a quantidade de artigos sobre as espécies endêmicas e ameaçadas da região Neotropical produzidos a cada ano pela produção geral sobre aves no mundo, coletada no Scopus. Obtivemos a tendência temporal usando o coeficiente de correlação de Pearson ($P < 0,05$)

O conhecimento produzido foi obtido associando as palavras-chave indicadas pelos autores aos temas ligados às áreas amplas da ciência da conservação, tais como: evolução, genética, comportamento, taxonomia, conservação e reprodução, entre outros (Anexo 2). Termos generalistas como “aves”, “local” e “métodos” não foram considerados, pois são frequentemente citados nos estudos e não expressam especificamente os temas estudados.

Estes causariam confusão na interpretação dos resultados, pois prevaleceriam como os temas mais importantes (por exemplo, aves, Brasil e Passeriformes). A importância da lista vermelha da IUCN no fomento à produção científica sobre as aves estudadas foi avaliada somando a quantidade de documentos publicados antes e depois de cada espécie ser incluída na lista. O conhecimento indicado pela IUCN como necessário à conservação das espécies também foi organizado. As ações propostas e ameaças para cada espécie foram associadas a termos relacionados às áreas amplas de manejo e conservação, tais como: conservação, requerimentos ecológicos, monitoramento populacional, manejo, entre outros (Anexo 3). Para avaliar a relação entre o conhecimento produzido com o conhecimento necessário indicado pela IUCN, comparamos as frequências dos temas ligados às áreas amplas da ciência da conservação e da ornitologia com a frequência dos termos relacionado às áreas amplas de manejo e conservação indicados pela IUCN.

Resultados

No total, 250 espécies foram analisadas nesse estudo (Anexo 1), sendo que duas (*Pyrrhura snethlageae* e *Eulidia yarrellii*) ocorrem em mais de um país. Foram encontrados 689 tipos de documentos sobre elas, sem repetição (646 artigos, três capítulos de livros, três anais de congresso, três erratas, quatro cartas, 15 notas e 15 artigos de revisão). Todos os documentos publicados foram usados nas análises. O Brasil foi o país com maior número de espécies (90) e artigos (275), enquanto Argentina e Honduras os países com menos espécies (1) e poucos artigos (3) (Tabela 2).

Tabela 2. Distribuição dos documentos publicados e quantidade de espécies endêmicas e ameaçadas por países da região Neotropical

País	Espécies	Número de estudos
BRASIL	90	275
COLÔMBIA	48	73
PERU	33	36
EQUADOR	23	161
MÉXICO	21	83
VENEZUELA	14	12
BOLÍVIA	8	52
COSTA RICA	6	11
PANAMÁ	4	1
CHILE	3	19
ARGENTINA	1	3
HONDURAS	1	3

A produção científica sobre as aves silvestres endêmicas e ameaçadas da região Neotropical em relação à produção global sobre aves não mostrou tendência temporal de crescimento significativa (Fig. 1a; r = 0,14; P =0,82) variando em média 1,89 ± 0,95 artigos/ano entre 1870 e 1995 (Fig 1b) e aumentando para 25,08 ± 14,11 artigos/ano a partir de 1996 (Fig 1c).

Em relação a influência das características das espécies na produção de conhecimento, apenas três variáveis parecem moderadamente correlacionadas: o número máximo de localidades conhecidas e a área de ocorrência estimada com uma correlação de 0,66, e estas com a estimativa de tamanho populacional (0,37 e 0,39, respectivamente). Desta forma, apenas a variável de área de ocorrência estimada foi utilizada nos lineares generalizados utilizando a distribuição de Poisson e, sua versão corrigida por Quasi-Poisson, mostraram evidências de sobredispersão dos dados, uma vez que existem muitas espécies com poucos ou nenhum estudo. Desta forma, os modelos finais avaliados utilizando a distribuição Binomial Negativa, mostraram-se mais adequados a esta distribuição de erros. Após o processo de

simplificação de modelos, o modelo explicativo final (desvio residual =269,16, 243 graus de liberdade, AIC=1087,7) mostra efeitos estatisticamente significativos da visibilidade da espécie, representada pelo tamanho corporal (z = 4,43, p < 0,011) e visibilidade cultural no eBird (z = 2,73, p = 0,018) e da raridade, representada pelo ano de descrição da espécie (z = -2,55, p = 0,011) sobre o número total de publicações para cada espécie analisada (Tabela 3). Ou seja, espécies descritas mais recentemente tendem a possuir menos artigos publicados, enquanto espécies com maior tamanho corporal e com maior visibilidade cultural tendem a ter mais artigos publicados.

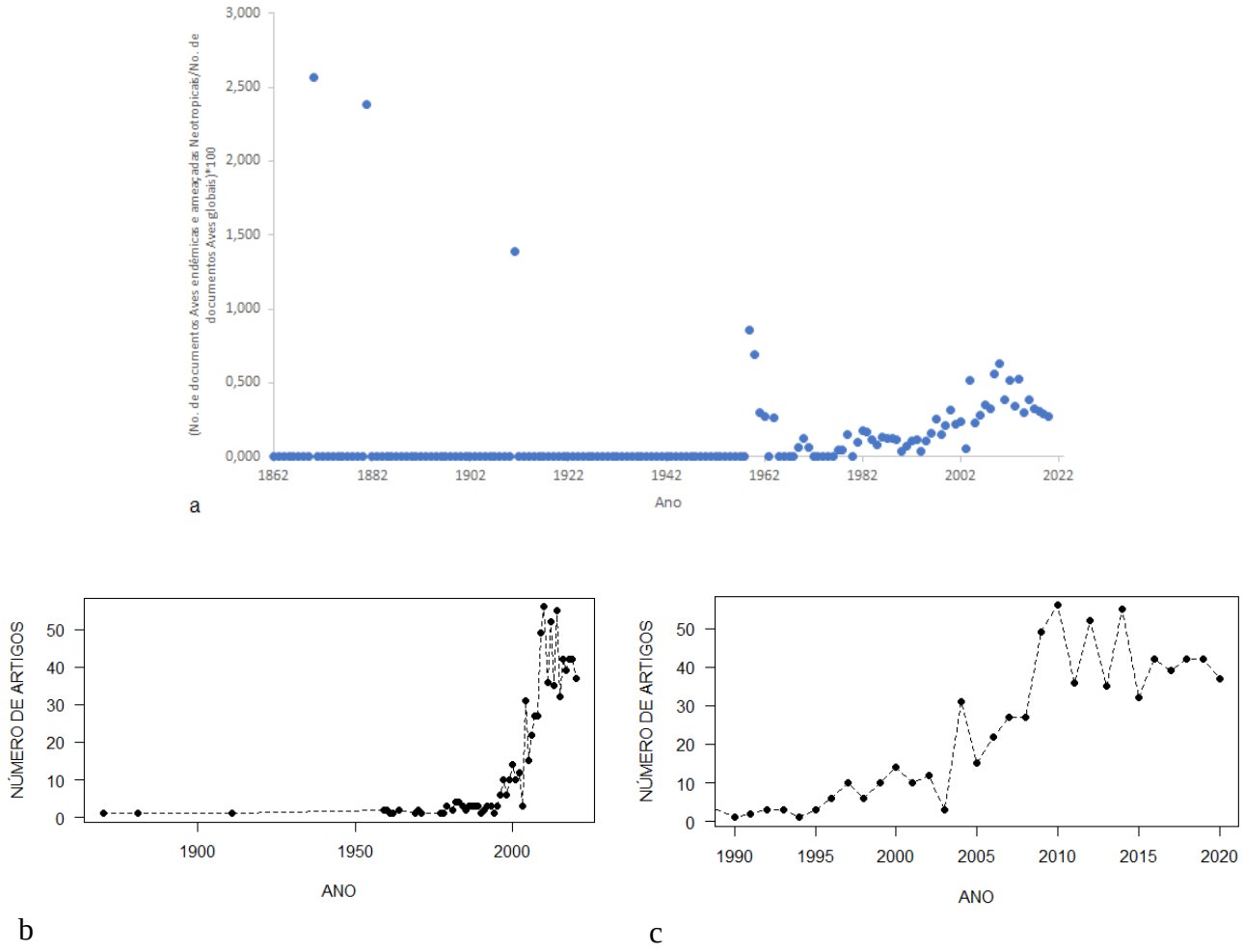


Figura 1. Número de publicações indexadas na base SCOPUS (a) sobre aves silvestres endêmicas e ameaçadas da região Neotropical comparadas ao total de publicações sobre aves no mundo; (b) sobre aves silvestres endêmicas e ameaçadas da região Neotropical entre 1870 e 2020 (c) e mais detalhadamente entre 1990 e 2020 (n

= 689)

Em relação à capacidade de pesquisa dos países da região Neotropical, o número de instituições de pesquisa, o número total de documentos publicados e o número de documentos publicados na área de Ciências Ambientais apresentaram valores de correlação altos (acima de 0,95), sendo então altamente redundantes. Descartando as duas variáveis relacionadas aos documentos publicados e mantendo o número de instituições de pesquisa por país como variável preditora, em nova análise, ainda restaram valores de correlação moderados entre o número de instituições de pesquisa e o número total de autores (0,48) e investimento em pesquisa (0,57), o que viola o pressuposto de colinearidade dos dados. Na nova análise de regressão linear simples, com cada uma das variáveis sendo utilizada como um preditor independente, todos os três modelos geraram resíduos que mostram distribuição normal. Entretanto, os dados do total de artigos publicados sobre aves ameaçadas de extinção para o Brasil, por ser discrepante dos valores dos demais países, atua como alavanca (*leverage*) e distorce os resultados finais. Desta forma, novas regressões, comparando os resultados com e sem o Brasil mostrou que as variáveis de número de instituições de pesquisa e de gastos com pesquisa e desenvolvimento deixam de ter efeitos estatisticamente significativos quando o Brasil é retirado da análise. O mesmo acontece quando os dados da variável resposta são logaritmizados. Além disso, a presença dos dados do Brasil não tem efeito na análise realizada com o número de autores. Então, o número total de autores, indicando a rede de colaboração, possui um efeito estatisticamente significativo sobre o número de artigos publicados sobre espécies de aves florestais endêmicas e ameaçadas de extinção na região Neotropical (R^2=0,98, p<0,001), de tal forma que a cada autor a mais aumenta em média 0,38 artigo para o país (Figura 2).

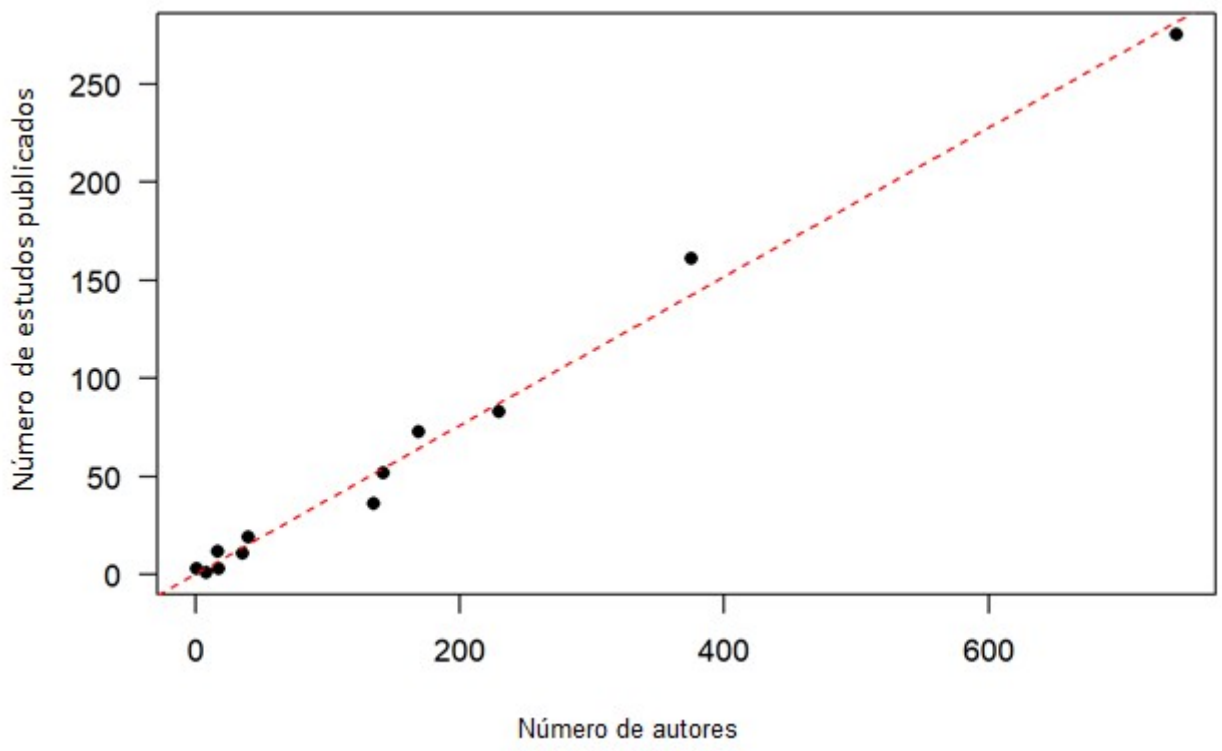


Figura 2: Relação do número total de estudos publicados sobre aves florestais endêmicas e ameaçadas de extinção por país da região Neotropical em resposta ao número total de autores que publicaram em cada país. A relação é estatisticamente significativa por uma análise de regressão linear simples (linha tracejada)

As espécies mais estudadas foram *Buteo galapagoensis* (n=30 documentos), *Guaruba guarouba* e *Geospiza pallida* (n=23), *Certhidea olivacea* (n=22), *Ara glaucogularis* (n=21) e *Crax blumenbachii* (n=20). No total, 62 (25%) espécies foram responsáveis por 70,41% dos estudos indexados (Anexo 3). Por outro lado, 65 espécies não foram associadas a nenhum documento indexado na base de dados Scopus, entre elas, várias consideradas criticamente ameaçadas (IUCN 2021), tais como *Columbina cyanopis*, *Lepidopyga lilliae*, *Oxypogon cyanolaemus*, *Pyrrhura subandina*, *Troglodytes monticola*, *Lophornis brachylophus* e *Grallaria chthonia*.

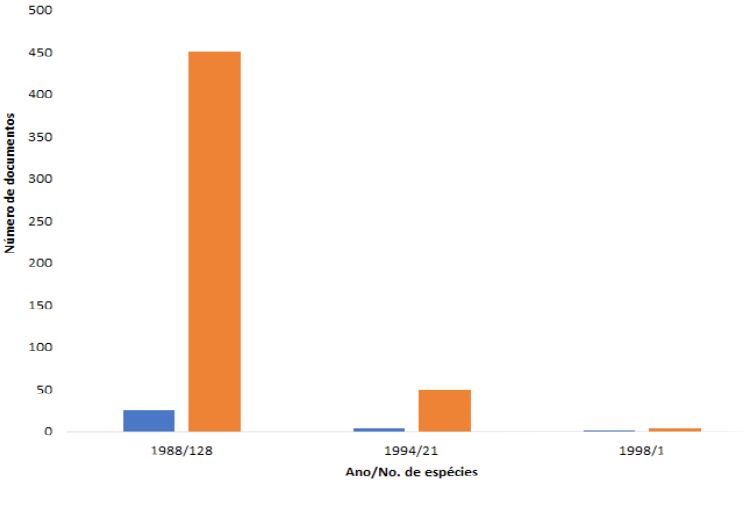
O conhecimento produzido associando as palavras-chave às áreas amplas da ciência da conservação (Tabela 3) está relacionado principalmente a temas ligados às características das espécies (26,56%) e interações ecológicas (24,38%). Por outro lado, poucos estudos são

realizados sobre temas aplicados à ciência da conservação como estratégias de manejo (8,71%), distribuição da espécie (7,40%), abundância e áreas protegidas (1,74%), assim como voltados à educação ambiental (0,15%).

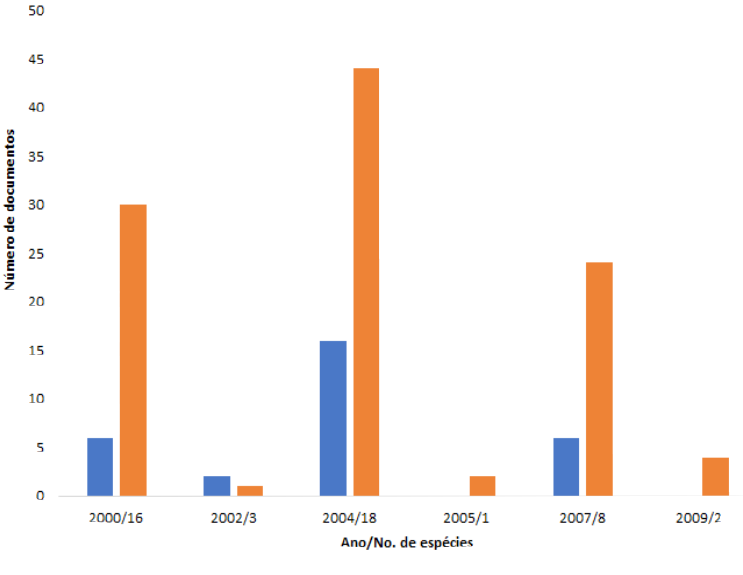
Tabela 3. Frequência dos termos associando as palavras-chave às áreas amplas da ciência da conservação e da ornitologia nos estudos sobre aves silvestres endêmicas e ameaçadas da região Neotropical (número de estudos = 689, número de palavras-chave=1606)

Termos	Frequência (%)
Características das espécies	26,56
Interações ecológicas	24,38
Genética	14,08
Conservação	11,03
Evolução	10,74
Parasitas	9,00
Gestão	8,71
Ameaças	7,98
Distribuição	7,40
Biota	6,82
População	5,52
Taxonomia	5,22
Saúde	5,04
Áreas de conhecimento	4,64
Tolerâncias abióticas	3,05
Biogeografia	2,47
Abundância	1,74
Áreas protegidas	1,74
Inventário	1,31
Pessoas	1,16
Comunidade	1,02
Educação ambiental	0,15

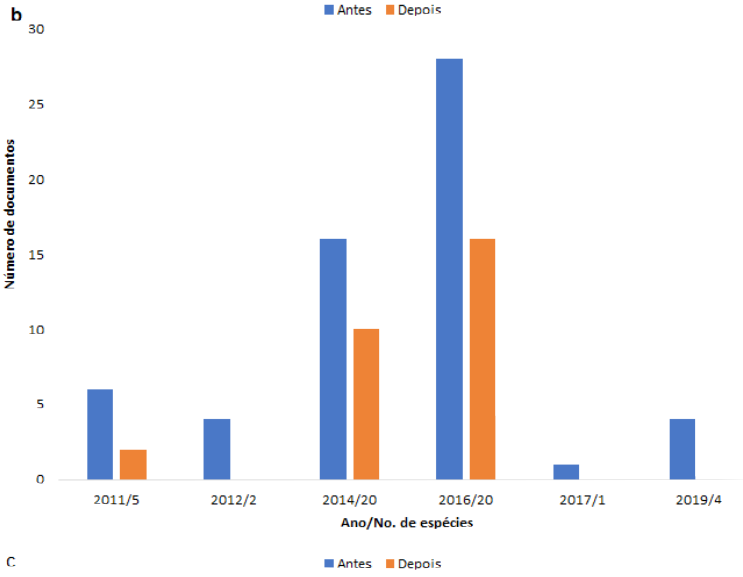
A importância da lista vermelha da IUCN no aumento das publicações sobre as aves silvestres endêmicas e ameaçadas da região Neotropical pode ser verificada principalmente nas espécies que estão na lista a mais tempo (Figura 3).


500
450
400
350
300
250
200
150
100
50
0
Número de documentos
1988/128
1994/21
1998/1
Ano/No. de espécies
Antes
Depois

a


50
45
40
35
30
25
20
15
10
5
0
Número de documentos
2000/16
2002/3
2004/18
2005/1
2007/8
2009/2
Ano/No. de espécies
Antes
Depois

b


30
25
20
15
10
5
0
Número de documentos
2011/5
2012/2
2014/20
2016/20
2017/1
2019/4
Ano/No. de espécies
Antes
Depois

c

Figura 3. Quantidade de documentos publicados antes e depois da inclusão das espécies de aves silvestres endêmicas e ameaçadas da região Neotropical na lista vermelha da IUCN**. a) entre 1988 e 2000; b) entre 2000 e 2010; c) entre 2010 e 2020**

O conhecimento indicado pela IUCN como necessário à conservação das espécies analisadas (Tabela 4) prioriza a importância de ações visando a criação e ampliação das áreas protegidas (78,4%), estudos para conhecer a distribuição das espécies (56,8%), bem como estudos que avaliem a abundância (42,4%) e requerimentos ecológicos (38,8%) das espécies de aves silvestres endêmicas e ameaçadas da região Neotropical. Além disso, ressalta a necessidade de gestão nas áreas protegidas (38,8%), monitoramento das populações (26,8%), ações de sustentabilidade (25,6%), educação ambiental (18,8%) e ações práticas de conservação (18,4%).

Tabela 4. Frequência das ações propostas indicadas pela IUCN para a conservação de aves silvestres endêmicas e ameaçadas da região Neotropical (250 espécies)

Ações Propostas	Frequência (%)
Áreas protegidas	78,4
distribuição	56,8
abundância	42,4
Requerimentos ecológicos	38,8
Gestão	38,8
Monitoramento populacional	26,8
Sustentabilidade	20,4
Educação Ambiental	18,8
Conservação	18,4
Avaliar as ameaças	12,4
Reprodução	10,0
Genética	4,0
Restrições ao comércio	2,8
Taxonomia	3,6
Saúde	1,6

Entre as ameaças apontadas pela IUCN (Tabela 5), a perda de habitat e degradação estão associadas à 92,4% das espécies silvestres endêmicas e ameaçadas da região

Neotropical. Além disso, outras ameaças importantes foram a caça (12,4%), comércio ilegal (9,2%), espécies exóticas invasoras (8,8%), mudança climática (8,4%), distúrbios provocados pelo gado (8%), impactos dos pesticidas (6,8%) e parasitismo (5,6%).

Tabela 5. Frequência das ameaças indicadas pela IUCN (250 espécies)

Ameaças	Frequência (%)
Perda de habitat e degradação	92,4
Caça	12,4
Comércio ilegal	9,2
Espécies invasoras	8,8
Mudanças climáticas	8,4
Distúrbios provocados pelo gado	8,0
Impacto dos pesticidas	6,8
Parasitismo	5,6
Doenças	2,4
Perda de fontes de água	2,4
Endogamia	2,0
Dificuldades de pesquisa	1,2

Discussão

Nosso estudo avaliou a produtividade científica sobre 16,8% das aves ameaçadas que constam na lista vermelha da IUCN e identificou aspectos importantes para a ciência da conservação, bem como algumas lacunas significativas na construção do conhecimento sobre as aves silvestres endêmicas e ameaçadas da região Neotropical. Nossos resultados mostram que a produção científica sobre esse grupo de aves não segue a tendência de aumento verificada em outros estudos com aves ameaçadas (Ducatez & Lefebvre 2014, Buechley et al. 2019), em outras áreas do conhecimento (King 2004; Carneiro et al. 2008; Nabout et al. 2012) ou com o aumento da preocupação ambiental global (Ribeiro 2001; Rudek & Muzzillo 2007). Além disso, é importante destacar que o número de estudos sobre este grupo ainda é muito baixo

com a maioria das espécies (90%) tendo menos de cinco documentos publicados, apesar da importância ecológica e funcional destas espécies (Bracken & Low 2012; Harvey et al. 2016). É importante ressaltar que analisamos documentos científicos publicados e indexados na base de dados Scopus, porém, muitas informações sobre espécies ameaçadas estão hoje disponíveis em plataformas digitais, relatórios públicos e atlas da vida selvagem (Lindenmayer & Sheele 2017), as quais não foram aqui analisadas.

Nossos resultados mostram um padrão relacionado à visibilidade na escolha das espécies mais estudadas e um grupo pequeno e seleto de espécies vem sendo privilegiado com a maior parte das publicações. Vimos que animais maiores e mais fáceis de serem visualizados ou encontrados são mais atraentes aos pesquisadores gerando mais conhecimento. De fato, algumas das espécies mais estudadas são consideradas carismáticas (*Buteo galapagoensis* – Equador, *Guaruba guarouba*, *Anodorhynchus leari* – Brasil, *Sephanoides fernandensis* - Chile) ou patrimônio cultural (*Ara glaucogularis* - Bolívia) em seus países. Além disso, o uso de espécies carismáticas ou de forte apelo cultural funcionam como espécies-bandeiras e excelentes ferramentas de apoio à conservação (Male & Bean 2005; Christie 2006); Ducarme et al. 2013; McGinlay et al. 2017). No entanto, a carência de estudos sobre espécies menos famosas ou impopulares pode comprometer os esforços para a elaboração de ações de conservação eficientes, principalmente quando elas estão ameaçadas. Outra tendência verificada está relacionada à raridade das espécies. Nosso estudo mostrou que animais recentemente descritos ainda carecem de quantidade de artigos e informações suficientes para subsidiar as estratégias de conservação.

Por outro lado, o grau de ameaça, o tamanho da população, o número máximo de localidades e a extensão da área de ocorrência parecem não ser fatores estimulantes aos pesquisadores na produção do conhecimento (Mackenzie & Robertson 2015) ou não se traduzem na

produção de mais artigos sobre as espécies florestais endêmicas e ameaçadas do que para as demais espécies de aves. Sabe-se que o interesse científico por uma espécie é movido por um conjunto complexo de fatores, incluindo a facilidade com que a espécie pode ser estudada, seu valor comercial, a disponibilidade de recursos financeiros, o estado de conservação ou interesse público nos resultados (Brooke et al. 2014; Robertson & Mackenzie 2015). De fato, o grau de ameaça tem sido levado em consideração, pois houve um aumento na oferta de recursos financeiros, por parte dos órgãos de financiamento, direcionados aos projetos com espécies ameaçadas (Betts et al. 2019). No entanto, ainda é necessário ampliar esse investimento em pesquisa, em especial para as espécies ameaçadas não-carismáticas (Male & Bean 2005). Ao longo da última década menos de 15% dos fundos necessários para reduzir o status de conservação de todas as espécies de aves atualmente ameaçadas foram aplicados (McCarthy et al. 2012). Particularmente, na região Neotropical, os investimentos financeiros e recursos tecnológicos aplicados a conservação da biodiversidade são ainda mais escassos (Rodríguez et al 2005), comprometendo a capacidade de pesquisa e recuperação das espécies dos países que compõem a região.

Surpreendentemente, o baixo número de localidades e a restrita extensão da área de ocorrência de algumas espécies, apesar de parecerem fatores facilitadores devido à necessidade de menor investimento financeiro para acesso às áreas, não são. O tamanho reduzido destas populações endêmicas e ameaçadas, pode intimidar os pesquisadores a terem sucesso em suas pesquisas (Kunin & Shmid 1997; Novotný & Basset 2000; Caro et al. 2011). No entanto, torna-se necessário vencer estes desafios e ampliar a produção de conhecimento sobre estas espécies antes que sejam completamente extintas.

Nossos resultados mostram que a maior parte dos estudos abrangeram temas como interações ecológicas, características das espécies, genética e conservação. Porém apenas 25%

das espécies estão sendo contempladas nas pesquisas. As outras carecem de informações básicas sobre a história de vida e ecologia, lacunas consideradas importantes para a elaboração de estratégias eficientes de conservação (Thomas et al. 2011; Hortal et al. 2015; Hohenlohe et al. 2020). Além disso, vimos que para a maioria das espécies, ainda é prioritário conhecer temas básicos e aplicados à ciência da conservação, como biologia reprodutiva, área de vida, tamanhos populacionais (Cook et al. 2010; Ferraro & Pattanayak 2006; Sutherland et al. 2004), estratégias de manejo, reintrodução e reprodução em cativeiro (Thomas et al. 2011, Hortal et al. 2015, Hohenlohe et al. 2020).

Diante desse cenário, cientistas concordam que o mais importante em todo o processo de conservação é a necessidade de seguir prioridades claras que orientem e direcionem a pesquisa e a ação conservacionista (Stotz et al 1996; Silveira 2009; Betts et al 2019; Bachman et al. 2019). Nesse sentido, as diretrizes propostas pela IUCN podem ajudar a definir estas prioridades para as espécies ameaçadas. Nosso estudo corrobora a importância da lista vermelha da IUCN na conservação, já reconhecida por Rodrigues et al. (2006) e Betts et al (2019), indicando que após a inclusão da espécie na lista vermelha, a quantidade de estudos sobre ela aumenta consideravelmente. Entre as ameaças identificadas pela IUCN, a perda e degradação de habitat lidera como principal ameaça. No entanto, para a maioria das espécies não se conhece quais os efeitos reais destas ameaças, dificultando assim a tomada de decisões eficientes e imediatas para salvá-las. Entre as ações indicadas pela IUCN, a criação, ampliação e gestão adequada de áreas protegidas aparecem como as mais importantes e são reconhecidas como as principais ferramentas para minimizar a degradação e perda de habitat (Gaston et al. 2008; Bernard et al. 2014). No entanto, a IUCN (2019) ressalta que, mesmo dentro de áreas protegidas, poucas espécies possuem proteção efetiva contra as ameaças, tais como plano de conservação específicos ou plano de manejo para o ambiente das espécies. As

outras ameaças decorrentes de perturbações antrópicas, tais como caça, comércio ilegal, espécies exóticas invasoras, distúrbios provocados pelo gado, impactos do uso de pesticidas e o impacto dos parasitas, também podem ser amenizados se o sistema de áreas protegidas forem gerenciados e monitorados sistematicamente e se estratégias de conservação forem aplicadas além dos seus limites, de modo a atingir os objetivos de conservação da diversidade biológica a longo prazo (Ayres 2005).

Concluindo, vimos que a falta de conhecimento sobre as interações das espécies e seus efeitos na sobrevivência e aptidão individual, conhecida como lacuna Eltoniana (Peterson et al. 2011), compromete a compreensão sobre os processos do ecossistema, a resposta das espécies às pressões ambientais, a organização da teia alimentar, os fatores de perda de espécies e o manejo adequado à conservação (Hortal et al. 2015; Rosado et al. 2016). Particularmente, a falta de conhecimento sobre a história de vida e os papéis funcionais das espécies, conhecida como lacuna Hutchinsoniana (Cardoso et al. 2011) dificulta a reprodução em cativeiro e limita nossa capacidade de prever as respostas às mudanças no habitat (Mokany & Ferrier 2011). Da mesma forma, a carência de dados sobre a abundância e dinâmica populacional das espécies, conhecida como lacuna Prestoniana (Cardoso et al. 2011), também fragiliza a tomada de decisão sobre o futuro das populações a médio e longo prazo. Todas essas lacunas têm implicações profundas no planejamento sistemático de conservação, ecologia de restauração e seleção de áreas protegidas e precisam ser urgentemente preenchidas. No entanto, esse esforço envolve o aumento do interesse dos pesquisadores e a ampliação dos financiamentos para projetos de pesquisa direcionados a esses temas e espécies. Portanto, diante da urgência em salvar as espécies, esse parece ser o único caminho viável para muitas aves silvestres endêmicas e ameaçadas da região Neotropical.

Agradecimentos

Somos gratos a Nabout, J.C., Campos e Silva, J.V., Pinto, M.P., Albuquerque, U.P. e Ladle, R.J. pelas revisões e sugestões.

Financiamento

Este artigo faz parte da dissertação de mestrado de K.J.S.B.C., apoiado pela bolsa de pesquisa da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES - No. 88882.452192/2019-1).

Declaração de divulgação

Os autores declaram que não há conflitos de interesse.

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5 CONCLUSÃO

- Existe uma tendência crescente de pesquisas sobre espécies ameaçadas de aves terrestres endêmicas no Brasil, embora o volume de estudos ainda seja muito baixo e elas claramente não sejam uma prioridade de pesquisa, mesmo entre os cientistas conservacionistas.
- No Brasil, apenas 10 espécies são responsáveis por quase metade de todas as pesquisas publicadas e claramente ainda carecemos de informações sobre biologia básica e ecologia para muitas espécies neste grupo.
- Os estudos em nosso banco de dados cobriram uma ampla gama de tópicos, mas muitos carecem de informações pertinentes para apoiar a tomada de decisões sobre manejo e conservação.
- A falta de conhecimento sobre esse grupo de aves brasileiras compromete a efetiva conservação e deve ser prioridade política aumentar o esforço de pesquisa dos pesquisadores nacionais.
- Em relação às aves Neotropicais a produção científica sobre esse grupo não acompanhou a tendência global de crescimento e permaneceu muito baixo com a maioria das espécies tendo menos de cinco documentos publicados. Poucas espécies foram responsáveis pela maioria dos estudos indexados e 65 espécies não foram associadas a nenhum documento indexado.
- As principais características que influenciaram a produção do conhecimento sobre o grupo foram o tamanho corporal e a visibilidade cultural. Além disso, a rede de colaboração entre os autores se mostrou como fator importante para ampliar a capacidade de pesquisa dos países.
- A maior parte dos estudos abrangeram temas como interações ecológicas, características das espécies, genética e conservação. No entanto, para a maioria das espécies florestais endêmicas e ameaçadas da região Neotropical, ainda é prioritário conhecer temas básicos e aplicados à ciência da conservação, como biologia reprodutiva, área de vida, tamanhos populacionais, estratégias de manejo, reintrodução e reprodução em cativeiro.
- Em relação às ameaças, para a maioria das espécies não se conhece quais seus efeitos

reais, dificultando assim a tomada de decisões eficientes e imediatas para salvá-las. Entre as ações indicadas pela IUCN, a criação, ampliação e gestão adequada de áreas protegidas aparecem como as mais importantes e são reconhecidas como as principais ferramentas para minimizar a degradação e perda de habitat.

- Assim, diante da urgência em salvar as espécies, as lacunas Eltoniana, Prestoniana e Hutchinsoniana sobre essas espécies precisam ser preenchidas e para isso, o aumento do interesse dos pesquisadores e a ampliação dos financiamentos para projetos de pesquisa direcionados a esses temas e espécies parece ser o único caminho viável para muitas aves silvestres endêmicas e ameaçadas da região Neotropical.

ANEXO 1. Lista das aves silvestres endêmicas e ameaçadas de extinção globalmente na região Neotropical, países onde elas ocorrem, categoria de ameaça na lista vermelha da IUCN, número de estudos e características das espécies associadas à raridade: (i) ano de inclusão da espécie na lista; (ii) ano de descrição da espécie; (iii) número máximo de indivíduos adultos; (iv) número máximo de localidades onde a espécie ocorre e (v) extensão da ocorrência (EOO), área contida dentro do menor limite contínuo que engloba todos os pontos conhecidos, inferidos ou projetados do táxon, excluindo os casos de vagantes e visitantes (IUCN 2021), compilados da lista vermelha. Características das espécies associadas à visibilidade: (i) tamanho da espécie, obtidos na lista vermelha (IUCN) e (ii) quantidade de visualizações no banco de dados on-line de observações de aves eBird (https://ebird.org/home).

				Raridade					**Visibilidade**	
Espécie	**Países**	**Categoria de ameaça na lista vermelha da IUCN**	**Número de estudos**	**Ano de inclusão na lista vermelha da IUCN**	**Ano de descrição da espécie**	**População (Número máximo de indivíduos maduros)**	**Número máximo de localidades onde a espécie ocorre**	**Estimativa de área de ocorrência (km²)**	**Tamanho corporal (cm)**	**Visualizações no eBird**
Sporophila iberaensis	Argentina	EN	3	2016	2016	999	1	8400	10	0
Pauxi unicornis	Bolívia	CR	4	2014	1939	4999	10	14000	90	14
Pyrrhura snethlageae	Bolívia	VU	2	2014	2002		2	563000	22	0
Ara glaucogularis	Bolívia	CR	21	1988	1921	249	3	43500	85	274
Ara rubrogenys	Bolívia	CR	14	1988	1847	272	10	27400	57	285
Hylopezus auricularis	Bolívia	VU	2	2000	1941	9999	4	270	14	81
Cranioleuca henricae	Bolívia	EN	1	2000	1997	1500	6	12800	14	32
Phibalura boliviana	Bolívia	EN	4	2012	1930	530	10	1600	21	828
Poospiza garleppi	Bolívia	EN	4	1988	1893	2700	100	10800	17	176
Guaruba guarouba	Brazil	VU	24	1988	1788	13400	100	498000	34	164
Crax blumenbachii	Brazil	EN	20	1988	1825	170	4	77400	84	250
Anodorhynchus leari	Brazil	EN	15	1988	1856	999	2	31200	70	268
Amazona pretrei	Brazil	VU	13	1988	1830	19000	100	95400	32	0
Celeus obrieni	Brazil	VU	11	2007	1973	6000	100	861000	27	206
Formicivora paludicola	Brazil	CR	10	2016	2013	700	100	1500	15	0
Amazona rhodocorytha	Brazil	VU	9	1988	1890	9999	100	168000	35	781

Penelope jacucaca	Brazil	VU	8	1988	1825	9999	100	650000	67	295
Antilophia bokermanni	Brazil	CR	8	2000	1998	700	1	300	15	184
Phylloscartes roquettei	Brazil	EN	8	1988	1928	7000	7	316000	11	157
Pyrrhura lepida	Brazil	VU	7	1988	1832	6700	100	585000	24	248
Leptodon forbesi	Brazil	EN	6	2000	1922	999	7	90100	50	141
Penelope ochrogaster	Brazil	VU	5	1988	1870	1700	5	1050000	72	1579
Pyrrhura cruentata	Brazil	VU	5	1988	1820	9999	100	281000	30	568
Herpsilochmus pectoralis	Brazil	VU	5	1988	1857	9999	100	879000	11	178
Scytalopus novacapitalis	Brazil	EN	5	1988	1958	100	100	119000	11	230
Lepidothrix iris	Brazil	VU	5	2004	1851		100	983000	9	186
Ramphastos ariel	Brazil	EN	4	2014	1826			5990000	50	0
Touit melanonotus	Brazil	VU	4	1988	1820	9999	100	400000	15	418
Pyrilia vulturina	Brazil	VU	4	1988	1820		100	1030000	23	204
Pyrrhura leucotis	Brazil	VU	4	2014	1820	9999	100	352000	23	447
Lepidothrix vilasboasi	Brazil	VU	4	1988	1959	9999	100	89600	8	5
Calyptura cristata	Brazil	CR	4	1988	1818	49	1	3	8	0
Pyrrhura pfrimeri	Brazil	EN	3	2007	1920	49999	5	20300	23	65
Formicivora grantsaui	Brazil	EN	3	2011	2007	9999	4	3600	12	146
Terenura sicki	Brazil	CR	3	1988	1983	249	8	12900	10	155
Scytalopus gonzagai	Brazil	EN	3	2016	2014	9999	5	4600	12	9
Scytalopus iraiensis	Brazil	EN	3	2000	1998	999	20	381000	12	93
Xiphocolaptes falcirostris	Brazil	VU	3	1988	1824	9999	9	825000	29	138
Synallaxis infuscata	Brazil	EN	3	1988	1950	999	12	31100	16	106
Carpornis melanocephala	Brazil	VU	3	1988	1820	9999	100	713000	21	643
Lipaugus conditus	Brazil	VU	3	1988	1980	1700	4	1400	24	0
Elaenia ridleyana	Brazil	VU	3	2000	1888	500	1	38	17	186
Nemosia rourei	Brazil	CR	3	1988	1870	200	5	2200	14	33
Sporophila beltoni	Brazil	VU	3	2016	2013	9000	100	57100	15	56

Tangara peruviana	Brazil	VU	3	1988	1806	9999	100	316000	14	1030
Penelope pileata	Brazil	VU	2	1988	1830	6700	100	1210000	78	438
Thalurania watertonii	Brazil	EN	2	2004	1847	2499	100	39800	13	444
Glaucidium mooreorum	Brazil	CR	2	2007	2002	49	18	100	14	0
Malacoptila minor	Brazil	EN	2	2014	1911		100	131000	20	0
Pteroglossus bitorquatus	Brazil	EN	2	2014	1911		100	131000	35	1239
Pyrrhura griseipectus	Brazil	EN	2	2007	1900	999	3	3300	23	255
Pyrrhura snethlageae	Brazil	VU	2	2014	2002		100	563000	22	0
Clytoctantes atrogularis	Brazil	VU	2	2000	1990	9999	1	216000	17	22
Myrmotherula klagesi	Brazil	VU	2	1988	1927		100	289000	10	351
Myrmotherula snowi	Brazil	CR	2	1994	1985	49	20	230	9	49
Herpsilochmus pileatus	Brazil	VU	2	2002	1823	2499	10	23400	11	422
Rhegmatorhina gymnops	Brazil	VU	2	1988	1888		100	168000	13	367
Myrmoderus ruficauda	Brazil	EN	2	1988	1831	1700	100	155000	14	294
Pyriglena atra	Brazil	EN	2	1988	1825	1700	100	9200	17	111
Merulaxis stresemanni	Brazil	CR	2	1988	1960	49	1	29	20	28
Acrobatornis fonsecai	Brazil	VU	2	2000	1996	9999	10	13400	14	162
Xipholena atropurpurea	Brazil	VU	2	1988	1820	9999	100	250000	19	355
Hemitriccus furcatus	Brazil	VU	2	1994	1846	9999	100	238000	11	1000
Cichlopsis leucogenys	Brazil	EN	2	2016	1850	2499	100	124000	20	526
Anumara forbesi	Brazil	EN	2	1988	1886	10000	100	447000	22	81
Conothraupis mesoleuca	Brazil	EN	2	1988	1939	999	3	347000	16	63
Crax pinima	Brazil	CR	1	2014	1870	49	1	313000	65	0
Glaucis dohrnii	Brazil	EN	1	1988	1852	999	5	17800	12	306
Phaethornis aethopygus	Brazil	VU	1	2011	1950		100	272000	9	328
Psophia dextralis	Brazil	EN	1	2014	1934		100	1160000	48	0
Psophia obscura	Brazil	CR	1	2014	1857	249	100	241000	48	0
Picumnus varzeae	Brazil	EN	1	2004	1912		100	254000	8	62

Pyrrhura amazonum	Brazil	EN	1	2014	1906		100	392000	22	2402
Dysithamnus plumbeus	Brazil	VU	1	1988	1831	9999	100	172000	12	196
Eleoscytalopus psychopompus	Brazil	EN	1	1994	1989	999	2	8200	11	59
Scytalopus diamantinensis	Brazil	EN	1	2011	2007		5	21200	13	91
Dendrocolaptes hoffmannsi	Brazil	VU	1	2004	1909		100	1160000	28	104
Thripophaga macroura	Brazil	VU	1	1988	1821	7000	100	112000	18	363
Cotinga maculata	Brazil	EN	1	1988	1776	249	100	51800	20	107
Onychorhynchus swainsoni	Brazil	VU	1	1994	1858	1700	100	288000	16	0
Phylloscartes ceciliae	Brazil	CR	1	1988	1987	249	10	20200	12	171
Hemitriccus kaempferi	Brazil	VU	1	1988	1953	12000	100	11700	10	278
Columbina cyanopis	Brazil	CR	0	1988	1870	249	5	650	15	297
Buteogallus lacernulatus	Brazil	VU	0	1988	1827	9999	100	1040000	45	710
Celeus tinnunculus	Brazil	VU	0	2014	1829		100	146000	27	0
Touit surdus	Brazil	VU	0	1988	1820	9999	100	1680000	16	556
Pionus reichenowi	Brazil	VU	0	2014	1884	9999	100	243000	26	0
Formicivora erythronotos	Brazil	EN	0	1988	1852	8500	5	410	11	269
Myrmotherula minor	Brazil	VU	0	1988	1864	9999	100	189000	9	398
Myrmotherula urosticta	Brazil	VU	0	1988	1857	7000	100	119000	9	283
Rhopornis ardesiacus	Brazil	EN	0	1988	1831	1700	10	12000	19	258
Sclerurus cearensis	Brazil	VU	0	2016	1924		100	658000	19	0
Automolus lammi	Brazil	EN	0	2014	1947	2499	100	80600	19	73
Cranioleuca muelleri	Brazil	EN	0	2004	1911		100	246000	14	77
Neopelma aurifrons	Brazil	VU	0	2000	1831	2499	100	5100	13	126
Iodopleura pipra	Brazil	EN	0	1988	1831	2499	100	767000	9	803
Phylloscartes beckeri	Brazil	EN	0	2000	1995	9999	7	1500	12	163
Hemitriccus mirandae	Brazil	VU	0	1994	1925	7000	8	212000	10	321
Tangara fastuosa	Brazil	VU	0	1988	1831	9999	100	39400	13	328
Sephanoides fernandensis	Chile	CR	10	1988	1831	3500	1	20	13	69

Eulidia yarrellii	Chile	CR	4	1988	1847	210	1	8500	8	242
Aphrastura masafucrae	Chile	CR	5	1988	1866	249	1	21	16	3
Penelope perspicax	Colombia	EN	5	1988	1911	999	6	560	76	1865
Crax alberti	Colombia	CR	4	1988	1852	2499	5	71100	88	416
Odontophorus strophium	Colombia	VU	2	1988	1844	9999	100	17400	25	146
Leptotila conoveri	Colombia	EN	2	1988	1943	19999	100	39200	25	907
Ramphomicron dorsale	Colombia	EN	0	2004	1880		3	3900	9	412
Oxypogon cyanolaemus	Colombia	CR	0	2014	1880	249	1	2800	12	19
Oxypogon stuebelii	Colombia	VU	0	2014	1884	999	1	4200	8	958
Eriocnemis isabellae	Colombia	CR	1	2009	2007	999	1	44	9	1
Eriocnemis mirabilis	Colombia	EN	2	1988	1967	999	4	680	8	15
Coeligena prunellei	Colombia	VU	2	1988	1843	9999	5	17100	11	947
Coeligena orina	Colombia	CR	1	2004	1953	2499	10	6700	14	283
Anthocephala floriceps	Colombia	VU	2	2019	1854	2500	10	8800	8	534
Campylopterus phainopeplus	Colombia	EN	0	1988	1879	49	5	2900	13	1
Lepidopyga lilliae	Colombia	CR	0	1988	1917	249	3	47200	9	371
Capito hypoleucus	Colombia	VU	1	1988	1897	7000	200	12000	19	1411
Bolborhynchus ferrugineifrons	Colombia	VU	1	1988	1880	2700	10	18600	18	518
Hapalopsittaca fuertesi	Colombia	CR	3	1994	1912	249	5	3700	24	336
Pyrrhura subandina	Colombia	CR	0	2014	1917	49	4		21	0
Pyrrhura viridicata	Colombia	EN	3	1988	1913	3200	1	1600	25	816
Pyrrhura calliptera	Colombia	VU	1	1988	1854	6700	100	24500	22	811
Grallaria bangsi	Colombia	VU	0	2004	1900	9999	5	5800	18	1154
Grallaria kaestneri	Colombia	EN	0	1994	1992	800	3	1700	15	186
Grallaria fenwickorum	Colombia	CR	2	2011	2010	249	1	1200	19	171
Grallaria milleri	Colombia	VU	5	1998	1912	7000	10	18200	18	1531
Scytalopus rodriguezi	Colombia	EN	2	2007	2005	7000	2	15400	11	272
Scytalopus canus	Colombia	EN	1	2011	1915	999	2	3000	10	122

Synallaxis fuscorufa	Colombia	VU	0	2004	1882	9999	5	5800	17	1205
Lipaugus weberi	Colombia	CR	2	2002	2001	249	16	270	24	374
Pogonotriccus lanyoni	Colombia	EN	0	1994	1988	1700	8	34800	11	331
Myiotheretes pernix	Colombia	EN	2	1988	1899	1700	1	2000	21	543
Vireo caribaeus	Colombia	VU	2	1988	1942	9999	1	21	12	263
Troglodytes monticola	Colombia	CR	0	2004	1899	249	1	1800	11	17
Cistothorus apolinari	Colombia	EN	6	1988	1914	1700	11	24200	12	935
Thryophilus sernai	Colombia	EN	0	2016	2012		5	8000	13	371
Thryophilus nicefori	Colombia	CR	5	1988	1946	200	10	13000	15	417
Henicorhina negreti	Colombia	VU	2	2007	2003	9999	5	18700	11	1150
Atlapetes blancae	Colombia	CR	0	2009	2007	49	1	320	16	91
Psarocolius cassini	Colombia	EN	1	1988	1898	1700	100	31300	46	283
Hypopyrrhus pyrohypogaster	Colombia	VU	4	1988	1847	9999	100	48400	30	3715
Macroagelaius subalaris	Colombia	EN	2	1988	1840	1700	100	7000	30	234
Myiothlypis basilica	Colombia	VU	1	2004	1913	1700	10	4200	14	783
Dacnis hartlaubi	Colombia	VU	2	1988	1855	9999	10	99700	11	1143
Dubusia carrikeri	Colombia	EN	0	2016	1946	2499	1	4300	20	0
Bangsia aureocincta	Colombia	EN	1	1988	1910	1700	100	8000	16	1433
Bangsia melanochlamys	Colombia	VU	1	1988	1910	1700	10	39600	16	2038
Anthocephala berlepschi	Colombia	VU	1	2019	1893	4500	20	17500	8	412
Pyrrhura chapmani	Colombia	VU	0	2019	1941	14000	10	14800	24	0
Amazilia boucardi	Costa Rica	EN	0	1988	1877	7000	10	15300	9	1951
Amazilia alfaroana	Costa Rica	CR	1	2017	1896	49	1	80	11	3370
Coccyzus ferrugineus	Costa Rica	VU	0	1988	1843	999	1	30	33	69
Nesotriccus ridgwayi	Costa Rica	VU	2	1994	1895	15000	1	30	13	65
Habia atrimaxillaris	Costa Rica	EN	5	1988	1924	15000	2	1700	18	2276
Pinaroloxias inornata	Costa Rica	VU	3	1994	1843	15000	1	30	12	113
Metallura baroni	Ecuador	EN	4	1988	1893	1700	5	3400	10	460

Eriocnemis nigrivestis	Ecuador	CR	3	1988	1852	150	5	590	8	90
Eriocnemis godini	Ecuador	CR	1	1988	1851	49	1	100	10	0
Chaetocercus berlepschi	Ecuador	EN	3	1988	1889	2700	100	28500	6	278
Buteo galapagoensis	Ecuador	VU	30	1988	1837	330	10	29600	55	2782
Amazona lilacina	Ecuador	EN	1	2014	1844	2499	100	28200	34	0
Pyrrhura orcesi	Ecuador	EN	7	1994	1988	999	1	3800	22	376
Pyrrhura albipectus	Ecuador	VU	2	1988	1914	7000	10	19600	24	452
Scytalopus robbinsi	Ecuador	EN	4	2007	1997	5000	2	5200	11	86
Pyrocephalus nanus	Ecuador	VU	5	2016	1838	9999	1	25500	13	0
Progne modesta	Ecuador	EN	3	2005	1837	999	100	28700	16	554
Mimus trifasciatus	Ecuador	EN	8	1994	1837	999	2	12	25	343
Mimus macdonaldi	Ecuador	VU	3	2000	1890	1700	2	80	28	1089
Atlapetes pallidiceps	Ecuador	EN	10	1988	1900	226	1	36	16	146
Certhidea olivacea	Ecuador	VU	22	2016	1837		10	15600	10	1083
Geospiza psittacula	Ecuador	VU	0	2004	1837		10	26500	13	879
Geospiza pauper	Ecuador	CR	12	1988	1890	1700	1	30	12	259
Geospiza pallida	Ecuador	VU	23	2004	1870		6	21600	15	1140
Geospiza septentrionalis	Ecuador	VU	1	2016	1899	999	2	50	11	7
Geospiza acutirostris	Ecuador	VU	1	2016	1894	999	1	19		527
Geospiza conirostris	Ecuador	VU	15	2016	1890	999	1	70	15	741
Geospiza propinqua	Ecuador	VU	0	2016	1894	999	1	19		461
Geospiza heliobates	Ecuador	CR	9	1988	1901	80	2	18	14	61
Amazilia luciae	Honduras	EN	4	1988	1867	19999	10	16100	9	734
Dendrortyx barbatus	México	VU	6	1988	1846	3600	100	36000	34	444
Zentrygon carrikeri	México	EN	1	1994	1941	999	5	470	30	311
Lophornis brachylophus	México	CR	0	1994	1949	999	1	70	7	71
Eupherusa cyanophrys	México	EN	0	1988	1964	1700	2	7400	11	372
Eupherusa poliocerca	México	VU	0	1988	1871	15000	10	12500	11	186

Thalurania ridgwayi	México	VU	0	1994	1900	15000	10	34200	10	728
Amazona finschi	México	EN	20	2004	1864	6700	100	394000	32	7241
Amazona viridigenalis	México	EN	10	1988	1853	4300	100	61000	33	32817
Rhynchopsitta terrisi	México	EN	5	1988	1947	2499	10	1900	42	488
Cyanolyca mirabilis	México	VU	0	1988	1903	7000	6	31400	24	157
Hylorchilus navai	México	VU	4	1994	1973	7000	9	8400	16	366
Troglodytes tanneri	México	VU	2	1988	1890	400	1	38	13	39
Mimus graysoni	México	CR	6	1988	1871	280	1	50	25	21
Toxostoma guttatum	México	CR	1	2000	1885	49	1	150	23	51
Spizella wortheni	México	EN	10	1994	1884	999	25	13900	13	257
Pipilo socorroensis	México	EN	1	2016	1867	9999	1	170	16	0
Junco insularis	México	EN	1	1988	1876	249	1	60	15	24
Xenospiza baileyi	México	EN	6	1988	1931	9999	5	26800	12	643
Geothlypis speciosa	México	EN	2	1988	1859	7000	5	16000	13	351
Geothlypis beldingi	México	VU	4	1994	1883	2499	27	55300	14	1549
Geothlypis flavovelata	México	VU	2	1994	1896	7000	100	62400	12	156
Leptotila battyi	Panamá	VU	0	2000	1901	99999	10	7100	25	0
Selasphorus ardens	Panamá	EN	1	1988	1870	12000	10	3000	7	17
Pyrrhura eisenmanni	Panamá	EN	0	2014	1985	2499	2	1800	22	0
Pselliophorus luteoviridis	Panamá	VU	0	1994	1924	15000	10	4800	17	62
Phytotoma raimondii	Peru	VU	10	1988	1883	9999	100	88000	18	482
Penelope albipennis	Peru	EN	6	1988	1878	200	10	4400	85	454
Loddigesia mirabilis	Peru	EN	4	1988	1847	999	2	8700	12	616
Eulidia yarrellii	Peru	CR	4	1988	1847	210	1	8500	8	242
Pauxi koepckeae	Peru	CR	3	2014	1971	249	10	620	90	4
Xenoglaux loweryi	Peru	EN	3	1988	1977	999	100	2200	13	270
Cinclodes palliatus	Peru	CR	2	1988	1844	249	5	6300	24	327
Atlapetes melanopsis	Peru	EN	2	2000	2002	7000	5	7200	17	89

Cacicus koepckeae	Peru	EN	2	1988	1965	9999	100	76500	23	2
Aulacorhynchus huallagae	Peru	EN	1	1988	1933	1500	2	4900	39	16
Capito wallacei	Peru	VU	1	2002	2000	999	1	370	19	112
Picumnus steindachneri	Peru	EN	1	1988	1882	15000	10	8200	10	513
Forpus xanthops	Peru	VU	1	1994	1895	999	4	4800	15	227
Leptasthenura xenothorax	Peru	EN	1	1988	1921	999	4	7600	16	424
Zaratornis stresemanni	Peru	VU	1	1988	1964	4000	100	116000	18	354
Doliornis sclateri	Peru	VU	1	2004	1874	7000	100	16600	21	162
Zimmerius villarejoi	Peru	VU	1	2000	2001	9999	1	77200	10	544
Myiarchus semirufus	Peru	VU	1	2004	1878	9999	100	93600	18	600
Microspingus alticola	Peru	EN	1	1988	1895	1700	100	32000	15	269
Grallaricula ochraceifrons	Peru	EN	0	1988	1983	700	2	2300	10	264
Taphrolesbia griseiventris	Peru	EN	0	1988	1883	999	5	28000	15	238
Aglaeactis aliciae	Peru	EN	0	1988	1896	2499	10	1100	12	47
Herpsilochmus parkeri	Peru	EN	0	1988	1986	999	2	19	12	95
Percnostola arenarum	Peru	VU	0	2004	2001	1700	5	33800	10	137
Grallaria przewalskii	Peru	VU	0	2004	1882		100	37300	17	652
Asthenes usheri	Peru	VU	0	1988	1947	9999	2	9700	15	0
Cranioleuca berlepschi	Peru	VU	0	1988	1905	1700	11	17800	18	256
Synallaxis hypochondriaca	Peru	VU	0	2016	1895	15000	4	8900	18	127
Synallaxis zimmeri	Peru	EN	0	1988	1957	1700	5	1500	16	83
Synallaxis courseni	Peru	VU	0	1988	1971	1700	5	7700	18	235
Poecilotriccus luluae	Peru	EN	0	2014	2001	7000	6	1500	10	571
Poospiza rubecula	Peru	EN	0	1988	1895	700	7	26600	15	125
Cnemathraupis aureodorsalis	Peru	EN	0	1988	1974	2500	3	18000	22	121
Aglaiocercus berlepschi	Venezuela	EN	5	2007	1898	7000	1	4200	22	75
Hylonympha macrocerca	Venezuela	EN	1	1988	1873	4000	4	470	19	45
Grallaria excelsa	Venezuela	VU	1	1988	1893	9999	10	147000	24	45

Grallaria chthonia	Venezuela	CR	0	1988	1956	49	1	500	17	0
Grallaricula cumanensis	Venezuela	VU	0	2012	1900		10	10700	11	53
Premnoplex tatei	Venezuela	EN	2	2016	1925	7000	4	2300	15	59
Premnoplex pariae	Venezuela	EN	0	2016	1949	2400	3	470	15	0
Thripophaga amacurensis	Venezuela	EN	1	2016	2013		1	830	17	9
Phyllomyias urichi	Venezuela	EN	0	2000	1899	1700	4	1100	12	1
Arremon phygas	Venezuela	VU	0	2016	1912		10	10400	16	41
Basileuterus griseiceps	Venezuela	EN	1	1988	1869	7000	7	2700	14	57
Myioborus pariae	Venezuela	EN	1	1988	1949	7000	3	610	13	50
Poospiza goeringi	Venezuela	VU	0	1988	1870	7000	100	8300	14	22
Diglossa venezuelensis	Venezuela	EN	0	1988	1925	11000	5	4500	13	18

ANEXO 2. Lista e frequência das palavras-chave indicadas pelos autores dos documentos publicados sobre aves silvestres endêmicas e ameaçadas de extinção globalmente na região Neotropical e temas das áreas amplas da ciência da conservação aos quais foram associadas.

Palavras-chaves	Freq	Termos
ANNUAL RAINFALL	1	ABIOTIC TOLERANCES
CLIMATE	1	ABIOTIC TOLERANCES
CLIMATE CHANGE	4	ABIOTIC TOLERANCES
CLIMATE CHOICE	1	ABIOTIC TOLERANCES
IONIC REGULATION	1	ABIOTIC TOLERANCES
LA NINA	1	ABIOTIC TOLERANCES
SEASONALITY	2	ABIOTIC TOLERANCES
SEASONALLY DRY FOREST	1	ABIOTIC TOLERANCES
ELEVATION	1	ABIOTIC TOLERANCES
ELEVATION GRADIENT	1	ABIOTIC TOLERANCES
ELEVATIONAL GRADIENTS	1	ABIOTIC TOLERANCES
EXTREME CLIMATIC EVENT	1	ABIOTIC TOLERANCES
LATITUDINAL VARIATION	1	ABIOTIC TOLERANCES
HURRICANE DISTURBANCE	1	ABIOTIC TOLERANCES
PRECIPITATION	1	ABIOTIC TOLERANCES
OUTLYING RIDGES	1	ABIOTIC TOLERANCES
RAINFALL	1	ABIOTIC TOLERANCES
ABUNDANCE	4	ABUNDANCE
BIRD ABUNDANCE	1	ABUNDANCE
CARRYING CAPACITY	1	ABUNDANCE
GROWTH RATE	1	ABUNDANCE
SPECIES LIMITS	4	ABUNDANCE
POPULATION ABUNDANCE	1	ABUNDANCE
PLEISTOCENE	1	BIOGEOGRAPHY
PLIO PLEISTOCENE	1	BIOGEOGRAPHY
PALEOGEOGRAPHY	1	BIOGEOGRAPHY
GEOGRAPHIC REGIONS	1	BIOGEOGRAPHY
GEOGRAPHIC VARIATION	1	BIOGEOGRAPHY
GEOGRAPHICAL VARIATION	1	BIOGEOGRAPHY
RELICTUATION	1	BIOGEOGRAPHY
AMAZONIAN BIOGEOGRAPHY	1	BIOGEOGRAPHY
BIOGEOGRAPHY	9	BIOGEOGRAPHY
CARBON 13	1	CHEMISTRY
DEUTERIUM	1	CHEMISTRY
DILUTION	1	CHEMISTRY
FIPRONIL	1	CHEMISTRY
NITROGEN 15	1	CHEMISTRY
PHENOL RED	1	CHEMISTRY
PLASMA OSMOLALITY	1	CHEMISTRY
OSMOLARITY	1	CHEMISTRY
OSMOREGULATION	1	CHEMISTRY
CATECHOLAMINES	1	CHEMISTRY
CORTICOSTERONE	1	CHEMISTRY
CORTICOSTERONE METABOLITES	1	CHEMISTRY
ADMIXTURE	1	CHEMISTRY
AGE	1	CHEMISTRY
AVIAN COMMUNITY COMPOSITION	1	COMMUNITY
BIRD COMMUNITIES	1	COMMUNITY
BIRD COMMUNITY	1	COMMUNITY
COMMUNITY	1	COMMUNITY
COMMUNITY ASSEMBLY	1	COMMUNITY
COMMUNITY BIRD COMPOSITION	1	COMMUNITY

Palavras-chaves	Freq	Termos
COMPOSITION	1	COMMUNITY
BIRD CONSERVATION	2	CONSERVATION
CONSERVATION	56	CONSERVATION
HABITAT CONSERVATION	1	CONSERVATION
ISLAND CONSERVATION	1	CONSERVATION
ZOO	1	CONSERVATION
ZOO BIRDS	1	CONSERVATION
CONSERVATION COSTS	1	CONSERVATION
CONSERVATION INTERVENTION	1	CONSERVATION
CONSERVATION OF ENDEMIC BIRDS	1	CONSERVATION
CONSERVATION PRIORITIES	1	CONSERVATION
CONSERVATION STATUS	1	CONSERVATION
CONSERVATION STRATEGIES	1	CONSERVATION
NATURE CONSERVATION	1	CONSERVATION
FEEDING AND CONSERVATION	1	CONSERVATION
FLAGSHIP FLEET	1	CONSERVATION
FLAGSHIP SPECIES	1	CONSERVATION
IUCN RED LIST	2	CONSERVATION
ULTRACONSERVED ELEMENTS	1	CONSERVATION
PERIPHERAL ISOLATE	1	CONSERVATION
ALTITUDINAL DISTRIBUTION	2	DISTRIBUTION
ALTITUDINAL MIGRATION	1	DISTRIBUTION
ALTITUDINAL SEGREGATION	1	DISTRIBUTION
DISTRIBUTION	13	DISTRIBUTION
DISTRIBUTION AREA	1	DISTRIBUTION
DISTRIBUTION RANGE	2	DISTRIBUTION
GEOGRAPHIC DISTRIBUTION	2	DISTRIBUTION
GEOGRAPHICAL DISTRIBUTION	2	DISTRIBUTION
NEW RECORDS	4	DISTRIBUTION
RANGE EXTENSION	4	DISTRIBUTION
OCCUPANCY	1	DISTRIBUTION
OCCURRENCE	1	DISTRIBUTION
ENDEMIC BIRD AREAS	1	DISTRIBUTION
DISJUNCT DISTRIBUTION	1	DISTRIBUTION
DISPERSAL	1	DISTRIBUTION
RESTRICTED DISTRIBUTION	1	DISTRIBUTION
RESTRICTED RANGE	1	DISTRIBUTION
RESTRICTED RANGE SPECIES	1	DISTRIBUTION
RANGE	1	DISTRIBUTION
RANGE EXPANSION	1	DISTRIBUTION
BIRD RECORDS	2	DISTRIBUTION
NEW OCCURRENCE	1	DISTRIBUTION
PARROT DISTRIBUTION	1	DISTRIBUTION
POTENTIAL DISTRIBUTION	2	DISTRIBUTION
HOME RANGE	1	DISTRIBUTION
POTENTIAL DISTRIBUTION LOSS	1	DISTRIBUTION
RECORDS OF OCCURRENCE	1	DISTRIBUTION
BIOTIC INTERACTION	1	ECOLOGICAL INTERACTIONS
BIRD HABITATS	1	ECOLOGICAL INTERACTIONS
BREEDING AREA	1	ECOLOGICAL INTERACTIONS
BREEDING BIOLOGY	2	ECOLOGICAL INTERACTIONS
BREEDING ECOLOGY	1	ECOLOGICAL INTERACTIONS
BREEDING HABITAT	1	ECOLOGICAL INTERACTIONS
CAVITY NESTERS	1	ECOLOGICAL INTERACTIONS
CAVITY REUSE	1	ECOLOGICAL INTERACTIONS

Palavras-chaves	Freq	Termos
COOPERATIVE BREEDING	3	ECOLOGICAL INTERACTIONS
COOPERATIVE POLYANDRY	3	ECOLOGICAL INTERACTIONS
ECOLOGICAL NICHE	3	ECOLOGICAL INTERACTIONS
ECOLOGY	3	ECOLOGICAL INTERACTIONS
FORAGING	4	ECOLOGICAL INTERACTIONS
FORAGING ECOLOGY	3	ECOLOGICAL INTERACTIONS
FRUGIVORY	4	ECOLOGICAL INTERACTIONS
FUNDAMENTAL NICHE	1	ECOLOGICAL INTERACTIONS
HABITAT	2	ECOLOGICAL INTERACTIONS
HABITAT CHARACTERIZATION	1	ECOLOGICAL INTERACTIONS
HABITAT PREFERENCE	1	ECOLOGICAL INTERACTIONS
HABITAT REQUIREMENTS	1	ECOLOGICAL INTERACTIONS
HABITAT SELECTION	4	ECOLOGICAL INTERACTIONS
HABITAT USE	11	ECOLOGICAL INTERACTIONS
INTERACTION DIVERSITY	1	ECOLOGICAL INTERACTIONS
INTERSPECIFIC COMPETITION	1	ECOLOGICAL INTERACTIONS
LANDSCAPE ECOLOGY	1	ECOLOGICAL INTERACTIONS
NEST SITE SELECTION	3	ECOLOGICAL INTERACTIONS
NESTING	3	ECOLOGICAL INTERACTIONS
POLYANDRY	3	ECOLOGICAL INTERACTIONS
PREDATION	3	ECOLOGICAL INTERACTIONS
TOOL USE	8	ECOLOGICAL INTERACTIONS
URBAN ECOLOGY	1	ECOLOGICAL INTERACTIONS
COMPETITION	2	ECOLOGICAL INTERACTIONS
CONTACT ZONES	1	ECOLOGICAL INTERACTIONS
COOPERATION	2	ECOLOGICAL INTERACTIONS
CRACID ECOLOGY	1	ECOLOGICAL INTERACTIONS
ECOLOGICAL SEGREGATION	1	ECOLOGICAL INTERACTIONS
MULTISCALE HABITAT SELECTION	1	ECOLOGICAL INTERACTIONS
MUTUALISM	1	ECOLOGICAL INTERACTIONS
MUTUALISTIC INTERACTIONS	1	ECOLOGICAL INTERACTIONS
NEST SITE COMPETITION	1	ECOLOGICAL INTERACTIONS
NEST SITES	2	ECOLOGICAL INTERACTIONS
NATAL DISPERSAL	1	ECOLOGICAL INTERACTIONS
NESTING BIOLOGY	2	ECOLOGICAL INTERACTIONS
NESTING SITE	1	ECOLOGICAL INTERACTIONS
NESTING SUCCESS	2	ECOLOGICAL INTERACTIONS
NEW BREEDING LOCALITIES	1	ECOLOGICAL INTERACTIONS
ORNITHOPHILY	1	ECOLOGICAL INTERACTIONS
ANNUAL SURVIVAL	1	ECOLOGICAL INTERACTIONS
ANNUAL VARIATION	1	ECOLOGICAL INTERACTIONS
ENDOZOOCHOROUS SEED DISPERSAL	1	ECOLOGICAL INTERACTIONS
DISEASE ECOLOGY	1	ECOLOGICAL INTERACTIONS
SPECIES AREA RELATIONSHIP	1	ECOLOGICAL INTERACTIONS
STRAGGLING	1	ECOLOGICAL INTERACTIONS
SEED DISPERSAL	3	ECOLOGICAL INTERACTIONS
SECONDARY CAVITY NESTING	1	ECOLOGICAL INTERACTIONS
SEDIMENT INGESTION	1	ECOLOGICAL INTERACTIONS
SOCIALITY	1	ECOLOGICAL INTERACTIONS
ECOSYSTEM SERVICES	1	ECOLOGICAL INTERACTIONS
MATE CHOICE	1	ECOLOGICAL INTERACTIONS
MATING SYSTEM	1	ECOLOGICAL INTERACTIONS
EXTRA PAIR COPULATIONS	1	ECOLOGICAL INTERACTIONS
EXTRACTIVE FORAGING	1	ECOLOGICAL INTERACTIONS
FLEDGING SUCCESS	2	ECOLOGICAL INTERACTIONS

Palavras-chaves	Freq	Termos
FLENDGLINGS	1	ECOLOGICAL INTERACTIONS
FOLIVORY	2	ECOLOGICAL INTERACTIONS
FORAGING SUCCESS	1	ECOLOGICAL INTERACTIONS
FOREST COVER	1	ECOLOGICAL INTERACTIONS
FOREST REMNANTS	1	ECOLOGICAL INTERACTIONS
HERBIVORES	1	ECOLOGICAL INTERACTIONS
HERBIVOROUS PASSERINE	1	ECOLOGICAL INTERACTIONS
MICROBIOME	2	ECOLOGICAL INTERACTIONS
MICROHABITAT	1	ECOLOGICAL INTERACTIONS
NEW NEST PREDATOR	1	ECOLOGICAL INTERACTIONS
NICHE BREADTH	1	ECOLOGICAL INTERACTIONS
NICHE CONTRACTION	1	ECOLOGICAL INTERACTIONS
NICHE EXPANSION	1	ECOLOGICAL INTERACTIONS
NICHE OVERLAP	1	ECOLOGICAL INTERACTIONS
NICHE SHIFT	1	ECOLOGICAL INTERACTIONS
SPECIALIST SPECIES	1	ECOLOGICAL INTERACTIONS
PLANT ANIMAL INTERACTION	1	ECOLOGICAL INTERACTIONS
PLANT ANIMAL MUTUALISMS	1	ECOLOGICAL INTERACTIONS
POLLEN LOAD	1	ECOLOGICAL INTERACTIONS
POLLINATION	1	ECOLOGICAL INTERACTIONS
RELATEDNESS	1	ECOLOGICAL INTERACTIONS
REMAINING HABITAT	1	ECOLOGICAL INTERACTIONS
RESOURCE COMPETITION	1	ECOLOGICAL INTERACTIONS
RESOURCE PARTITIONING	1	ECOLOGICAL INTERACTIONS
RESOURCE PATCH	1	ECOLOGICAL INTERACTIONS
RESOURCE SELECTION	1	ECOLOGICAL INTERACTIONS
TYPE LOCALITY	1	ECOLOGICAL INTERACTIONS
VERTICAL STRATIFICATION	1	ECOLOGICAL INTERACTIONS
DIFFERENCES	1	ECOLOGICAL INTERACTIONS
DIVERSIFICATION	4	ECOLOGICAL INTERACTIONS
FRUIT AVAILABILITY	1	ECOLOGICAL INTERACTIONS
HUSBANDRY	1	ECOLOGICAL INTERACTIONS
INVERTEBRATE ABUNDANCE	1	ECOLOGICAL INTERACTIONS
LEAF HARVEST	1	ECOLOGICAL INTERACTIONS
LEKKING	1	ECOLOGICAL INTERACTIONS
NECTAR RESOURCES	1	ECOLOGICAL INTERACTIONS
NEIGHBOUR JOINING	1	ECOLOGICAL INTERACTIONS
HOST PREFERENCE	1	ECOLOGICAL INTERACTIONS
POST DISPERSAL SEED PREDATION	1	ECOLOGICAL INTERACTIONS
POSTFLEDGING SURVIVAL	1	ECOLOGICAL INTERACTIONS
POTENTIAL AREAS	1	ECOLOGICAL INTERACTIONS
PSEUDO CONTROL REGION	1	ECOLOGICAL INTERACTIONS
REALIZED NICHE	1	ECOLOGICAL INTERACTIONS
MOVEMENTS	1	ECOLOGICAL INTERACTIONS
REGIONAL DIVERSITY	1	ECOLOGICAL INTERACTIONS
RECRUITMENT	1	ECOLOGICAL INTERACTIONS
AWARENESS	1	ENVIRONMENTAL EDUCATION
ADAPTATION	2	EVOLUTION
ADAPTIVE CAPACITY	1	EVOLUTION
ADAPTIVE DIVERGENCE	1	EVOLUTION
ADAPTIVE RADIATION	3	EVOLUTION
ADAPTIVE SPECIALIZATION	1	EVOLUTION
ALLOMETRY	1	EVOLUTION
ALLOPATRIC SISTER TAXA	1	EVOLUTION
ALLOPATRIC SPECIATION	1	EVOLUTION

Palavras-chaves	Freq	Termos
ALLOPATRY	1	EVOLUTION
ALLOPREDICTION	1	EVOLUTION
ANCESTOR RECONSTRUCTION	1	EVOLUTION
ANCESTRAL CHARACTER STATE RECONSTRUCTION	1	EVOLUTION
ANCESTRY	1	EVOLUTION
ASYMMETRIC REPRODUCTIVE ISOLATION	1	EVOLUTION
AVIAN SPECIATION	1	EVOLUTION
CO DIVERGENCE	1	EVOLUTION
CO EVOLUTION	1	EVOLUTION
CO SPECIATION	1	EVOLUTION
GEOGRAPHIC BARRIERS	1	EVOLUTION
HYBRID SPECIATION	1	EVOLUTION
HYBRID ZONE	1	EVOLUTION
ISOLATION BY DISTANCE	1	EVOLUTION
MOLECULAR SYSTEMATICS	3	EVOLUTION
PHYLOGENY	10	EVOLUTION
SPECIATION	6	EVOLUTION
SYSTEMATICS	8	EVOLUTION
VICARIANCE	1	EVOLUTION
COEVOLUTION	1	EVOLUTION
COEXISTENCE	2	EVOLUTION
CONVERGENCE	1	EVOLUTION
COSPECIATION	1	EVOLUTION
MOLECULAR PHYLOGENETICS	1	EVOLUTION
MOLECULAR PHYLOGENY	2	EVOLUTION
NATURAL SELECTION	1	EVOLUTION
NEOTROPICAL AVIAN EVOLUTION	1	EVOLUTION
EVOLUTION	1	EVOLUTION
EVOLUTION OF PARROTS	1	EVOLUTION
PHYLOGENETIC	1	EVOLUTION
PHYLOGENETIC ANALYSIS	1	EVOLUTION
PHYLOGENETIC SIGNAL	1	EVOLUTION
PHYLOGENETICS	1	EVOLUTION
REPRODUCTIVE ISOLATION	1	EVOLUTION
SPECIALISATION	1	EVOLUTION
DRIFT	1	EVOLUTION
MORPHOLOGICAL DIVERGENCE	1	EVOLUTION
RECENT DIVERGENCE	1	EVOLUTION
ALBINISM	2	GENETIC
ANCIENT DNA	1	GENETIC
ANONYMOUS NUCLEAR LOCI	2	GENETIC
CHD GENE	1	GENETIC
CHD1	1	GENETIC
CHROMOSOMES	1	GENETIC
CONSERVATION GENETICS	3	GENETIC
GENE FLOW	4	GENETIC
GENES ISS	1	GENETIC
GENETIC ADMIXTURE	1	GENETIC
GENETIC DISTANCE	1	GENETIC
GENETIC DIVERSITY	8	GENETIC
GENETIC DRIFT	3	GENETIC
GENETIC MANAGEMENT	1	GENETIC
GENETIC MARKER	1	GENETIC
GENETIC PEDIGREES	1	GENETIC

Palavras-chaves	Freq	Termos
GENOMICS	1	GENETIC
HYBRID	1	GENETIC
HYBRID FITNESS	1	GENETIC
HYBRIDISATION	2	GENETIC
HYBRIDIZATION	6	GENETIC
HYBRIDS	1	GENETIC
HYPER DOMINANCE	1	GENETIC
INBREEDING	1	GENETIC
INTROGRESSION	1	GENETIC
KARYOTYPE	1	GENETIC
KARYOTYPES	1	GENETIC
LANDSCAPE GENETICS	1	GENETIC
MICROSATELLITE	3	GENETIC
MITOCHONDRIAL DNA	5	GENETIC
MITOGENOME	7	GENETIC
DINUCLEOTIDE	1	GENETIC
DNA BARCODING	1	GENETIC
DNA FINGERPRINTING	1	GENETIC
MINISATELLITE DNA	1	GENETIC
MINISATELLITES	2	GENETIC
MOLECULAR CLOCK	1	GENETIC
MOLECULAR MARKERS	2	GENETIC
MTDNA	2	GENETIC
EXONS	1	GENETIC
MICROSATELLITE DNA	1	GENETIC
MICROSATELLITE LOCI	1	GENETIC
CYTOCHROME B	1	GENETIC
LEUCISM	2	GENETIC
MELANISM	1	GENETIC
HETEROZYGOSITY	1	GENETIC
HETEROZYGOSITY LOSS	1	GENETIC
NEW GENUS	1	GENETIC
NEXT GENERATION SEQUENCING	1	GENETIC
POPULATION GENETIC STRUCTURE	1	GENETIC
SELF COMPATIBILITY	1	GENETIC
HOLOTYPE	1	GENETIC
NUCLEAR DNA	1	GENETIC
PABV	1	GENETIC
PABV 5	1	GENETIC
PAIRING SUCCESS	1	GENETIC
PATERNITY	2	GENETIC
PATERNITY EXCLUSION	1	GENETIC
ANIMAL HEALTH	1	HEALTH
ANIMAL WELFARE	1	HEALTH
ANTHROPOGENIC DISTURBANCE	1	HEALTH
ANTIBODIES	1	HEALTH
AVIAN ADENOVIRUS 1	1	HEALTH
AVIAN HEART RATE	1	HEALTH
AVIAN INFLUENZA	1	HEALTH
AVIAN MEDICINE	1	HEALTH
BACTERIAL RESISTANCE	1	HEALTH
BFDV	1	HEALTH
BODY CONDITION	1	HEALTH
CARDIAC ELECTROPHYSIOLOGY IN BIRDS	1	HEALTH
CHLAMYDIOSIS	1	HEALTH

Palavras-chaves	Freq	Termos
CHLAMYDOPHILA PSITTACI	1	HEALTH
CLOACAL MICROBIOTA	1	HEALTH
HEALTH STATUS	1	HEALTH
HEART RATE	1	HEALTH
IMMUNE FUNCTION	1	HEALTH
INNATE IMMUNE FUNCTION	1	HEALTH
INTRAOCULAR PRESSURE	1	HEALTH
TOLL LIKE RECEPTORS	1	HEALTH
TRACHEA	1	HEALTH
TRACHEAL SURGERY	1	HEALTH
TUMOR	1	HEALTH
VACCINATION	1	HEALTH
VALVULAR ENDOCARDITIS	1	HEALTH
VIRULENCE	1	HEALTH
VIRULENCE FACTORS	1	HEALTH
WELFARE	1	HEALTH
ZOONOSES	1	HEALTH
SUBCUTANEOUS MASS	1	HEALTH
TERATOMA	1	HEALTH
DIABETES INSIPIDUS	1	HEALTH
DISEASE	1	HEALTH
E COLI	1	HEALTH
ECOIMMUNOLOGY	1	HEALTH
HUMORAL RESPONSE	1	HEALTH
LEPTOSPIROSIS	1	HEALTH
NATURAL ANTIBODIES	1	HEALTH
NATURAL INFECTION	1	HEALTH
MYCOPLASMA GALLISEPTICUM	1	HEALTH
NARIS MALFORMATION	1	HEALTH
NEUROLOGIC	1	HEALTH
PERMETHRIN	1	HEALTH
AVIAN KIDNEY	1	HEALTH
ENCEPHALITIS	1	HEALTH
ENVENOMATION	1	HEALTH
DISEASE SPILLOVER	1	HEALTH
SEMEN ANALYSIS	1	HEALTH
SEMEN COLLECTION	1	HEALTH
SEROLOGY	2	HEALTH
STOMATOCHORY	1	HEALTH
RADIOGRAPHIC EXAM	1	HEALTH
SALMONELLA SPP	1	HEALTH
EPINEPHRINE	1	HEALTH
ESCHERICHIA COLI	2	HEALTH
DEPENDENT SIGNALS	1	HEALTH
COMPARATIVE COGNITION	2	HEALTH
LIVER	1	HEALTH
FEATHER DAMAGING BEHAVIOR	1	HEALTH
FEATHER PICKING	1	HEALTH
FEATHER PLUCKING	1	HEALTH
EYE	1	HEALTH
FLUID THERAPY	1	HEALTH
FOOD ENRICHMENT	1	HEALTH
HEMOSIDEROSIS	1	HEALTH
HETEROPHIL LYMPHOCYTE RATIO	1	HEALTH
STRESS RESPONSE	1	HEALTH

Palavras-chaves	Freq	Termos
PHYSIOLOGICAL PARAMETERS	1	HEALTH
PATHOLOGY	1	HEALTH
PATHOLOGY DECS	1	HEALTH
POLYDIPSIA	1	HEALTH
PSITTACINE BEAK AND FEATHER DISEASE	1	HEALTH
POLYOMAVIRUS	1	HEALTH
PROVENTRICULAR DILATATION DISEASE	1	HEALTH
PSEUDOMONAS AERUGINOSA	1	HEALTH
PVA	1	HEALTH
STRESS	1	HEALTH
AVIAN INVENTORY	1	INVENTORY
BIRD CENSUS	2	INVENTORY
CENSUS	1	INVENTORY
INVENTORY	5	INVENTORY
ANATOMY	2	KNOWLEDGE AREA
ANESTHESIOLOGY	1	KNOWLEDGE AREA
CARTOGRAPHIC	1	KNOWLEDGE AREA
MARKETING	1	KNOWLEDGE AREA
ORNITHOLOGY	4	KNOWLEDGE AREA
PHYLOGEOGRAPHY	7	KNOWLEDGE AREA
POPULATION GENETICS	4	KNOWLEDGE AREA
RESTORATION ECOLOGY	2	KNOWLEDGE AREA
COALESCENT THEORY	1	KNOWLEDGE AREA
COMPARATIVE BIOLOGY	1	KNOWLEDGE AREA
FLORAL BIOLOGY	1	KNOWLEDGE AREA
FLORISTIC	1	KNOWLEDGE AREA
HEMATOLOGY	2	KNOWLEDGE AREA
PLANT PHENOLOGY	1	KNOWLEDGE AREA
HISTORY	1	KNOWLEDGE AREA
HISTORY OF SCIENCE	1	KNOWLEDGE AREA
ONTOGENY	1	KNOWLEDGE AREA
ARTIFICIAL NESTS	1	MANAGEMENT
BIRD MONITORING	2	MANAGEMENT
CAPTIVE BREEDING	2	MANAGEMENT
CAPTIVITY	1	MANAGEMENT
CONSERVATION PLANNING	3	MANAGEMENT
HABITAT MANAGEMENT	2	MANAGEMENT
INVASIVE SPECIES ERADICATION	1	MANAGEMENT
MANAGEMENT	3	MANAGEMENT
MONITORING	3	MANAGEMENT
REINTRODUCTION	8	MANAGEMENT
TRANSLOCATIONS	1	MANAGEMENT
WEED MANAGEMENT	1	MANAGEMENT
COWBIRD CONTROL	1	MANAGEMENT
NEST BOXES	1	MANAGEMENT
NEST SPACING	1	MANAGEMENT
NEST SUCCESS	1	MANAGEMENT
NEST SURVIVAL	1	MANAGEMENT
ENDANGERED SPECIES MANAGEMENT	1	MANAGEMENT
REINTRODUCTION PLAN	1	MANAGEMENT
REINTRODUCTION PROGRAMS	1	MANAGEMENT
REINTRODUCTIONS	1	MANAGEMENT
RAT CONTROL	1	MANAGEMENT
ENVIRONMENTAL MANAGEMENT	1	MANAGEMENT
ERADICATION PROGRAM	1	MANAGEMENT

Palavras-chaves	Freq	Termos
BIRDLIFE	1	MANAGEMENT
COALITIONS	1	MANAGEMENT
CONTROL REGION	1	MANAGEMENT
COOPERATIVE PROBLEM SOLVING	1	MANAGEMENT
ENVIRONMENTAL CUES	1	MANAGEMENT
ENVIRONMENTAL ENRICHMENT	1	MANAGEMENT
POPULATION MONITORING	2	MANAGEMENT
POST RELEASE MONITORING	2	MANAGEMENT
PAY TO STAY	1	MANAGEMENT
PRIORITIES	1	MANAGEMENT
PRIORITY SETTING	1	MANAGEMENT
PROBLEM SOLVING	2	MANAGEMENT
PRODUCTIVITY	1	MANAGEMENT
INFORMATION GAPS	1	MANAGEMENT
INNOVATION	1	MANAGEMENT
NON INVASIVE MONITORING	1	MANAGEMENT
PROVISIONING RULES	1	MANAGEMENT
AVIAN LOUSE	2	PARASITE
ACARI	1	PARASITE
AMBLYOMMA	1	PARASITE
AMBLYOMMA AURICULARIUM	1	PARASITE
AMBLYOMMA DUBITATUM	1	PARASITE
AMBLYOMMAGEAYI	1	PARASITE
ANALGOIDEA	1	PARASITE
ASCARIDIA HERMAPHRODITA	1	PARASITE
ASTIGMATA	2	PARASITE
AVIAN POX	1	PARASITE
AVIAN POX VIRUS	1	PARASITE
BAYLISASCARIS PROCYONIS	1	PARASITE
BROOD PARASITE	1	PARASITE
ECTOPARASITE	3	PARASITE
IXODIDA	1	PARASITE
IXODIDAE	1	PARASITE
PHILORNIS DOWNSI	7	PARASITE
TOXOPLASMA GONDII	1	PARASITE
TREMATODE	1	PARASITE
SYRINGOPHILIDAE	1	PARASITE
COWBIRD PARASITISM	1	PARASITE
CRYPTOSPORIDIUM	1	PARASITE
ECTOPARASITES	1	PARASITE
ECTOPARASITISM	1	PARASITE
HOST PARASITE INTERACTION	1	PARASITE
HOST PARASITE INTERACTIONS	1	PARASITE
MOLOTHRUS BONARIENSIS	1	PARASITE
ORNITHOCORY	1	PARASITE
ORNITHODOROS KOHLSI	1	PARASITE
PHILORNIS	2	PARASITE
PHILORNIS PARASITISM	1	PARASITE
PHTHIRAPTERA	1	PARASITE
DEGEERIELLA REGALIS	1	PARASITE
SHINY COWBIRD	1	PARASITE
LICE	1	PARASITE
FEATHER MITES	2	PARASITE
EXPERIMENTAL PARASITE CONTROL	1	PARASITE
HEMATOPHAGOUS ECTOPARASITES	1	PARASITE

Palavras-chaves	Freq	Termos
HIPPOBOSCIDAE	1	PARASITE
PARASITE	2	PARASITE
PARASITE DIVERSIFICATION	1	PARASITE
PARASITES	2	PARASITE
PARASITIC	1	PARASITE
PARASITISM	1	PARASITE
PARATANAISIA BRAGAI	1	PARASITE
PARATANAISIA ROBUSTA	1	PARASITE
HOST MASS	1	PARASITE
QUILL MITES	1	PARASITE
CRAFTING TOOLS	1	PEOPLE
CULTURAL EVOLUTION	1	PEOPLE
LOCAL BOTANICAL KNOWLEDGE	1	PEOPLE
SETTLEMENT	1	PEOPLE
SOCIOECONOMIC FACTORS	1	PEOPLE
SELECTIVE LOGGING	1	PEOPLE
FOLK PHYSICS	1	PEOPLE
GROUP DYNAMICS	1	PEOPLE
BIRD DENSITY	1	POPULATION
DENSITY	4	POPULATION
DENSITY DEPENDENCE	1	POPULATION
POPULATION DENSITY	2	POPULATION
POPULATION	5	POPULATION
POPULATION DECLINE	3	POPULATION
POPULATION STRUCTURE	3	POPULATION
DEMOGRAPHY	1	POPULATION
DISJUNCT POPULATIONS	1	POPULATION
SURVIVAL	1	POPULATION
SURVIVAL PROBABILITY	1	POPULATION
SURVIVORSHIP	2	POPULATION
MALE FEMALE RATIO	1	POPULATION
POPULATION DECLINING	1	POPULATION
POPULATION DIFFERENTIATION	1	POPULATION
POPULATION ESTIMATES	1	POPULATION
POPULATION REGULATION	1	POPULATION
POPULATION SIZES	1	POPULATION
POPULATION STABILITY	1	POPULATION
POPULATION STATUS	2	POPULATION
MORTALITY	1	POPULATION
POPULATION TREND	1	POPULATION
POPULATION VIABILITY	1	POPULATION
NON BREEDING POPULATIONS	1	POPULATION
AMANA NATIONAL FOREST	2	PROTECTED AREA
BIOSPHERE RESERVE	1	PROTECTED AREA
CERRO HOYA NATIONAL PARK	1	PROTECTED AREA
MUNCHIQUE NATIONAL PARK	1	PROTECTED AREA
NATIONAL PARK	2	PROTECTED AREA
NATURAL PARKS	1	PROTECTED AREA
RESERVA BIOLOGICA DO GURUPI	1	PROTECTED AREA
SANTUARIO HISTORICO BOSQUE DE POMAC	1	PROTECTED AREA
PROTECTED AREA	1	PROTECTED AREA
PROTECTED AREAS	1	PROTECTED AREA
ABNORMAL BEHAVIOR	2	SPECIES CHARACTERISTICS
ANIMAL BEHAVIOR	1	SPECIES CHARACTERISTICS
ANIMAL BEHAVIOUR	1	SPECIES CHARACTERISTICS

Palavras-chaves	Freq	Termos
ANIMAL COLORATION	1	SPECIES CHARACTERISTICS
ANIMAL COMMUNICATION	1	SPECIES CHARACTERISTICS
ANTI PREDATOR BEHAVIOR	1	SPECIES CHARACTERISTICS
ASYNCHRONOUS HATCHING	1	SPECIES CHARACTERISTICS
AUSTRAL MIGRANT	1	SPECIES CHARACTERISTICS
AVIAN COGNITION	1	SPECIES CHARACTERISTICS
AVIAN TAIL STRUCTURE	1	SPECIES CHARACTERISTICS
BEAK SHAPE	1	SPECIES CHARACTERISTICS
BEAK SHAPE VOCALIZATIONS	1	SPECIES CHARACTERISTICS
BEHAVIOR	3	SPECIES CHARACTERISTICS
BEHAVIOR CHANGE	1	SPECIES CHARACTERISTICS
BIRDSONG	2	SPECIES CHARACTERISTICS
BLOOD FEEDING	1	SPECIES CHARACTERISTICS
BODY SIZE	2	SPECIES CHARACTERISTICS
BREEDING	3	SPECIES CHARACTERISTICS
BREEDING BEHAVIOR	3	SPECIES CHARACTERISTICS
BREEDING PERIOD	1	SPECIES CHARACTERISTICS
BREEDING SEASON	2	SPECIES CHARACTERISTICS
BREEDING SYSTEMS	1	SPECIES CHARACTERISTICS
BROOD CARE	1	SPECIES CHARACTERISTICS
BUTEO GALAPAGOENSIS PATERNAL CARE	1	SPECIES CHARACTERISTICS
CLIFF NESTING	1	SPECIES CHARACTERISTICS
DIET	8	SPECIES CHARACTERISTICS
DIETARY PLASTICITY	1	SPECIES CHARACTERISTICS
FRUGIVORE	1	SPECIES CHARACTERISTICS
GOAL DIRECTEDNESS	1	SPECIES CHARACTERISTICS
GRANIVORY	1	SPECIES CHARACTERISTICS
INCLUSIVE FITNESS	1	SPECIES CHARACTERISTICS
INCUBATION	2	SPECIES CHARACTERISTICS
IRIDESCENCE	1	SPECIES CHARACTERISTICS
IRIS COLORATION	1	SPECIES CHARACTERISTICS
JUVENILE	1	SPECIES CHARACTERISTICS
JUVENILE PLUMAGE	1	SPECIES CHARACTERISTICS
JUVENILES	2	SPECIES CHARACTERISTICS
LIFE HISTORY	4	SPECIES CHARACTERISTICS
MATE CHANGES	1	SPECIES CHARACTERISTICS
MORPHOLOGY	5	SPECIES CHARACTERISTICS
NATURAL HISTORY	4	SPECIES CHARACTERISTICS
NEST	8	SPECIES CHARACTERISTICS
PHYSICAL COGNITION	3	SPECIES CHARACTERISTICS
VOCALIZATION	5	SPECIES CHARACTERISTICS
VOCALIZATIONS	8	SPECIES CHARACTERISTICS
TIMING OF BREEDING	1	SPECIES CHARACTERISTICS
VOCAL COMMUNICATION	1	SPECIES CHARACTERISTICS
VOCALISATION	1	SPECIES CHARACTERISTICS
VOICE	1	SPECIES CHARACTERISTICS
WING MORPHOLOGY	1	SPECIES CHARACTERISTICS
YOUNG BIRDS	1	SPECIES CHARACTERISTICS
STRUCTURAL COLOR	1	SPECIES CHARACTERISTICS
TERRITORIALITY	3	SPECIES CHARACTERISTICS
COGNITION	2	SPECIES CHARACTERISTICS
COURTSHIP DISPLAY	1	SPECIES CHARACTERISTICS
DUET	2	SPECIES CHARACTERISTICS
EGG	1	SPECIES CHARACTERISTICS
EGG DESCRIPTION	1	SPECIES CHARACTERISTICS

Palavras-chaves	Freq	Termos
EGGS	1	SPECIES CHARACTERISTICS
MONOGAMY	1	SPECIES CHARACTERISTICS
NEST CONSTRUCTION	2	SPECIES CHARACTERISTICS
NEST DESCRIPTION	2	SPECIES CHARACTERISTICS
NEST SITE CHARACTERISTICS	1	SPECIES CHARACTERISTICS
MIGRANTS BIRDS	1	SPECIES CHARACTERISTICS
MIGRATION	2	SPECIES CHARACTERISTICS
NESTLING GROWTH	1	SPECIES CHARACTERISTICS
NESTLINGS	2	SPECIES CHARACTERISTICS
NESTS	1	SPECIES CHARACTERISTICS
ACOUSTIC COMMUNICATION	1	SPECIES CHARACTERISTICS
ACOUSTIC DISTANCE	1	SPECIES CHARACTERISTICS
ACOUSTIC VARIATION	1	SPECIES CHARACTERISTICS
DELAYED PLUMAGE MATURATION	1	SPECIES CHARACTERISTICS
SEXUAL DIMORPHISM	2	SPECIES CHARACTERISTICS
SEXUAL SELECTION	3	SPECIES CHARACTERISTICS
SEXUAL SIZE DIMORPHISM	1	SPECIES CHARACTERISTICS
SITE FIDELITY	1	SPECIES CHARACTERISTICS
SOCIAL BEHAVIOR	2	SPECIES CHARACTERISTICS
SOCIAL LEARNING	1	SPECIES CHARACTERISTICS
TOOL MANUFACTURE	1	SPECIES CHARACTERISTICS
REPRODUCTION	2	SPECIES CHARACTERISTICS
REPRODUCTIVE BEHAVIOR	1	SPECIES CHARACTERISTICS
REPRODUCTIVE PARAMETERS	1	SPECIES CHARACTERISTICS
REPRODUCTIVE SUCCESS	2	SPECIES CHARACTERISTICS
SALT LICK	1	SPECIES CHARACTERISTICS
BROOD BREAK UP	1	SPECIES CHARACTERISTICS
CAUSAL COGNITION	1	SPECIES CHARACTERISTICS
CAUSAL UNDERSTANDING	1	SPECIES CHARACTERISTICS
FEEDING BEHAVIOR	2	SPECIES CHARACTERISTICS
FEEDING BOUTS	1	SPECIES CHARACTERISTICS
DISASSORTATIVE PAIRING	1	SPECIES CHARACTERISTICS
FLEDGLING DESCRIPTION	1	SPECIES CHARACTERISTICS
FLIES	1	SPECIES CHARACTERISTICS
FLOCKING PATTERNS	1	SPECIES CHARACTERISTICS
FORAGING BEHAVIOR	2	SPECIES CHARACTERISTICS
FORAGING STRATEGIES	1	SPECIES CHARACTERISTICS
HELPING BEHAVIOUR	1	SPECIES CHARACTERISTICS
HETEROCHROMIA IRIDIS	1	SPECIES CHARACTERISTICS
NESTLING BEAK POLYMORPHISM	1	SPECIES CHARACTERISTICS
SONG	1	SPECIES CHARACTERISTICS
SONG DIVERGENCE	1	SPECIES CHARACTERISTICS
SONGS	1	SPECIES CHARACTERISTICS
PLUMAGE	1	SPECIES CHARACTERISTICS
PLUMAGE CONVERGENCE	1	SPECIES CHARACTERISTICS
PLUMAGE DEVELOPMENT	1	SPECIES CHARACTERISTICS
PARENTAL BEHAVIOR	1	SPECIES CHARACTERISTICS
PARENTAL CARE	2	SPECIES CHARACTERISTICS
PARROT COGNITION	1	SPECIES CHARACTERISTICS
GEOPHAGY	2	SPECIES CHARACTERISTICS
MOLT	1	SPECIES CHARACTERISTICS
MOLT CYCLE	1	SPECIES CHARACTERISTICS
NUTRIENT	1	SPECIES CHARACTERISTICS
NUTRITION	1	SPECIES CHARACTERISTICS
PREENING	1	SPECIES CHARACTERISTICS

Palavras-chaves	Freq	Termos
PREFERENTIAL FEEDING	1	SPECIES CHARACTERISTICS
ORNAMENTATION	1	SPECIES CHARACTERISTICS
RECTRICIAL BULB	1	SPECIES CHARACTERISTICS
TAXONOMY	19	TAXONOMY
ZOOLOGICAL NOMENCLATURE	1	TAXONOMY
SUBSP NOV	1	TAXONOMY
SUBSPECIES	2	TAXONOMY
SYNONYM	2	TAXONOMY
SYNONYMY	2	TAXONOMY
TAXONOMIC GROUPS	1	TAXONOMY
TAXONOMIC LIST	1	TAXONOMY
TAXONOMIC REVISION	1	TAXONOMY
ENDEMIC SUBSPECIES	1	TAXONOMY
ENGLISH NAME	2	TAXONOMY
SP NOV	1	TAXONOMY
NEOTYPE	1	TAXONOMY
NOMENCLATURE	1	TAXONOMY
AFRICANIZED HONEY BEES	1	THREATS
BIOLOGICAL INVASIONS	1	THREATS
BOA ESPERANCA DAM	1	THREATS
CATTLE GRAZING	1	THREATS
DEFORESTATION	1	THREATS
FOREST FRAGMENTATION	3	THREATS
GAME BIRD	1	THREATS
GAMEBIRD	1	THREATS
HABITAT DEGRADATION	1	THREATS
HABITAT DISTURBANCE	1	THREATS
HABITAT FRAGMENTATION	4	THREATS
HABITAT LOSS	2	THREATS
INTRODUCED BIRDS	1	THREATS
INTRODUCED MAMMALS	1	THREATS
INTRODUCED PLANTS	1	THREATS
INTRODUCED SPECIES	4	THREATS
INVASIVE	1	THREATS
INVASIVE SPECIES	4	THREATS
THREAT FACTORS	1	THREATS
URBANIZATION	1	THREATS
SUBSISTENCE HUNTING	1	THREATS
AGRICULTURAL LANDSCAPE	1	THREATS
AGRICULTURE	1	THREATS
HUNTING	2	THREATS
EXOTIC PETS	1	THREATS
EXOTIC PLANTATION	1	THREATS
EXOTIC PLANTATIONS	1	THREATS
EXOTIC SPECIES	1	THREATS
EXTINCTION	2	THREATS
EXTINCTION RISK	2	THREATS
MINING	1	THREATS
PET TRADE	1	THREATS
RATTUS RATTUS	1	THREATS
LOCAL EXTINCTION	1	THREATS
FERAL	1	THREATS
FRAGMENTATION	2	THREATS
POACHING	1	THREATS
HOOKS	1	THREATS

Palavras-chaves	Freq	Termos
MOUNTAIN FORESTS CONTRACTION	1	THREATS

ANEXO 3 – Ações e ameaças propostas pela IUCN como necessário à conservação de cada espécie de ave silvestre endêmica e ameaçada globalmente na região Neotropical.

scientificName	Conservation Actions Proposed	Conservation Actions Proposed - Terms	Threats in detail	Threats in detail - Terms
Acrobatornis fonsecai	Survey to provide a better delimitation of its range and assess numbers. Research its precise ecological requirements. Designate reserves in the Serra das Lontras and the Serra Bonita that include areas with an extensive cabruca canopy. Provide incentives for landowners to protect remaining forest	population size, ecological requirements, new protected areas, incentives for protection	Virtually all forest below 400 m has been converted to cocoa plantations or completely cleared. The system of shaded cocoa plantations has secured the survival of a continuous canopy cover in places, but there is no forest regeneration owing to weeding of the understorey. During the 1990s, falls in the price of cocoa and the introduction of a fungal disease resulted in a downturn in cocoa production. Landowners have started to sell timber from the shading forests, and to shift production from cocoa to other crop-types or livestock-grazing	habitat loss and degradation
Aglaeactis aliciae	Survey the Chusgón Valley and more widely in the Pataz area to investigate the possibility of the existence of additional subpopulations. Determine the distribution of A. cupripennis to judge whether there are distributional gaps between the two hummingbirds where A. aliciae might occur (T. S. Schulenberg in litt. 1999). Research the species's ecological requirements (T. Züchner in litt. 1999), in particular assessing the suitability of Eucalyptus plantations as habitat (Lambert and Angulo 2007). Investigate the species's taxonomic relationship with A. cupripennis.	distribution, ecological requirements, taxonomy, area protection, environmental education, new protected areas	The village of Molino is in a heavily populated area (B. P. Walker in litt. 1995) and, given its restricted range, this species is probably very vulnerable to habitat destruction. Perhaps the greatest concern is the felling of alder for replacement with eucalyptus plantations which provide better timber for the mining industry (G. Engblom in litt. 2005). Alder woodland and montane shrubland is also impacted by cutting for firewood and small scale burning to improve pasture for grazing livestock (F. Angulo Pratolongo in litt. 2005, Lambert and Angulo 2007). Similar habitat loss is occurring throughout the region (G. Engblom in litt. 2005)	habitat loss and degradation

	Safeguard remaining habitat. Pressure local authorities to include species-specific material in school syllabuses and to initiate a second awareness campaign. Create a reserve for this species (F. Angulo Pratolongo in litt. 2012)			
Aglaiocercus berlepschi	Conserve remaining habitat within its restricted range; the establishment of a protected area to safeguard remaining forest within the Serranía de Turimiquire is a high priority (C. J. Sharpe in litt. 2016). Research trends, population size and threats	new protected areas, area protection, population size, monitor the population, evaluate the threats	There has been widespread clearance for agriculture and pasture in the Cordillera de Caripe, resulting in extensive degradation of forest. Clearance, repeated burning and understorey removal for coffee (Boesman and Curson 1995) are the main causes. The slopes of Cerro Negro are largely bare, with the more obvious forest patches actually shade-coffee plantations (Boesman and Curson 1995). There is conversion to coffee, mango, banana and citrus plantations in many parts of the region (Colvee 1999), but extensive forest areas remain (Colvee 1999, Sharpe in litt. 2011). Increases in cash-crop agriculture, especially the cultivation of "ocumo blanco" (Xanthosoma sagittifolium), since the mid- to late 1980s, have resulted in uncontrolled burning and forest degradation (C. J. Sharpe in litt. 2003). Similar threats are present in the Turimiquire Massif (J. Pérez-Emán in litt. 2012, Sharpe and Lentino 2015). Legally protected areas are not adequately enforced (Sharpe and Lentino 2015). It is considered nationally Endangered in Venezuela (Sharpe 2008, Sharpe and Lentino 2015)	habitat loss and degradation
Amazilia alfaroana	Carry out targeted searches for the species on the Volcán de Miravalles and throughout the Tilarán Highlands (Kirwan and Collar 2016)	ecological requirements	Recent forest loss at this locality has been minimal (Global Forest Watch 2016) and so any potential remaining population is suspected to be stable, but there remains the likelihood that the species did suffer as a result of habitat loss in the past (Kirwan and Collar 2016)	unknown threat
Amazilia boucardi	Survey to determine its population size, current distribution and the quality of remaining mangroves. Monitor the clearance and degradation of mangrove	population size, distribution, area management, new protected areas,	The construction of salinas and shrimp ponds, and selective logging for charcoal production are destroying mangrove habitats (F. G. Stiles in litt. 1999). Other threats include illegal cutting, dyke and road construction (which have affected the hydrology in	habitat loss and degradation, urban intensification,

	forests within the species's range. Investigate the causes of its absence from patches of apparently suitable habitat. Expand Carara Biological Reserve to protect mangroves around the mouth of the río Grande de Tárcoles. Protect mangroves north of Corcovado National Park around the río Sierpe (Capper et al. 1998). Perhaps use this endemic species as part of an awareness campaign to promote the protection of mangrove forests (R. Garrigues in litt. 2007)	ecological requirements	a number of places), and pollution (notably around the Golfo de Nicoya port of Puntarenas). The entire Pacific coast of Costa Rica is under heavy development pressure, with potentially negative effects on mangrove forests (R. Garrigues in litt. 2007). This species could be affected by a significant rise in sea-level caused by climate change (R. Garrigues in litt. 2012)	climate change

Amazilia luciae	Develop a system of core protected areas and work with neighbouring ranches to ensure that adjacent land is appropriately managed (M. Bonta in litt. 1999). Expand the Sierra de Agalta National Park to encompass suitable habitat within the valley (M. Bonta in litt. 1999). Survey to locate additional populations. Promote the species as a flagship for local and national conservation (M. Bonta in litt. 1999). Complete fencing thorn forest around Polígono to exclude cattle	area management, new protected areas, area protection, distribution, flagship	At Santa Bárbara and Cofradía most of the thorn-forest has been cleared for grazing and what little remains is extremely dry with few birds of any species present. Most remaining habitat in the río Aguán and Agalta valleys is on large haciendas, managed (non-intensively) for cattle-grazing (M. Bonta in litt. 1999), but there is still clearance for plantation agriculture and cattle pastures (Anderson et al. 1998). In the Agalta valley, bulldozers are removing thorn-forest for replacement with rice cultivation (M. Bonta in litt. 1999). The río Aguán valley contains the largest extent of thorn forest in Honduras, estimated at 8,495 ha with the four largest fragments measuring between 360 and 476 ha (Anderson et al. 2010); improved access to the valley has facilitated the continuing conversion to pineapple plantations (an average of 379 ha were cleared per year between 1994 and 2000; Anderson et al. 2010). Overall, most suitable habitat probably exists as fragments of less than 100 ha in size, with the majority located on private land, exacerbating the risk of habitat loss (D. L. Anderson in litt. 2010). Perhaps most concerning are plans to pave and extend a road through the range of this species, which would presumably lead to further habitat loss (S. Eccles in litt. 2000). There are reportedly a number of multinational projects within the species's range in both eastern and western Honduras that are awaiting approval and could result in further habitat loss (D. L. Anderson in litt. 2010)	habitat loss and degradation
Amazona finschi	Monitor population trends through regular surveys. Monitor levels of habitat destruction and degradation. Implement trade regulation strategies in the 1999 plan. Conduct outreach work and	trade regulation, area management, species recovery, area protection	Capture for domestic and international trade is the major threat to wild populations. It is highly valued in trade (Cantu et al. 2007) and was the most captured Amazon parrot species in the early 1980’s (Inigo-Elias and Ramos 1991). Illegal trade is intensive and widespread, and Amazona finschi is one of the most	illegal trade, habitat loss and degradation

	environmental education as outlined in the 1999 plan. Carry out habitat conservation and the recovery of wild populations as recommended in the 1999 Plan. Monitor the success of strategies from the 1999 plan. Protect the remaining stands of tropical forest stands on areas where the slope is greater than 6°: ideally all areas on steep slopes should be restored to forest, in order to provide habitat for all native wildlife (including Lilac-crowned Parrot) avoid soil erosion and promote alternative economic activities on the rugged coastal areas such as recreation and tourism (Ortega-Rodríguez and Monterrubio-Rico 2008)		frequently confiscated Mexican parrots (K. Renton in litt. 2005). During 1981-2001, 4,061 individuals were recorded as traded internationally, of which 79% were exported directly from Mexico and 64% were taken from the wild (CITES 2004a). It remains one of the top five most-captured Mexican parrot species, with an estimated 5,400 individuals/year captured illegally in Mexico (Cantu et al. 2007). Adults and juveniles are easily netted in large numbers because of their habit of congregating at communal roost sites late in the afternoon (Renton 2005, K. Renton in litt. 2005). Chicks are commonly poached from nests (K. Renton in litt. 2005). During interviews with local people throughout the species's range, 75% reported poaching in their area (K. Renton in litt. 2005). In addition, this species is reported to require semi-deciduous forest with tall, mature trees for nesting, and may not adapt to nesting in modified areas (see Monterrubio-Rico et al. 2009, Marin-Togo et al. 2012). Habitat loss and degradation, mostly for conversion to both small-holder and large-scale cultivation and pasture are serious threats (K. Renton in litt. 2007, A. Salinas in litt. 2007, Ortega-Rodríguez and Monterrubio-Rico 2008). Semi-deciduous forest along the Pacific coast is being lost at a greater rate than any other forest type in Mexico (Masera et al. 1996, K. Renton in litt. 2005), resulting in the destruction of nest sites and reduction in the extent of this crucial breeding habitat (Renton 2005). In Michoacán, the more easily accessible potential nesting areas, such as plains or rolling hills, have now been converted to extensive cattle ranching or agriculture (Ortega-Rodríguez and Monterrubio-Rico 2008). Large development projects, such as dams, have also resulted in loss of breeding habitat for the species (K. Renton in litt. 2007). Semi-deciduous forest now covers only 3,847 km2 or 6.6% of the species's current known distribution (Marin-Togo et al. 2012). Decreases in rainfall that could result from global climate change would result in declines in the reproductive potential of wild populations in tropical dry forests (K. Renton in litt. 2007), while hurricanes are predicted to increase in strength and frequency in this area which could negatively affect the species's habitat (K. Renton in litt. 2016). Despite the various pressures on habitats, in showing that the species has disappeared from more than 70% of its estimated former range, Marin-Togo et al. (2012) also showed that primary habitat comprised more than half the area of absence for this species (60.7%), reinforcing the view that trapping pressure is the	

			predominant threat to the species	
Amazona lilacina	Carry out further surveys to estimate the population size. Use remote sensing techniques to monitor land-use change on the Pacific slope of Ecuador. Conduct awareness-raising activities to reduce trapping and trade. Increase the area of suitable habitat that receives effective protection	population size, regulate land use, environmental education, new protected areas	Most of Ecuador's forests and mangroves have been cleared since the mid-20th century, with aquaculture pond development for shrimp farming being the main driver of mangrove loss (B. Biddle in litt. 2014). The clearance and unsustainable use of mangroves may have slowed because of protection measures, but loud bird-scaring devices used at existing shrimp farms are likely to cause disturbance to the species (B. Biddle in litt. 2014). Overall, habitat loss and degradation driven by agricultural expansion, timber and fuelwood harvesting and development are regarded as on-going threats to this species. Trapping pressure is another on-going threat, with surveys for this species in November 2012 suggesting that the local pet trade in A. lilacina is occurring on a small scale; for example, within one village close to an occupied site there were at least four individuals being kept as pets and a further 10 in a neighbouring village. A further threat to the species was noted to be the unwitting breeding of hybrids with race salvini for release as part of local conservation efforts (M. Pilgrim and B. Biddle in litt. 2013); however, this has since been halted (B. Biddle in litt. 2014)	habitat loss and degradation, illegal trade
Amazona pretrei	Carry out surveys to obtain an up-to-date population estimate. Conduct regular surveys to assess population trends. Study current levels of off-take for trade. Monitor rates of habitat loss and degradation. Protect breeding areas in Caçapava do Sul and Santana da Boa Vista. Improve protected-area management. Enforce the law against collectors and, especially, dealers by searching vehicles between December and February (Prestes et al. 1997). Continue the awareness campaign	population size, monitor the population, area management, stop illegal trade	In 1914, 25% of Rio Grande do Sul was forested but, by 1988, this was less than 3% as a result of cutting for timber, building materials and fuelwood; over-exploitation of other forest products, notably Araucaria seeds, which possibly explains shifts to Santa Catarina (Snyder et al. 2000); intense grazing, and livestock trampling. There is an organised internal trade, with parrots usually taken by cutting the nesting-tree, resulting in permanent abandonment	habitat loss and degradation, livestock disturbance, illegal trade
Amazona rhodocorytha	distribution. Protect forests where the species occurs outside reserves in Rio de Janeiro. Effectively protect habitat and birds within reserves and further develop the captive-breeding population. Enforce anti-trafficking laws, especially on the roads connecting Monte Pascoal National	population size, area protection, distribution, ecological requirements, dispersal, environmental	Less than 10% of original forest cover remains in Bahia and Espírito Santo, and only 2% in Alagoas (Brown and Brown 1992, Conservation International 1995), primarily because of conversion to plantations and pastureland. Indeed, less than 1% of this species's overall habitat is now estimated to remain (Klemann-Júnior et al. 2008). In Rio de Janeiro, many important habitat fragments are being cleared, notably around Desengano State	habitat loss and degradation, illegal trade

	Park with the rest of south Brazil (Snyder et al. 2000). Map the species's current distribution within its Extent of Occurrence. Identify priority areas for conservation purposes. Research dietary and nesting requirements. Estimate the species's home range. Study the impact of forest fragmentation within its population. Implement an education programme (L. Klemann-Júnior in litt. 2012)	education, evaluate the threats	Park. The collapse of the cocoa economy in south Bahia has resulted in increased logging by landowners and the colonisation of reserves by former plantation workers (Snyder et al. 2000). If the seasonal displacement of birds is confirmed, this would multiply the problems of habitat loss. In the 1998-1999 breeding season, 174 nestlings were poached, mostly from reserves, for the national and international cage-bird trade (Brown and Brown 1992), while 664 individuals were recorded in captivity at the Centre for Reintroduction of Wild Animals in 2005-2006 and others were found in private cages (L. Klemann-Júnior in litt. 2007). Illegal trade is apparently the overriding threat to the species in Espírito Santo (Klemann-Júnior et al. 2008b). Souvenirs containing feathers have been seen for sale outside Monte Pascoal National Park (Sweeney 1996). It is considered a pest species in some papaya, coffee and cocoa plantations (Klemann-Júnior 2006, L. Klemann-Júnior in litt. 2012)	
Amazona viridigenalis	Conduct surveys to obtain an estimate for the total population size. Monitor populations to determine the extent of declines. Identify the most important nesting aggregations for protection (Enkerlin-Hoeflich and Hogan 1997). Integrate ranchers into efforts to curtail trapping and regenerate habitat (Enkerlin-Hoeflich and Hogan 1997). Urban populations allow for the possibility of environmental education and public awareness programs, including large metropolitan areas of Matamoros and Reynosa (K. Berg in litt. 2016)	population size, monitor the population, breeding biology, integrate local people, environmental education	In 1970-1982, 16,490 birds (mostly nestlings) were legally imported into the USA. Illegal exports from Mexico and a pre-export mortality of >50% equates to 5,000 birds per year (Enkerlin-Hoeflich and Hogan 1997). Trappers damage nests when extracting chicks (sometimes felling entire trees), reducing nest-site availability and leading to permanent site abandonment (Snyder et al. 2000). Many gallery forests have been cleared or degraded, with over 80% of Tamaulipas lowlands cleared for agriculture (especially sorghum) and pasture. Habitat is now patchily distributed on cattle-ranches, where trapping pressure is greatest (Enkerlin-Hoeflich and Hogan 1997). Urban intensification may also present a threat to this species as despite the establishment of urban populations, removal of dead palms by landscapers could harm the species (K. Berg in litt. 2016), and widespread poaching of chicks from well-known urban nest sites could significantly harm these populations in the future (K. Berg in litt. 2016)	illegal trade, habitat loss and degradation, destruction of nest sites, urban intensification

Anodorhynchus leari	Continue annual population censuses (Lugarini et al. 2012). Ensure the de facto protection of all known populations. Create further protected areas within the species's range (Lugarini et al. 2012). Restore degraded areas of habitat (Lugarini et al. 2012). Enhance existing nest sites to prevent premature fledging of chicks (J. Gilardi in litt. 2012). Continue to compensate farmers for crop losses. Incentivise the planting of licuri and other food source plants (Lugarini et al. 2012). Continue environmental education programme (Lugarini et al. 2012). Promote sustainble methods of licuri management (Lugarini et al. 2012). Continue and expand the programme of growing and planting seedlings of caatinga plants, including licurí (Lugarini et al. 2012). Enforce legal measures, especially through local patrolling to prevent trapping (Munn 1995, Reynolds 1997, Snyder et al. 2000) and increase the severity of penalties for those caught (Lugarini et al. 2012). Monitor trafficking of birds, both within Brazil and internationally (Lugarini et al. 2012). Confiscate all birds from trade, integrating them into breeding programmes. Evaluate potential sites for the release of confiscated and captive bred birds throughout historic range. Promote the sustainable extraction of caatinga natural resources (Lugarini et al. 2012)	population size, species conservation project, new protected areas, incentives for protection, environmental education, area management, monitor illegal activities, captive breeding	The historical decline has been attributed to habitat clearance for agriculture, hunting and trapping (Lima 2007). The main factor currently limiting the population size is believed to be a reduction of food resources, especially licurí (Brandt and Machado 1990, Lugarini et al. 2012). Habitat is cleared for the subsistence cultivation of maize, beans and cassava and for large-scale livestock grazing (Lugarini et al. 2012). Licurí palm-stands formerly covered 250,000 km2 but have been vastly reduced by livestock-grazing. Vegetation is cleared through burning, which tends to have little control (Lugarini et al. 2012). A major fire could now eradicate most of the food supply for the Toca Velha-Serra Branca population. The extraction of firewood and timber also pose threats (IBAMA 2006). In 1992-1995, c.20 birds were caught and sold to smugglers from Toca Velha-Serra Branca (Munn 1995), and in 1996 at least 19 individuals were taken (Reynolds 1997). The threat of live-capture for trade, both domestic and international, continues, but has been significantly reduced (Lugarini et al. 2012, A. Roos in litt. 2012). Birds are occasionally persecuted for foraging on maize crops when palm nuts are scarce (Melo Barros et al. 2006). Hunting for food and wildlife products are potential threats	habitat loss and degradation, hunting, illegal trade
Anthocephala berlepschi	Assess the species's population, distribution and ecological requirements (P. G. W. Salaman in litt. 1998, 1999). Designate more protected areas, for	monitor the population, distribution, ecological	The species is threatened by forest loss, as it does not tolerate heavily converted habitats (Züchner et al. 2019). Agriculture has long dominated parts of the east slope of the Central Andes (Stiles et al. 1999). Since the 1950s, much of the original habitat in the	habitat loss and degradation

	example at the following AICAs: Cañón del Río Combeima, Cuenca del Rio Toche and Valle de San Salvador (P. G. W. Salaman in litt. 1998, 1999, Rico-Guevara et al. 2016). Create management plans to conserve the species (Rico-Guevara et al. 2016). Improve habitat connectivity and give protection to rural buffer zones around forest fragments (Rico-Guevara et al. 2016)	requirements, new protected areas, species conservation project, connectivity, area protection	higher side-valleys has been cleared and used for coffee, sugarcane and banana plantations, as well as for cultivations of potatoes and beans and cattle-grazing (B. López-Lanús et al. in litt.; P. G. W. Salaman in litt. 1998, 1999). Mature secondary forest patches are scattered and natural vegetation cover has been reduced by c. 85% between 1,900 and 3,200 m altitude (B. López-Lanús et al. in litt.; P. G. W. Salaman in litt. 1998, 1999). In Tolima, hydroelectricity projects have led to habitat destruction and fragmentation (Rico-Guevara et al. 2016). However, recent rates of deforestation in the area are very low (per Tracewski et al. 2016)	
Anthocephala floriceps	Assess the species's population, distribution and ecological requirements (P. G. W. Salaman in litt. 1998, 1999). Designate more protected areas, for example at the Valle del Río Frío (Rico-Guevara et al. 2016). Create management plans to conserve the species (Morales-Rozo et al. 2016). Improve habitat connectivity and give protection to rural buffer zones around forest fragments (Rico-Guevara et al. 2016)	population size, distribution, new protected areas, species conservation project, connectivity, area protection	The species is threatened by forest loss, as it does not tolerate heavily converted habitats (Züchner et al. 2019). Forests in the Sierra Nevada de Santa Marta have been heavily logged in the past, with only around 15% of the original vegetation remaining (Renjifo et al. 2016). However, an analysis of the rate of forest loss between 2000 and 2012 found that deforestation in the Sierra Nevada de Santa Marta was only minor (per Tracewski et al. 2016), indicating that the area of remaining forests is relatively stable, albeit small and fragmented	habitat loss and degradation
Antilophia bokermanni	Survey similar habitats throughout north-east Brazil during September and October between 10h00 and 14h00 when male calling activity is at its peak (Coelho and Silva 1998, Girão and Souto 2005, J. Mazar Barnett and G. M. Kirwan in litt. 2000) to locate additional populations. Formally protect remaining habitat as a national wildlife refuge or national park. In 2010, Aquasis led a group of stakeholders in a formal request for the creation of a strict protected area along the slopes of Chapada do Araripe.	distribution, new protected areas, area protection, environmental education, ecological requirements, area management	Lowlands adjacent to the Chapada have been largely cleared for agriculture (especially banana, maize, beans and tomatoes), cattle raising and the construction of homes (Aquasis 2006). There are several recreational facilities along the slopes of the Chapada do Araripe. These include large open parks and swimming pools, which have involved deforestation in their development, particularly in areas where there is spring water. A large recreational water-park was built at the type-locality in 2000 (Aquasis 2006), but a small patch of habitat is being conserved there, and the species persists despite the disturbance (A. B. Hennessey in litt. 2005). Fires in 2004-2005 largely destroyed an area of forest known to contain seven active nests of the species. Another fire in September 2010 affected the same area, as well as	loss of water sources, habitat loss and degradation

	After a brief field visit in 2011 by government officials, no further action was taken by environmental authorities, and by early 2016 the process was still pending at the Brazilian Ministry of Environment (Aquasis in litt. 2016). Provide incentives for landowners to establish a network of private reserves as a buffer zone (Coelho and Silva 1998). Work with environmental and water management authorities to protect springs and streams along the slopes of the Chapada, and their associated gallery forests (Aquasis 2006). Conduct awareness campaigns in the Araripe region to engender pride in biodiversity and water resources, using the species as a symbol for the conservation of the entire Chapada (Aquasis 2006). Promote and facilitate research on humid forest ecosystem services, as well as species composition and ecology, in order to support future conservation actions related to habitat recovery and restoration (Aquasis 2006, Aquasis in litt. 2010). Minimise or eliminate disturbance and clearance of vegetation along watercourses during the species's nesting season (Linhares et al. 2010). Promote habitat recovery and continue working together with governmental environmental agencies and key stakeholders to create a fully protected area that will encompass all the remaining habitat of the species (A. Campos in litt. 2016)		other areas where the species is known to occur (Aquasis in litt. 2010). The springs that supply the streams which support the moist forest habitat of the species have shown an average reduction of 75% in their outflow over the past hundred years, possibly due to deforestation on the slopes and plateau of the Chapada do Araripe, posing a long-term threat to the species's remaining habitat. Diversion, channelling and piping of the springs and streams are also reducing the area of available gallery forest habitat (Aquasis 2006). The species is not known to be trapped either by wildlife traders or by the local population for pets (Aquasis 2006)	

Anumara forbesi	Urgent need to establish a protected area at Mato do Estado (S. Aline Roda in litt. 2007). Survey known sites in Alagoas and Pernambuco. Re-examine museum collections of G. chopi to disclose additional specimens of this species and identify areas for surveys. Survey to elucidate the species's status at Rio Doce. Investigate protecting habitat near Pirapora. Study and control parasitism by M. bonariensis	new protected areas, distribution, population size, prevent disease	Widespread habitat destruction, particularly in north-east Brazil, has even reduced forest-edge areas. It was estimated that the proportion of forest lost from within this species's range from 2000-2012 was equivalent to 10% over three generation lengths (Tracewski et al. 2016). However, the species might be able to withstand the conversion of forests to sugarcane plantations to some degree. At Pedra Talhada, the recent decline is also attributed to brood-parasitism by M. bonariensis. In 1981-1986, 64% of studied nests were parasitised and, in 1987, this was 100%. It has been observed in trade and there is potential confusion with the valued G. chopi	habitat loss and degradation, brood-parasitism, illegal trade
Aphrastura masafucrae	Eradication of introduced taxa is the highest priority conservation action for Alexander Selkirk Island as it is critical to ensure the persistence of multiple endemic species and subspecies, including rayaditos and petrels. Introduced taxa to focus on include feral cats and rats, goats and three important invasive plant species: murtilla Ugni molinae, elm-leaf blackberry Rubus ulmifolius and maqui Aristotelia chilensis (unlike on Robinson Crusoe, the populations of these three species are still quite manageable on Alejandro Selkirk and could realistically be eradicated). Establish canelo Drimys confertifolia seedlings and increase the area covered by canelo trees. Establish a continuous monitoring scheme of the species's population and its reproductive success (Hahn and Römer 2002). Study the species to gain a better understanding of its reproductive biology	control programme for invasive species, monitor the population, reproductive success, nest box, environmental education	It is probably secure as long as mature tracts of the ferns Dicksonia and Lophosauria remain intact, but a large proportion of natural vegetation on the island has been degraded and fragmented by goat-trampling, fire and timber-cutting (I. Hahn in litt. 2004, Hahn et al. 2004, Anon. 2007). Mature trees are important for foraging, roosting and probably provision of nesting cavities (P. Hodum in litt. 2007, 2008, 2012). Introduced mammalian predators are thought to have a significant impact on the population, with rats (Rattus spp.) and possibly mice (Mus musculus) impacting on brood survival, and feral cats impacting on juvenile and adult survival (Hahn and Römer 2002, Tomasevic et al. 2010). Significantly, it is absent from the lowlands, where the forest understorey has already been destroyed. An unusual increase of native Red-backed Hawk Geranoaetus polyosoma during the last decade, as illegal hunting of this species by fishermen has ceased and the hawk population has benefited from preying upon introduced mammals (Hahn et al. 2004), may have contributed modestly to any recent declines, with several cases noted of hawks preying on rayaditos (I. Hahn in litt. 2004, Hahn et al. 2004). Having a montane distribution that is close to the maximum altitude within its range, this species is also potentially susceptible to climate change (BirdLife International unpubl. data)	habitat loss and degradation, livestock disturbance, invasive species, climate change

	(I. Hahn in litt. 2012). Compare with the ecological requirements of Thorn-tailed Rayadito A. spinicauda on the mainland, and other Juan Fernández Islands endemics to develop management strategies (Hahn et al. 2004). Use nest boxes to increase the availability of nesting sites (Tomasevic et al. 2010). Continue educational programmes to increase awareness of the species, both in the islands and more broadly to the general public			
Ara glaucogularis	Continue nest guarding and monitoring. Expand, monitor and improve nest boxes and the captive-breeding programme. Develop a reintroduction programme. Continue illegal pet trade monitoring and confiscations of all native parrots from traders. Lobby local and national government regarding illegal pet trade. Research and promote the acquisition of land for the species's long-term conservation, studies into habitat requirements and restoration, and sustainable tourism support. Conduct research on Motacú palm to understand how to manage and regenerate the habitat (Gould 2013a). Continue wide-ranging education programmes, especially in Santa Rosa and Santa Ana area - supported by interpretive centres. Promote alternatives to macaw feather head-dress usage. Develop tourism infrastructure on private reserve lands. Maintain a low level of population monitoring and occasional new surveys. Implement field research to identify principal health threats. Further research needed into post-breeding behaviour; a	nest box, monitor illegal activities, area management, environmental education, new protected area, ecological requirements, monitor the population	It was severely threatened in the past by legal and illegal exploitation for the national and international cage-bird trade (A. Hesse in litt. 1999, I. Berkunsky in litt. 2012), although this has been radically reduced since 1984 (I. Berkunsky in litt. 2012). However in 2010 illegal trading of two recently-poached wild juvenile Blue-throated Macaws was uncovered (Berkunsky et al. 2011). The juveniles were eventually released into the wild, however this demonstrates that illegal poaching does still occur. All known breeding sites are on private cattle-ranches, where burning and clearing for pasture and tree-felling for fuel and fence posts have reduced the number of suitable nest trees and inhibited palm regeneration (Duffield and Hesse 1997, Hesse 1998, J. Gilardi in litt. 2012). However, cattle-rearing has occurred in the region since the 17th century (A. Hesse in litt. 1999); thus, the preferred food, the motacú palm Attalea phalerata, has been substantially reduced and is only regenerating slowly (B. Hennessey in litt. 2016). Nest-site competition from other macaws, toucans, bats and large woodpeckers is significant, and disturbance from mammals, birds and human activity may reduce the reproductive output of some pairs (J. Gilardi in litt. 2012). Between 2007 and 2012, 30 nests were monitored. Of these nests, 57% failed, with most failures occurring during incubation (Berkunsky et al. 2014). Reasons for nest failure were diverse but included disease, predation and abandonment. Botfly (Philornis spp.) infestations have been responsible for nest failures as have bees colonising nest sites, extreme weather events and parental neglect (Gould 2013a). Nestlings are vulnerable to predation from:	habitat loss and degradation, illegal trade, competition, hunting, endogamy

	study from 2007 to 2012 suggested that successful pairs do not breed the following year and more work is needed to ascertain how common this behaviour is (Berkunsky et al. 2014). A monitoring project is planned to track movements during the breeding and non-breeding seasons. It is not possible to follow flocks during the non-breeding season due to flooding, so tracking work will provide important information on the species's movements during this period (Berkunsky et al. 2012)		Toco Toucan Ramphastos toco, Crane Hawk Geranospiza caerulescens, Great-horned Owl Bubo virginianus and Southern-crested Caracara Caracara plancus (Gould 2013a). Hunting to provide feathers for indigenous headdresses probably has an important impact in some areas (I. Berkunsky in litt. 2012). There are fears that inbreeding within an increasingly fragmented population is resulting in reduced fertility (Loro Parque Fundación 2003). This is compounded by a lack of recruitment to the breeding population; during a five year study, no new breeding pairs were recruited (Berkunsky et al. 2014). Disease also represents a significant threat, particularly in areas where the species shares water sources with other bird species (Gould 2013a). A Population Viability Analysis found that changes in adult mortality had the greatest impact on estimates of extinction probability and population growth rates and that habitat loss and poaching also affected these estimates (Strem and Bouzat 2012)	
Ara rubrogenys	Continue surveying and monitoring (Clarke and Duran Patiño 1991, Snyder et al. 2000). Fence key patches of gallery forest to limit cattle-grazing and permit vegetation to regenerate (Snyder et al. 2000). Effectively enforce trade laws (Herrera and Hennessey 2007). Organise awareness campaigns (Clarke and Duran Patiño 1991). Identify suitable sites for protected areas throughout the species's range (Kyle 2005, A. Rojas, F. Hiraldo and J. L. Tella in litt. 2012). Establish education programs to reduce nest-poaching and trapping. Assess the costs of compensating crop damage to avoid persecution of macaws in agricultural areas, and investigate alternatives to resolve the conflict between agriculture and macaw conservation as the main threat for the species (A. Rojas, F. Hiraldo and J. L. Tella in litt. 2012). Create a management plan for captive birds in captive breeding, involving	area protection, trade regulation, environmental education, incentives for protection, captive breeding	Its original natural habitat is inter-Andean dry forest but this has been degraded to thorn and cactus scrub by centuries (if not millennia) of highly unsustainable human activities, nowadays mainly overgrazing by goats, firewood cutting and charcoal production (S. K. Herzog in litt. 2007). An estimated 40% of natural vegetation in valleys within its range had been converted to agriculture by 1991, with other areas degraded by intense grazing. Several important food trees are harvested for fuel and charcoal. As food plants are lost, agricultural land is used more, thereby increasing the species's exposure to persecution as a crop-pest, and the use of firearms for pest control has been recorded (Brace et al. 1995). Macaws are also potentially threatened by pesticides applied to crops where macaws forage mostly during the non-breeding season (A. Rojas, F. Hiraldo and J. L. Tella in litt. 2012). Illegal trapping continues, but has been reduced as a result of legal protection (Pitter and Christiansen 1995, Juniper and Parr 1998, Herrera and Hennessey 2007, A. Rojas in litt. 2007). The majority of the Bolivian parrot trade is domestic, but more valuable threatened species end up in Peru or further afield. 26 Red-fronted Macaws were recorded passing through the Los Pozos pet market, Santa Cruz between August 2004-July 2005, and there are four other wildlife markets in the city and others in Cochabamba, suggesting this figure may only represent a small	habitat loss and degradation, pesticides impact, illegal trade, hunting

	Bolivia and foreign countries, and incorporate pets and illegally traded birds into this programme (J. D. Gilardi, A. Rojas, F. Hiraldo and J. L. Tella in litt. 2012)		proportion of birds illegally trafficked in the country (Herrera and Hennessey 2007). In 2011, 45 Red-fronted Macaws were recorded in houses; some had been taken from nests as nestlings, but most of them were trapped when foraging in crops. In 2017, more than 100 individuals were found as cage birds in local communities (J. L. Tella in litt. 2017). Most were kept as pets, but some were to sell to in major cities (A. Rojas, F. Hiraldo and J. L. Tella in litt. 2012). The two main threats appear to be nest-poaching and trapping for local pet supply, and persecution as crop pests (especially in corn and peanut cultivations), and possibly contamination by pesticides applied to crops (A. Rojas, F. Hiraldo and J. L. Tella in litt. 2012, J. L. Tella in litt. 2017)	
Arremon phygas	Conduct surveys to get more accurate population size and trend estimates. Initiate programmes to develop economic alternatives to reduce agricultural encroachment in villages adjacent to the national park (Rodríguez and Rojas-Suárez 1995, Sharpe 2008, Sharpe in litt. 2011)	population size, trends, sustainable activities	Within its range there has been widespread clearance for agriculture and pasture, and even in El Guácharo National Park there has been clearance, repeated burning and understorey removal (Boesman and Curson 1995, Sharpe and Lentino 2008). The slopes of Cerro Negro have been extensively cleared, with the more obvious forest patches actually shade-coffee plantations (Boesman and Curson 1995), and on Cerro Humo, increases in agriculture since the mid- to late 1980s, have led to uncontrolled burning and forest degradation. However, in the Turimiquire Massif while there has been conversion to plantations, extensive forested areas may still be present (e.g. Colvee 1999, Sharpe in litt. 2011)	habitat loss and degradation

Asthenes usheri	Conduct surveys to get better population size and trend estimates. Research the impacts of potential threats to get a better understanding of their impacts on this species	evaluate the threats, population size	Its habitat is thought to be declining as a result of burning and grazing and there may be indirect habitat damage caused by a change in humidity resulting from deforestation of adjacent areas (BirdLife International 2000)	habitat loss and degradation
Atlapetes blancae	Explore the potential distribution range of the species. Carry out targeted searches for new subpopulations. Investigate the species's behaviour, ecology and habitat requirements. Investigate the threats to the species. Protect remaining habitat. Restore agricultural and pastureland, e.g. by promoting silvipasture methods (American Bird Conservancy 2019)	distribution, ecological requirements, evaluate the threats, new protected areas, area management, sustainable activities	Over 70% of the natural vegetation within the municipality of San Pedro de los Milagros has already been converted to cattle pastures, and the remaining habitat is likewise under risk of being converted to pasture and agricultural land (American Bird Conservancy 2019). The species may also potentially be threatened by brood parasitism by Shiny Cowbirds (American Bird Conservancy 2019)	habitat loss and degradation, brood-parasitism
Atlapetes melanopsis	Survey to delimit its distribution and estimate numbers. Assess its precise ecological requirements. Assess the impact of existing threats upon the species. Ensure that some populations are adequately protected	distribution, population size, ecological requirements, evaluate the threats	Habitat destruction at elevations suitable for this species has been ongoing for several thousand years, but is probably not increasing, as the human population of the region is in decline, owing to migration to larger towns and cities. Nonetheless, burning to maintain and increase available pasture prevents the regeneration of natural vegetation, except in steep, rocky areas and ravines (Valqui and Fjeldså 1999)	habitat loss and degradation

Atlapetes pallidiceps	Continue to study the species and its habitat to facilitate successful land management (Agreda et al. 1999a). Maintain habitat through selective cutting in the non-breeding season (N. Krabbe in litt. 2012). Continue the control of Shiny Cowbird Molothrus bonariensis (M. Schaefer and V. Schmidt in litt. 2002), concentrating on the peak laying period of mid-February to mid-April (Krabbe et al. 2011). Establish environmental education programmes around the known site	ecological requirements, area management, control programme for invasive species, environmental education	Brood parasitism by the Shiny Cowbird Molothrus bonariensis has a significant impact on breeding success (M. Schaefer and V. Schmidt in litt. 2002), with an overall parasitism rate of 42% in 2002 (Schmidt and Schaefer 2003, Oppel et al. 2004b). The positive population trend observed in A. pallidiceps since the initiation of cowbird control in 2003 adds further weight to the significance of this threat (Krabbe et al. 2011). The impacts (positive and negative) on the species of livestock grazing are not well understood and require further study. Fires potentially threaten the species (J. Freile in litt. 2011, M. Schaefer in litt. 2011), but also result in an improvement to its habitat (N. Krabbe in litt. 2011). An annual turnover of 40% in singing males, as calculated from data obtained in 1999-2007 (Krabbe et al. 2011), indicates that the impact of a change in management or a new threat would be rapid	brood-parasitism
Aulacorhynchus huallagae	Survey to improve knowledge of its status, distribution and ecology. Assess the population within Río Abiseo National Park. Assess the likely impact of current threats. Designate further protected areas encompassing montane forests within its potential range	distribution, population size, ecological requirements, evaluate the threats, new protected areas	The Huallaga valley, especially the upper reaches, was being taken over by coca-growers in the early 1990s, and it seems likely that forest at all elevations has suffered (M. A. Plenge in litt. 1993). Deforestation has been widespread in the region, but mainly below this species's altitudinal range. In fact, the human population within its range was higher in the post than at present (T. Mark in litt. 2010)	habitat loss and degradation

Automolus lammi	Carry out surveys to assess the species's total population size. area management through remote sensing. Increase the area of suitable habitat that receives effective protection. Work with the owners of sugar-cane mills to secure the protection of remaining forest fragments on their land	population size, area management, area protection, distribution	The region occupied by this species has suffered the catastrophic loss of forest for agricultural expansion, primarily sugar-cane production, with virtually all remaining forest existing in fragments (Zimmer 2008), mostly restricted to steep slopes and ridge-tops (Stattersfield et al. 1998). Most of these fragments exist on sugar-cane mill properties and lack any protection (Silveira et al. 2003). In Murici Biological Reserve, illegal selective logging of larger trees was an on-going problem as recently as 2004 (Zimmer 2008). Automolus species have been shown to be among the species most adversely affected by selective logging and by fragmentation owing in part to their poor dispersal capabilities (Thiollay 1992, Stouffer and Bierregaard 1995). In addition, it has been suggested that the application of aerially-dispersed pesticides in surrounding agricultural land could be impacting insectivorous bird species in forest fragments (Silveira et al. 2003)	habitat loss and degradation, pesticides impact

Bangsia aureocincta	Survey other mountain ridges of the Caramanta massif (Stiles 1998). Protect forest at Alto de Pisones effectively. Initiate conservation measures at Alto de los Galápagos (P. G. W. Salaman in litt. 1999)	distribution, new protected areas	Deforestation has been severe on Cerro Tatamá. On the Caramanta massif, the species occurs in a large forest block, which is effectively intact from 800-1,000 m up to 2,000+ m (Wege and Long 1995, F. G. Stiles in litt. 1999). However, a proposed highway will run within 5-7 km of Alto de Pisiones, opening the area up to logging, mining and human settlement (F. G. Stiles in litt. 1999). Furthermore, Alto de los Galápagos is on the Cartago-San José road (Wege and Long 1995). Although the region is inhabited by Emberá Indians, further colonisation will inevitably lead to deforestation (Salaman and Stiles 1996, Stiles 1998, F. G. Stiles in litt. 1999), through small-scale agriculture and subsistence activities. The presence of guerrillas in the area renders government action and research difficult (Stiles 1998, P. G. W. Salaman in litt. 1999)	habitat loss and degradation, research difficult

Bangsia melanochlamys	Survey unexplored parts of the population's range to improve the information for distribution and altitudinal extent (Renjifo et al. 2002). In particular, study the Espíritu Santo gorge in Yarumal, which is near to where the species was originally seen, and has one of the few remaining forested areas in the region. Establish studies to determine its ecological requirements and the state of the population (Renjifo et al. 2002). Improve and enforce the application of protective measures in Tatamá National Park (P. G. W. Salaman in litt. 1999). Extend the park's boundaries to below 2,000 m and clarify the ownership of land (Renjifo et al. 2002)	distribution, ecological requirements, population size, area protection, new protected areas	Principal threats to this species are those that increase fragmentation and destruction of its habitat, including deforestation, cattle ranching, mining, small-scale agriculture and road building (Renjifo et al. 2002). The slopes of Cerro Tatamá have been severely deforested and primary forest, on which the species may be dependent, is disappearing in many areas, particularly below 1,500 m. The species occurs in effectively intact habitat above c.1,500 m in the Mistrató area, and in a large forest block at 800-1,000 m upwards to above 2,000 m around Alto de Pisiones (Wege and Long 1995, F. G. Stiles in litt. 1999). However, the species displays altitudinal movements when breeding, and in none of the protected areas where it is found is the full altitudinal variation represented (Renjifo et al. 2002). A highway is to be built near Alto de Pisiones, opening up the area to logging, mining and human settlement (Stiles 1998). Although the region is inhabited by Embera Indians, further colonisation will inevitably lead to deforestation (Salaman and Stiles 1996, Stiles 1998, F. G. Stiles in litt. 1999). Paramilitary activity within its range has prevented recent survey work, and renders government action and research difficult (Stiles 1998, P. G. W. Salaman in litt. 1999)	habitat loss and degradation, research difficult

Basileuterus griseiceps	Survey historical localities and any significant tracts of forest remaining in the cordillera. Conduct studies of habitat requirements in order to determine levels of tolerance of disturbed habitats (Rodríguez and Rojas-Suárez 1995, Sharpe 2008). Increase the area of suitable habitat that has protected status, especially in the Turimiquire massif, where some of the most seriously threatened forests in Venezuela are found (Sharpe 2008) and where the species appears to be most common (C. J. Sharpe in litt. 2011, J. Pérez-Emán in litt. 2012)	distribution, ecological requirements, new protected areas	The entire Turumiquire Massif is under severe human pressure, which, through widespread clearance for agriculture and pasture, has resulted in extensive degradation of its montane forests. Even in El Guácharo National Park (incorporating Cerro Negro), there is forest clearance, burning and removal of the understorey for coffee (Boesman and Curson 1995). The slopes of Cerro Negro are largely bare, with the more obvious forest patches actually shade-coffee plantations (Boesman and Curson 1995). Shade-coffee cultivation safeguards some trees but destroys the understorey upon which this bird depends (Boesman and Curson 1995). There is conversion to coffee, mango, banana, and citrus plantations in the Serranía de Turumiquire, but extensive forested areas remain (Colvee 1999, C. J. Sharpe in litt. 2011). However, on Cumbres de San Bonifacio there are only two peaks above 1,400 m (Boesman and Curson 1995)	habitat loss and degradation

Bolborhynchus ferrugineifrons	Survey and monitor the species's population movements, densities and distribution. Clarify its natural history and threats to identify appropriate conservation actions (Snyder et al. 2000). Enhance the protection of Los Nevados through fire control, a major reduction in livestock-grazing and agriculture and, where necessary, compensation to farmers	monitor the population, population size, distribution, evaluate the threats, area management, incentives for protection	Conversion of forest for agricultural purposes has been widespread below 3,300 m in the Central Andes. At higher elevations, the forest is exploited for firewood and grazing, but large areas remain. Given its adaptation to the agricultural environment, the level of threat posed by deforestation is unknown (Snyder et al. 2000). Conversely, widespread destruction of páramo vegetation, even in Los Nevados, seems to have seriously affected numbers. This is caused by frequent burning (promoting fresh shooting), intense grazing and, to a lesser extent, conversion to potato cultivation. The Colombian authorities have been unable to purchase pre-existing landholdings within national parks, often rendering the parks ineffective. It is occasionally kept as a pet	habitat loss and degradation

Buteo galapagoensis	Monitor the population. Minimise illegal persecution	monitor the population, monitor illegal activities	The most probable cause of the species's historical decline is persecution by humans (de Vries 1973), which still continues on Santa Cruz and south Isabela (H. Vargas and F. Cruz in litt. 2000) but is now a fairly uncommon practice elsewhere (D. Wiedenfeld in litt. 2012). The largest island, Isabela, may support a comparatively small population owing to competition for food with introduced feral cats and other predators (de Vries 1973). Similar scenarios may have been partly responsible for the local extinctions. Lack of genetic diversity (Bollmer et al. 2005) has been suggested as a potential threat, and it has led to increased parasite loads and vulnerability to disease in certain island populations (Whiteman et al. 2006), but the species has never had a large effective population size so this is unlikely to become a major threat to the species now (D. Wiedenfeld in litt. 2007). The removal of goats and pigs from Santiago may reduce habitat for non-breeding individuals as vegetation recovers (T. de Vries in litt. 2000, 2007)	hunting, competition, endogamy, livestock disturbance
Buteogallus lacernulatus	distribution, particularly in the Jequitinhonha valley, Minas Gerais, and central Bahia. Consolidate protected areas where it occurs. Maintain and create habitat corridors between forest fragments. Initiate awareness programmes to address hunting problems	distribution, area protection, connectivity, environmental education	It is primarily at risk from habitat destruction, which is compounded by its low density and highly fragmented range. Unwarranted persecution as a predator of domestic animals remains a problem in São Paulo and Minas Gerais (Machado et al. 1998)	habitat loss and degradation, hunting
Cacicus koepckeae	Survey to clarify the species's range and population, especially in the headwater regions of the ríos Alto Manu, Serjali, Mishagua, Cashpajali, de las Piedras, Cujar, Alto Purús, Curanja and possibly into west Brazil (Gerhart 2004). Conduct further ecological research, particularly	distribution, ecological requirements, new protected areas, area management, area protection	It is apparently restricted to riverine habitats (Grilli et al. 2012, Fraga et al. 2016), and it may therefore be at heightened risk from actual and impending settlement and agricultural development. However, small-scale, low-impact farming may not adversely affect the species, and it has been heard calling from mosaics of forest and cultivated land around a village (Gerhart 2004). The primary threat to this species is accelerating deforestation in the	habitat loss and degradation

	into habitat specialisations and the extent to which secondary or degraded habitats are tolerated (Gerhart 2004). Increase the area of suitable habitat that has protected status. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006)		Amazon basin as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network (Soares-Filho et al. 2006, Bird et al. 2011, A. Lees in litt. 2011)	
Calyptura cristata	Develop and follow a standardised survey protocol involving focal watches at suitable fruiting trees, focusing particularly in suitable habitat in the Serra dos Órgãos including the Reserva Ecologica Guapiaçu, and in the Serra do Mar near Ubatuba (Ridgely and Tudor 1994; Lambert 2007). Protect all remaining low-altitude forest in the vicinity of the rediscovery site. Continue to search for extant populations in the state of São Paulo	population size, new protected areas	Deforestation appears to have brought this species to the brink of extinction - historically driven by gold and diamond mining and the creation of coffee plantations in areas where the species was initially collected (Lambert 2007). If it is an altitudinal migrant, the lack of remaining forest below 1,000 m is likely to be a particular threat. Development within forest around the edges of the Serra dos Órgãos National Park, particularly at the site of the 1996 rediscovery, is concerning (C. E. Carvalho verbally 1998). The harvesting of bromeliads, mistletoes and orchids from the forest of the region may further threaten the species by reducing food supply, but also by altering habitat structure and microclimate (Lambert 2007). Climate change could also have an impact on the species, particularly through habitat shifting (Şekercioğlu et al. 2012)	habitat loss and degradation, climate change

Campylopterus phainopeplus	Conduct surveys to locate population strongholds (P. G. W. Salaman in litt. 1999, T. Züchner in litt. 1999). Protect effectively areas harbouring healthy populations (P. G. W. Salaman in litt. 1999, T. Züchner in litt. 1999). Work with local communities and regional institutions to identify and prioritise conservation and management strategies (Salazar and Strewe undated)	distribution, area protection, integrate local people, area management	Only 15% of the original vegetation in the Sierra Nevada de Santa Marta remains (L. M. Renjifo in litt. 1993 and verbally 2000). The main threat is the conversion of forest to marijuana and coca plantations (L. G. Olarte in litt. 1993, L. M. Renjifo in litt. 1993 and verbally 2000, J. Fjeldså verbally 2000), which has been compounded by the government spraying herbicides (L. G. Olarte in litt. 1993, L. M. Renjifo in litt. 1993 and verbally 2000). It is not known whether this activity is still undertaken by the Colombian authorities (L. M. Renjifo in litt. 1993 and verbally 2000). From the 1950s onwards, immigration to the area has been considerable, and agricultural expansion (e.g. coffee and livestock), logging, burning and afforestation with exotic trees (e.g. pines) (IUCN 1992, Dinerstein et al. 1995, L. G. Olarte and M. Pearman per P. G. W. Salaman in litt. 1998, 1999 and verbally 2000, Salazar and Strewe undated) have caused extensive forest loss. The high-altitude breeding habitat is not known to be significantly threatened. The species is fairly common in shade coffee plantations when not breeding, but the extent of such plantations is decreasing (L. G. Olarte and M. Pearman per P. G. W. Salaman in litt. 1998, 1999 and verbally 2000)	habitat loss and degradation,pesticides impact

Capito hypoleucus	Survey remaining forests across its known range and survey potential sites to acquire an improved population estimate. Monitor rates of forest loss within the species's range. Increase the area of primary forest within the species's range that is protected. Encourage the reforestation of pastures and other formerly forested areas	population size, area management	Vast areas of forest within its range have been cleared and used for livestock-farming, arable cultivation, narcotics plantations, infrastructure development, oil extraction and mining (Cuervo and Salaman 1999, A. Cuervo in litt. 1999, L. Dávalos in litt. 1999, Dinerstein et al. 1995, Donegan and Salaman 1999, Forero 1989, P. G. W. Salaman in litt. 1999, Stiles et al. 1999). The northern tip of the Central Andes has been progressively settled and deforested since the 19th century, although some extensive forests survive (Forero 1989, Wege and Long 1995). The middle Magdalena valley was rapidly opened up, colonised, logged and farmed during the 1960s and 1970s, although forest regeneration has begun following land abandonment in some areas (Stiles et al. 1999). The Serranía de San Lucas was covered by primary forest until 1996, when a gold rush began, and most of the eastern slopes have since been settled, logged and converted to agriculture and coca production, with streams polluted by mining and cocaine production (Cuervo and Salaman 1999, A. Cuervo in litt. 1999, L. Dávalos in litt. 1999, Donegan and Salaman 1999, P. G. W. Salaman in litt. 1999). Forest loss within its range is thought to be occurring at a rate of around 25% per 10-15 years (T. Donegan in litt. 2011)	habitat loss and degradation
Capito wallacei	Search for the species on the western slope and in the northern Cerros del Sira. Assess the size of its population. Gather more information on its ecology and life history. Seek protected status for the isolated ridge	distribution, ecological requirements, new protected areas	There is little human habitation in the watershed, and none above 300 m. Only a small amount of hunting is conducted by infrequent visitors. However, deforestation is extensive on the west slope of the adjacent Cordillera Azul, especially in the drainage of the Río Biabo	habitat loss and degradation

Carpornis melanocephala	Survey using tape-playback in areas of suitable habitat to locate additional populations. Investigate its ecological requirements. Ensure de facto protection of all reserves where it is currently known to occur. Designate Murici as a biological reserve and ensure its de facto protection	population size, ecological requirements, area protection	Extensive deforestation is continuing in this region and this species is now largely dependent on a few key protected areas. The harvesting of palmito palms Euterpe edulis may also be a threat (Aleixo and Galetti 1997). A widespread fire in July 1995 destroyed most of the forest at one site in Bahia (E. O. Willis and Y. Oniki in litt. 1999)	habitat loss and degradation

Celeus obrieni	Conduct further surveys to ascertain the species's range, numbers, population trends and the threats it faces. In particular, survey existing protected areas within the species's range (Jalapão National Park, Jalapão State Park, Lageado State Park and Indigenous Reserve Craos) to confirm its presence. Protect remaining cerrado woodland and bamboo woodland, including small fragments with high importance for connectivity and gene flow	distribution, area protection	The main threats to the species are probably from habitat loss and degradation through fires, infrastructure development, pasture expansion and conversion to soya plantations (F. Olmos in litt. 2006, Gomes Marcelino et al. 2012). Habitat loss is particularly intense in Goiás and Maranhão, where about 70% or the native vegetation is already lost (Gomes Marcelino 2014). The species's habitat is highly fragmented, with patches of cerrado woodland mostly smaller than 5ha (Gomes Marcelino and Pinheiro 2014). In Tocantins, it has been reported that a major expansion in Eucalyptus cultivation will take place to meet demand for paper manufacturing, with more than 1 million hectares of cerrado expected to be converted to plantations (T. Dornas in litt. 2011). In addition to Eucalyptus and soybean, sugarcane is also a major crop in Tocantins (T. Dornas in litt. 2011). The species was recently rediscovered during surveys prior to the building of a new section of the Belém-Brasília highway (BR-010). The new road will facilitate access to the area and the expansion of soybean cultivation will probably follow. Preferred habitat (cerrados with bamboo patches), is frequently burned for cattle ranching; whether this practice destroys habitat or helps to maintain it remains poorly understood; however, in the short-term the extensive habitat loss, fragmentation and degradation that results is expected to have a negative effect on the species (B. Hennessey in litt. 2010). Only around 3% of this species's original habitat may remain (B. Hennessey in litt. 2010). A potential new threat is posed by the construction of dams for hydroelecticity (T. Dornas in litt. 2012)	habitat loss and degradation

Celeus tinnunculus	Carry out surveys to assess the total population size. Clarify the species's habitat requirements and tolerance of forest degradation and fragmentation. Monitor rates of deforestation by using remote sensing techniques. Increase the area of suitable habitat that receives effective protection	population size, ecological requirements, area management, new protected areas	Given the extensive loss of Brazil's Atlantic forests, with deforestation said to have been particularly severe since the early 1970s (Tabarelli et al. 2005), this species is almost certainly in decline. It has been estimated that 7-12% remains of the original extent of Atlantic Forest in Brazil (Tabarelli et al. 2005, Ribeiro et al. 2009), some of which now exists in 'archipelagos' of tiny and widely scattered fragments (Tabarelli et al. 2005). In the Bahia biogeographical sub-region, c.17% of original forest remains, with only 4.2% of this protected (Ribeiro et al. 2009). Across the Atlantic Forest region in Brazil, it has been estimated that 42% of the total area of remaining forest exists in fragments of less than 250 ha (Ribeiro et al. 2009). The destruction of forest in this region has been driven historically by the expansion of cattle ranching and timber extraction, with government subsidies fuelling continued agricultural expansion in recent decades, and additional pressures imposed by the harvesting of firewood, illegal logging, hunting, plant collecting and invasive species (Tabarelli et al. 2005)	habitat loss and degradation, hunting, plant collecting, invasive species

Certhidea olivacea	Implement a full-scale monitoring programme for birds on the Galápagos islands in order to assess the impact of threats including diseases and habitat change and the effects of restoration (Dvorak et al. 2012). Continue research into Philornis downsi. Control introduced species. Protect remaining suitable habitat. Ensure management to control invasive plants does not impact negatively on the species	area management, control programme for invasive species, area protection	The traditional strongholds for the species (upper transition and Scalesia zones) are the areas most threatened by anthropogenic habitat alteration (Dvorak et al. 2012). Scalesia has in particular been heavily impacted, with it having potentially covered most of Santa Cruz (Stewart 1915), but now only occurring in small scattered patches; and these have been invaded by non-native plants (Rentería and Buddenhagen 2006, Jäger et al. 2007, Dvorak et al. 2012). Control of these plants with herbicides, could also impact this species by impacting the plant community, and so affecting the the invertebrate community - the Warbler-finches' food source (Dvorak et al. 2012). Other invasive species may also be affecting Green Warbler-finch too, with rats, mosquitoes and the parasitic fly Philornis downsi all being potential threat to the avifauna of the Galápagos (Fessl and Tebbich 2002, Whiteman et al. 2005, Fessl et al. 2010, Dvorak et al. 2012)	habitat loss and degradation, invasive species, pesticides impact, brood-parasitism

Chaetocercus berlepschi	Survey remnant moist forest in the Colonche Hills. Determine its status on Isla de la Plata. Exclude roaming livestock from Machalilla (Best et al. 1996, Becker and López Lanús 1997). Prevent further loss and degradation of habitat within Machalilla. Map and protect forest within the Cordillera Chongón-Colonche (Becker and López Lanús 1997, E. von Horstman in litt. 2000, 2008). Encourage ecotourism at Loma Alta Ecological Reserve to financially benefit local people (Becker and López Lanús 1997). Establish a new protected area within the breeding habitat of the species (Harris et al. 2009)	distribution, population size, area protection, ecotourism, new protected areas	All forest-types within its range have greatly diminished owing to logging and agricultural clearance (Dodson and Gentry 1991, Best et al. 1996). Persistent grazing by goats and cattle damages the understorey, prevents regeneration and is a serious current threat (Dodson and Gentry 1991, Pople et al. 1997). Rapid habitat loss continues, at least in unprotected areas, and will soon remove almost all extant forest (Dodson and Gentry 1991). Uncontrolled forest fires are a major threat to forest in the Cordillera Chongón-Colonche (E. von Horstman in litt. 2000, 2008). Even in Machalilla, its habitat is threatened by illegal settlement, deforestation, livestock-grazing and habitat clearance by people with land rights (Becker et al. 2000, Harris et al. 2009)	habitat loss and degradation, livestock disturbance
Cichlopsis leucogenys	Conduct surveys to get more accurate knowledge of the species's range, population size and trends. Attempt to protect areas of remaining habitat	population size, distribution, area protection	This species is threatened by deforestation as a result of expanding human populations	habitat loss and degradation

Cinclodes palliatus	Continue to conduct surveys to better determine its current distribution and population size, especially in the highlands north central Huancavelica (J. Barrio in litt. 2012). Assess its precise ecological requirements to determine reasons for this species's apparently restricted range and rarity. Designate reserves to provide legal protection for known range areas. Coordinate with mining companies on the protection of the bogs occurring inside their properties. Monitor changes in habitat caused by increasing peat extraction, and their effects on populations (G. Engblom in litt. 2003)	distribution, population size, ecological requirements, area protection, new protected areas, area management	Suitable habitat was previously subjected to relatively little human disturbance owing to its high altitude. However, the use of peat for mushroom-growing, private gardening and public parks in Lima has increased in the past ten years, and bogs are rapidly destroyed as their soil is transported to Lima (G. Engblom in litt. 2003). Some suitable habitat is apparently being overgrazed by alpacas, llamas and sheep (J. Barrio in litt. 2009). Mining operations are also causing habitat degradation through the dumping of deposits in bogs and lakes, and through the deliberate draining of some bogs, an activity that is estimated to be affecting over 50% of suitable sites (J. Barrio in litt. 2012). In addition, wetland areas in its range are threatened by water extraction for agriculture (C. Aucca Chutas in litt. 2008). The chances of this species surviving will greatly diminish if peat extraction and habitat alteration continue. Furthermore, having a montane distribution that is close to the maximum altitude within its range, this species is potentially susceptible to climate change (BirdLife International unpublished data)	habitat loss and degradation, climate change

Cistothorus apolinari	Survey and monitor known populations. Census and study the poorly-known páramo population (F. G. Stiles in litt. 1999), especially within national parks (Wege and Long 1995). Protect wetland habitats (P. G. W. Salaman in litt. 1999). Assess the taxonomic status of the páramo population. Control Shiny Cowbird Molothrus bonariensis populations at breeding sites (Renjifo et al. 2002, Rosselli and Stiles 2012); without such control, the Sabana de Bogotá population is unlikely to survive (Rosselli and Stiles 2012). Ensure the continued protection of páramo habitats within existing national parks	monitor the population, new protected areas, taxonomy, control programme for invasive species, area protection	It is declining rapidly owing to the drainage and burning of wetlands for agriculture, mainly onion cultivation, but also cattle-farming (Wege and Long 1995). Siltation, because of erosion on deforested hillsides in the region (Wege and Long 1995), and pollution by agrochemicals and sewage alter the wetland vegetation, and insecticide use may reduce food availability or directly poison birds. In the Bogotá area, several relict wetlands are threatened by human settlement and highway projects (Wege and Long 1995, F. G. Stiles in litt. 1999). Reed-harvesting and tourism are possibly minor threats, and nest parasitism by Shiny Cowbird Molothrus bonariensis may increasingly be a threat (Renjifo et al. 2002, Rosselli and Stiles 2012). Degradation of páramo habitats continues even within protected areas, e.g. El Cocuy National Park (Cortes-Herrera & Briceño 2004, O. Cortes in litt. 2007)	habitat loss and degradation, pesticides impact, brood-parasitism
Clytoctantes atrogularis	Reassess forest state and species's status at the type-locality. Survey for the species elsewhere in Rondônia, Mato Grosso and Amazonas. The call has recently been recorded and playback should be used during future surveys. Establish reserves in this area of the Brazilian Shield to protect this and other threatened species. Eliminate incentives for cattle-ranching and other inappropriate forms of agriculture within the region	area management, ecological requirements, survival, distribution, new protected areas	The principal threats are the expansion of the agricultural frontier as a direct result of highway construction (Cleary 1991) (which has declined in the 1990s) and commercial logging (which is increasingly significantly) (M. Cohn-Haft in litt. 1999). Although its range includes adjacent parts of Amazonas and Mato Grosso, deforestation in Rondônia proceeds apace (Skole and Tucker 1993), at the rate of 4,000 km2 per year. Fortunately, a dam project designed to flood the Cachoeira Nazaré has been abandoned, but other hydroelectric schemes in Rondônia are apparently proceeding (Whitney 2005)	habitat loss and degradation

Cnemathraupis aureodorsalis	Survey to better determine its range between and beyond known localities. Determine the extent to which burning of páramo grassland affects this species. Increase the area of suitable habitat that has protected status	distribution, evaluate the threats, new protected areas	Elfin forests are vulnerable to grazing and fires spreading out of adjacent páramo grasslands, both of which inhibit forest regeneration and lead to a detrimental lowering of the treeline (Kessler and Herzog 1998). The human population-density within the species's range is low (T. S. Schulenberg in litt. 1999), but its elfin-forest habitat is more seriously threatened than previously thought. Even in remote protected areas such as Río Abiseo National Park the forest is degraded by fires started to provide grazing areas for cattle; all five known sites suffer from this threat (Engblom in litt. 2003)	habitat loss and degradation
Coccyzus ferrugineus	Conduct surveys to estimate the population, perhaps using call play-back and mist-netting (T. Sherry in litt. 2007). Monitor population trends through regular surveys. Carry out research into the species's breeding biology (T. Sherry in litt. 2007). Study the impact of introduced mammals. Begin to eradicate introduced mammals where feasible	population size, monitor the population, control programme for invasive species	Cats are potential predators of adults, fledglings and nests, whilst rats are potential nest predators. Feral deer, pigs and goats graze suitable habitat. Pigs especially devastate the lower strata and understorey of native forests and inhibit forest regeneration (Sherry 1985, F. G. Stiles in litt. 1999). On many other islands, this combination of feral mammals has caused the extinction of numerous endemic plant and animal species. There is also low-level disturbance from increasing tourism (Sherry 1985). Global climate change might pose a threat in the future, perhaps through the effects of changes in weather patterns (T. Sherry in litt. 2007)	invasive species

Coeligena orina	Continue surveys to research the species's range, population size and trends. Support the proposed expansion of Las Orquídeas National Park, and the Dusky Starfrontlet Reserve in the Páramo de Frontino. Establish a management plan for Páramo de Frontino and Dusky Starfrontlet Reserve. Lobby for the adequate protection of Las Orquídeas National Park. Mobilise funds to facilitate law enforcement within the National Park and extensions to it	population size, distribution, area management	Páramo de Frontino contains rich deposits of gold, zinc and copper, which have attracted the attention of mining companies. However, political instability in the region has prevented exploitation of these resources to date. The future expansion of mining remains a serious potential threat. The area is currently wholly unprotected and is suffering from continuing deforestation for pasture and agriculture. In 2010 a fire consumed around 110 ha of vegetation in the area (Renjifo et al. 2014). Future colonisation by human settlers is likely to lead to habitat loss and degradation; a process ongoing in the nearby Las Orquídeas National Park	habitat loss and degradation
Coeligena prunellei	Conduct surveys in relatively inaccessible and well forested parts of the Serranía de las Quinchas (Stiles et al. 1999). Study its ecology and breeding behaviour (T. Züchner in litt. 1999). Prepare a management plan for the species (T. Züchner in litt. 1999). Augment conservation activities in Guanentá-Alto Río Fonce Fauna and Flora Sanctuary (P. G. W. Salaman in litt. 1999). Protect areas of the favoured habitat holding significant populations (P. G. W. Salaman in litt. 1999, T. Züchner in litt. 1999)	ecological requirements, species conservation project, area protection	The upper Magdalena valley and the Sagamosa drainage have been undergoing habitat loss, fragmentation and alteration since the 17th century (Stiles et al. 1999). The primary causes are human settlement and urbanisation, with associated logging and agricultural land-use including coffee and, to a lesser extent, plantain and sugarcane plantations and pastures (Stiles et al. 1999). As a result, tiny remnant forest patches are restricted to steep slopes and along streams (Stiles et al. 1999), with the significant exception of Guanentá-Alto Río Fonce (Wege and Long 1995). However, there are still extensive forests that are poorly known to ornithology in the Serranía de las Quinchas, west Boyacá (Stiles et al. 1999)	habitat loss and degradation, urban intensification
Columbina cyanopis	Monitor the size and trends of the population at Botumirim. Survey the	population size, monitor the	The reasons for this species's historical rarity are unknown because, until recently, large areas of potentially suitable habitat	habitat loss and degradation,

	Serra das Araras to locate and determine the size of any remaining population and propose measures for its protection. Survey near Cuiabá and at Campo Grande to determine its status and protect these areas if appropriate. Survey any area with apparently suitable habitat, especially Emas National Park and Iquê-Juruena Ecological Station, Chapada dos Veadeiros, Serra de Ricardo Franco State Park, other chapadas in Mato Grosso and the still extensive open cerrados along the Tocantins/Goiás border (F. Olmos in litt. 2005), taking care to avoid overlooking the species by confusing it with other sympatric species (Tobias et al. 2006). Study its ecology to assess reasons for its historical rarity. Protect the remaining habitat within the species's known range. Enforce protection measures at the new private reserve and state park at Botumirim	population, distribution, ecological requirements, area protection	remained. It is now severely threatened by the massive destruction of the Brazilian cerrado. The combined effects of grazing, invasive grasses, annual burning and conversion to agriculture for Eucalyptus plantations, soybeans and pastures for exportable crops, encouraged by government land reform (Stotz et al. 1996, Parker and Willis 1997), had heavily or moderately altered two-thirds of the cerrado region by 1993 (Conservation International 1999). Most of this destruction has occurred since 1950 (Cavalcanti 1999). The cerrado habitat may also be altered by climate change, which poses a further threat to the species (Şekercioğlu et al. 2012)	climate change
Conothraupis mesoleuca	Research the status, distribution, ecology and habitat requirements of the species in the Emas National Park and Alto Rio Juruena. Survey using tape-recordings of the song in remnant cerrado woodland and gallery forest in other areas, especially in the Iquê-Juruena Ecological Station, Serra das Araras Ecological Station, Noel Kempff Mercado National Park and elsewhere between Emas and eastern Bolivia. Conduct surveys in deciduous and semi-deciduous woodland, including those in Mato Grosso do Sul and northern Mato Grosso, including Serra de Ricardo Franco. Increase the area of suitable habitat that has protected status, particularly in the upper Juruena basin	population size, distribution, ecological requirements, area protection	This species is likely to have suffered from forest clearance and degradation through agricultural expansion and mechanisation in the region. The spread of soya cultivation in particular poses a serious threat outside Emas National Park (Buzzetti in litt. 2007). If the species does indeed rely on flooded riverside habitats, its population may be naturally fragmented owing to the fragmented and linear nature of suitable areas; however, in this case habitat loss would be a major threat (Candia-Gallardo et al. 2010). An impending hydroelectric project planned for Bacia do Alto Juruena and involving the construction of five hydroelectric plants will flood the Juruena river area, which appears to be the global stronghold for the species, and could extinguish more than half of the total population in a short time (MMA 2014)	habitat loss and degradation

	(Candia-Gallardo et al. 2010). Lobby against the proposed hydroelectric project			
Cotinga maculata	Survey areas of suitable habitat within its range to locate further populations. Use observation towers to monitor the species's occurrence and populations (B. Whitney in litt. 2019). Research the species's ecology and habitat preferences (CEMAVE 2018). Effectively protect and restore remaining habitat (CEMAVE 2018). Increase connectivity between fragments of forest where the species remains (CEMAVE 2018)	distribution, monitor the population, area protection, ecological requirements, connectivity, area management	The main threats to the species are the large-scale destruction of the remaining lowland Atlantic forest and illegal capture for the cage-bird trade (CEMAVE 2018). The extensive and continuing deforestation within its range has isolated populations in a few key protected areas. Forest is logged and burned and cleared for conversion to agriculture for crops such as coffee and for grazing (CEMAVE 2018, Cavarzere et. al. 2019). In the past, birds were collected for feather-flower craftwork by local Indians and Bahian nuns. The apparent scarcity of the species in trade during recent decades is probably a consequence of its rarity	habitat loss and degradation, illegal trade

Cranioleuca berlepschi	Survey to improve knowledge of this species's status and distribution. Improve land-use management by segregating agricultural, grazing and forest areas (Fjeldså and Kessler 1996). Regulate the use of fire (Fjeldså and Kessler 1996). Reintroduce old, high-yielding agricultural techniques (Fjeldså and Kessler 1996). Encourage local people to take a leading role in land-use management and restoration schemes (Fjeldså and Kessler 1996)	status, distribution, regulate land use, integrate local people	Timberline habitats in the Andes have been diminishing since the arrival of humans thousands of years ago, primarily through the use of fire (Kessler and Herzog 1998). During the colonial period, sustainable land-use systems established by Pre-Columbian cultures were largely replaced with unsustainable agricultural techniques, including widespread burning (Kessler and Herzog 1998). Regular burning of páramo grassland adjacent to elfin forest, to promote the growth of fresh shoots for livestock, has lowered the treeline by several hundred metres, and continues to destroy large areas of this species's habitat (Kessler and Herzog 1998). Small and fragmented remnant elfin forests are additionally threatened by clearance for agriculture and grazing, with an alarmingly high rate of conversion to cash-crops in the (until relatively recently pristine) Cordillera de Colán (Barnes et al. 1995, Davies et al. 1997, Kessler and Herzog 1998). Road construction has increased pressure from grazing and selective logging, and there is ongoing rapid habitat clearance in the Leimebamba-Abra Barro Negro area (H. Lloyd in litt. 2007)	habitat loss and degradation

Cranioleuca henricae	Carry out further surveys to obtain an improved estimate of the population. Carry out targeted searches in the Consata basin to determine whether the population still persists there. Monitor population trends through regular surveys. area management within the species's range. Act to prevent further erosion and landslides below Inquisivi (S. K. Herzog in litt. 1999, 2007). Support the maintenance of traditional land-use and tenure systems that allow natural woodland habitats to persist (Maijer and Fjeldså 1997). Establish municipal or private reserves that ensure protection of the best remaining forest patches. Encourage sustainable ethno-ecotourism as a new source of income for local communities that protect forest patches (S. K. Herzog in litt. 1999, 2007)	population size, ecological requirements, area management, sustainable activities, new protected areas, ecotourism	Much suitable habitat has long been destroyed or severely degraded due to anthropogenic impact (Maijer and Fjeldså 1997, S. K. Herzog in litt. 1999, 2007). For centuries, woodland within the range has been cut for firewood and charcoal production, which greatly reduces the abundance of the ‘grey beard’ bromeliad (Maijer and Fjeldså 1997, S. K. Herzog in litt. 1999, 2007). Although many older trees with the 'grey beard' bromeliad remain in the Cotojaces basin, habitat regeneration is impeded by heavy overgrazing, burning and clearance for agriculture (Maijer and Fjeldså 1997, S. K. Herzog in litt. 1999, 2007). The conversion of native vegetation into Eucalyptus plantations, combined with the destruction of native vegetation and high grazing pressure, has caused hydrological changes leading to massive soil erosion and landslides (S. K. Herzog in litt. 1999, 2007). The species’s stronghold near Inquisivi in La Paz department may be extirpated by landslides by 2050 or sooner (S. K. Herzog in litt. 1999, 2007). The expansion of the road network threatens the remaining habitat by facilitating access to the area and exploitation of the forest for charcoal production (S. K. Herzog in litt. 1999, 2007). Climate change is likely to significantly reduce this species’s range (del Rosario Avalos and Hernández 2015	habitat loss and degradation, livestock disturbance, climate change
Cranioleuca marcapatae	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation.	new protected areas, area management, area protection, sustainable activities	The primary threat to this species is accelerating deforestation; it is thought to be particularly susceptible to fragmentation and edge effects (Soares-Filho et al. 2006, Bird et al. 2011, A. Lees in litt. 2011)	habitat loss and degradation

	Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006)			
Cranioleuca muelleri	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes	new protected areas, area protection, area management	The primary threat to this species is accelerating deforestation in the Amazon basin as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network; it is thought likely to be particularly susceptible to fragmentation and edge effects (Soares-Filho et al. 2006, Bird et al. 2011, A. Lees in litt. 2011). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011)	habitat loss and degradation
Crax alberti	Determine its population and distribution more accurately and confirm its persistence in the Serranía de San Jacinto and the upper Sinú drainage (Cuervo and Salaman 1999, Stiles et al. 1999, A. Cuervo in litt. 1999, P. G. W. Salaman in litt. 1999, 2000). Protect forests on the serranías de San Lucas and de las Quinchas (Stiles et al. 1999, A. Cuervo in litt. 1999, P. G. W. Salaman in litt. 1999, 2000). Implement effective conservation measures in existing protected areas (L. Dávalos in litt. 1999, P. G. W. Salaman in litt. 1999, 2000).	population size, distribution, area protection, environmental education, ecotourism, reintroduction	This species may be tolerant of low levels of habitat degradation (Strewe et al. 2010); however, its range is affected by outright habitat loss and severe degradation. Vast areas of forest have been cleared since the 17th century, and are used for livestock-farming, arable cultivation, cotton and illegal drug plantations, oil extraction and mining (Dinerstein et al. 1995, Cuervo and Salaman 1999, Stiles et al. 1999, Strewe et al. 2010, L. G. Olarte in litt. 1993, L. M. Renjifo in litt. 1993, A. Cuervo in litt. 1999, L. Dávalos in litt. 1999, P. G. W. Salaman in litt. 1999, 2000, J. D. González in litt. 2005, J. M. Ochoa in litt. 2005). Severe deforestation has taken place in the lower part of Paramillo National Park, the middle Magdalena valley and in the Sierra Nevada de Santa Marta (Ochoa et al. 2016). A GIS study of an area representing 16.5% of the species's range in 2002 estimated	habitat loss and degradation, hunting, pesticides impact

	Establish and enforce a hunting prohibition (Urueña et al. 2006). Continue environmental educations to limit hunting, and provide resources to replace the need for habitat conversion (A. Cuervo in litt. 1999). Develop ecotourism centred on the species (Shanahan 2017). Carry out a reintroduction programme		that 39% of the species's potential distribution within this area was lost between 1986 and 2002, with a deforestation rate of 2.4% per year (Melo et al. 2008). Deforestation outside of the El Paujíl Bird Reserve was previously found to be accelerating at an annual rate of 2.1-7% (Machado and Salaman 2008/2009). There are fears that deforestation may increase in areas such as the Sierra Nevada de Santa Marta and the Serranía de San Lucas now that conflict has subsided (Negret et al. 2017, Shanahan 2017). Cultivation (notably of coffee), logging and marijuana-plantation expansion and subsequent government spraying with non-specific herbicides affect the Sierra Nevada de Santa Marta (Dinerstein et al. 1995, Strewe et al. 2010, L. G. Olarte in litt. 1993, L. M. Renjifo in litt. 1993). Colonisation and deforestation for coca farming are the principal threats acting around the El Paujíl Bird Reserve (Quevedo et al. 2005). In 1996, there was a gold rush in the Serranía de San Lucas and most of the eastern slopes have since been settled, logged and converted to agriculture and coca production (A. Cuervo in litt. 1999, L. Dávalos in litt. 1999, P. G. W. Salaman in litt. 1999, 2000). Few individuals are thought to remain in this area due to hunting (D. Caro in litt. 2009). Hunting and egg-collecting for food have contributed to past and present declines, and a recent survey of villages surrounding the Paramillo National Park suggests these activities will continue into the future unless the economic situation of the villagers improves (Cabarcas et al. 2008, A. Cuervo in litt. 1999, P. G. W. Salaman in litt. 1999, 2000). A study of hunting in three municipalities in Antioquia estimated that 57 individuals were caught by hunters between 2002 and 2003 (Melo et al. 2008). The species is also threatened by infrastructure development, as exemplified by the Santa Marta-Riohacha Highway, which acts as a barrier between populations in Tayrona National Park and the foothills of the Sierra Marta de Santa Marta (Strewe et al. 2010)	
Crax blumenbachii	Survey Monte Pascoal, Rio Doce and other localities where the species has been recorded in the past to assess its current status at these sites, and conduct ground surveys of areas identified as potential localities from which the species is not yet recorded. Survey known populations to obtain population	distribution, ecological requirements, area protection, captive breeding, environmental education, monitor illegal activities	The species has suffered chronic habitat loss and hunting pressure. Virtually all lowland forest north of Rio de Janeiro is within actively protected reserves or has been completely converted to plantations and pastureland. Even in Monte Pascoal National Park, habitat loss continues as a result of conflicts over the land rights of local people. Hunting and capture for the bird trade persist in reserves and are likely to have a severe impact on such fragmented populations (Silveira et al. 2005)	habitat loss and degradation, hunting, illegal trade

	estimates and more information on ecology and habitat use patterns. Ensure the de facto protection of all reserves with known populations. Patrol reserves to prevent hunting and trapping. Create private reserves protecting forest remnants within the species's range. Continue the reintroduction programme, managing captive stocks to avoid loss of genetic diversity, increasing the number of institutions breeding the species and integrating all captive populations within a common management and breeding protocol. Identify further potential reintroduction sites, continue long-term monitoring of released individuals and ensure effective protection of localities selected for reintroduction. Establish environmental education programmes in communities living around protected areas, focusing these on the issue of hunting. Lobby for the unauthorised killing, capture or trade of C.blumenbachii to be made offences subject to prison without bail			
Crax pinima	Continue to search potentially suitable remaining habitats for the species, and follow up any further reports of its persistence in the wild. Consider genetic analysis on the captive male to confirm that it is C. pinima. Maintain and expand the tiny captive population with a view to eventual reintroduction if appropriate. Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and	distribution, genetic, new protected areas, area management, area protection	The expansion of agribusiness and logging has currently made the Belém Centre of Endemism the most deforested sector of Amazonia, with only a few large and well-preserved forest tracts. Even within reserves such as Gurupi habitat destruction has been significant as illegal logging, cultivation and grazing have continued unchallenged. Hunting is likely to represent a significant additional threat	habitat loss and degradation, hunting

	maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Integrate the protection of Gurupi Biological Reserve with that of the surrounding indigenous lands (Mendes et al. 2017). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes			
Cyanolyca mirabilis	distribution in the Sierras de Miahautlán and de Yucuyacua as well as other mountainous systems of Guerrero (R. Almazán-Núñez in litt. 2016). Designate a protected area including the mountains of the Sierra Madre del Sur, from Omiltemi to Sierra de Petatlán (R. Almazán-Núñez in litt. 2016) and designate a protected area in the Sierra de Miahuatlán encompassing the range of this species (Hernández-Baños et al. 1995)	new protected areas	Many of the remaining forests within its range are under clearance for timber and large-scale agricultural expansion. Corn, fruit (notably citrus fruit in the Sierra de Miahautlán [Dinerstein et al. 1995]) and coffee cultivation is replacing lower montane forests, and logging is removing pine-oak forests (Navarro 1992). The continuing spread of West Nile virus is not thought to pose a serious threat, and no related mortality has been detected in this species (P. Escalante in litt. 2005)	habitat loss and degradation

Dacnis hartlaubi	Conduct further field surveys to better assess its population and distribution, notably in the Serranía de las Quinchas (Stiles et al. 1999), but also in east Cundinamarca (Stiles 1992). Research its ecological requirements to determine the extent to which primary forest is necessary to maintain viable populations and understand its occurrence in some shade-tree plantations. Protect Laguna de Pedropalo, Cundinamarca, and its adjoining forest (Renjifo et al. 2002)	population size, ecological requirements, distribution, new protected areas	There is continuing clearance of suitable humid forests for agriculture and human settlement. In central-west Cundinamarca and on the upper slopes of the Cauca valley (Quindío and Valle del Cauca), centuries of cultivation have left only remnant forest patches (Wege and Long 1995, Stiles et al. 1999). Colonisation and conversion of the Andean slopes in the middle Magdalena valley to cultivated and pastureland reached a peak in the 1970s, probably affecting any subpopulations between west Cundinamarca and the Serranía de las Quinchas and de los Yariguíes (the largest remaining blocks of wet forest in the region [Stiles et al. 1999, T. Donegan in litt. 2012]). However, many areas have since been abandoned and become successional habitats (Stiles et al. 1999). The population in Valle del Cauca is bisected by the Cali-Buenaventura highway, and thus threatened by agricultural expansion (Salaman and Stiles 1996)	habitat loss and degradation
Dendrocolaptes hoffmannsi	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest	new protected areas, area management, area protection	The primary threat to this species is accelerating deforestation within its restricted range in the Amazon basin (Soares-Filho et al. 2006, Bird et al. 2011, A. Lees in litt. 2011). It is thought to be highly sensitive to human disturbance, and its natural rarity and preference for primary forest are likely to make it particularly susceptible to threats (del Hoyo et al. 2003, A. Lees in litt. 2011). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011)	habitat loss and degradation

	protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes			
Dendrortyx barbatus	Carry out surveys to obtain an up-to-date total population estimate. Monitor the rates of habitat loss and degradation across its range. Implement a conservation awareness programme for the Sierra Gorda, targeting villages near known populations. Document habitat requirements, especially within the Sierra Gorda. Survey for additional populations in San Luis Potosi, Hidalgo, Veracruz and Oaxaca. Conduct research to determine the level of gene flow between the northern and southern parts of the species's range	population size, area management, environmental education, habitat requirements, gene flow, distribution	Habitat destruction and fragmentation are the result of logging, clearance for agriculture, road-building, tourist developments, intensive urbanisation, sheep-ranching and grazing (Dinerstein et al. 1995). Conversion from shade to sun coffee is a serious threat to some areas of habitat (Eitniear and Baccus 2002, J. C. Eitniear in litt. 2004). Fragmented populations are susceptible to subsistence hunting, predators, genetic retrogression and further human encroachment (J. C. Eitniear in litt. 1999). In Veracruz, there is widespread conversion of habitat to monoculture crops, human settlement and livestock-grazing (Eitniear et al. 1999) and there have been reports of hunting with dogs with little discrimination between species (Eitniear and Baccus 2002, J. C. Eitniear in litt. 2004). In Hidalgo, there is little remaining habitat	habitat loss and degradation, hunting

Diglossa venezuelensis	Survey El Guácharo National Park, Cumbres de San Bonifacio, Serranía de Turumiquire and Cerro Humo to assess its precise distribution and estimate populations (Rodríguez and Rojas-Suárez 1995, Sharpe 2008). Assess its habitat requirements and tolerance to degradation and disturbance (Rodríguez and Rojas-Suárez 1995, Sharpe 2008). Increase the area of suitable habitats that have protected status, particularly in the Turimiquire Massif (C. J. Sharpe in litt. 2011). Improve management and enforcement in protected areas where the species is present	distribution, population size, ecological requirements, new protected areas, area management	The species is threatened by habitat clearance for agriculture and livestock (Sharpe 2015). There has been widespread clearance for agriculture and pasture in the Cordillera de Caripe, resulting in extensive degradation of forest. Even in El Guácharo National Park there is clearance, repeated burning and understorey removal for coffee (Boesman and Curson 1995). The slopes of Cerro Negro are largely bare, with the more obvious forest patches actually shade-coffee plantations (Boesman and Curson 1995). There is conversion to coffee, mango, banana and citrus plantations in the Turimiquire Massif, but extensive forest areas remain (Colvee 1999, C. J. Sharpe in litt. 2011, Sharpe 2015). On Cerro Humo, increases in cash-crop agriculture since the mid- to late 1980s has resulted in uncontrolled burning and forest degradation. A proposed gas pipeline on the Paria Peninsula could have disastrous consequences for the species's habitat (C. J. Sharpe in litt. 2003). A new paved road from Güiria to Macuro will almost certainly lead to increased habitat clearance (C. J. Sharpe in litt. 2003). In 2012, the state oil company PDVSA began preparations to construct antennas, a radar, and a heliport on the summit of Cerro Patao (the second highest summit of the Paria Peninsula), where a patch of 0.1 km2 of cloud forest remains (M. Santos in litt. 2012). By 2012, the number of park personnel in the Paria Peninsula National Park had fallen to two (M. Santos in litt. 2012)	habitat loss and degradation

Doliornis sclateri	Conduct surveys to clarify its status, distribution and annual ecological requirements. Improve land-use management by segregating agricultural, grazing and forest areas (G. Engblom in litt. 2003). Regulate the use of fire (G. Engblom in litt. 2003). Reintroduce old, high-yielding agricultural techniques (G. Engblom in litt. 2003). Educate and encourage local people to take a leading role in land-use management and restoration schemes (G. Engblom in litt. 2003)	distribution, status, ecological requirements, regulate land use, integrate local people, sustainable activities	The páramo/cloud-forest ecotone habitat favoured by this species has been seriously reduced and degraded throughout its range, owing to the use of fire to maintain pastureland. Sadly, pre-Columbian sustainable land use systems were largely replaced with unsustainable agricultural techniques during the colonial period (Kessler and Herzog 1998). Such land management practices occur even inside protected areas in the region. Habitat losses in some areas have been estimated at 50% within the last 25 years (G. Engblom in litt. 2003)	habitat loss and degradation
Dubusia carrikeri	Survey its range to better determine its current population and distribution. Research its ecological requirements. Strengthen and improve the conservation measures in the Sierra Nevada de Santa Marta Biosphere Reserve, at least where important populations of this species are found. Work with local communities and regional institutions to identify and prioritise conservation and management strategies (Salazar and Strewe undated)	population size, ecological requirements, distribution, area protection, integrate local people, area management	Forest in the Santa Marta mountains is threatened by agricultural expansion, logging and burning. Possibly only 15% of the vegetation is unaltered, and much of the forest in certain areas has been cleared for coffee and illegal marijuana plantations, which have been subsequently sprayed with herbicide by the government (Stattersfield et al. 1998). Forest fires as a result of irresponsible ecotourism and climate change may also affect this species (T. Donegan in litt. 2016)	habitat loss and degradation, climate change, pesticides impact
Dysithamnus plumbeus	Survey known sites to ascertain its status. Survey other forested areas within its range to clarify its current distribution. Monitor known populations, especially those at Sooretama and Rio Doce. Ensure the integrity of protected areas where it does occur	distribution, monitor the population, area protection	The fragmentation of the species's range by extensive forest clearance has been and remains the one significant threat. It is now primarily restricted to a small number of protected areas, several of which remain to be consolidated, and from where recorded numbers are low	habitat loss and degradation

Elaenia ridleyana	Survey to provide a more accurate estimate of population size. Clarify the species's habitat requirements (A. Schulz Neto in litt. 1999). Study any problems caused by introduced species and assess methods for their control (A. Schulz Neto in litt. 1999). If appropriate, initiate control measures against introduced species. Effectively protect areas of occupied habitat from development and any other threats. Reduce persecution by children through awareness campaigns	population size, ecological requirements, area protection, control programme for invasive species, environmental education	It was presumably historically more numerous as the island was reportedly covered in forest when discovered in 1503 (Olson 1981). All large trees have been cut and all remaining vegetation is secondary (Olson 1981). There are proposals to further develop tourism and this would cause yet greater damage to its habitat. It may suffer predation from introduced mammals such as rats and cats (A. Schulz Neto in litt. 1999). Children target birds with slingshots and presumably kill some individuals of this species (Olson 1994). Fire may pose a credible threat, and an introduced vine is reported to threaten remaining preferred habitat (T. Mark in litt. 2003)	habitat loss and degradation, invasive species
Eleoscytalopus psychopompus	Continue studying the known populations at Ituberá and Una. Search for the species in other fragments of remaining habitat in the area. Determine its population size and status at the known localities. Study the species's ecology, including habitat requirements, and breeding biology. Effectively safeguard Una Biological Reserve and the habitat at Ituberá. Initiate sustainable development projects within the species's range	distribution, monitor the population, area protection, population size, ecological requirements	The destruction of coastal Atlantic forest has been extensive in Bahia, south of Salvador, and only small fragments remain, totalling perhaps 10% of their original extent in the area (Tobias et al. 2006). The species is presumed to be at great risk from the continuing loss of suitable habitat	habitat loss and degradation
Eriocnemis godini	Survey any remnant patches of habitat near the type-locality. Protect any remaining habitat (Heynen et al. 2015). Clarify its taxonomic status	distribution, new protected areas, taxonomy	What is surmised to be suitable habitat at the type-locality has been almost completely destroyed, although remnants can be found in steep-sided stream-cuts in the arid upper Guaillabamba drainage. The area around the type-locality is not within a protected area (Heynen et al. 2015)	habitat loss and degradation

Eriocnemis isabellae	Carry out further studies to determine status and population size. Develop a Species Action Plan. Continue and extend local conservation and education initiatives. Work towards the creation of a protected area in the Serranía del Pinche	population size, species conservation project, environmental education, new protected areas	The primary threat is the shifting of the agricultural border towards remaining primary forests, which causes a loss of vegetation cover, contamination of watersheds and soil degradation (Cortés-Diago et al. 2007). Illegal coca cultivation is a major threat due to the lack of governmental presence, with 8.3 % of potentially suitable habitat reportedly damaged annually by coca cultivation. The illegal cultivation of opium poppy (Papaver somniferum) is increasing in the region, and the herbicides used to combat this can pose an additional threat to the species (Cortés-Diago et al. 2007, Gallo-Cajiao and López-O. 2014). The potential completion of a road from El Estrecho in the Patía Valley to Guapi on the Pacific coast would hold serious implications for Serraníadel Pinche (Cortés-Diago et al. 2007)	habitat loss and degradation

Eriocnemis mirabilis	Survey other areas of suitable habitat in Cauca. Research its status and annual ecological requirements at the type-locality (Mazariegos and Salaman 1999). Continue to support the establishment and expansion of the newly formed reserve. Designate additional areas of suitable habitat as reserves. Improve the protection of Munchique National Park. Carry out habitat restoration in Munchique National Park	distribution, population size, ecological requirements, area protection, new protected areas, area management	In the 1960s and 1970s, the local economy was based on the fruit crop "lulo", which was grown under the forest canopy, and hence deterred logging. However, a fungal disease and lepidopteran pest destroyed the crop in the 1980s, and logging recommenced. An old mule-track below the type-locality has recently been cleared and widened, and small-scale logging has begun in the immediate vicinity (Mazariegos and Salaman 1999). The Serranía del Pinche and Munchique National Park are threatened by habitat clearance for illegal coca cultivation; fires lit to clear forest at lower elevations spread to higher areas destroying sensitive habitats (L. Mazariegos in litt. 2007, P. Salaman in litt. 2008). Other areas of forest which potentially hold the species are threatened with clearance by slash and burn (L. Mazariegos in litt. 2007)	habitat loss and degradation
Eriocnemis nigrivestis	Expand awareness campaigns to other areas, particularly the Íntag valley and the Volcán Atacazo (Jahn & Santander 2008). Implement recently-developed management plans to improve protection of the Cotacachi-Cayapas Ecological Reserve and the Protective Forest Mindo-Nambillo through law enforcement against illegal logging, hunting, and colonisation inside the reserves, and sustainable management projects in their buffer zones (Jahn and Santander 2008). Survey unexplored forest tracts, particularly the western slope of Volcán Pichincha, Volcán Atacazo and the main massif of the Toisán (T. Züchner in litt. 1999, Santander et al. 2004, Jahn & Santander 2008). Identify key sites for new community and private reserves (Jahn	environmental education, area protection, distribution, new protected areas, area management, connectivity, prevent disease, ecological requirements	The main threat is the felling of forest for timber and charcoal, facilitating the introduction of cattle and the eventual spread of the agricultural frontier for ranching and to a lesser extent production of crops (Phillips 1998, Santander et al. 2004, Jahn 2008). In Canton Cotacachi, Imbabura, 45% of households still use firewood and charcoal for cooking and heating, contributing to the destruction of key habitat (Jahn and Santander 2008). The situation is similar on the west slope of Volcán Pichincha, where some families still produce charcoal for auto-consumption and commercialisation in Quito (Jahn & Santander 2008). Suitable habitat on ridge-crests is disappearing more rapidly than surrounding vegetation, because the crests provide flat ground for cultivating potatoes and livestock-grazing within otherwise steep terrain (Bleiweiss and Olalla 1983). The Toisán population is threatened by rapid deforestation on the south-west slope of the cordillera, copper mining concessions, and invasions of landless farmers within the Cotacachi-Cayapas Ecological Reserve (Jahn 2008, Jahn and Santander 2008). Some ridges where it formerly occurred are now almost completely devoid of natural vegetation, and even if it still occurs in these areas it is unlikely to be	habitat loss and degradation

	and Santander 2008). Lobby for legislation prohibiting mining in the Cordillera de Toisán (Jahn and Santander 2008). Provide local people with alternative incomes that do not damage the species's habitat (Santander et al. 2004, Jahnand& Santander 2008), and develop and implement an endowment fund strategy for conservation easements (Jahn & Santander 2008). Continue to reforest degraded lands and re-establish biological corridors to guarantee connectivity between remnant forest fragments and continuous habitat (Santander et al. 2004, Jahn and Santander 2008), ensuring forest tract connectivity between the altitudinal extremes of the range (Guevara 2013). Pre-emptively restore native woody vegetation in at least 30% of grass páramo within the Cotacachi-Cayapas Ecological Reserve, Volcán Pichincha, and Volcán Atacazo over the next 25 years in anticipation of future climate change (Jahn 2008, Jahn & Santander 2008). Monitor changes in habitat on a five-yearly basis (Jahn and Santander 2008). Carry out studies on feeder-transmitted diseases (Jahn and Santander 2008). Research minimum forest patch size required by the species and use remote sensing to identify suitable habitat corridors that should be protected (Guevara et al. 2015). Investigate habitat requirements during the breeding season. Implement further research to assess the impact of competition with Gorgeted Sunangel (Heliangelus strophianus) (Guevara et al. 2015)		numerous. Around 93 % of the suitable habitat within its probable historic range has been degraded or destroyed (Williams and Santander 2003), with 97 % lost in Pinchincha Province (Santander et al. 2004). Human-induced fires threaten large tracts of forest during the dry season (Jahn 2008). The construction of a pipeline at Cerro Chiquilipe led to habitat destruction for the pipeline itself, an access road and a depressurisation station despite the known presence of the hummingbird (Santander et al. 2004). Volcán Pichincha has sporadically erupted since 1999, and ash-fall in the area has been considerable. The impacts of this on the species and its habitat are unknown. Climate change in the future may push the climate zone for this species above the current treeline (Jahn 2008), and could lead to increased competition with Gorgeted Sunangel Heliangelus strophianus as that species expands its altitudinal range (Jahn 2008, Guevara 2013). However, the current treeline is thought to be lower than it was historically owing to centuries of anthropogenic stresses (particularly fire) causing the gradual loss and fragmentation of high altitude forest (Jahn 2008)	

Eulidia yarrellii	Research the genetic structure of the populations. Carry out habitat restoration in the Lluta, Chaca and Azapa valleys, ensuring that species whose flowers are visited regularly by E. yarrellii are planted (P. L. Gonzalez-Gomez in litt. 2014). Continue population monitoring, as detailed in the species recovery plan. Limit the amount of pesticides used in Azapa and Chaca valleys. Investigate the effects of territorial interactions between Chilean Woodstar and Peruvian Sheartail (Clark et al. 2013). Scale-up work to raise awareness of the species among the general public (Yañez 2016). Continue with the planning of a network of small reserves to protect the habitat used by the species	genetic, area management, monitor the population, pesticides impact, competition, environmental education, connectivity	Remaining native habitat in the narrow and heavily cultivated valleys inhabited by the species is confined to small patches, and the indigenous plants favoured may be severely threatened. Dense thickets, possibly used as courtship territories, are now scarce due to the spread of agricultural activities in Azapa and Vítor (Clark et al. 2013). Although it has adapted to use introduced plants, the presence of certain native species may still be a limiting factor (Estades 2007). The chañar tree Geoffroea decorticans may be an important food resource, but is often destroyed by farmers who consider it invasive and believe it attracts mice (Estades 2007). Pesticides began to be heavily used in the Azapa valley in the 1960s in order to control the Mediterranean Fruit-fly and other crop pests, but as the Peruvian Sheartail Thaumastura cora has not suffered similar declines, this may not be the primary cause of this species's decline (Estades 2007). Competition with Peruvian Sheartail has been suggested as a potential threat (Estades et al. 2007, C. Estades in litt. 2007, S. N. G. Howell in litt. 2007, Clark et al. 2013). A recent study which examined interactions between the two species found that food niche overlap is relatively low and that E. yarrellii dominates T. cora in male–male territorial interactions. However, potentially increased energetic costs for E. yarrellii associated with frequent territorial chases and courtship displaying with sheartails may exacerbate the effects of other threats on E. yarrellii (van Dongen et al. 2013). Hybridisation is also a potential threat; a male hybrid of the two species was found in the Azapa valley where Peruvian Sheartail is common and Chilean Woodstar rare, and a low level of hybridisation has been found among the two species (Clark et al. 2013, van Dongen et. al. 2013). The various threats of habitat destruction, pesticide use and competition with other hummingbirds are likely to be synergistic in their impacts on the species (P. L. Gonzalez-Gomez in litt. 2014)	habitat loss and degradation, pesticides impact, competition, hybridisation

Eupherusa cyanophrys	Conduct surveys to assess the precise distribution and the extent of altitudinal migration. Carry out surveys to obtain a population estimate and determine the impact of Hurricane Paulina. Designate a protected area in the Sierra de Miahuatlán encompassing the range of this species (Hernández-Baños et al. 1995)	distribution, population size, new protected area	The cloud-forests on the Sierra Miahuatlán were essentially unspoilt by human activity until the mid-1960s, when huge areas were cut and burnt for the planting of maize. Lower montane forest in the sierra is still being cleared, largely for the cultivation of citrus fruits (Dinerstein et al. 1995). In October 1997, Hurricane Paulina destroyed large portions of suitable cloud-forest habitat (A. G. Navarro in litt. 1998), but the full impact of this stochastic event on the species is unknown	habitat loss and degradation
Eupherusa poliocerca	Carry out surveys to obtain a population estimate and clarify its distribution and the extent of remaining habitat. Designate a protected area in the Sierra de Atoyac (Hernández-Baños et al. 1995) encompassing the range of this species. Protect any remaining habitat near Putla de Guerrero	population size, distribution, area protection, new protected areas	It tolerates some habitat degradation adjacent to suitable forested habitats, but lower montane forests are being widely cleared for corn, fruit and coffee (Dinerstein et al. 1995), with forests at higher elevations being destroyed by cutting for lumber. Areas near Putla de Guerrero are now heavily deforested and further degraded by goats (Wege and Long 1995)	habitat loss and degradation
Formicivora erythronotos	Monitor populations. Designate protected areas in Mambucaba and Ariró. Ensure that the Tamoios Environmental Protection Area encompasses part of this species's range. Devise strategies for area management that favour this species	monitor the population, new protected areas, area protection, area management	It cannot tolerate many of the human activities occurring within its range. Development of the narrow coastal plain for tourism and beachside housing has been extensive and threatens the small remnant patches of suitable habitat, especially at Fazenda Ariró where there are plans for a large hotel complex (Mendonça and Gonzaga 1999b, E. Mendonça and L. P. Gonzaga in litt. 2000). There is widespread clearance of Euterpe sp. palms for pasture and plantations, both of which provide unsuitable habitat for this species (Mendonça and Gonzaga 1999b). Such plantations have reduced available habitat in the Vale do Mambucaba (E. Mendonça and L. P. Gonzaga in litt. 2000)	habitat loss and degradation, urban intensification

Formicivora grantsaui	Survey the region to search for new localities and to obtain a population estimate. Monitor the population. Monitor the extent and condition of habitat. Increase the area of occupied and suitable habitat that is protected. Carry out measures to reduce the incidence and impacts of fires. Encourage ecotourism around this species and link this to local livelihoods	distribution, population size, monitor the population, area management, new protected areas, ecotourism	The protection of part of the species's range has allowed the recovery of vegetation from mining activities and direct exploitation; however, the species's habitat remains potentially affected by fires (Gonzaga et al. 2007), which can be serious (C. Albano in litt. 2010), although further study is required to assess their impacts on the species itself	habitat loss and degradation
Formicivora paludicola	Protect key sites, especially older marshes with a high plant biodiversity, and prevent further development projects affecting the marshes in which the species occurs. Restore marshland in the Rio Tietê and Rio Paraíba do Sul basins. Enhance connectivity between patches occupied by the species. Investigate the impact of the invasive grass Urochloa arrecta and ginger lily Hedychium coronarium on populations and their potential spread to further sites	area protection, area management, connectivity, control programme for invasive species	Current threats arise from anything affecting the tiny patchwork of marshes that form the entire range of the species. Within the last 100 years, the marshlands around Sao Paulo have been almost completely lost (Del-Rio et al. 2015). In particular, sand mining activity, agriculture and other developments such as for housing or fish farming have been identified (Buzzetti et al. 2013). The invasion of marshes in the species range by two invasive plants, the grass Urochloa arrecta and the ginger lilly Hedychium coronarium, appears to render the marshes unsuitable for the species, and is a considerable threat (Buzzetti et al. 2013, Del-Rio et al. 2017)	loss of water sources, habitat loss and degradation

Forpus xanthops	Survey the population, especially in the less accessible centre of its range, and between the known ranges of the two Forpus species. Monitor the population, working with local people to generate the will to conserve the species in situ (Begazo 1996). Study its biology and ecology throughout an annual cycle. Control trade and enforce laws on trapping. Create at least one protected area within the species range (Angulo et al. 2008)	monitor the population, integrate local people, ecological requirements, stop illegal trade, new protected areas	Trapping for the local cage-bird trade is probably the sole reason for its recent and drastic decline. Trappers estimate that over 17,000 birds were caught in 1981-1994 (a claim verified by dealers), and 1,481 were legally exported in 1981-1984 (Begazo 1996), but no wild-caught specimens were recorded in international trade in 1991-1995 (Snyder et al. 2000). The mortality rate between capture and sale is estimated at 40-100% (Dorst 1957), inevitably raising demand. By 1988, trade was reduced, with just 56 birds recorded in Lima's bird market that year (Begazo 1996). In a study during 2007-2008, 16 individuals were recorded at a market in Chiclayo, the true number traded being much higher since the rate of detection was estimated to be 3% (Gastañaga et al. 2011). An emerging threat is the building of dams on the Marañón, with four planned to be finished by the mid-2010s (Dourojeanni et al. 2009)	illegal trade
Geospiza acutirostris	Attempt to prevent the introduction of invasive species onto Genovesa	area protection	Its restricted range potentially puts it at risk from invasive predators or disease	unknown threat
Geospiza conirostris	Attempt to prevent the introduction of invasive species onto Espanola	area protection	The island remains free of introduced predators, and apparently the bot-fly Philornis downsi has also not established (perhaps due to the arid nature of the island) (Wiedenfield et al. 2007), but there is a background level of threat of this occurring in the future	unknown threat

Geospiza heliobates	Continue to survey for further populations. Establish yearly monitoring at Playa Tortuga Negra and Caleta Black. Continue control measures for rats, wasps, ants, cats and fire ants at Playa Tortuga Negra and Caleta Black, and monitor effects on the population (Grant and Grant 1997). Further study the impact of Philornis downsi on adults and nestlings, and develop effective control methods, which may include application of control agents directly into nests (D. Wiedenfeld in litt. 2012), pheromone disturbance, or the release of sterile males (Charles Darwin Foundation 2014). Study the impact of Galapagos Hawk Buteo galapagoensis. Facilitate printing of the species action plan in Spanish and English (G. Young in litt. 2011). Restore the Ramsar site at Vilamill. Establish translocation techniques to re-establish individuals at former sites following rat control, using head-started young birds less likely to return to their natal site (G. Young in litt. 2012). A recent study found that some species of Darwin's finches can be encouraged to 'self-fumigate' their nests through the provision of permethrin-treated cotton fibres, resulting in the significantly fewer Philornis downsi and more successfully fledged offspring. It is suggested this may be an effective method of reducing nestling mortality for the Mangrove Finch (Knutie et al. 2014)	distribution, monitor the population, control programme for invasive species, translocation	This species is declining owing to predation and disease as a result of the presence of invasive species. Rattus rattus abundance is high at both breeding sites and is believed to be the major reason for the high nesting failure due to predation (70% in 2007) and low fledgling success (Fessl et al. 2010). Other possible introduced predators include feral cats (especially important during the post-fledging phase), Smooth-billed Ani Crotophaga ani and fire ants Solenopsis spp., although fire ants seemed to have been successfully exterminated in 1997 (Grant and Grant 1997, Vargas 1997, 1999). The blood-sucking nest parasite Philornis downsi represents a significant threat, as it is present in all nests and infestation is high (with a mean of 42 parasites per nest). The first case of nesting mortality due to Philornis parasitisation was recorded in 2007, and this threat is becoming relatively more prominent as invasive rodents are now controlled (G. Young in litt. 2012). Avian pox may also represent a significant threat to the species. Moreover, due to the low population size, the species is inherently susceptible to the effects of inbreeding (Fessl et al. 2010), loss of genetic diversity and hybridization with the congeneric Woodpecker Finch Geospiza pallida (Lawson et al. 2017). Research has shown that the species favours structurally distinct mangroves and hence may be susceptible to human modification of this habitat, and it may be especially susceptible to sea level rise driven by climate change (D. Wiedenfeld in litt. 2012). Habitat loss through the felling of large trees and collection of wood for fires may be a threat near Puerto Villamil (Young et al. 2013)	

Geospiza pallida	Implement a full-scale monitoring programme for birds on the Galápagos islands in order to assess the impact of threats including diseases and habitat change and the effects of restoration (Dvorak et al. 2012). Continue research into Philornis downsi and implement management to limit its negative impact on Woodpecker Finch. Control introduced species. Protect remaining suitable habitat. Ensure management to control invasive plants does not impact negatively on the species	evaluate the threats, control programme for invasive species, area protection	Habitat loss owing to human activities is thought to be a major threat. Endemic Scalesia forest on Santa Cruz had decreased to 1-2% of its original size by 2009 and has been invaded by introduced tree species (Dvorak et al. 2012). Spraying with herbicides to control these invasive plants may have reduced invertebrate abundance. Introduced herbivores are also thought to have had a negative impact on the species, causing significant damage to native vegetation. The species is known to be susceptible to the parasitic fly Philornis downsi and highly susceptible to avian pox (Dvorak et al. 2012). Droughts may have a negative impact on the species (Dvorak et al. 2012)	habitat loss and degradation, pesticides impact, invasive species, brood-parasitism

Geospiza pauper	Investigate methods to control or eradicate Philornis downsi. Continue to monitor the population size. Extend the national park to incorporate the agricultural zone on Floreana. Continue and extend control measures against introduced species and diseases	control programme for invasive species, , monitor the population, evaluate the threats, area protection	The most significant threat is from the introduced ectoparasite Philornis downsi, which occurs in finch nests on Floreana (Wiedenfeld et al. 2007), and is responsible for 41% of nestling mortality (O'Connor et al. 2010a, S. Kleindorfer in litt. 2008). In 2004-2008 nesting success was extremely low in all years (4-8 % of all nests producing fledglings), 28% of nestlings were predated, and parasite intensity from P. downsi was second highest of any bird species studied so far on the Galápagos archipelago (O'Connor et al. 2010a). It is thought to be at elevated risk from fly parasitism because its only extant habitat is adjacent to cleared agricultural land with fruiting trees which are favoured by the adult fly (S. Kleindorfer in litt. 2008). Floreana has a suite of introduced predators and herbivores including cattle, donkeys, pigs, cats, dogs and rats (Jackson 1985), and suffers from extensive habitat destruction and degradation as a result of agriculture (Cruz and Cruz 1996), habitat alteration by invasive plant species, and free-ranging domestic livestock (H. Vargas and F. Cruz in litt. 2000). Avian pox (Avipox virus) occurs on the island and infects a significant proportion of individuals. Predator marks from invasive rodents increased threefold between 2004-2008, and tourist visitation to favoured Scalesia habitat has increased more than tenfold since 2004 (S. Kleindorfer in litt. 2008). Having a montane distribution that is close to the maximum altitude within its range, this species is potentially susceptible to climate change (BirdLife International unpublished data). The species also appears to be at risk from hybridization with Geospiza psittacula and Geospiza parvula, which may have already resulted in the local extinction of G. psittacula on Floreana (Kleindorfer et al. 2014)	brood-parasitism, invasive species, livestock disturbance, disease, climate change, free-ranging domestic
Geospiza propinqua	Attempt to prevent the introduction of invasive species onto Genovesa	area protection	Its restricted range potentially puts it at risk from invasive predators or disease	unknown threat

Geospiza psittacula	Implement a full-scale monitoring programme across the Galápagos Islands. Ensure that management activities to control invasive alien plant species do not have a negative impact on Large Tree-finch. Investigate drivers behind observed declines and assess the impact of Philornis downsi on the population. Protect and enhance existing habitat	area management, evaluate the threats, area protection	The species is likely to be affected by a number of threats. Development, introduced herbivores, the spread of invasive alien plant species and the herbicides used to manage these invasions may all have contributed to unfavourable habitat conditions for the species on Santa Cruz (Dvorak et al. 2012). The introduced parasitic fly Philornis downsi is known to have a negative impact on nesting success in Galápagos finches and the species may be susceptible to avian pox. Severe weather and changes in rainfall patterns owing to climate change also pose a threat	habitat loss and degradation, invasive species, pesticides impact, brood-parasitism, disease, climate change
Geospiza septentrionalis	Continue to restrict access to these islands, and monitor populations. Montior the possible spread of bot-flies and avian pox on these islands	area protection, monitor the population, prevent disease	The avifauna of the Galapagos Islands face a litany of threats (Wiedenfeld and Jiménez-Uzcátegui 2008), perhaps the most severe of which is that from invasive species. The bot-fly Philornis downsi was first discovered in the Galapagos in 1997 and has been demonstrated to reduce fledgling success (Fessl et al. 2006) but at widely varying rates each year, which may be related to rainfall (Dudaniec et al. 2007). The potential for the introduction of a suitable vector for avian pox is high, and P. downsi, although preferring more humid islands would appear to be a potential risk to the species	invasive species, brood-parasitism
Geothlypis beldingi	Use standardised survey techniques to survey all potential nesting habitat in Baja California Sur and adjacent south-eastern Baja California, identifying potential new locations using satellite imaging. Conduct a thorough census of each site by counting singing males in spring in order to ascertain the current population, and repeat at regular intervals to detect local and regional trends. Conduct a formal dispersal study in order	breeding area, population size, dispersal, genetic, taxonomy, area management, new protected areas, environmental education, ecoturism, distribution, evaluate the threats	The oases of Baja California are under high human pressure, especially in the south. Accidental and induced fires, reed-cutting for tourism facilities and house construction, and drainage for agriculture and cattle-ranching have decreased suitable habitat (Rodríguez-Estrella et al. 1999). Such apparently isolated and disjunct populations are probably vulnerable to stochastic events, with hurricanes frequently eliminating portions of reedgrass vegetation in August-October (Rodríguez-Estrella et al. 1999); however, this may underestimate the species's dispersal capabilities (Erickson et al. 2008), which might make it more resilient to such threats	habitat loss and degradation

	to design long-term management actions for the Belding's Yellowthroat metapopulation system. Undertake genetic studies to address questions concerning such issues as the validity of recognising two subspecies or the genetic consequences of population patchiness and potential bottlenecks (Erickson et al. 2008). Incorporate marsh creation into plans for the development of golf courses and resorts within this species's range (Erickson 2006, Erickson et al. 2008). Prohibit burning and cutting of the water-edge vegetation at all sites (Rodríguez-Estrella et al. 1999). Initiate a public awareness programme. Promote bird tourism to generate income for protecting key sites. Increase the capacity of San José del Cabo in water treatment and quality monitoring. Ensure an adequate supply of water to the oasis at San José del Cabo through water rights. Implement an education and outreach programme on the importance and environmental services of the watershed at San José del Cabo. Promote better cattle ranching practices and law enforcement (C. Devenish in litt. 2010)			

Geothlypis flavovelata	Survey any remaining patches of freshwater marsh within its known range. Protect known sites and any other important sites found during surveys. Discourage the draining of small marshes on private land. Conduct awareness campaigns with sugar cane plot owners and hold talks to discuss alternative management practices to reduce the impacts on this species (E. Rodriguez-Ruiz in litt. 2016). Study the potential impacts bio-accumulation of pesticides may be having in this system (E. Rodriguez-Ruiz in litt. 2016)	distribution, protect area, area management, environmental education, pesticides impact	Loss of habitat has extirpated several local populations (Curson et al. 1994). Freshwater marshes have been heavily modified throughout its range, primarily for cattle-ranching, agriculture and urban growth (Stattersfield et al. 1998, E. Rodriguez-Ruiz in litt. 2016), but the species appears able to persist in small parcels of habitat (S. N. G. Howell in litt. 1998, Howell 1999). Its use of sugar cane plantations may bring this species into contact with further threats, as the main harvest period for this crop coincides with the breeding season; and the pesticides impact on sugar cane is likely to be affecting the species and its prey (E. Rodriguez-Ruiz in litt. 2016). Perhaps more serious is recent industrial development in the region. This has resulted in considerable drainage since the 1970s, making the future of the Laguna Champayán uncertain (Collar and Andrew 1988)	habitat loss and degradation, loss of water sources, pesticides impact
Geothlypis speciosa	Census populations in the four known areas and produce recommendations of the most suitable areas for protection. Survey any suitable habitat near Lago Zumpango	population size, distribution	The marshes within its range have been greatly reduced in size, having been drained and planted with crops. The marshes in the upper río Lerma are fragmented as a result of drainage and water extraction to supply México City and Toluca. The water-levels of Lagos Yuriria, Pátzcuaro and Cuitzeo are falling through drainage and a natural build-up of organic material	loss of water sources

Glaucidium mooreorum	Further surveys are required to locate any remaining populations and confirm the species's persistence. Protection of remaining lowland forest fragments in the area is urgently needed, along with more effective law enforcement to prevent illegal deforestation. Erecting nest boxes in potentially suitable forest fragments should be considered (C. Albano in litt. 2008) as well as using playback	population size, area protection, monitor illegal activities, reproductive success	The Pernambuco Center, where this species was described, is by far the most modified region of Atlantic Forest, having declined in extent from c. 39,500 km2 to c. 1,900 km2 by 2002. Most of the 52 remaining reserves are less than 5 km2 in size and almost none of this truly lowland (Butchart et al. 2018). Large amounts of forest were cleared to make way for sugar cane plantations (Pereira et al. 2014). The remainder is severely fragmented and legal restrictions have proven inadequate in halting deforestation from fire and illegal logging. Some suitable habitat does remain at the type locality (S. A. Roda in litt. 2006, 2008). Hunting is also reported to pose a threat to this species	habitat loss and degradation, hunting
Glaucis dohrnii	Assess its current status at Monte Pascoal National Park, Linhares Forest Reserve and Córrego Grande Biological Reserve. Survey historical localities and other areas of suitable habitat. Study its ecological requirements. Promote the continued protection of forest at Estação Veracruz and existing reserves where the species occurs	evaluate the threats, distribution, ecological requirements, area protection	The lowland forests of east Brazil have been fragmented and destroyed, and this is considered to be the principal cause of its decline. Although there are recent records from two reserves, these are under pressure from settlers, suffer from fire and road construction and generally provide inadequate protection. Perhaps most importantly, they protect few watercourses and consequently little suitable habitat for this species. The new owners of Estação Veracruz have apparently abandoned plans to clear the forest (F. Olmos in litt. 1999)	habitat loss and degradation

Grallaria bangsi	Determine more accurately its geographic and altitudinal range in the Sierra Nevada (Renjifo et al. 2002). Conduct censuses to estimate the density and state of the population, thus enabling an assessment of suitable habitat and the design of conservation measures (Renjifo et al. 2002)	distribution, population size	The Sierra Nevada de Santa Marta is increasingly being destroyed and fragmented by illegal agricultural expansion, logging and burning (Renjifo et al. 2002). Only 15% of the sierra's vegetation is unaltered, and this species has probably lost 51% of its habitat (Renjifo et al. 2002). The south-east slope of the sierra is extensively deforested, whilst the west slope has been largely cleared for illegal marijuana plantations, and subsequently sprayed with herbicide by the government (Stattersfield et al. 1998)	habitat loss and degradation, pesticides impact
Grallaria chthonia	Carry out further surveys (especially in May-June when it should be most vocal) in the vicinity of the type-locality in Venezuela and Colombia to attempt to relocate the species and assess its current status and ecological requirements (Rodríguez and Rojas-Suárez 1995, P. Boesman in litt. 2000, Sharpe and Lentino 2008, 2015). Reassess the potential impact of deforestation. Ensure the de facto protection of El Tamá National Park (Sharpe and Lentino 2008, 2015). Determine its taxonomic status (Sharpe and Lentino 2008, 2015, Sharpe in litt. 2011)	status, ecological requirements, evaluate the threats, area protection, taxonomy	In 1990, habitat at the type-locality was reportedly undisturbed above 1,150 m, but deforestation was proceeding rapidly in the area (M. Pearman in litt. 1995). In 1996, the río Chiquito valley was entirely coffee plantations below 1,600 m, with much habitat at 1,900-2,200 m converted to grow potatoes and other vegetables (P. Boesman in litt. 2000, Sharpe and Lentino 2008). The next valley to the west had some habitat at c.1,850 m, and there is presumably habitat in between these two valleys (P. Boesman in litt. 2000). Some 17% of the El Tamá National Park has been affected by agriculture, especially coffee plantations, and small-scale cattle raising (Sharpe and Lentino 2008, 2015)	habitat loss and degradation
Grallaria excelsa	Using tape-playback, survey to assess its current distribution and ecological requirements, and identify appropriate conservation measures (Sharpe and Ascanio 2008). Determine whether this taxon is a valid species. Survey the upper elevations of the Coastal Cordillera for G. e. phelpsi, which has gone unrecorded for decades (P. Boesman in litt. 2012). Employ nets in the lower elevations of Guaramacal NP where the voice of G.	distribution, ecological requirements, taxonomy, distribution, area management, new protected areas	Some large tracts of forest remain in the Cordillera de Mérida and Cordillera de la Costa, but deforestation has been locally severe (Huber and Alarcón 1988, C. J. Sharpe in litt. 1997). Agricultural colonisation represents a significant threat in the Sierra de Perijá, Cordillera de Mérida and Cordillera de la Costa, and many areas have already been cleared for cultivation, both commercial and subsistence (Stattersfield et al. 1998, Sharpe and Ascanio 2008). The Sierra de Perijá has been extensively deforested for narcotics cultivation, uncontrolled colonisation, cattle-ranching and mineral exploitation (C. J. Sharpe in litt. 1997, A. Viloria per J. Fjeldså in litt. 1998)	habitat loss and degradation

	undulata / excelsa can often be heard, to establish which of the two species is present (P. Boesman in litt. 2012). Initiate active management of Sierra de Perijá National Park. Increase the area of suitable habitat that has protected status. Evaluate the taxonomic status of phelpsi (Sharpe and Ascanio 2008, 2015)			
Grallaria fenwickorum	Carry out further surveys to assess the population size and improve knowledge of its distribution. Monitor population trends. Monitor the extent and condition of habitat in the species's potential range. Increase the area of protected forest in the species's potential range	population size, monitor the population, distribution, ecological requirements, area protection, area management, new protected areas	The species has lost 19.5% of its original habitat however forest cover was stable between 2000 and 2010 (Renjifo et al. 2014). The species's habitat is threatened by on-going moderate levels of deforestation for pasture and cultivation, and is potentially threatened by mineral extraction (Barrera et al. 2010, Carantón 2010), which has so far been limited by local political instability (Carantón 2010), but has seen a recent increase in interest as public order has improved (Barrera et al. 2010). The threat of forest conversion is exacerbated by the largely private ownership of land in the Páramo de Sol massif and the low level of habitat protection in the region (Barrera et al. 2010). Forests in the region are also affected by timber extraction and hunting (Carantón 2010). In 2010 a fire caused by tourists burned approximately 110 ha of páramo habitat (Carantón 2014)	habitat loss and degradation, hunting

Grallaria kaestneri	Search for the species in suitable habitat throughout its range (P. G. W. Salaman in litt. 1999, 2003). Protect habitat in the known range (Stiles 1992), including the relatively intact Farallones de Medina area. Monitor population and study habitat selection in Monterredondo (O. Cortes-Herrera in litt. 2007)	distribution, area protection, monitor the population	There is fairly extensive disturbance of forest at suitable altitudes on the east slope in Cundinamarca, mostly in the form of timber extraction. However, selective logging may even favour the species, in contrast to clear-cutting, which is clearly a threat and has generally occurred up to altitudes of 1,500-2,000 m on the east slope (P. G. W. Salaman in litt. 1999, 2003). It has been noted that the species occurs in areas regenerating after landslides (Fundación ProAves in press). Clearance for agriculture and grazing by goats are threats in some areas (O. Cortes-Herrera in litt. 2007). Near the type-locality, large areas of primary forest remain away from the Monterredondo-El Calvario road, around which logging and scattered pastures reach their most extensive levels. The Farallones de Medina area, previously a stronghold for the species (P. G. W. Salaman in litt. 1999, 2003), has now been deforested, and recent searches there have not recorded the bird (O. Cortes in litt. 2012)	habitat loss and degradation

Grallaria milleri	Conduct additional surveys of the Volcán Ruíz-Tolima massif and adjacent areas of the Central Andes. Protect suitable habitat in the Toche valley (P. G. W. Salaman in litt. 1999, 2000)	distribution, new protected areas	Most forest below 3,300 m in the Central Andes has long been converted to agricultural land-use. In the Toche valley, this has primarily taken place since the 1950s, mostly for coffee plantations, potatoes, beans and cattle-grazing (López-Lanús et al. 2000, P. G. W. Salaman in litt. 1999, 2000). Some forest clearance continues and mature secondary forest patches are now scattered. Natural vegetation cover is judged to have been reduced to c.15% between 1,900 and 3,200 m, with most remnants occurring above 2,200 m (López-Lanús et al. 2000, P. G. W. Salaman in litt. 1999, 2000). Searches for G. m. gilesi in remnant forests have so far failed, suggesting that this taxon may already be extinct (Salaman et al. 2009)	habitat loss and degradation
Grallaria przewalskii	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006)	new protected areas, area management, area protection	Projected deforestation is the primary threat affecting this species (Soares-Filho et al. 2006, Bird et al. 2011). Road improvements and an increasing population within the range of the species has seen continuing or increasing forest clearance for small-scale agriculture, firewood and to establish rights to land ownership. It is likely to be sensitive to fragmentation and edge effects in addition to direct habitat loss within its small range	habitat loss and degradation

Grallaricula cumanensis	Develop alternative agricultural techniques for areas adjacent to Paria Peninsula National Park (Rodríguez and Rojas-Suárez 1995, Sharpe 2008, Sharpe and Lentino 2015). There is a vital need to manage the Turimiquire massif and Paria Peninsula, not just for this species but for all Parian Montane Centre endemics, including non-avian taxa (C. J. Sharpe in litt. 2015). This last remaining sizeable area of unprotected forest in the Turimiquire Massif, the c. 80 km2 Quiriquire or Piedra 'e Mole' block (Azpúrua et al. 2013), should be designated as a national park (C. J. Sharpe in litt. 2015, Sharpe and Lentino 2015)	sustainable activities, area management, new protected areas	There has been widespread clearance for agriculture in the Turimiquire Massif and the Paria Peninsula and both regions are considered highly threatened. Swidden agriculture and commercial coffee cultivation occur within strict protected areas: even in El Guácharo National Park there is clearance, repeated burning and understorey removal for coffee (Boesman and Curson 1995, Sharpe 2008). The slopes of Cerro Negro are largely bare with the more obvious forest patches actually shade-coffee plantations (Boesman and Curson 1995). There is conversion to coffee, mango, banana, and citrus plantations in the Turimiquire Massif, but extensive forested areas remain (Colvee 1999, Sharpe in litt. 2011). On Cerro Humo, increases in cash-crop agriculture since the mid- to late 1980s, have resulted in uncontrolled burning and forest degradation	habitat loss and degradation

Grallaricula ochraceifrons	Survey areas of suitable habitat on each of the isolated ridges in the region. Conduct basic biological research on the species (Hornbuckle 1999). Enforce the protection of habitat in Alto Mayo Protected Forest, and ensure that high-altitude forest is included within its boundary (Dillon and Sánchez Vega 1999, Hornbuckle 1999)	distribution, ecological requirements, area protection	The remaining areas of suitable habitat are being cleared for timber, agriculture and to secure ownership of the land, gradually around Abra Patricia, but more rapidly in the Cordillera de Colán (Davies et al. 1997, Dillon and Sánchez Vega 1999, J. Hornbuckle in litt. 1998). More recent surveys have confirmed that habitat destruction in the region continues unabated, albeit more extensively at lower altitudes (Garcia-Moreno et al. 1997). Abra Patricia is under pressure owing to road improvements, recent immigration and population growth in the area (Garcia-Moreno et al. 1997, Hornbuckle 1999, J. Hornbuckle in litt. 1998). Mining activity around Yambrasbamba contributes to habitat destruction both directly and by encouraging road-building in the vicinity (F. Angulo Pratolongo in litt. 2012)	habitat loss and degradation

Guaruba guarouba	Conduct surveys to search for previously unknown populations, especially in the south and west of its range. Ensure the de facto protection of Gurupi Biological Reserve. Maintain the integrity of Tapajós National Park. Protect and manage land between existing protected areas to facilitate nomadic movements. Enforce legal restrictions on trade, especially in internal markets. Further develop the captive breeding programme	distribution, area protection, area management, restrictions on trade, captive breeding	Habitat destruction and fragmentation as a result of road construction, subsequent development and settlement, with accompanying illegal logging, are threats in the east of its range. Selective logging of primary hardwoods removes suitable roosting and nesting cavities (Yamashita 2003). However, the species is not as forest-dependent as several other non-threatened Psittacid species in the region, and it is capable of commuting between multiple forest-patches and moving around non-forest landscapes (A. C. Lees in litt. 2013). In addition, the majority of remaining suitable habitat is not as fragmented as originally thought and much of this is under protection (de Luca et al. 2009). Nevertheless, projected rates of deforestation within its range, based on forecasts of infrastructure development (Soares-Filho et al. 2006), suggest that the species will be impacted over the coming decades (Bird et al. 2011). It has been extensively trapped for trade, but, although some illegal trade persists, this is no longer a major concern as trade is now usually within the substantial captive population, and does not have a significant impact on the wild population (L. F. Silveira in litt. 2012, A. C. Lees in litt. 2013)	habitat loss and degradation, illegal trade
Habia atrimaxillaris	Survey the Golfito Faunal Reserve to determine the status of this species (Wege and Long 1995). Protect any remaining habitat outside existing protected areas. Establish a captive breeding population to support future reintroduction and supplementation efforts	population size, new protected areas, captive breeding	The vast majority of the forest to the north and east of the Golfo Dulce has been logged (G. Stiles in litt. 1999), and habitat loss is continuing outside protected areas	habitat loss and degradation

Hapalopsittaca fuertesi	Investigate the possibility that it occurs in Ucumari regional park. Monitor its population and research its ecological requirements to enable effective management of remaining habitat. Ensure the effective management of Alto Quindío Acaime Natural Reserve (Snyder et al. 2000) and El Mirador Municipality Nature Reserve. Acquire private properties with core breeding population and protect the species from expanding pasturelands. Work with local farmers and communities in raising awareness of the species's conservation and avoid possible trade of the species. Continue monitoring the population. Acquire and reforest pastureland with native trees	distribution, monitor the population, ecological requirements, area management, new protected areas, integrate local people	Clearance of forest in the region of the type-locality was already extensive in 1911, and very little habitat now remains. The species remains highly threatened by forest loss for cattle pasture and selective logging of mature trees (vital for nesting) for timber and firewood. A large gold reserve was discovered close to a key population, however, the threat of deforestation was mitigated by a group of conservation organisations who purchased the area of critical habitat which is now a reserve (Anon. 2012). Most mature trees with natural cavities have been selectively logged, creating a shortage of natural nesting sites	habitat loss and degradation, hunting
Hemitriccus furcatus	distribution, particularly between the two disjunct populations, to clarify distribution and status. Investigate ecological requirements, especially the purported link to large-leaved bamboo.	distribution, ecological requirements, area protection	Although some deforestation may lead to a short-term increase in areas with bamboo, forest clearance has been so extensive throughout its range that it is likely to have greatly reduced numbers. Smallholder farms are rapidly encroaching on the remaining forest at Boa Nova, Bahia (A. Whittaker in litt. 1999)	habitat loss and degradation

	Consolidate key protected areas, such as Serra do Mar State Park. Investigate the feasibility of protecting remaining forest at Boa Nova. Survey historical localities such as Matodentro, São Paulo and the portion of Serra do Mar State Park south of Ubatuba that have significant forest remnants			
Hemitriccus kaempferi	Slow rates of deforestation. Survey remaining patches of lowland forest in Santa Catarina and adjacent areas of Paraná to clarify distribution and status (Collar et al. 1992; Mazar Barnett et al. 2000). Resurvey forest within the vicinity of Brusque (Naka et al. 2000). Investigate ecological requirements of the species at current localities. Expand the Bracinho State Ecological Station at Santa Catarina, Reserva Particular do Patrimônio Natural de Volta Velha, APA de Guaratuba and the National Park Saint-Hilare/Lange at Paraná state to incorporate adjacent patches of the species's lowland forest habitat	distribution, ecological requirements, new protected areas	Deforestation has been extensive in the Atlantic forest, and lowland forest remaining in the vicinity of all sites continues to be cleared. The main threats for the species are apparently banana, rice and timber plantations and the urbanisation of the coastal plain (Belmonte-Lopes unpublished data). Potential construction of a new road system (BR 101) would lead to further fragmentation of all the remaining areas, and sea level rise is a longer-term threat (R. Belmonte-Lopes in litt. 2009)	habitat loss and degradation

Hemitriccus mirandae	Survey Tapacurá, upland areas in Ceará and other potential sites to ascertain the species's presence and status. Ensure the de facto protection of remaining habitat in the Serra do Baturité. Protect habitat in the Serra da Ibiapaba, and at Areia, Garanhuns and Lagoa do Ouro. Continue conservation efforts at Pedra Talhada	population size, area protection	There has been massive deforestation within its disjunct and fragmented range. Only 1% of original forest remains in Serra do Baturité, largely as a result of clearing for "sun" coffee since the early 1970s (R. Otoch per F. Olmos in litt. 1999), and the situation is similar in Serra da Ibiapaba. Remaining habitat is threatened by the construction of holiday homes, and fires (R. Otoch per F. Olmos in litt. 1999). Only 2% of original forest cover remains in Alagoas and Pernambuco and 6% in Paraíba (Brown and Brown 1992), with most forest replaced by sugarcane plantations. Remnant patches are highly fragmented and threatened by fires spreading from adjacent plantations. However, the rate of deforestation seems to be slowing down: An analysis of forest loss over time indicated only minor rates of deforestation within the species's range, equivalent to 2.9% over three generations (11 years) (Tracewski et al. 2016). The species has been recorded in secondary forest, but seems to prefer intact, undisturbed forest; so it is likely vulnerable to habitat degradation. The remaining areas of forest within the range are highly fragmented	habitat loss and degradation

Henicorhina negreti	Determine species's true elevational range (Krabbe 2009). Map wet Pacific forest at appropriate elevations, estimate deforestation rate, and establish the species's presence in highly-fragmented forest (Krabbe 2009). Continue monitoring existing populations and survey new areas for additional subpopulations. Lobby the government to adequately protect known sites, which support this and other threatened species, by directing resources more effectively. Support local organisations seeking to protect key sites	area management, distribution, monitor the population, new protected areas, integrate local people	Forest clearance affects this species directly, but it also leads to reduced cloud and fog cover and a general drying of the habitat. This allows congeners to colonise the areas where Munchique Wood-wrens currently occur in isolation (T. Donegan in litt. 2006). Climate change has the potential to shift the elevation at which Munchique Wood-wren and Grey-breasted Wood-wren Henicorhina leucophrys replace one another upwards, potentially reducing the possible range of the species (T. Donegan in litt. 2006). However, of more immediate concern, climate change is contributing to the increase in the severity of dry seasons in the region that have facilitated many human-induced fires in otherwise extremely wet forests (P. Salaman in litt. 2007, 2008). Human pressure in Munchique is escalating. Consequently, deforestation within Munchique National Park, until recently essentially pristine, is now a serious issue and has escalated at an alarming rate (P. Salaman in litt. 2007, 2008)	habitat loss and degradation, livestock disturbance

Herpsilochmus parkeri	Survey to elucidate the species's status near Abra Patricia. Census areas adjacent to the mountain ridge near Jesús de Monte to estimate the population and improve knowledge of the species's distribution (Begazo et al. 2001). Create a reserve on this isolated mountain ridge. Enforce the protection of habitat in Alto Mayo Protected Forest, and ensure that high-altitude forest is included within its boundary (Sánchez Vega 1999, Hornbuckle 1999b, J. Hornbuckle in litt. 1999). Several proposals are set out in Angulo et al. (2008)	status, distribution, population size, area protection	Its tiny geographic range is coupled with widespread deforestation of the adjacent lowlands in the río Mayo valley. Forest clearings are gradually encroaching further up onto the mountain ridge. Coca and coffee are widely cultivated in this region. Around Afluente, remaining areas of suitable habitat are gradually being cleared for timber, agriculture, and to secure ownership of the land (J. Hornbuckle in litt. 1999). Recent surveys have confirmed that habitat destruction in the region continues unabated, albeit more extensively at lower altitudes (Sánchez Vega 1999). Abra Patricia is under pressure owing to road improvements, recent immigration and population growth in the area (Sánchez Vega 1999, Hornbuckle 1999b, J. Hornbuckle in litt. 1999)	habitat loss and degradation
Herpsilochmus pectoralis	Survey to improve knowledge of its distribution and habitat requirements. Survey Serra de Itabaiana for this and other threatened species. Map and ecologically evaluate extant patches of deciduous forest (da Silva and Oren 1997), especially in Bahia. Conduct long-term studies on the ecology of this species's forests (e.g. succession and selective logging) to develop viable strategies for economic utilisation (da Silva and Oren 1997). Create a system of conservation units (following surveys and mapping) that adequately protects the species, including the site 23 km from Jeremoaba in Bahia, an area in central Maranhão and the de facto protection and expansion of Chapada da Diamantina National Park to include known sites just outside the park's boundaries	distribution, ecological requirements, population size, distribution, sustainable forest management, new protected areas	It is still insufficiently known to determine precise threats, but clearance for irrigated and dry field agriculture has removed extensive tracts of deciduous forest (da Silva and Oren 1997). The high biomass of these forests makes them important sources of charcoal for Brazil's steel and pig-iron industries, and supposedly substitute plantations of Eucalyptus sp. are being used by the paper pulp industry (da Silva and Oren 1997). Intensive grazing and extensive burning are widespread throughout its range	unknown threat

Herpsilochmus pileatus	Secure the adequate protection of a number of sites for this species	area protection	Coastal forests in southern Bahia have suffered tremendous reduction in size during the last few decades. Logging companies, pastures, and social pressure from native peoples and landless people movements are some of the factors that have contributed to the deforestation process. The species has a very limited range, and although common, remaining vegetation is still being destroyed. Planned large-scale tourist resort development along the coast of southern Bahia may also have a large negative impact (del Hoyo et al. 2003). Designated protected areas where the species could be safe are under threat themselves (J. F. Pacheco in litt. 2001)	habitat loss and degradation
Hylonympha macrocerca	Improve the protection and management of the national park (Sharpe 2008, 2015, Sharpe in litt. 2011). Census populations on cerros Humo, Patao, El Olvido and Azul (Sharpe 2008). Study its ecological requirements (C. J. Sharpe, J-P. Rodríguez and F. Rojas-Suárez in litt. 1999). Initiate programmes to develop economic alternatives to reduce agricultural encroachment in villages adjacent to the national park (Sharpe 2008, Sharpe in litt. 2011)	area protection, area management, population size, ecological requirements, sustainable activities	Increases in cash-crop agriculture, especially the cultivation of "ocumo blanco" (Xanthosoma sagittifolium) and "ocumo chino" (Colocasia esculenta), since the mid- to late 1980s have resulted in some uncontrolled burning and forest degradation. Cerros Humo and Patao have been worst affected, with the east of the peninsula fairly undisturbed. Since it is an understorey inhabitant, removal of understorey vegetation for coffee and cacao cultivation is likely to lead to reduced population density (C. Sharpe in litt. 2007, D. Ascanio in litt. 2007). In 2012, the state oil company PDVSA began preparations to construct antennas, a radar, and a heliport on the summit of Cerro Patao (the second highest summit of the Paria Peninsula), where a patch of 0.1 km2 of cloud forest remains (M. Santos in litt. 2012)	habitat loss and degradation

Hylopezus auricularis	distributions in north Bolivia (S. Mayer in litt. 1999). Conduct research into the species's ecology (S. Mayer in litt. 1999). Designate a protected area for the species (J. Hornbuckle in litt. 1999)	new protected areas, distribution, ecological requirements	It has apparently adapted well to heavy habitat disturbance by humans (Maijer 1998). However, knowledge of its distribution and ecological requirements is very limited, and it cannot at present be considered secure (Maijer 1998)	unknown threat
Hylorchilus navai	Survey "islands" of habitat between Selva El Ocote and the Cañon de Sumidero (J. Morales-Pérez in litt. 1998). Formally designate the proposed Chimalapas-Uxpanapa Biosphere Reserve (Whittingham and Atkinson 1996)	distribution, area protection	Settlement and cattle-ranching following road-building have fragmented forests within its range (Atkinson et al. 1993). Although limestone outcrops are generally not suitable for ranching, deforestation has left them isolated and threatened by firewood extraction (Atkinson et al. 1993, Gomez de Silva 1997). This has important implications since such small birds with rounded wings are (predictably) poor dispersers (Atkinson et al. 1993, Gomez de Silva 1997). The Uxpanapa/Chimalapas region has seen large-scale habitat modification in recent decades which may have impacted on the species (A. Townsend Peterson in litt. 2016)	habitat loss and degradation

Hypopyrrhus pyrohypogaster	Conduct further surveys to assess the distribution of both the species and its habitat, particularly in Antioquia (Wege and Long 1995), and the poorly known, but relatively intact, forests from Caquetá to Putumayo. Ensure protection of forest remnants in Antioquia (A. M. Cuervo in litt. 1999, P. G. W. Salaman in litt. 1999, Cuervo et al. 2003). Fund and improve the implementation and enforcement of conservation measures in protected areas (P. G. W. Salaman in litt. 1999, Renjifo et al. 2002). Organise a campaign to stop trade in wild-caught birds (A. M. Cuervo in litt. 1999) and develop captive breeding programmes to meet avicultural demand and support future reintroduction and population supplementation efforts	distribution, area protection, captive breeding, stop illegal trade	The historical decline of this species is attributed to the extensive clearance of forest, principally through timber extraction and agricultural development, and remaining fragments are subject to continuing human pressure. Despite its tolerance of modified landscapes, the species is thought to require the presence of mature forest, and much of its preferred inter-montane subtropical forest habitat has been lost (possibly over 90%) in the Andes, and continues to decrease (Fundación ProAves de Colombia 2011); 7·8% of its habitat was lost in the decade 2000–2010 (Garizábal et al. 2014). Tatamá and Cueva de los Guácharos National Parks are affected by settlers, with extensive deforestation in the former, and opium production in the latter (Wege and Long 1995). However, increases in forest cover in some areas, e.g. Otun-Quimbaya reserve and Ucumari forest, have failed to result in population increases, suggesting that other factors may also be involved (C. Downing in litt. 2007). Brood parasitism, for example by Giant Cowbirds Molothrus oryzivorus, could explain the local disappearance of the species in some areas (O. H. Marín in litt. 2012). It is sometimes persecuted as a maize crop-pest, and is trapped for the cage-bird trade (Betancur 1994, A. M. Cuervo in litt. 1999)	habitat loss and degradation, brood-parasitism
Iodopleura pipra	distribution to clarify distribution and status. Study ecological requirements and seasonal movements. Secure key sites, notably around Ubatuba in São Paulo, and Murici and Usina Serra Grande in Alagoas. Investigate the feasibility of protecting remaining forest at Boa Nova	distribution, ecological requirements, area protection, new protected areas	Loss of Atlantic forest is the main threat, since this habitat is rapidly being cleared for agricultural and real-estate development. Possible migratory movements to adjacent montane areas in the austral summer will be disrupted by the increasing fragmentation of Atlantic forest	habitat loss and degradation

Junco insularis	Eradicate goats and cats from the island (B. Tershy and B. Keitt in litt. 1999). Survey to provide a more recent assessment of the population size and remaining habitat	control programme for invasive species, population size	Open shrub-grasslands have been greatly reduced by agriculture and grazing, and the rate of habitat conversion is increasing, primarily for production of potatoes (M. A. Cruz-Nieto in litt. 2007). There has been a progressive loss of habitat even on the Coahuila-Nuevo León border, especially in the El Potosí Valley (M. A. Cruz-Nieto in litt. 2007). Grazing and the use of chemicals modify and reduce the quality of the habitat and disturb nesting birds (Garza de Leon et al. 2007). It seems unlikely that large tracts of habitat remain near the currently known sites (Wege et al. 1993, Garza de Leon et al. 2007, Canales del Castillo et al. 2010). Reported reproductive success is very low, only 14% in La India, and 18.3% overall based on monitoring of 175 nests (R. Canales del Castillo, I. Ruvalcaba Ortega and J. González Rojas in litt. 2016); predation (Garza de Leon et al. 2007, Ruvalcaba-Ortega et al. in prep.) and livestock disturbance (Canales del Castillo et al. 2010) seem to be the main causes, but it is not known how this affects populations (Garza de Leon et al. 2007). Snakes, birds and coyotes are thought to predate nests (Ruvalcaba-Ortega et al. in prep., M. A. Cruz-Nieto in litt. 2007)	habitat loss and degradation, pesticides impact, breeding area, reproductive success, livestock disturbance

Lepidopyga lilliae	Conduct field surveys to clarify its distribution and population. Research its taxonomic status and ecological requirements (Renjifo et al. 2002). Increase the area of suitable habitat that has protected status. Improve active protection of Isla de Salamanca National Park. Improve the control of trade of mangrove wood and related products and develop alternative sources of income (Parra et al. 2016). Restore damaged mangrove ecosystems (Renjifo et al. 2002). Clarify status at Bocas del Atrato, Antioquia. Educate local communities about the environment and the development of ecotourism (Parra et al. 2016)	population size, distribution, taxonomy, ecological requirements, area protection, new protected areas, area management, environmental education, ecotourism	Over recent decades, a large amount of the mangrove forest along the Colombian Caribbean coast has been cleared for agriculture, altered due to exploitation of rivers, or destroyed through construction of dykes, roads and canals (Parra & Agudelo 2002). Construction of a pipeline and road through the wetlands of the Ciénaga Grande de Santa Marta and Isla de Salamanca in the mid-1970s obstructed tidal flow and caused very extensive mangrove die-back, continuing until at least 1992 (Wege and Long 1995). Conversion of mangroves to livestock pasture, domestic and industrial pollution, sewage, urbanisation, development of tourist infrastructure and mangrove and forest cutting are further problems (Parra & Agudelo 2002, Parra et al. 2016). Land is being sold to build a large-scale port in the future, representing a potentially severe threat to the species's remaining habitat (J. C. De Las Casas in litt. 2007)	habitat loss and degradation

Lepidothrix iris	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes	new protected areas, area management, area protection	The species is threatened by continuing deforestation (Ridgely and Tudor 1994). There have been very high rates of deforestation in Mato Grosso (23.6% of forest cleared by 1988) and Maranhão (19.2%), with large areas also being cleared in Pará (9.6%), due to road building, ranching and land speculation (Cleary 1991). The rate is projected to accelerate in the near future as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network, destroying over 50% of the available habitat within its known range (Soares-Filho et al. 2006, Bird et al. 2011). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011)	habitat loss and degradation

Lepidothrix vilasboasi	Survey to establish the species's status, especially within the Mundurucânia Forest Reserve. Carry out further surveys to assess the limits of its distribution. Clarify the extent of forest destruction at, and near, the type-locality. Improve the management of Jamanxim National Forest. Increase the extent of habitat protection	population size, distribution, area management, sustainable forest management, new protected areas	The extent of deforestation in the vicinity of the type-locality remains unknown, but the region is being developed for cattle-ranching (Ridgely and Tudor 1994). Forest at the 2002 locality has already been destroyed and clearance is increasing rapidly in response to the increasing demand for cattle pasture from colonists (Olmos and Pacheco 2003), with the Novo Progresso area currently experiencing one of the highest rates of deforestation in the Amazon (F. Olmos in litt. 2007). Current plans to pave the BR 163 Cuiabá-Santarém road will bring even greater habitat destruction, opening up soya markets in the Mato Grosso for rapid transfer to Santarém, unless strong government action is taken (Olmos and Pacheco 2003, A. Lees in litt. 2007, 2011). However, an increase in selective logging is perhaps a more likely consequence, which would pose a lesser threat given that the species is likely to be tolerant of moderate levels of habitat disturbance and degradation (A. Lees in litt. 2007, 2011). Part of the theoretical range is included in Jamanxim National Forest, which is supposed to be logged in a sustainable way, but unsustainable clearance is also occurring here (F. Olmos in litt. 2007). An analysis of the impact of future infrastructure development on Amazonian birds predicts that loss of forest will cause Lepidothrix vilasboasi to become Critically Endangered by 2020 (Vale et al. 2009)	habitat loss and degradation

Leptasthenura xenothorax	Survey remaining Polylepis habitat in the Cordillera Vilcanota (Fjeldså and Kessler 1996, G. Servat in litt. 1999). Protect Yanacocha forest and other Polylepis habitat in the Cordillera Vilcanota (G. Servat in litt. 1999). Expand the Polylepis planting programme, and plant buffer zones below Polylepis woodland with firewood species to provide an alternative fuel source (Fjeldså and Kessler 1996)	new protected areas, distribution	Uncontrolled fires and heavy grazing prevent Polylepis regeneration (Fjeldså and Kessler 1996). Cutting for timber, firewood and charcoal is locally destructive, but could be sustained if regeneration were not prevented (Fjeldså and Kessler 1996). Other factors are the change from camelid to sheep- and cattle-farming, and the inadequacy of afforestation projects (in particular the use of exotic tree species) (Fjeldså and Kessler 1996). The extent of Polylepis woodlands in Cuzco halved during the 1980s	habitat loss and degradation, livestock disturbance, invasive species
Leptodon forbesi	Urgently survey all forest patches larger than 10 ha in Pernambuco, Alagoas and neighbouring states (Seipke 2008). Designate Murici as a biological reserve and ensure its de facto protection. Protect any remaining forest at São Miguel dos Campos. Conduct field and museum studies to clarify its taxonomic status including DNA analysis. Conduct additional surveys in forest fragments in Paraíba and Sergipe states to determine the species's occurrence therein, and in north-eastern Bahia, where it may also be present (L.F. Silveira and F.V. Dénes in litt. 2012). Conduct research into the impact of land-use change on the species (Pereira et al. 2014). Develop a captive-breeding programme (Pereira et al. 2014)	distribution, area protection, population size, genetic, evaluate the threats, captive breeding	There has been massive deforestation in coastal Alagoas and Pernambuco, with most suitable habitat cleared or threatened. The two key sites in Alagoas are both under severe threat, with forest at Murici covering 70 km2 in the 1970s, but less than 30 km2 in 1999 (J. M. Goerck in litt. 1999, 2000). Indiscriminate small-scale logging was still occurring at the site in 1992, and the area is further threatened by fires spreading from adjacent sugarcane plantations. Some forest persists at São Miguel dos Campos but it is still under pressure from logging and hunting (F.V. Dénes and L.F. Silveira in litt. 2007). The current condition of forest at Água Azul is unknown	habitat loss and degradation

Leptotila battyi	Carry out surveys to assess numbers within protected areas and identify additional sites requiring protection. Study the species's ecological requirements (Baptista et al. 1997). Assess the extent of habitat loss within protected areas and the region as a whole. Increase the area of suitable habitat that has protected status. Raise awareness of the species and its status in an effort to reduce hunting pressure	population size, distribution, ecological requirements, area management, new protected areas, environmental education	Habitat destruction and fragmentation, and hunting for food threaten this species (Ridgely and Gwynne 1989, Baptista et al. 1997, G. R. Angehr in litt. 1998). On the mainland the main causes of deforestation are clearance for subsistence cultivation and for cattle pastures (G. R. Angehr in litt. 2007). Since the closure of the Coiba penal colony, areas on the island formerly maintained for cattle and agriculture have been reverting to forest, increasing the area of suitable habitat there (G. R. Angehr in litt. 2007). Away from Coiba, most lowland areas in its range have already been deforested (G. R. Angehr in litt. 1998)	habitat loss and degradation
Leptotila conoveri	Evaluate forest cover in its range and follow-up with surveys of larger blocks to determine the current population and distribution (López-Lanús et al. 2000). Investigate the ecological requirements of this species, especially the degree to which it tolerates modified habitats, and apply this in the development of a captive breeding programme. Protect a stronghold area, if found (López-Lanús et al. 2000)	population size, distribution, ecological requirements, captive breeding, area protection	Parts of the upper Magdalena valley have been converted to agriculture since the 18th century (Stiles et al. 1999) but, when the type-series was collected in 1942, the higher valleys of the Toche area, Tolima, were heavily forested. Since the 1950s, much of the original habitat in these valleys has been cleared and used for agriculture, including coffee plantations, potatoes, beans and cattle-grazing (P. G. W. Salaman in litt. 1999, López-Lanús et al. 2000). Mature secondary forest patches are now fragmented, and natural vegetation cover is judged to have been reduced to c.15% between 1,900 and 3,200 m (P. G. W. Salaman in litt. 1999, López-Lanús et al. 2000)	habitat loss and degradation

Lipaugus conditus	Survey to determine its status within the protected areas. Quantify potential threats. Protect the species under Brazilian law	population size, evaluate the threats	Although there are no obvious immediate threats to its habitat at known sites, both disturbance and fires caused by hikers have been considered potential threats. The newly discovered population at Nova Caledônia is more accessible and susceptible to disturbance by hikers and other tourists, and logging is a potential concern here, although not at present, with eucalyptus plantations encroaching on habitat below the species's elevation range (A. Foster in litt. 2014). In September 1993, a major forest fire was noted in or adjacent to Serra dos Órgãos National Park, indicating that this threat could be particularly significant. Similarly, a major forest fire burned at least 25% of suitable habitat at Nova Caledônia in 2011 (J. King in litt. 2012). Projected climate change could cause shifts in the distribution and extent of its habitat and thus its elevation range (S. Pimm in litt. 2013), with some anecdotal observations suggesting that the species is moving upslope at Nova Caledônia (A. Foster in litt. 2013)	habitat loss and degradation, climate change

Lipaugus weberi	Conduct detailed surveys to determine the extent of its distribution, population status, and genetic variation and exchange between the Amalfi and Anorí populations (Renjifo et al. 2002). Develop a management plan for the species. Pursue the protection of remaining pre-montane forest fragments in the region, particularly those persisting in the Riachón river valley in Amalfi (Renjifo et al. 2002). Control exploitation of palms and other forest resources. Encourage the local government to acquire land between 1,200 and 1,600 m for future protected areas. Encourage alternative technologies for the use of the land, and campaign to prevent the conversion of forests to pastures (Renjifo et al. 2002). There remain some large intact and potentially suitable subtropical forest areas in eastern and southeastern Antioquia. Conservation efforts in these areas may prove more practical and probably reveal healthy populations of this and other threatened species (Salaman in litt. 2003, Sharpe 2015). Protect Bosque El Guayabito from deforestation (Fundación ProAves in litt. 2012). Connect fragmented habitats where the species is known to occur (Snow and Sharpe 2015)	distribution, population size, genetic, species conservation project, new protected areas, area protection, sustainable activities, environmental education, connectivity	The Central Andes have undergone almost complete ecological change - surviving forested areas are now highly fragmented and isolated. Pre-montane forest cover is estimated to be 3-4% of its original extent (Cuervo et al. 2001). The species is presumed to have been extirpated from a large part of its range (Renjifo et al. 2002), with almost 9% of habitat lost between 2000 and 2010 (Cuervo 2014). Forest loss is driven by mining and agriculture, in particular coffee, plantain and cattle (Cuervo et al. 2001, Renjifo et al. 2002). While until recently political instability hampered human activities in the area, the current stability favours high rates of colonization, which likely increases deforestation in the area (Fundación ProAves 2011). Construction of several major hydro-electric dams within the species's range threatens remaining habitat as does the development of road networks and gold mining and exploration (Fundación ProAves 2011). High acidity and poor soil drainage reduce vegetation succession and accentuate problems of soil erosion (Renjifo et al. 2002). Afforestation with exotic species is an increasing problem in the area (Cuervo et al. 2001). The species can only tolerate habitat fragmentation if the remaining fragments are large (> 70 ha) and interconnected (Cuervo et al. 2008). Climate change is feared to put another strain on the species, as its climatically suitable range is projected to disappear by the year 2050 (Velásquez-Tibatá et al. 2012)	habitat loss and degradation, climate change

Loddigesia mirabilis	Continue to survey to locate additional sites for the species (H. Lloyd in litt. 2007). Survey to investigate its potential occurrence west of the río Utcubamba (R. Webster and R. A. Rowlett in litt. 1998). Estimate the population near Florida. Protect remaining forests in the Cordillera del Colán (Barnes et al. 1995). Develop initiatives to reduce the impact of hunting	distribution, population size, new protected areas, to reduce the impact of hunting	Deforestation is widespread on the mountain slopes of the Cordillera del Colán, with much habitat cleared since 1978, and remaining forest under threat of conversion to cash-crops such as marijuana and coffee (Barnes et al. 1995). However, the species's apparent preference for forest edge and isolated woodlots on steep slopes may reduce its vulnerability to habitat alteration. Interviews with Florida's inhabitants and enquiries in a nearby market town have revealed that dried hearts of the males of this species are believed to have aphrodisiac properties (Garrigues 2000). Hunting with slingshots for this reason may even explain the skewed sexual ratio (Garrigues 2000)	hunting, habitat loss and degradation

Lophornis brachylophus	Designate a protected area in the Sierra de Atoyac (Hernández-Baños et al. 1995) incorporating the known range of this species. Survey to clarify the full extent of this species's distribution. Survey to assess the impact of shade coffee plantations on this species and understand its altitudinal movements; and also to document on their interactions with plant species of the region (P. Sierra-Morales in litt. 2016). If it is confirmed that the species performs altitudinal migration; ensure protection of habitat across its altitudinal range (Anon. 2012)	new protected area, distribution, evaluate the threats, ecological requirements, area protection	In the early 1990s, semi-deciduous forest between Paraíso and Nueva Delhi was being rapidly cleared for the cultivation of maize, fruit and coffee, and habitat winthin the species's known range continues to be reduced as a result of land-use changes (Sierra-Morales et al. 2016). Much of the remaining forest provides cover for illegal drug-growing, making an evaluation of habitat quality difficult (S. N. G. Howell in litt. 1998)	habitat loss and degradation, research difficult

Macroagelaius subalaris	Ascertain the status of birds and habitat throughout its former range, especially areas that have not been visited recently. Conduct studies to determine whether the species is dependent on oak forest throughout its range (Cortes-Herrera and Hernandez-Jaramillo 2007). Increase the area of suitable habitat that has protected status. Search for the species in other areas containing marshes adjacent to forest (Fundación ProAves de Colombia 2011)	population size, distribution, ecological requirements, new protected areas	Since the 17th century, the west slope of the East Andes has been extensively logged, burned and cleared for conversion to agriculture (Stiles et al. 1999). This species's dependence on oaks Quercus humboltii make it highly susceptible to the effects of logging, cutting for firewood and grazing by cattle, which is thought to limit oak forest to marginal relict patches on steep and rocky areas (Cortes-Herrera and Hernandez-Jaramillo 2007). However, in some areas above 2,500 m, forest cover remains more extensive (Stiles et al. 1999). Landscape changes accelerated during the 20th century, especially after 1960, although in some areas habitat regeneration is beginning following the abandonment of marginal land (Stiles et al. 1999). Deforestation is also taking place for mining operations, principally gold mining (O. Cortes in litt. 2011). Pastures dominate the valley below Guanentá-Alto Río Fonce, but the forest is mostly intact from 1,950-2,200 m upwards. However, the lower tracts are still affected by selective logging. Landslides, following the loosening of soils after deforestation, present a threat to relict patches of forest on slopes (Cortes-Herrera and Hernandez-Jaramillo 2007)	habitat loss and degradation

Malacoptila minor	Carry out surveys to assess the total population size. Conduct research to clarify the species's habitat requirements. Monitor rates of deforestation in its range through remote sensing. Increase the area of suitable habitat that is effectively protected	population size, ecological requirements, area management, new protected areas	The primary threat to this species is accelerating deforestation in the Amazon Basin as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network (Soares-Filho et al. 2006, Bird et al. 2011). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011)	habitat loss and degradation
Megascops gilesi	Survey the Sierra Nevada de Santa Marta to clarify the species's distribution, population size and trends. Assess threats to the species. Protect remaining habitat	distribution, population size, trends, ecological requirements, area protection	The main threat faced by the species is habitat loss stemming from deforestation. The forests of the Sierra Nevada de Santa Marta have been heavily logged and burnt since the 1950s, and about 85% of the original forest cover has disappeared. Forests are mainly converted for non-native tree plantations (primarily pine and eucalyptus) and livestock farming (Dinerstein et al. 1995, Snyder et al. 2000, C. Olaciregui in litt. 2012)	habitat loss and degradation

Merulaxis stresemanni	Carry out surveys including playback in Jequitinhonha, Bandeira and and Fazenda Jueirana to determine the size and status of this population. Search for additional populations in all fragments of lowland forests in Bahia and Minas Gerais, using the voice cut now available, and determine the size and status of the remaining population. Safeguard the remaining unprotected 4,300 hectares of forest in the Jequitinhonha valley, and all remaining tracts of humid forest in Bahia. Create corridors to connect small tracts of pristine forest currently disconnected from the largest tract on the Bandeira-Jordânia-Macarani border. Regulate use of playback on tiny known population, whilst maintaining potential for ecotourism	population size, distribution, new protected areas, connectivity, ecotourism	Most humid forest in Bahia has been cleared or converted to cacao plantations, and remaining patches are disappearing very rapidly. Forest in the Minas Gerais and Bahia border area is being cleared for small (mostly in Jordânia county, Minas Gerais) and large scale cattle ranching (R. Ribon in litt 2007). Forest is also degraded by loggers from Bahia state (R. Ribon in litt 2007). Intentional or accidental fires are set every year, degrading the border of the remaining pristine forest (R. Ribon in litt 2007)	habitat loss and degradation

Metallura baroni	Research its ecology, particularly breeding and movements (B. Tinoco in litt. 2012). Assess the status of known populations and connectivity amongst them (B. Tinoco in litt. 2012). Ensure effective protection of habitat in Las Cajas National Park (T. Zuchner in litt. 1999). Improve land-use management by segregating agricultural, grazing and forest areas (Fjeldså and Kessler 1996, Tinoco et al. 2009). Regulate the use of fire (Fjeldså and Kessler 1996). Reintroduce old, high-yield agricultural techniques (Fjeldså and Kessler 1996, Tinoco et al. 2009). Educate and encourage local people to take the lead in land-use management and restoration schemes (Fjeldså and Kessler 1996)	ecological requirements, population size, connectivity, regulate land use, area management, sustainable activities, integrate local people, environmental education	Timberline habitats in the Andes have been diminishing since the arrival of humans thousands of years ago, primarily through the use of fire (Kessler and Herzog 1998). Sustainable land-use systems established by Pre-Columbian cultures were largely replaced by unsustainable agricultural techniques, including widespread burning of high-Andean habitats, during the colonial period (Kessler and Herzog 1998). Regular burning of páramo grassland, adjacent to elfin forest, to promote growth of fresh shoots for livestock, has lowered the treeline by several hundred metres, and destroyed large areas of this species' habitat, and is ongoing (Kessler and Herzog 1998). For the same reasons, Polylepis forest is one of the most threatened habitats in South America, having been reduced to isolated fragments within its historical range throughout the Andes (Fjeldså and Krabbe 1990, Fjeldså and Kessler 1996). Other threats include firewood-gathering, road construction and potato cultivation (Stattersfield et al. 1998, Tinoco et al. 2009)	habitat loss and degradation
Microspingus alticola	Survey to determine its distribution and population size (Fjeldså and Kessler 1996, G. Servat in litt. 1999), especially on the east slope of the Cordillera Blanca (W.-P. Vellinga in litt. 1999). Survey the extent and degree of isolation/connectivity of Polylepis-Gynoxys in north-central Peru, and determine the effect of fragmentation on this species (Fjeldså and Kessler 1996, G. Servat in litt. 1999). Improve and clarify the management plan for Huascarán National Park (Frimer and Møller Nielsen 1989, Fjeldså and Kessler 1996, H. Lloyd in litt. 2007). Encourage	distribution, population size, evaluate the threats, area management, integrate local people	Cutting for firewood and a lack of regeneration, caused by burning and intensive grazing, are reducing mixed Polylepis-Gynoxys woodlands (Fjeldså and Kessler 1996). Gynoxys itself has been variously described as unpalatable, favoured for grazing (Fjeldså and Kessler 1996), and particularly vulnerable to grazing of shoots, which prevents regeneration (G. Servat in litt. 1999). Other factors include the change from camelid- to sheep- and cattle-farming, and erosion and soil degradation caused by agricultural intensification, road construction and the inadequacy of afforestation projects (particularly the use of exotic tree species) (Fjeldså and Kessler 1996)	habitat loss and degradation, livestock disturbance, invasive species

	local people to take a leading role in land-use management and restoration schemes (Fjeldså and Kessler 1996, G. Servat in litt. 1999)			
Mimus graysoni	Continue the eradication of cats and sheep from Socorro (Martínez-Gómez and Curry 1996, B. Tershy and B. Keitt in litt. 1999). Ensure that infrastructure development for the cat eradication efforts do not negatively impact the species (J. E. Martínez-Gómez in litt. 2016). Implement a area management plan after sheep have been completely removed (Martínez-Gómez et al. 2001). Establish a research monitoring station on Socorro (Rodríguez-Estrella et al. 1996). Monitor the population, especially before and after eradication efforts. Consider establishing a captive breeding programme (Collar and Butchart 2013)	control programme for invasive species, area management, captive breeding, monitor the population	Sheep had intensively grazed almost one third of the island by 1990 (Castellanos and Rodríguez-Estrella 1993), leaving no suitable nesting or foraging habitat in the south of the island (Martínez-Gómez and Curry 1996). By now, sheep are effectively controlled. Predation by feral cats was initially thought responsible for the species's decline, but cats were only introduced some time after 1972 (Martínez-Gómez et al. 2001), and examinations of cat stomach contents and scats have not provided any substantive evidence (Martínez-Gómez and Curry 1996). However, cats are likely to prey upon dispersing individuals that move into areas with little or no understorey (J. E. Martínez-Gómez in litt. 2007). Cat eradication efforts are now underway, but this work has the potential to indirectly threaten the species via construction of tracks through dense understorey vegetation (J.E. Martínez-Gómez in litt. 2016). Competition with the immigrant Mimus polyglottos is probably not a factor because Mimus graysoni is much larger, has different habitat preferences and is not outcompeted in undisturbed habitats (Castellanos and Rodríguez-Estrella 1993, Martínez-Gómez and Curry 1996). Since 1994, c.30 ha of forest have been lost owing to a now permanent locust Schistocerca piceifrons swarm on the island, which irrupts twice yearly. Its effects are thought to be more severe owing to the degradation of native vegetation by introduced grazing mammals, and the suppression of native bird populations (which typically exert top-down control of insect populations on the island) by introduced cats. Locusts cut leaves, flowers and fruit from trees and thus represent a serious threat to fruit eaters such as Socorro Mockingbird (J. E. Martínez-Gómez in litt. 2007). Potential urban developments on Socorro, including the enlargements to the airstrip and the possibility of a new federal prison, could destroy breeding habitat and increase the risk of accidental introduction of other invasive species	habitat loss and degradation, urban intensification

Mimus macdonaldi	Estimate population size as a baseline to determine trends. Minimise chance introductions of predators (e.g. rats Rattus spp.) and disease (H. Vargas and F. Cruz in litt. 2000). Research breeding ecology and adult survival in relation to climatic variation, with particular reference to drought events	population size, area protection, ecological requirements, survival	This species is inherently susceptible owing to its extremely limited range. It may be affected by the regular and extreme weather events that have been shown to cause significant fluctuations in the population of Floreana Mockingbird M. trifasciatus (Wiedenfeld and Jiménez 2008). It is also at constant risk of the introduction of pest species (e.g. rats Rattus spp.), parasites (Wiedenfeld et al. 2007) and diseases to occupied islands, although none of these pests are now present (D. Wiedenfeld in litt. 2012)	unknown threat

Mimus trifasciatus	Monitor populations and environmental conditions on both islands, preferably annually (Grant et al. 2000). Minimise the risk of chance introductions of predators and disease. Support the establishment of captive-breeding populations and reintroduce to Floreana if eradication of rats, cats, anis, pigs, goats and donkeys is successful. Investigate possibility of reintroduction to other islets, or areas of Floreana, where black rats and cats are absent (G. Jiménez-Uzcátegui in litt. 2012). As Opuntia megasperma appears to be an important food source during the breeding season, it is important to both establish if it is key for breeding and consider a supplementary feeding programme for future reintroductions (Ortiz-Catedral 2014). In addition improved biosecurity measures should be implemented and mockingbirds should only be reintroduced in areas far from poultry and humans (Deem et al. 2012)	monitor the population, area management, area protection, captive breeding, reintroduction, control programme for invasive species, ecological requirements	Extinction on Floreana was probably caused by the depredations of introduced Black Rats (Rattus rattus), feral cats and feral dogs, with introduced goats causing habitat loss (Harris 1973, Curry 1986, Grant et al. 2000). Higher adult mortality occurs in the unusually dry La Niña years (Grant et al. 2000); dry years are increasing in frequency, and this is thought to be driving fluctuations in the population size (as seen in 2007 and 2008) which leave the species prone to extinction (D. Wiedenfeld in litt. 2010). The Smooth-billed Ani (Crotophaga ani) is known to predate other bird species on the archipelago and has been seen on Champion and Gardner-by-Floreana (G. Jiménez-Uzcátegui in litt. 2007). Increased mortality on Champion during the 1982-1983 El Niño event is thought to have been the result of avian pox virus (Grant et al. 2000), and the invasive parasite (Philornis downsi) has been recorded (Wiedenfeld and Jimenez-Uzcategui 2008). Transmission of diseases from domestic chickens could also pose a threat (Deem et al. 2012). There are black rats present on nearby islets whose accidental introduction to either of the breeding islands poses an ever present threat (G. Jiménez-Uzcátegui in litt. 2007). The loss of immigration from the now extinct Floreana population has raised concerns for the long-term survival of the two remaining populations, as they are believed to have lost a significant amount of genetic diversity (Grant et al. 2000, Hoeck et al. 2009) although there appears to be no link between inbreeding and immunocompetence within the species (Hoeck and Keller 2012)	invasive species, habitat loss and degradation, brood-parasitism, disease, endogamy

Myiarchus semirufus	Survey more widely within the species historical range to determine current distribution and reassess its threat status. Advocate that areas of Prosopsis and Acacia woodland are protected and grazing by goats and fuelwood collection be prohibited. Raise awareness over the species's status and encourage bee-keepers not to kill flycatchers. Research its natural history (F. Angulo in litt. 2012)	distribution, status, area protection, environmental education	Human population density has increased considerably in the past three decades. There has been an expansion of large plantations, particularly of sugar cane, within its range and in some cases suitable habitat has been destroyed (C. Devenish in litt. 2012). Goat density has increased concomitantly and grazing pressure threatens dry scrub and wooded habitats. Daily collection of firewood by the many households in the region, cutting both live trees and dead, is causing a gradual reduction in the extent and density of scrub and woodland (R. Ridgely and F. Angulo in litt. 2007). At Chaparri community residents are specifically prohibited from cutting live wood, which is placing additional pressure on the continuing existence of dead limbs and snags; nesting in cavities and recesses, Rufous Flycatchers may well thereby be being put under additional pressure through the loss of nest sites (R. Ridgely and F. Angulo in litt. 2007). Bee-keeping for honey production has been encouraged for the last several decades through various aid programmes. The larger tyrant flycatchers of the region have reportedly become habitual predators of the bees around the hives, and local people apparently try to kill then (with slingshots) at any opportunity. All such larger flycatchers have declined markedly in most areas including especially the Rufous Flycatcher (R. Ridgely and F. Angulo in litt. 2007)	habitat loss and degradation, livestock disturbance, hunting

Myioborus pariae	Monitor the population trend. Urgently survey cerros Patao, Azul, and El Olvido. Study its ecological requirements (Rodríguez and Rojas-Suárez 1995, Sharpe 2008). Ensure continued protection of forested cerros within the Paria Peninsula National Park. Initiate programmes to develop economic alternatives to reduce agricultural encroachment in villages adjacent to the national park (Rodríguez and Rojas-Suárez 1995, Sharpe 2008, C. J. Sharpe in litt. 2011)	monitor the population, distribution, ecological requirements, area protection, sustainable activities	Increases in cash-crop agriculture, especially the cultivation of "ocumo blanco" (Xanthosoma sagittifolium) and "ocumo chino" (Colocasia esculenta), since the mid- to late 1980s, have resulted in uncontrolled burning and forest degradation. Cerros Humo and Patao have been worst affected, with the east of the peninsula fairly undisturbed. A new paved road from Güiria to Macuro will almost certainly lead to increased habitat clearance (C. J. Sharpe in litt. 1995, 2000, 2003). The species has been recorded once in trade, but this is assumed to be a single case, as the species is not considered to be an attractive cagebird (Sharpe 2008)	habitat loss and degradation
Myiotheretes pernix	Survey its range to better determine its current population and distribution. Research its ecological requirements (Renjifo et al. 2002). Strengthen and improve the conservation measures in the Sierra Nevada de Santa Marta Biosphere Reserve, at least where important populations of this species are found. Work with local communities and regional institutions to identify and prioritise conservation and management strategies (Salazar and Strewe undated)	distribution, ecological requirements, area protection, captive breeding, environmental education, monitor illegal activities, integrate local people, area management	Only 15% of the original vegetation in the Sierra Nevada de Santa Marta remains, albeit largely on the north slope where this species occurs (L. M. Renjifo in litt. 1993). The main past and continuing threat is the conversion of forest to marijuana and coca plantations (L. G. Olarte in litt. 1993, L. M. Renjifo in litt. 1993, J. Fjeldså verbally 2000, L. M. Renjifo verbally 2000), which was compounded by spraying of the slopes with herbicides (L. G. Olarte in litt. 1993, L. M. Renjifo in litt. 1993). It is not known whether this activity is still undertaken by the Colombian authorities (L. M. Renjifo verbally 2000). Less significant threats, which followed human immigration to the area from the 1950s onwards, are agricultural expansion (e.g. coffee at lower altitudes and livestock), logging, burning and afforestation with exotic trees (e.g. pines) (Dinerstein et al. 1995, P. G. W. Salaman in litt. 1999, Salazar and Strewe undated)	habitat loss and degradation, pesticides impact

Myiothlypis basilica	Conduct surveys to establish the state of the population and its ecological requirements (Renjifo et al. 2002). Develop a management and conservation strategy for the Sierra Nevada de Santa Marta, particularly for montane forests (Renjifo et al. 2002)	population size, ecological requirements, area management	Despite possibly tolerating some habitat degradation, it is threatened by extensive deforestation, and has lost 21% of its habitat (Renjifo et al. 2002). The principal causes of deforestation are the development of cattle ranches and Pinus plantations, for example at La Cuchilla de San Lorenzo (Renjifo et al. 2002). Illegal agricultural expansion, logging and burning (Dinerstein et al. 1995, Renjifo et al. 2002) have altered all but 15% of the sierra's original vegetation (Stattersfield et al. 1998, Renjifo et al. 2002). The north slope of the Sierra Nevada de Santa Marta is the most degraded area, and this area corresponds to where the majority of birds are found. Although this species is found in two protected areas, this has not prevented extensive and continuing deforestation (Renjifo et al. 2002). Populations may also persist above the treeline in scrubby habitats, suggesting that the species may show a degree of resilience to deforestation (C. Downing in litt. 2007)	habitat loss and degradation
Myrmoderus ruficauda	Survey remnant habitat patches in the north-east, and Córrego do Veado. Designate Murici as a biological reserve and ensure its de facto protection. Effectively protect other forest fragments, especially in north-east Brazil. Continue conservation measures at Pedra Talhada. Investigate protecting the newly discovered site on the rio Mucuri	distribution, area protection, area management	In the north-east, logging and clearance for sugarcane and pasturelands has reduced remaining forests to isolated and fragmented patches. Murici is severely threatened by logging and fires spreading from adjacent plantations (A. Whittaker in litt. 1999). Further south, little forest remains because of conversion to plantation agriculture (Brown and Brown 1992, Fearnside 1996)	habitat loss and degradation

Myrmotherula klagesi	Conduct surveys of suitable habitats within and surrounding the known range to determine its true distribution and abundance. Ensure that remaining tracts of várzea forest receive adequate protection	distribution, area protection	The species is predicted to lose 30-59% of its habitat by 2020 due to agriculture, deforestation and hydroelectric dam construction (MMA 2014). Intensive logging and selective exploitation of kapok trees Ceiba pentandra are accelerating deforestation of the várzea forests where it may occur, and the presence of an established industrial timber infrastructure suggests that rates of logging are likely to be maintained (Dinerstein et al. 1995, Stattersfield et al. 1998)	habitat loss and degradation
Myrmotherula minor	Carry out surveys to assess the species's total population size. Monitor any decline in or degradation of its remaining habitat. Protect Fazenda União. Ensure the de facto protection of reserves, especially Serra da Bocaina and Serra do Mar. Promote environmental awareness in communities near reserves (Whitney and Pacheco 1995)	monitor the population, area management, area protection, environmental education	Virtually all lowland Atlantic forest outside protected areas has been deforested within its historical range, and even some of the protected areas in which it occurs are not secure (Whitney and Pacheco 1995). There is almost no suitable habitat remaining in Espírito Santo below 700 m, and the lowlands and foothills of south Rio de Janeiro and São Paulo have become easily accessible to humans since the 1970s, with most of the forest below the base of the slopes cleared or heavily degraded (Whitney and Pacheco 1995)	habitat loss and degradation
Myrmotherula snowi	Monitor the population at Murici and conduct surveys to confirm the species's status at other sites where it has been recorded. Survey other remnant patches of upland Atlantic forest in Alagoas, Pernambuco and Paraíba to search for further populations. Ensure the de facto protection and management of Murici Ecological Station. Secure the long-term protected status and conservation of Mata do Estado. Implement an environmental education programme at	monitor the population, population size, distribution, area management, area protection, ecological requirements, reproductive success	Forest at Murici has been reduced from 70 km2 in the 1970s to 30 km2 of highly disturbed and fragmented habitat in 1999 (J. M. Goerck in litt. 1999, 2000), largely as a result of logging and conversion to sugarcane plantations and pastureland. The site continues to be threatened by fires spreading from adjacent plantations, hunting, timber extraction and agriculture (J. M. Goerck in litt. 1999, A. Whittaker in litt. 1999, J. M. Goerck in litt. 2000, SAVE Brasil 2016). The Frei Caneca private reserve and BirdLife/SAVE Brasil area are also still suffering from illegal charcoal exploitation (P. Develey in litt. 2007). The massive clearance of Atlantic forest in Alagoas and Pernambuco has left few other sites likely to support populations of this species.	habitat loss and degradation, hunting

	Murici Ecological Station. Conduct research into the species's ecology, associations with mixed-flocks and breeding biology. Consider captive breeding and/or translocating individuals to other, protected areas of Atlantic forest (Lees et al. 2014, Pereira et al. 2014, SAVE Brasil 2016). Restore forest in land adjoining existing forest fragments where the species survives (Pereira et al. 2014)		Having a montane distribution that is close to the maximum altitude within its range, this species is also potentially susceptible to climate change (BirdLife International unpubl. data)	
Myrmotherula urosticta	Carry out surveys to obtain an estimate of the species's population size. Monitor the decline and degradation of suitable habitat. Protect Fazenda União. Ensure de facto protection of existing reserves by hiring, training and maintaining guards from local communities. Actively pursue all measures to stimulate environmental awareness in communities near reserves	population size, area management, area protection, integrate local people, environmental education	Virtually all lowland Atlantic forest outside protected areas has been cleared within its historical range, and even some of the protected areas in which it occurs are not secure (Whitney and Pacheco 1995). Its habitats are historically threatened by agricultural conversion and deforestation for mining and plantation production, and current key threats are urbanisation, agricultural expansion, colonisation and associated road-building (Dinerstein et al. 1995, Fearnside 1996)	habitat loss and degradation, urban intensification

Nemosia rourei	Monitor the population at Pindobas IV and Mata do Caetés (Anon. 2007). Survey the montane region of south Espírito Santo, and adjacent Minas Gerais and Rio de Janeiro, concentrating on elevations between 850 and 1,250 m and those sites which have previously been identified as potentially suitable for the species. Research ecology and seasonal abundance. Promote the creation of a Reserva Particular do Patrimônio Natural at the private farms where the species occurs (Anon. 2007). Raise awareness of environmental issues among local communities. Study alternative agricultural and wood production systems (Anon. 2007)	monitor the population, distribution, ecological requirements, population size, new protected areas, environmental education, sustainable activities,	Extensive deforestation within its range must have had a severe impact on this species. Forests within Itarana, where the species was recorded in 1941, have since been reduced to a number of small fragments. However, the species has been recorded in Eucalyptus spp. and Pinus spp. plantations using this suboptimal habitat while moving between fragments. Threats associated with the loss of forest include quarrying of limestone, granite and marble, illegal palm extraction, the expansion of coffee plantations, small-scale firewood-cutting, and larger-scale timber-cutting, including for charcoal production (Hilty 2011)	habitat loss and degradation

Neopelma aurifrons	Survey to identify new localities and provide more recent records from historical localities (Whitney et al. 1995b). Confirm its presence in Chapada da Diamantina. Estimate populations in Sooretama and Augusto Ruschi. Protect the known site in Rio de Janeiro	distribution, population size, new protected areas	It is threatened since its range is within an area that has been severely deforested over a long period of time (Whitney et al. 1995b). Its lowland forests have been historically threatened by agricultural conversion, deforestation for mining and plantation production (Fearnside 1996). Current key threats to these forests are urbanisation, agricultural expansion, dam construction, colonisation and associated road building (Dinerstein et al. 1995, de Vasconcelos in litt. 2007)	habitat loss and degradation, urban intensification
Nesotriccus ridgwayi	Estimate the population. Study the impact of introduced mammals. Eradicate introduced mammals where feasible	population size, evaluate the threats, control programme for invasive species	Rats and cats are potential predators, and feral deer, pigs and goats graze suitable habitat. Pigs especially devastate the lower strata and understorey of native forests and inhibit forest regeneration (Sherry 1985, F. G. Stiles in litt. 1999). On many other islands, this combination of feral mammals has caused the extinction of numerous endemic plant and animal species. There is also low-level disturbance from increasing tourism (Sherry 1985)	invasive species, livestock disturbance, habitat loss and degradation

Odontophorus strophium	Monitor the population size and trend. Ensure effective protection for the Serrania de los Yariguíes National Park. Identify and survey remnant forests elsewhere in Santander, outside Cachalú and Yariguíes (T. Donegan in litt. 2012). Develop initiatives to protect any additional sites discovered, including targeted land acquisition where appropriate	monitor the population, area protection, distribution, new protected areas	Since the 17th century, the west slope of the east Andes has been extensively logged and converted to agriculture, including pastures and, at lower altitudes, coffee, plantain and sugarcane plantations (Stiles et al. 1999). Forest loss below 2,500 m has been almost complete (Stattersfield et al. 1998), with habitat in many areas reduced to tiny, isolated relicts on steep slopes and along streams. These landscape changes accelerated during the 20th century, especially after 1960, although there has been some modest recovery in recent years (Stiles et al. 1999, Renjifo et al. 2014). Hunting for domestic consumption and predation by dogs are also threats (Donegan et al. 2005, Renjifo et al. 2014). Selective logging and hunting affects birds in the lower part of Guanentá-Alto Río Fonce, but the forest is largely intact at 1,950-2,200 m	habitat loss and degradation, hunting
Onychorhynchus swainsoni	Survey remaining suitable habitat within its known range to clarify distribution and status. Study its ecological requirements, with Itatiaia National Park perhaps a suitable locality. Increase the area of suitable habitat that has protected status	distribution, population size, ecological requirements, new protected areas	The widespread clearance, degradation and fragmentation of the Atlantic forest are the principal threats to this naturally rare tyrannid	habitat loss and degradation

Oxypogon cyanolaemus	Urgent conservation action is needed to protect the species's remaining habitat. Improve the level of habitat protection within Sierra Nevada de Santa Marta National Park. Use environmental education and community engagement to raise awareness of the species and find ways to protect community interests whilst restoring and protecting remaining habitat for the species (Rojas and Vasquez 2015). Encourage sustainable livestock and land management practices. Seek to supply local people with firewood, in order to avoid further habitat destruction. Continue to search for remaining populations of the species and study their ecology and habitat use. Monitor the extent and condition of habitat	area protection, environmental education, integrate local people, sustainable activities, ecological requirements, area management	The páramo of the Sierra Nevada de Santa Marta has undergone a high degree of destruction and degradation through conversion to livestock pasture and clearance for agricultural cultivation (Cortes-Herrera & Villagran 2016). The habitat is seriously affected by the grazing of cattle herds and pigs belonging to indigenous communities, who repeatedly burn the páramo for pasture (WWF 2013, Rojas and Vasquez 2015). In March 2015 almost all natural vegetation except grasses, in localities where the species was observed, had been destroyed by fire; foraging resources are thus likely to be spread over a very wide area of possibly hundreds of hectares (Rojas and Vasquez 2015). Indigenous communities collect L. occultus for firewood and for use in the construction of houses (Cuatrecasas 2013, in Collar and Salaman 2013; Cortes-Herrera & Villagran 2016), further drastically reducing the population of this frailejón, which is classified as Critically Endangered on the Colombian Red List (García et al. 2005) and which may be a key food source for O. cyanolaemus	habitat loss and degradation, livestock disturbance
Oxypogon stuebelii	Assess population size and trend, and determine potential threats	population size, evaluate the threats	Threats are reasonably limited inside Los Nevados National Park, which is well protected and an ecotourism destination. Nevertheless, the paramos continue to be burnt to provide fresh grasslands for cattle, while localised potato cultivation occurs in the subparamo (Collar and Salaman 2013)	habitat loss and degradation

Pauxi koepckeae	Conduct field studies of the species's distribution, population density and ecology in order to estimate the size of the surviving population, determine its conservation requirements and vulnerability to human encroachment. Continue working with communities around Cerros del Sira in conducting local knowledge surveys about the distribution of the species and in raising awareness of its unique status. Identify and implement measures that will measurably improve the livelihoods of the local indigenous communities in return for their essential assistance in conserving the species through a community enforced hunting ban. Work with INRENA (the protected areas authority) to develop and implement a conservation management plan for the species and its habitat (MacLeod et al. 2006)	distribution, population size, ecological requirements, environmental education, integrate local people, sustainable activities, species conservation project	Continuing hunting by local communities is the single greatest threat to the species and is likely to be having a serious negative impact (Gastañaga 2006, Gastañaga et al. 2011). It was rediscovered due to reports from hunters, and there are reliable reports of a hunter trying to sell the species to local restaurants as bush meat in 2008 (R. MacLeod and M. Gastañaga in litt. 2014). Although the species is legally protected there is no concerted effort to educate the local population as to the global importance of the species and no formal infrastructure in place to establish protection (Gastañaga et al. 2011). Road-building and associated rural development have a negative impact and inhibit dispersal (Herzog and Kessler 1998, Fjeldså in litt. 1999). Subsistence agriculture threatens its habitat (R. MacLeod in litt. 2000), as does opening up the foothills to colonisation and hunting. New gold mining developments and conversion of patches of forest to pasture have been recently recorded in and around the El Sira Communal Reserve (Novoa et al. 2016). Oil exploration and illegal logging are potential future threats in El Sira, as well as forest clearance by colonists	hunting, habitat loss and degradation

Pauxi unicornis	Conduct field studies to locate and estimate the size of the surviving population and to determine its conservation requirements and vulnerability to human encroachment. Develop a systematic scheme to monitor the population (Garcia Soliz et al. 2007). Monitor illegal activities within the national parks (Garcia Soliz et al. 2007). Work with the Carrasco and Amboro National Parks and local communities to develop and implement conservation management plans for the species and its habitat. Develop work with local educators and schools and carry out an awareness campaign to inform local people about the conservation importance and uniqueness of the species and its habitat to their area (Garcia Soliz et al. 2007). Work with local communities to promote a community based hunting ban for the species and to reduce human pressure on its habitat. Identify and implement measures that will measurably improve the livelihoods of the local communities in return for their assistance in conserving the species. Improve enforcement of protected areas. Develop ecotourism activities in the region, with the species as an emblem, in order to provide an alternative source of income for local communities (Garcia Soliz et al. 2007). Develop a captive breeding programme (Programa Paujil Copete de Piedra, n.d.)	ecological requirements, population size, monitor the population, monitor illegal activities, integrate local people, environmental education, ecotourism, captive breeding	In Bolivia, forests within its altitudinal range are being cleared for the cultivation of staple and export crops by recent colonists from the altiplano (Dinerstein et al. 1995, Fjeldså in litt. 1999, Maillard 2006). Road-building and associated rural development have a negative impact and inhibit dispersal (Herzog and Kessler 1998, Fjeldså in litt. 1999). Hunting for its meat seems to be by far the biggest threat and is likely to be having a serious negative impact in all parts of its range (Gastañaga 2006, R. MacLeod in litt. 2014). Human encroachment (for the growing of coca and other farming) and severe hunting pressure is increasing throughout the range, including in national parks, which lack effective protection, and effective extinction in the wild may take place within 20-30 years unless massive conservation action can be achieved (R. MacLeod in litt. 2014). The Bolivian government recently announced a plan to build a highway through half of the (TIPNIS) (Programa Paujil Copete de Piedra, n.d.). Climate change may also pose a threat to the species; modelling of the change in the species's range in response to climate change alone projected a 55-85% reduction between 2014 and 2080 (del Rosario Avalos & Hernández 2015)	habitat loss and degradation, hunting, climate change

Penelope albipennis	Monitor natural and reintroduced populations (Pautrat et al. 2000). Continue and expand local awareness campaigns and monitor the impact of these campaigns on both the populations and the targeted communities (Ortiz-Tejada and O'Neill 1997, Flanagan and Williams 2001, Angulo 2011). Continue to develop dry forest sustainable use strategies such as eco-tourism or apiculture (Flanagan and Williams 2001, F. Angulo in litt. 2012). Establish a studbook for the species, so that breeders of captive individuals can ensure that a long-term viable captive population is maintained, and research the genetic status of both captive and wild White-winged Guan populations (F. Angulo in litt. 2012). Create a protected area north of the species's known distribution (Angulo et al. 2006). Involve local communities in the conservation strategy for the species (Angulo et al. 2006). Establish the identity of the isolated population of guans in the upper Marañon valley (Mark 2011)	monitor the population, environmental education, sustainable forest management, genetic, new protected areas, integrate local people, taxonomy	Overhunting, may have caused historical decline and this remains a threat (Angulo 2008) and has hampered reintroduction efforts. Habitat destruction, through clearance for agriculture and cutting for timber, artisanal woodcrafts, charcoal and firewood, is another serious threat, but the species seems to tolerate some habitat modification (Angulo verbally to the Neotropical Ornithological Congress 2007, Angulo 2008). Mining concessions were granted in the northern part of the species's range in 2008. Should minerals be found and exploited suitable habitat will no doubt be destroyed (F. Angulo in litt. 2009, 2010)	hunting, habitat loss and degradation

Penelope jacucaca	Carry out surveys to assess the population size. Conduct research into the extent and level of hunting pressure on the species. Develop and implement an action plan for the species and its habitat. Improve de facto protection of protected areas within its range. Initiate local awareness campaigns to combat hunting in protected areas	population size, evaluate the threats, species conservation project, area protection, environmental education	North-eastern Brazil is the poorest region in the country and has a strong hunting culture. This large and attractive species is considered either locally extinct or very rare over much of its distribution and is under intensive pressure from hunting even in "protected" areas. Additionally, both Raso da Catarina and Serra Negra are intensively exploited by Indian groups, who have also cut much of the latter forest (Santos 2001b). Degradation of dry forests and arboreal caatinga, apparently its favoured habitats, has also been intensive	habitat loss and degradation, hunting
Penelope ochrogaster	Survey to assess the species's current range and ascertain its occurrence in Araguaia National Park, where there has not been comprehensive recent work and there is a record of an unidentified Penelope species dating from the late 1990s. Protect populations in Poconé from further habitat loss. Consider the development of sustainable forestry practices to supply materials for bridge repairs on the Transpantaneira road. Encourage sustainable forestry practices among the cattle-grazing community. Support the proposal for a national park in the Rio Paraguaizinho Basin (P. de T. Z. Antas in litt. 2012)	distribution, area protection, integrate local people, new protected areas	Habitat loss for new cattle pastures and small-scale agriculture is the major threat in Poconé, where hunting is rare or non-existent. Tabebuia trees are cut to rebuild bridges along the Transpantaneira road each year after the floods (Olmos 1998). Elsewhere, it has presumably suffered from massive habitat loss and hunting for food. Large areas of central Brazil have been converted to plantations of eucalyptus, soybeans and pastures for exportable crops (Stotz et al. 1996, Parker and Willis 1997). Much of this destruction has occurred since 1950, and has been encouraged by government land reform initiatives (Parker and Willis 1997)	habitat loss and degradation

Penelope perspicax	Survey and estimate population sizes, especially in Ucumarí (Silva Arias 1996, P. G. W. Salaman in litt. 1999, 2000). Develop and implement an action plan for the species and its habitat (N. Gómez in litt. 1999, P. G. W. Salaman in litt. 1999, 2000) and extend captive breeding efforts.. Provide posters and resources for an educational programme about cracids, particularly aimed at limiting hunting (P. G. W. Salaman in litt. 1999, 2000)	population size, species conservation project, captive breeding, environmental education	It has suffered from severe loss of suitable habitat (almost total in the middle Cauca valley) over the period of human colonisation. Many of the localities, at least historical ones, are near the Buenaventura-Buga and Buenaventura-Cali roads, and are thus severely threatened by colonisation and associated deforestation (Salaman and Stiles 1996). Munchique National Park is subject to the same threats, as well as dam construction. The species is also hunted for food, even in some protected areas, although apparently not in Ucumarí (P. G. W. Salaman in litt. 1999, 2000). If it does occur in the relatively intact forests of the Pacific slope of Valle del Cauca and Cauca, then logging is a key threat (P. G. W. Salaman in litt. 1999, 2000). It is not clear which factors limit the distribution and population of this species but habitat fragmentation and hunting are likely to be the major threats (Rios et al. 2008)	habitat loss and degradation, hunting

Penelope pileata	Organise campaigns to raise awareness and reduce hunting and trapping for trade. Effectively protect Amazônia (Tapajós) National Park and designate further protected areas within its lowland forest range. Monitor population trends at known sites	environmental education, area protection, new protected areas, monitor the population	Forest destruction has been fairly widespread, especially in Maranhão and Pará (Cleary 1991, Strahl et al. 1994, F. Olmos in litt. 1999), as conversion to pasture and settlement of landless agriculturists are part of government-sponsored land reform (F. Olmos in litt. 1999), and is expected to accelerate as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network (Soares-Filho et al. 2006, Bird et al. 2011). There are additional pressures from hunting for food and its status as a prized aviary bird (Delacour and Amadon 1973, Sick 1993, Stattersfield et al. 1998). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011)	habitat loss and degradation, hunting

Percnostola arenarum	Protect in practice as well as legally the areas of habitat in which it is found from destruction and heavy exploitation. Assess the full extent of this species range and population size	distribution, population size, area protection	Based on current knowledge about this species, it has a very specialised habitat niche and a very small geographic range. The habitats in which it is found are subject to intense human activity in a region of rapid population growth. Varillal is heavily exploited for poles for building houses, and the leaves of the irapay palm are extensively harvested to make thatched roofs (Isler et al. 2001). The impact of these threats is exacerbated by the fact that the species has only been found in certain 'varillales', and even fewer 'irapayales', despite intense ornithological surveying (Isler et al. 2001). Despite protection, 200 people have entered the reserve and carved out homesteads, engaging in activities like illegal hunting and illegal road building and logging which destroys habitat (J. Alonso Alvarez in litt. 2003)	habitat loss and degradation

Phaethornis aethopygus	Carry out surveys to obtain a population estimate and improved knowledge of the species's distribution. Monitor population trends. Monitor the extent and condition of habitat in its range. Increase the area of forest in the Teles Pires, Tapajós and Xingu watersheds that is protected	population size, distribution, monitor the population, area management, new protected areas	Within the species's range, habitat destruction and fragmentation as a result of conversion to pasture, road construction and subsequent development and settlement, accompanied by illegal logging, are significant threats, with the Novo Progresso area currently experiencing one of the highest rates of deforestation in the Amazon (F. Olmos in litt. 2007). The paving of the BR-163 Cuiabá-Santarém highway is expected to bring even greater habitat destruction, opening up soya markets in the Mato Grosso for rapid transfer to Santarém, unless strong government action is taken (A. Lees in litt. 2007, MMA 2014). Observations of the species in disturbed habitats (Piacentini et al. 2009, A. Lees in litt. 2011, 2016) suggests that, like many hummingbird species, it tolerates some level of habitat degradation; however, the species get increasingly scarce in degraded forests. Overall, forest fragmentation may lead to the loss of lekking sites, and outright forest clearance is assumed to be catastrophic	habitat loss and degradation

Phibalura boliviana	Extend the area of nature reserve, and fence the boundary to prevent further cattle grazing and allow reforestation. Work with neighbouring landowners to manage fires to enable the restoration of savannah habitat. Purchase the protection rights for nesting trees, and fence these off as sanctuary areas. Plant trees to provide nesting habitat where appropriate. Continue awareness-raising activities in local communities, and involve local people in research and monitoring	new protected area, area protection, area management, breeding area, environmental education, integrate local people	Forest cover in the Apolo area has been drastically reduced over the past century and losses are continuing owing to large-scale clearance and burning for cattle ranching and agriculture. Habitat largely consists of highly eroded and degraded grazing land which is subject to annual burning (Bromfield et al. 2004). Wildfires are thought to reduce nesting success (Avalos 2010). Parts of the former range are now completely treeless and the species absent (B. Hennessey and A. van Kleunen in litt. 2012). Land redistribution laws due to come into force in in the area in 2012-2013 may impact efforts to protect remaining habitat (B. Skolnik and F. Rheindt in litt. 2012). Nesting success is low (c.20%, W. Ferrufino per. F. Rheindt in litt. 2012), with predation by jays, presumably facilitated by habitat degradation, apparently a major cause of nest failure. Extreme weather such as thunderstorms with strong winds and hail may be another important cause of nest failure, as nests are built in exposed locations (W. Ferrufino per. A. van Kleunen in litt. 2012). Such weather conditions may be becoming more frequent (A. van Kleunen in litt. 2012), and may be exacerbated by a lack of suitable nest sites leading to nesting in suboptimal locations	habitat loss and degradation
Phyllomyias urichi	Survey El Guácharo National Park, Serranía de Turimiquire and the Paria Peninsula, and other areas identified from aerial photographs, to assess its precise distribution and estimate populations (C. J. Sharpe, J. P. Rodríguez and F. Rojas-Suárez in litt. 1999; Sharpe 2008). Assess its habitat requirements and tolerance of	distribution, population size, ecological requirements, sustainable activities, area protection	There has been widespread clearance for agriculture and pasture in the Cordillera de Caripe. The forests here have been reduced by 60% over the past 25 years (Sharpe 2008). Even in El Guácharo National Park there is clearance, repeated burning and understorey removal for coffee (Boesman and Curson 1995). The slopes of Cerro Negro are largely bare with the more obvious forest patches actually shade-coffee plantations (Boesman and Curson 1995). There is conversion to coffee, mango, banana, and citrus plantations in the Serranía de Turimiquire, but extensive forested	habitat loss and degradation

	disturbance and degradation (C. J. Sharpe, J. P. Rodríguez and F. Rojas-Suárez in litt. 1999; Sharpe 2008). Confirm the record from the Paria Peninsula (Sharpe 2008, 2015). Develop and promote alternative agricultural techniques for areas adjacent to protected areas (Rodríguez and Rojas-Suárez 1995; Sharpe 2008). There is a pressing need to protect the much-reduced forests in the western portion of this species' range in the Serranía de Turimiquire (Sharpe in litt. 2011)		areas remain (Colvee 1999, Sharpe in litt. 2011). On Cerro Humo, increases in cash-crop agriculture, especially the cultivation of "ocumo blanco" since the mid- to late 1980s, have resulted in uncontrolled burning and forest degradation	
Phylloscartes beckeri	Survey areas of potentially suitable habitat between Boa Nova and Chapada Diamantina. Assess the population in Chapada da Diamantina National Park. Research its ecological requirements. Ensure the de facto protection of Chapada da Diamantina and surrounding forests. Investigate the feasibility of protecting remaining forest fragments near Boa Nova and in the Serra das Lontras	distribution, ecological requirements, area protection, new protected areas	In the Serra da Ouricana, forests have virtually disappeared owing to the expansion of pastureland and cultivation. Only a few privately-owned tracts of forest remain, and these are under pressure from clearance and fires spreading out of cultivated areas (Gonzaga and Pacheco 1995, Gonzaga et al. 1995). By 1999, the largest remaining patch of c.3 km2 had been largely destroyed and the long-term survival of this species in the area is highly questionable (J. M. Goerck in litt. 1999). Illegal charcoal burning and forest clearance has been observed in Chapada da Diamantina National Park, where the sight of logging trucks is not uncommon (Parrini et al. 1999)	habitat loss and degradation

Phylloscartes ceciliae	Survey sites with any remnant patches of habitat in Alagoas (such as Usina Serra Grande) and Pernambuco. Designate Murici as a biological reserve and ensure its de facto protection. Continue the reforestation programme and de facto protection at Pedra Talhada. Designate Mata do Estado and Pedra Dantas as protected areas (S. Roda in litt. 2007)	distribution, area protection, area management, new protected areas	There has been massive clearance of Atlantic forest in Alagoas, largely as a result of logging and conversion to sugarcane plantations and pastureland. Forest at Murici has been reduced from 70 km2 in the 1970s, to a mere 30 km2 of highly disturbed and fragmented habitat in 1999 (J. M. Goerck in litt. 1999). The site is severely threatened by fires spreading from adjacent plantations, and further logging with new roads were evident in January 1999 (J. M. Goerck in litt. 1999; A. Whittaker in litt. 1999)	habitat loss and degradation
Phylloscartes roquettei	Continue survey work to improve knowledge of the species's range. Urgently protect the known area near Pirapora, as well as other suitable habitat patches. Conduct an environmental awareness campaign directed at landowners, local communities and schools. Reinforce the protection of the region's gallery forests (Raposo et al. 2002)	distribution, area protection, environmental education	Its habitat is probably the most threatened in central Brazil owing to its valuable aroeira Astronium urundeuva wood and relatively fertile soils. Charcoal-burners were fully active at the type-locality in 1986, where there was also extensive forest cutting for pasture and agricultural development. The São Francisco basin is also threatened by limestone quarrying and a large-scale irrigation project that has already resulted in the loss of large areas of forest (Raposo et al. 2002). Cattle ranching has resulted in forest clearance across large parts of the state of Minas Gerais within its range (Lopes et al. 2008). These same threats are impacting upon recently discovered locations and are exacerbated when remaining forest is highly fragmented (Lopes et al. 2008)	habitat loss and degradation

Phytotoma raimondii	Monitor population trends through regular surveys. area management within the species's range. Ensure the integrity of the Murales forest and improve legal protection (G. Engblom in litt. 1998, 1999, 2000). Effectively protect forest in the Rafán area. Initiate environmental education and ecotourism at Rafán (G. Engblom in litt. 1998, 1999, 2000) and other areas. Work with oil companies in the Talara region to protect the extensive tracts of habitat (G. Engblom in litt. 1998, 1999, 2000)	monitor the population, area management, area protection, environmental education, ecotourism	The near-complete conversion of coastal river valleys to cultivation—especially large-scale sugar and rice plantations—has extirpated the species from numerous localities (G. Engblom in litt. 1998, 1999, 2000). Grazing by goats and burning have removed or heavily degraded the shrub layer in many remaining woodlands (G. Engblom in litt. 1998, 1999, 2000). Illegal subsistence logging for firewood and charcoal (especially to provide fuel for chicken grill restaurants in Lima) are now highly significant factors (G. Engblom in litt. 1998, 1999, 2000, Flanagan et al. 2009), and the roots of older Prosopis tree are also used in wooden art craft (Begazo et al. 2001). Near the species's stronghold in Talara, Prosopis was felled as fuel for commercial squid processing (Flanagan et al. 2009), but this has apparently stopped with a decrease in squid fishing (C. Devenish in litt. 2012). Land rights to part of the Murales forest were sold for agricultural conversion in 1999 (Flanagan and Chávez-Villavicencio 2000). A considerable proportion of habitat close to Rafán is degraded, and parts of this area were converted to sugar production in the 1990s (G. Engblom in litt. 1998, 1999, 2000). Further threats include urban expansion, the introduction of exotic plants (e.g. Tamarix spp.), which compete with the native vegetation, and the fly Enallodiplosis discordis, which may be acting as a disease vector and seriously impact carob trees (Prosopis pallida), one of the food species for Peruvian Plantcutter (M. Rosina and M. Romo in litt. 2018)	habitat loss and degradation, urban intensification, invasive species, disease

Picumnus steindachneri	Conduct further surveys of the isolated east-Andean ridges of this region (Hornbuckle 1999b). Assess population status and ecological requirements (Gorman and Sharpe 2015). Control logging and habitat conversion in Alto Mayo Protected Forest, working with agricultural interests to protect the watershed. Support conservation groups currently working to protect forests in the region (Hornbuckle 1999b). Proposed sites for protection are listed in Angulo et al. (2008)	distribution, monitor the population, ecological requirements, sustainable activities	Forests within its range have been logged since 1930 or earlier (Dillon and Sánchez Vega 1999). Deforestation for coca plantations was a threat in the early 1980s, but commercial production now appears to have ceased in the area (Dillon and Sánchez Vega 1999). Continuing population growth and immigration have led to heavy disturbance of (and deep intrusions into) forests where the species occurs, both through clear-cutting and selective logging (Dillon and Sánchez Vega 1999). This situation is particularly concerning in the south-east of its range, where forest is now confined to the highest slopes (Dillon and Sánchez Vega 1999). Large areas have been converted to agriculture (especially coffee plantations) and pastures (Dinerstein et al. 1995, Dillon and Sánchez Vega 1999, Hornbuckle 1999b)	habitat loss and degradation
Picumnus varzeae	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes	new protected areas, area management, area protection	This species is projected to lose more than half of its available habitat as a result of accelerating deforestation in the Amazon basin (Soares-Filho et al. 2006, Bird et al. 2011). Its flooded habitat is threatened with further degradation by the building of hydroelectric plants (A. Lees in litt. 2011). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011)	habitat loss and degradation

Pinaroloxias inornata	Assess the size of the population. Study the impact of introduced mammals, and factors that may affect the species abundance	population size, evaluate the threats	Rats and cats are potential predators, and grazing by feral deer, pigs and goats degrades natural habitats on the island. There is also low-level disturbance from increasing tourism. However, none of these appears to have adverse affects	invasive species, livestock disturbance, habitat loss and degradation
Pionus reichenowi	NA	NA	The species is threatened by forest loss	habitat loss and degradation
Pipilo socorroensis	Carry out surveys to assess the population size. Monitor population trends through regular surveys. Investigate the impact of domestic cats	population size, monitor the population, free-ranging domestic	The proliferation of sheep on the island therefore impacted this species as its favoured vegetation was destroyed (Rodriguez-Estrella et al. 1996).While the feral sheep have now been removed from Socorro (Ortiz-Alcaraz et al. 2016) any carrying-over, long-term impact that sheep had on the island is uncertain, and the removal of sheep from the island has been very recent (Ortiz-Alcaraz et al. 2016). Additionally, feral cats are present on the island, which may be predating upon this species	invasive species
Poecilotriccus luluae	Establish a protected area containing areas of forest on the Cordillera de Colán. Survey areas of suitable habitat to locate further populations. Determine its ecological requirements, particularly its response to edge habitat creation	new protected areas, distribution, ecological requirements	The remaining forests within the documented range of the species are being cleared for timber, agriculture and to secure land ownership, particularly rapidly on the Cordillera de Colán (where local people estimated that all remaining forest might be cleared in the ensuing decade). The forest near Abra Patricia is under increased threat since the road was rebuilt in 1998 (Davies et al. 1997). However, the species may benefit from edge habitat created by timber clearing (D. Lane in litt. 2003, Schulenberg 2014)	habitat loss and degradation

Pogonotriccus lanyoni	Search for the species in any potentially suitable habitat, e.g. the interior of the Serranía de las Quinchas, and isolated remnants at the northern tip of the central Andes. Protect such areas if found (Wege and Long 1995, Stiles et al. 1999). Conduct surveys within the known range to clarify its distribution and conservation status. Study its ecological requirements	distribution, new protected areas, ecological requirements	Logging, livestock-farming, arable cultivation, infrastucture development, oil extraction and mining have all played a part in the destruction of habitat in its range (Stiles et al. 1999). The northern tip of the central Andes has been progressively settled and deforested since the 19th century, although some extensive forests survive (Forero 1989, Wege and Long 1995). The middle Magdalena Valley was rapidly opened up, colonised, logged and farmed during the 1960s and 1970s, with nearly 40,000 km2 of forest cleared in little over a decade, although regeneration has begun following land abandonment in some areas (Stiles et al. 1999)	habitat loss and degradation

Poospiza garleppi	Continue surveys of suitable habitat within the region, as well as studies to assess the species's ecological requirements in detail (Fjeldså and Kessler 1996, A. Huanca-Llanos in litt. 2007). Use the latest survey data to calculate an up-to-date population estimate. Research potential impacts of pesticides on survival and productivity within agricultural habitat (A. Huanca-Llanos in litt. 2007, Huanca-Llanos undated). Ensure the effective protection of birds and habitats within Tunari National Park and the Cochabamba basin as a whole (Fjeldså and Kessler 1996). Improve land-use management by segregating agricultural, grazing and forest areas (Fjeldså and Kessler 1996). Encourage local people to take a leading role in land-use management and restoration schemes (Fjeldså and Kessler 1996). Survey all areas of potential habitat (Fjeldså and Kessler 1996, Anon. 2007, A. Huanca-Llanos in litt. 2007, Balderrama 2009). Consider implementing a programme to plant a variety of native shrubs (Huanca et al. 2009). Investigate the possible role of pesticides in population decline (Balderrama and Huanca 2009)	distribution, ecological requirements, population size, pesticides impact, species conservation project, area management, distribution	Settlement and agricultural conversion have already had a dramatic effect on the species's habitat, and further expansion threatens remaining habitat fragments. The species's preferred habitat, comprising areas of mixed woodland below the Polylepis zone, is also the most suitable for conversion to agriculture (A. Huanca-Llanos in litt. 2007). Forest clearance also occurs for firewood collection, replacement with Eucalyptus, and burning for pasture. Habitat loss is even a threat within Tunari National Park (Dinerstein et al. 1995, Fjeldså and Kessler 1996, S. K. Herzog in litt. 1999, Balderrama and Huanca 2009). Although the species persists in moderately altered landscapes, it is lost from areas in which all native vegetation is removed (Huanca et al. 2009), thus uncontrolled and intensive habitat clearance and degradation are serious threats. The species's use of human-altered and agricultural landscapes renders it susceptible to disturbance and poisoning through exposure to pesticides (Huanca et al. 2009). It is also suspected to suffer perhaps a low, but as yet unquantified, level of mortality through indiscriminate persecution by children (Huanca et al. 2009). Climate change could prove to be a potential threat to this species (Sekercioglu et al. 2012)	habitat loss and degradation, pesticides impact, climate change
Poospiza goeringi	Survey Páramos de Aricagua and La Negra to determine its persistence in these areas. Survey tracts of habitat connecting known areas. Survey habitat to the north-east of its known range, e.g. in Sierra de la Culata National Park. Survey elfin forest on the eastern slopes of the Mérida Andes (C. Rengifo in litt. 2012). Study the species's ecology to	status, distribution, ecological requirements, evaluate the threats, area protection	There has been extensive habitat loss in the Cordillera de Mérida for agricultural conversion, potentially to be compounded by proposed mining and road construction (M. L. Goodwin in litt. 1993, C. J. Sharpe in litt. 1997, 2003). However, this destruction has been concentrated in areas below the species's altitudinal range, although it may begin to affect its montane forests significantly in the near future	habitat loss and degradation

	determine its dependence on bamboo (Sharpe 2008). Assess the current impact of threats to its habitat. Provide adequate protection for Sierra Nevada and Páramos del Batallón y La Negra National Parks			
Poospiza rubecula	Urgent need to conduct surveys to determine the range and abundance of this species, as well as assess rates of decline (Barrio 1995, H. Lloyd in litt. 2007). Study the species's ecology to identify beneficial conservation measures. Effectively protect Zárate forest. Improve habitat protection by updating the management plan for Huascarán National Park	distribution, abundance, ecological requirements, area protection	Humans have utilised upland areas in Peru for thousands of years, but agricultural intensification, the change from camelids to more destructive livestock (goats, sheep and cattle), and afforestation with exotic trees (e.g. Eucalyptus and Pinus) are relatively new and highly significant detrimental factors (Fjeldså and Kessler 1996). High-altitude habitats are greatly modified by livestock-grazing, with unpalatable and grazing-resistant species favoured, while other species of shrub are lost (Fjeldså and Kessler 1996). Whether changes in the species-composition have an effect on P. rubecula is not known. The number of goats is rising in the species's range, and heavy grazing has severely limited tree regeneration at Zárate forest, a problem compounded by cutting for timber (Barrio 1995). Rates of habitat loss and degradation within the range have increased in recent years (H. Lloyd in litt. 2007)	habitat loss and degradation, livestock disturbance
Premnoplex pariae	Survey known sites and other suitable areas (Boesman and Curson 1995, Rodríguez and Rojas-Suárez 1995, C. J. Sharpe, J-P. Rodríguez and F. Rojas-Suárez in litt. 1999). Develop alternative agricultural techniques for areas adjacent to Paria Peninsula National Park (Rodríguez and Rojas-Suárez 1995)	distribution, sustainable activities	The main threatss to this species are habitat loss and fragmentation for agricultural expansion. On Cerro Humo, increases in cash-crop agriculture since the mid- to late 1980s, have resulted in uncontrolled burning and forest degradation	habitat loss and degradation

Premnoplex tatei	Survey known sites and other suitable areas (Boesman and Curson 1995, Rodríguez and Rojas-Suárez 1995, C. J. Sharpe, J-P. Rodríguez and F. Rojas-Suárez in litt. 1999). Protect remaining forest in the Turimiquire Massif by the creation of a national park (C. Sharpe in litt. 2016)	distribution, new protected areas	The main threats to this species are habitat loss and fragmentation for agricultural expansion. The slopes of Cerro Negro are largely bare with the more obvious forest patches actually shade-coffee plantations (Boesman and Curson 1995). There is conversion to coffee, mango, banana, and citrus plantations in the Turimiquire Massif, but extensive forested areas remain (Colvee 1999, Sharpe in litt. 2011)	habitat loss and degradation
Progne modesta	Urgently carry out surveys for this species throughout its range, visiting all known or suspected strongholds, to develop accurate population estimates. Establish monitoring program to determine population trends. Carry out research to determine the reasons for its small population and any declines. Carry out actions to reduce any threats to this species (e.g. control of nest predators)	population size, distribution, monitor the population, evaluate the threats, species conservation project	Little is known about the threats to this species. Past declines are likely to be due to introduced diseases and parasites, especially the parasitic botfly Philornis downsi, which occurs on all known breeding islands (Wiedenfeld et al. 2007), and introduced nest predators (e.g. rats Rattus) (D. Wiedenfield in litt. 2004, A. Tye in litt. 2005)	brood-parasitism, invasive species

Psarocolius cassini	Conduct surveys to elucidate the distribution range. Research its ecology, especially aspects related to conservation, such as precise habitat requirements and tolerance of habitat degradation. Ensure effective protection of the currently known sites of occurrence. Advocate conservation measures within natural biotic areas/anthropogenic reserves	distribution, ecological requirements, area protection	The most pertinent threat is the destruction of forests. Particularly along rivers, forests are being cleared for agriculture, oil palm plantations, infrastructural development and commercial or small-scale logging (Strewe 1999). The development programmes for the Pacific region involve greatly expanding the road network, promoting human immigration and settlement, logging, agricultural expansion and mining (Dinerstein et al. 1995, Wege and Long 1995, WWF/IUCN 1994-1997, Strewe 1999). In the area north of Ensenada de Utría, a striking increase in logging (especially of large emergents), agricultural activity and road-building, notably the bridging of a large river, was noted between 1997 and 1999 (Strewe 1999). Plans to create an interoceanic canal and complete the Pan-American highway across the Darién Gap have been halted, but if re-started this would have a severe impact on forests and birds in the region (Dinerstein et al. 1995, Wege and Long 1995, WWF/IUCN 1994-1997). Importantly, the two recently discovered groups in the Western Cordillera are currently unprotected, while deforestation in the region is accelerating (Fraga and Sharpe 2018). Additionally, Baudo Oropendola is being trapped for food and for the cagebird trade (Fundación ProAves 2008)	habitat loss and degradation

Pselliophorus luteoviridis	Survey to determine its population and distribution, especially in areas between known sites. Research the species's ecological requirements. Enforce better protection of known sites. Monitor the extent and rate of deforestation	population size, distribution, ecological requirements, area protection, area management	Only isolated patches of forest remain in east Chiriquí, and the Serranía de Tabasará is generally threatened by clearance for coffee plantations, cattle-grazing, overuse of pesticides and fires (Alvarez-Cordero et al. 1994). The core of its range around Cerro Santiago (in the Ngobe-Bugle Comarca [indigenous homeland]) is undergoing increasingly rapid deforestation owing to subsistence agriculture and cattle raising, and deforestation has now reached the continental divide. Deforestation is now occurring at the higher elevations favoured by the species, even within the boundaries of protected areas (Angehr 2003)	habitat loss and degradation, pesticides impact
Psophia dextralis	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes	new protected areas, area management, area protection	The primary threat to this species is accelerating deforestation in the Amazon basin as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network (Soares-Filho et al. 2006, Bird et al. 2011). It is also declining as a result of hunting pressure (del Hoyo et al. 1996, 2014, A. Lees in litt. 2011). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011)	habitat loss and degradation, hunting

Psophia obscura	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes	new protected areas, area management, area protection	The primary threat to this species is accelerating deforestation in the Amazon basin as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network (Soares-Filho et al. 2006, Bird et al. 2011). It is also declining as a result of hunting pressure (del Hoyo et al. 1996, 2014, A. Lees in litt. 2011). A new map of forest degradation across the Brazilian Amazon indicates that forest degradation and burning have also occurred recently within the species's range (Floresta Silenciosa 2018). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011)	habitat loss and degradation, hunting
Pteroglossus bitorquatus	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest protected as Permanent Preservation	new protected areas, area management, area protection	Although the species shows some tolerance of habitat fragmentation and degradation, the extent of projected deforestation in its known range is sufficient to pose a threat (Soares-Filho et al. 2006, Bird et al. 2011, A. Lees in litt. 2011). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011)	habitat loss and degradation

	Areas (APPs), which function as vital corridors in fragmented landscapes			
Pyriglena atra	Protect the patches of forest at localities in the vicinity of Santa Luzia de Itanhi. Survey all suitable habitat within range to establish occurrence. Investigate its ecological requirements	area protection, distribution, ecological requirements	Habitat loss within its known range has been substantial, even of the second growth in which it appears to be most abundant. It has been reported more frequently from larger forest fragments (S. Sampaio in litt. 2003, 2007), and remaining tracts are destined to become ever smaller and more isolated	habitat loss and degradation
Pyrilia vulturina	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes	new protected areas, area management, area protection	The primary threat to this species is accelerating deforestation in the Amazon basin as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network (Soares-Filho et al. 2006, Bird et al. 2011). Whilst it shows some tolerance of habitat degradation, it may also be susceptible to hunting (A. Lees in litt. 2011). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011)	habitat loss and degradation, hunting
Pyrocephalus nanus	Protect remaining habitat. Conduct research to better understand the threats affecting this species	area protection, ecological requirements	Potential threats include parasites, disease, changes in land use or the application of pesticides (Wiedenfeld 2006, Merlen 2013)	brood-parasitism, disease, pesticides impact

Pyrrhura albipectus	Carry out surveys to assess the species's distribution and total population size. area management within its range. Manage Podocarpus National Park such that threatened species are better protected	distribution, population size, area management	Habitat destruction is the principal concern, as upper tropical zone forests east of the Andes are being cleared at an alarming rate. However, subtropical forests in Podocarpus National Park and Cordillera del Cóndor are largely intact (Schulenberg and Awbrey 1997, Snyder et al. 2000). Logging has been extensive at lower elevations within its range (to c.1,000-1,200 m), and is gradually encroaching on core altitudes. In the Cordillera de Cutucú, some forest has been cleared for agriculture and to secure indigenous people legal ownership of their land. Illegal gold mining and human settlement occur, even within Podocarpus National Park, particularly at its southern boundary (Snyder et al. 2000). In the Peruvian part of its range, there is little or no threat of deforestation; however, there is a mining concession in the area (F. Angulo in litt. 2012). It is trapped in small numbers for the domestic cage-bird trade (Snyder et al. 2000)	habitat loss and degradation, illegal trade
Pyrrhura amazonum	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest	new protected areas, area management, area protection	The primary threat to this species is accelerating deforestation in the Amazon basin as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network (Soares-Filho et al. 2006, Bird et al. 2011). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011). Capture for the wild bird trade may represent a significant further threat	habitat loss and degradation, illegal trade

	protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes			
Pyrrhura calliptera	Search for the species in Sumapaz National Park. Confirm its occurrence at Macizo de Tamá, Norte de Santander, and search in the adjacent El Tamá National Park, Venezuela. Study population densities in different forest-types and estimate current population (Salaman 2000). Strengthen the effective protection of Chingaza National Park and adjacent protected areas. Formally protect Vereda Monterredondo. Monitor success of nest boxes in Chingaza National Park, and monitor birds at Soata (Cortés-Herrera et al. 2007)	distribution, population size, area protection, monitor the population, reproductive success	Past and continuing forest destruction and fragmentation through logging, conversion to agriculture, human settlement and development of the road network have been extensive (Salaman 2000), especially below 2,500 m on the west slope (Stattersfield et al. 1998). Some 62% of its original habitat is estimated to have been lost (Botero-Delgadillo et al. 2012). The greatest current threats to forest in the Eastern Cordillera are cattle grazing and burning for agriculture (Cortés-Herrera et al. 2007). On the east slope, logging is fairly widespread, although some large areas of intact habitat persist (Stiles 1992, P. G. W. Salaman in litt. 1999). Low levels of selective logging affect Guanentá-Alto Río Fonce Fauna and Flora Sanctuary. It is persecuted by local farmers as a crop-pest, a problem which may intensify as further forest is cleared for agriculture. Locally, it is kept as a pet, but it is unaffected by international trade. Nest site availability is considered the main population limiting factor (Anon 2005)	habitat loss and degradation, hunting

Pyrrhura chapmani	Assess the population size. Monitor the population trend. Investigate the extent and impact of deforestation, habitat destruction, hunting and trapping on the population size. Protect the remaining habitat	population size, monitor the population, monitor illegal activities, area protection	This species has been strongly threatened by trade in the past, but this pressure has declined significantly since the late 1980s. The species is CITES II listed and trade is now minimal throughout its range; however, it remains susceptible to hunting and trapping (Collar et al. 2019). Pyrrhura chapmani is also threatened by significant deforestation throughout its range (Donegan et al. 2016). Tree cover loss between 2001 and 2018 within the range of Upper Magdalena Parakeet amounted to 530 km2 (Global Forest Watch 2019)	hunting, habitat loss and degradation
Pyrrhura cruentata	Survey to locate and protect additional undetected populations (Snyder et al. 2000), especially in south Bahia and north-east Minas Gerais. Ensure the de facto protection of key reserves, especially Sooretama, Linhares and Estação Vera Cruz. Confiscation of birds from trade, and well-planned release of such birds into areas of the species' former range to enhance recovery and connectivity of disjunct populations (J. Gilardi in litt. 2012)	population size, area protection, monitor illegal activities, reintroduction	Extensive and continuing forest clearance is responsible for its current fragmented distribution. Its apparent tolerance of shade cacao plantations provides little hope because shading techniques since the 1980s have involved the use of banana and Erythrina trees, rather than standing forest, and unstable prices have resulted in conversion to pasture. Many remaining populations are now affected by site-specific threats such as conflicts between habitat conservation and the rights of local communities in Monte Pascoal National Park. Trapping for the cage-bird trade is a relatively new phenomenon, but the species is rare in national and international markets	habitat loss and degradation
Pyrrhura eisenmanni	Carry out surveys to produce a population estimate. Determine its precise ecological requirements and its ability to persist in degraded and fragmented habitats. Evaluate extent of threat from habitat loss and whether any capture for the bird trade. Ensure the effective protection of existing protected areas in which it occurs	population size, ecological requirements, survival, area management, area protection	Concern has been expressed that this taxon's conservation status is deteriorating (Juniper and Parr 1998), and it is said to be suffering from on-going deforestation (Forshaw 2006), although Cerro Hoyo National Park appears largely intact. It is uncertain whether there is any risk to the species from capture for trade	unknown threat

Pyrrhura griseipectus	Carry out further surveys in similar areas to the Baturité Mountains in north-eastern Brazil, such as the serras de Aratanha, Maranguape and Machado, for the presence of additional extant populations. Continue monitoring the known population in the Serra do Baturité. Improve conservation management practised in the Guaramiranga Ecological Park. Provide incentives for landowners to increase the network of private reserves in the Baturité Mountains. Monitor and control trade at local, national and international levels. Investigate the feasibility of using Giant Bamboo (Dendrocalamus giganteus) as artificial nest sites (Campos et al. 2014). Continue to conduct awareness campaigns to promote the Grey-breasted Parakeet as a symbol for the conservation of the moist forests and associated biodiversity in the Baturité Mountains. Investigate ex situ conservation measures	distribution, monitor the population, area management, new protected areas, trade regulation, environmental education, captive breeding	The principal threat to this species is believed to come from ongoing trapping for illegal local and national trade (C. Albano in litt. 2006, Anon. 2009; Girão and Albano 2008) and captive-breeding (Fernandes-Ferreira et al. 2012). The species occurs in the international cage bird trade. However, there has been a notable decrease in the illegal capture and trade of the species, possibly as a result of the ongoing education programme (F. Nunes in litt. 2016). Habitat destruction has played a role in the species's decline with original forest cover now reduced to just 13%. Coffee plantations (especially where sun coffee is grown instead of shade coffee) are impacting upon the species's habitat. Lack of natural nest sites, and nest predators (bees, wasps and small mammals) are also thought to be limiting the species's reproductive success (Campos et al. 2014)	habitat loss and degradation, illegal trade
Pyrrhura lepida	Census and monitor populations to assess the global population and demographic trends and to refine the distribution and locate strongholds. Investigate its ecology, threats and conservation	population size, ecological requirements, area management, area protection	Despite an apparent tolerance of some habitat degradation, it is perhaps close to extinction in coastal areas of north Maranhão, owing to large-scale deforestation (Juniper and Parr 1998). It occurs within protected areas, but their integrity is compromised by illegal logging (Juniper and Parr 1998). Deforestation in the	habitat loss and degradation

	requirements. Strengthen the network of protected areas within remaining core habitat. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes		Amazon basin is expected to increase as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network (Soares-Filho et al. 2006, Bird et al. 2011). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011)	
Pyrrhura leucotis	Continue monitoring this species in the field and in trade. Strengthen the protected area network within the Atlantic Forest of Brazil to conserve key sites	evaluate the threats, monitor the population, area protection	Forest clearance has been extensive, affecting most of the "matas de tabuleiro" in Bahia and Espirito Santo. Most of the original forest cover in the species’s range was cleared over a century ago, but remnant patches (e.g. where left to shade understorey plantations) are now being rapidly cleared (del Hoyo et al. 1997). The species is fairly frequently confiscated in captivity, suggesting that this taxon is frequently harvested for trade (J. Gilardi in litt. 2010)	habitat loss and degradation, illegal trade

Pyrrhura orcesi	Conduct surveys to determine its distribution and population status (Wege & Long 1995). Investigate the Cordillera de Molleturo Protection Forest's suitability for wildlife conservation. Assess threats to the species (Snyder et al. 2000). Extend the nest box scheme (H. M. Schaefer in litt. 2012)	population size, distribution, evaluate the threats, nest box	Below 900 m, the rate of deforestation in west Ecuador was 57% per decade in 1958-1988, although in the higher parts of its range, with steeper terrain and a harsher climate, deforestation is slower and a greater proportion of forest remains (Dodson & Gentry 1991). In particular, rapid rates of logging around Piñas and Manta Real occurred during the late 1980s and 1990s (N. Simpson in litt. 2000). Typically, these areas were then burnt for cattle-farming. Mining is an additional threat (H. M. Schaefer in litt. 2012). The species is particularly threatened because it does not occur at higher elevations. Lack of suitable nesting trees may be a limiting factor and nesting at suboptimal sites may increase predation by species such as Crimson-rumped Toucanet (Anon. 2006, Garzón & Juiña 2007, Waugh 2007). Its favoured nesting tree Dacryodes peruviana is highly sought after and frequently targeted for human use (Garzón & Juiña 2007). Subpopulations may be isolated due to forest fragmentation, and the communal breeding system of the species might further increase its vulnerability to habitat loss (H. M. Schaefer in litt. 2007). Owing to the cooperative breeding system, only ~50% of mature individuals reproduce. The species suffers from limited genetic diversity as reproductive output is directly related to the genetic diversity of flocks (Klauke et al. 2013). Inbreeding is known to occur, although its effects are unclear (H. M. Schaefer in litt. 2012). Climate change is apparently causing a very pronounced upslope shift in distribution (now 900-1,600m within Buenaventura valley where it was originally 600-1,100 in the 1980s; Klauke et al. 2016), with a corresponding drastic shrinking of distribution size and available habitat similar to Ecuadorian Tapaculo (Hermes et al. 2017)	habitat loss and degradation, climate change, endogamy

Pyrrhura pfrimeri	Determine the extent of remaining habitat and current rates of deforestation. Closely monitor the species in trade in case demand increases	area management, monitor illegal activities	The principal threat to this species is deforestation driven by selective logging, fires and habitat conversion to pasture (Olmos et al. 1998). Dry forest in Goiás decreased from covering 15.8 % of the region in 1990 to only 5.8 % in 1999, and less than 1 % of the remaining fragments were larger than 100 ha (F. Olmos in litt. 2007). There has been a 66% decrease in available habitat in the past 31 years, with a current annual deforestation rate of 2.1% (Bianchi 2010). Rapid deforestation is occurring within the species's range to create pasture and widespread burning to improve poor pasture is destroying dry forest habitat. Logging mainly targets durable woods that are commonly used to make fence poles, and cement companies are beginning to target areas of limestone outcrops (C. A. Bianchi in litt. 2006, 2007). The species is rarely recorded in trade or exotic bird collections but this poses a potential threat (Olmos et al. 1998). Population pressure will increase as its range lies close to the capital city, Brasilia (Olmos et al. 1998)	habitat loss and degradation, illegal trade
Pyrrhura snethlageae	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest	new protected areas, area management, area protection	The primary threat to this species is accelerating deforestation in the Amazon basin as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network (Soares-Filho et al. 2006, Bird et al. 2011). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011). Capture for the wild bird trade may represent a significant further threat	habitat loss and degradation, illegal trade

	Code that would lead to a decrease in the width of the areas of riverine forest protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes			
Pyrrhura subandina	Carry out further searches within its potential historic range, and follow up any reports of the species. If an extant population is found, immediately protect habitat	distribution, new protected areas	Ongoing conversion of habitat for agriculture within the historic range has dramatically reduced the area available to this species (Joseph and Stockwell 2002, ProAves in litt. 2011)	habitat loss and degradation

Pyrrhura viridicata	Estimate current population levels and the area of remaining suitable habitat (Snyder et al. 2000). Evaluate the state of all known populations, and localise new populations according to distribution models (C. Olaciregui in litt. 2012). Study its habitat tolerance and population densities in different forest-types (Snyder et al. 2000, Salazar and Strewe undated). Research its ecology, movements and conservation status (Snyder et al. 2000). Work with local communities and regional institutions to identify and prioritise conservation and management strategies (Salazar and Strewe undated). Establish education programmes working with local communities to combat hunting and persecution (Strewe 2005)	population size, distribution, monitor the population, ecological requirements, integrate local people, environmental education	Only 15% of the original vegetation in the Sierra Nevada de Santa Marta remains, albeit largely on the north slope where this species occurs (L. M. Renjifo pers. comm. 1993, 2000). The main current threat is the expansion of non-native tree plantations, such as those of pine and eucalyptus, along with on-going clearance of land for livestock farming (C. Olaciregui in litt. 2012). Historically, conversion of forest to marijuana and coca plantations was also a major threat (L. G. Olarte in litt. 1993, L. M. Renjifo pers. comm. 1993, J. Fjeldså verbally 2000, L. M. Renjifo pers. comm. 2000, C. Olaciregui in litt. 2012), which was compounded by the government spraying herbicides on the sierra (L. G. Olarte in litt. 1993, L. M. Renjifo pers. comm. 1993, 2000). Other threats that followed human immigration to the area from the 1950s onwards include logging and burning (Dinerstein et al. 1995, Snyder et al. 2000, Salazar and Strewe undated, P. G. W. Salaman in litt. 1999). It is known to be hunted in the río Frío valley, and in San Pedro district individuals in blackberry plantations have been shot. The species has not been found in the local bird trade (Strewe 2005)	habitat loss and degradation, pesticides impact, hunting
Ramphastos ariel	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for	new protected areas, area management, area protection	The primary threat to this species is accelerating deforestation in the Amazon basin as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network (Soares-Filho et al. 2006, Bird et al. 2011). It is also declining as a result of hunting pressure (del Hoyo et al. 2002, 2014). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011)	habitat loss and degradation, hunting

	agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes			
Ramphomicron dorsale	Conduct research into the species's ecology and life history. Estimate area of occupancy (C. Olaciregui in litt. 2012). Confirm presence at sites where the species was historically recorded (C. Olaciregui in litt. 2012). Carry out surveys to obtain a population estimate. Monitor trends in the population. Monitor the extent and condition of habitat. Raise awareness of the species's plight amongst local people. Increase the area of suitable habitat that receives adequate protection. Encourage sustainable livestock and land management practices	ecological requirements, distribution, population size, monitor the population, area management, new protected areas, environmental education	Forest clearance for agriculture is severe and has reached this species's elevation range (O. Cortes in litt. 2011), whilst trees in some areas are unsustainably cut for firewood (N. Krabbe in litt. 2010). The state of páramo and the timberline-páramo ecotone in parts of the species's range is described as "disastrous" (Fundación ProAves 2011). Extensive and regular burning (N. Krabbe in litt. 2010, Fundación ProAves in litt. 2011) and heavy livestock grazing are causing severe damage to the timberline zone (Fundación ProAves 2011). The species is also potentially affected by climate change (Fundación ProAves 2011)	habitat loss and degradation, livestock disturbance, climate change

Rhegmatorhina gymnops	Expand the protected area network to effectively protect IBAs. Effectively resource and manage existing and new protected areas, utilising emerging opportunities to finance protected area management with the joint aims of reducing carbon emissions and maximizing biodiversity conservation. Conservation on private lands, through expanding market pressures for sound land management and preventing forest clearance on lands unsuitable for agriculture, is also essential (Soares-Filho et al. 2006). Campaign against proposed changes to the Brazilian Forest Code that would lead to a decrease in the width of the areas of riverine forest protected as Permanent Preservation Areas (APPs), which function as vital corridors in fragmented landscapes	new protected areas, area management, area protection	The species is suffering from widespread deforestation in Pará and, particularly, Mato Grosso, which has increased markedly since the 1960s due to road building, ranching, smallholder agriculture, mining and hydroelectric development (Cleary 1991, Stotz et al. 1996). The primary threat to this species is accelerating deforestation in the Amazon basin as land is cleared for cattle ranching and soy production, facilitated by expansion of the road network (Soares-Filho et al. 2006, Bird et al. 2011). This is a particularly acute threat for this highly fragmentation sensitive species (Lees & Peres 2010). A population became extinct in a 230 ha forest patch 17 years after the fragment became isolated, due to the extinction of Eciton burchelli swarms (A. Whittaker; in Lees & Peres 2010). Proposed changes to the Brazilian Forest Code reduce the percentage of land a private landowner is legally required to maintain as forest (including, critically, a reduction in the width of forest buffers alongside perennial steams) and include an amnesty for landowners who deforested before July 2008 (who would subsequently be absolved of the need to reforest illegally cleared land) (Bird et al. 2011	habitat loss and degradation

Rhopornis ardesiacus	Establish further protected areas within the species' range, especially at Salto da Divisa, Minas Gerais (E. Luiz in litt. 2012). Regulate land use within Boa Nova national park and restore habitats there (E. Luiz in litt. 2012)	new protected areas, area management, regulate land use	Dry forest in east Bahia has been reduced to scattered fragments by rapid and continuing clearance for cattle pasture as well as clearance for firewood by local communities. Cattle and goats trample seedlings and prevent forest regrowth, and in some areas bromeliads are harvested for sale (E. Luiz in litt. 2007). Fragments totalled about 965 km2 in the early 1970s and, by 1990, 5-20% (nearer 5%) of primary dry forest was estimated to remain in this part of Bahia. However, much of what remains is apparently unsuitable for the species since many woodlots are highly disturbed by livestock. Furthermore, it has not been found in several areas of relatively pristine habitat	habitat loss and degradation, livestock disturbance, plant collecting

Rhynchopsitta terrisi	Protect all nesting colonies and wintering areas (R. Valdés-Peña et al. in litt. 2007, 2010). Conduct surveys to search for undiscovered colonies and extend captive breeding efforts. area management throughout its range. Actively control fires. Restore habitat affected by fires (Valdés-Peña and Ortiz Maciel 2007). Determine precise habitat usage (Macias Caballero 1998). Implement a permanent environmental education programme for local communities (R. Valdés-Peña et al. in litt. 2007, 2010). Develop alternative sustainable activities for local people in order to decrease pressure on habitat (R. Valdés-Peña et al. in litt. 2007, 2010, Ortiz-Maciel et al. 2010)	area protection, captive breeding, distribution, area management, ecological requeriment, environmental education, sustainable activities	Intensive grazing and agricultural conversion have destroyed and degraded forest (Snyder et al. 1996, Macias Caballero 1998). Annual fires burn large areas (in 1998, 20 km2 of foraging habitat were lost [Gómez-Garza and Garza-Tobón 1998], and 20 km2 of pine forest, including 90% of El Taray Sanctuary, were lost to two wildfires in 2005-2006 [Valdés-Peña and Ortiz Maciel 2007, R. Valdés-Peña et al. in litt. 2007, 2010]), which regenerate as dense (and unsuitable) chaparral vegetation (Snyder et al. 1996, Macias Caballero 1998). Data suggest that between 1999 and 2008 more than 15,400 ha of pine forest in the species's breeding range were destroyed by wildfires (S. G. Ortiz-Maciel et al. in litt. 2010). Droughts fuel fires and dry up natural water sources (in 1994, at least 50 birds drowned whilst attempting to drink from a cement-walled water tank [Snyder et al. 2000]). Additionally, the species is affected by low pinion production, and pressure from local people who collect pinions as an alternative income source (R. Valdés-Peña et al. in litt. 2007, 2010). Forest is also cleared for timber extraction (Valdés-Peña and Ortiz Maciel 2007). Climate change may also affect this species, as with a shift towards a drier environment may have a negative effect on breeding performance (Ortiz-Maciel et al. 2014), and could lead to the complete disappearance of this species's currently occupied habitat by 2090 (Monterrubio-Rico et al. 2015). The species is affected by some trapping and shooting (Ortiz-Maciel et al. 2006, Valdés-Peña and Ortiz Maciel 2007) and may experience years of low breeding success (Ortiz-Maciel et al. 2006, 2014) or even zero recruitment (R. Valdés-Peña et al. in litt. 2007, 2010)	habitat loss and degradation, climate change, hunting
Sclerurus cearensis	NA	NA	The species is threatened with extensive forest loss throughout its range, and is thought to be very intolerant of any habitat alteration, with even selective logging affecting local abundance (Remsen 2016)	habitat loss and degradation

Scytalopus canus	Carry out surveys to obtain a population estimate. Search for the species at areas of páramo near the known locations. Monitor population trends. Monitor the extent and condition of suitable habitat. Improve the protection of Paramillo National Park. Increase the area of protected habitat at Páramo de Frontino	population size, distribution, monitor the population, area management, area protection, new protected areas	Deforestation continues to affect the timberline ecotone in the species's range (Fundación ProAves 2011). Its habitats are also threatened by fires. In January 2010, a fire accidentally started by hikers destroyed an area of suitable habitat at Páramo de Frontino. Its ability to adapt to regenerating forest (Fundación ProAves in litt. 2011) may limit the impacts of these threats. As a high elevation species it is potentially threatened by the effects of climate change, which may influence the frequency and severity of fires and droughts and could alter the extent of suitable habitats (Fundación ProAves 2011)	habitat loss and degradation, climate change
Scytalopus diamantinensis	Carry out surveys to find new locations and obtain a population estimate. Monitor population trends. Monitor the extent and condition of suitable habitat. Promote sustainable ecotourism practices. Protect more forest fragments in the species's known range, perhaps partly through encouragement of private reserve designation (Bornschein et al. 2007). sustainable activities to reduce pressure on habitats	distribution, monitor the population, area management, ecotourism, new protected areas, sustainable activities	Its habitat is threatened by clearance for agriculture, primarily the cultivation of coffee and bananas, as well as cutting for both subsistence and industrial scale charcoal production and frequent wildfires originally set to improve pasture or clear vegetation for shifting agriculture (Bornschein et al. 2007, R. Belmonte-Lopes and M. R. Bornschein in litt. 2009). The remaining forest fragments in the Chapada Diamantina are described as very disturbed. Large-scale governmental projects and unsustainable ecotourism are also listed as threats (Bornschein et al. 2007). The species's ability to persist in both young and old secondary growth, including regenerating logged forest (Bornschein et al. 2007) indicates some tolerance of habitat degradation and disturbance	habitat loss and degradation
Scytalopus gonzagai	Surveys are required throughout the range to more accurately estimate the population of this and the additional restricted range species present within the Boa Nova-Iguai region. Awareness	population size, environmental education, sustainable forest management	Over 40% of the potential area of occupancy of the species is unprotected and suffers ongoing pressure from deforestation and logging, plus the conversion of secondary areas to pasture through burning. The apparent highly specialised habitat requirements render it potentially vulnerable to environmental change caused by	habitat loss and degradation, climate change

	and education work is required in local communities using these habitats, and a locally agreed management plan that retains zones of intact forest alongside productive forest is required		future climate alteration	
Scytalopus iraiensis	Abandon the planned construction of dams that would flood areas where this species occurs. Cease drainage, fires and all sand extraction operations in such areas. Create further conservation units to protect the species. Survey similar habitat in Sao Paolo and Santa Catarina. Conduct detailed studies of the species's ecology	area protection, new protected areas, distribution, ecological requirements	The Iraí dam has already flooded the type-locality, and urbanisation, industrial development and road-building affect other sites in this vicinity. There is a proposal to construct three further dams to cope with the water demands of Curitiba. The grasslands of the region are being systematically drained owing to canalisation schemes for improved agricultural land and pasture. Subsurface sand extraction and the planting of Eucalyptus trees have altered the landscape and vegetation in several areas. The use of widespread burning is common practice on these lands, which changes the floral composition and promotes the spread of invasive species	habitat loss and degradation, urban intensification
Scytalopus novacapitalis	Repeat surveys of known sites to determine rates of range contraction and population trends. Conduct further studies to determine whether this species can tolerate secondary or disturbed habitats or fragmentation	population size, ecological requirements	The population trend is suspected to be declining moderately rapidly owing to habitat loss and degradation. Due to the low agricultural potential of this species's favoured habitat, it has not been greatly affected by clearance for agriculture. Nevertheless, the annual burning of adjacent grasslands must limit the availability and extent of suitable habitat (Machado et al. 1998). Wetland drainage and the sequestration of water for irrigation schemes is further reducing habitat (Machado et al. 1998). The species’s range is severely fragmented, with continuing decline in area and quality of habitat owing to pollution, water extraction, trampling by livestock and mining	loss of water sources, habitat loss and degradation

Scytalopus robbinsi	Conduct playback surveys in the Buenaventura reserve and within the species's altitudinal range in El Oro, Azuay and Cañar to monitor population numbers and trends. Encourage SE Guayas and El Oro banana companies to protect remaining forest within their catchments (P. Coopmans in litt. 2006). Establish protected areas within the species's range to help protect remaining forests and restore connectivity between fragments	population size, area protection, new protected areas, connectivity, monitor the population	The species is threatened by habitat loss and fragmentation within its small range. As a forest dependent species intolerant of significant habitat modification and degradation, it is reportedly more susceptible to these threats than the El Oro Parakeet (Pyrhura orcesi), which occupies a very similar range and is considered to be Endangered. The main threats to remaining habitat are posed by forest clearance for livestock and conversion to plantations as well as gold mining. Upslope movement due to climate change is already occurring and is projected to lead to a continued shrinkage in distribution and available habitat (M. Schaefer in litt. 2016)	habitat loss and degradation, climate change
Scytalopus rodriguezi	Conduct further surveys to confirm the species presence on the East Andes side of the valley. Provide further protection against forest clearance within the existing Finca Merenberg Natural Reserve. Continue lobbying for Important Bird Area status for the area and the establishment of a protected area at Serranía de las Minas	distribution, area protection, new protected areas	Deforestation is the principal threat to the species, at least in the short term. The east slope of the Yariguíes massif has been extensively deforested, especially between 400 m and 2,000–2,400 m, while deforestation on the west slope has reached 1,700–1,900 m (Donegan et al. 2013). Selective logging, forest clearance to create pasture, and habitat degradation owing to trampling by free roaming livestock are the main drivers of its decline. Clearance in places of hundreds of mature oak and other hardwoods has drastically changed the forest physiognomy	habitat loss and degradation, hunting

Selasphorus ardens	Survey to clarify its actual distribution and abundance. Study its habitat requirements. Determine the identity of the birds on the Azuero Peninsula. area management within its range. Establish a protected area around Cerro Santiago and neighbouring peaks (G. Angehr in litt. 2007)	distribution, population size, ecological requirements, identification of bird species, area management, new protected areas, abundance	Although the species can survive in disturbed and secondary forest, it probably cannot if the forest is completely removed for pasture (G. Angehr in litt. 2013). Forest in eastern Chiriquí is becoming fragmented, and the Serranía de Tabasará is generally threatened by subsistence agriculture, clearance for coffee plantations, cattle-grazing, over-use of pesticides and fires (Alvarez-Cordero et al. 1994, G. Angehr in litt. 2007). Deforestation for subsistence agriculture is severely affecting the core of the species's range in the area of Cerro Santiago (G. Angehr in litt. 2007, G. Angehr in litt. 2013)	habitat loss and degradation
Sephanoides fernandensis	Continue to monitor the population using a quantitative census methodology that allows for statistical comparisons between surveys. Ensure that Cabbage Trees that were destroyed by the 2010 tsunami are replanted (Hahn et al. 2015). Enforce grazing restrictions on national park land (Roy et al. 1999). Evaluate feasibility of establishing feeding stations in native forest. Continue to replant native plants. Continue to support ongoing efforts to remove alien invasive plants and mammalian predators, and increase awareness. Investigate scale of predation risk from Austral Thrush and consider control measures if appropriate (Hahn et al. 2011a). Undertake research to evaluate genetic variation and inbreeding depression within the population (Roy et al. 2013)	monitor the population, area management, area protection, control programme for invasive species, environmental education, genetic	The clearance and degradation of vegetation by humans since the late 16th century and the impacts of herbivorous mammals (especially rabbits introduced in the 1930s) has limited the availability, quantity and quality of food resources. Wood harvesting at lower altitudes has contributed to the loss of native habitat (Roy et al. 2013). Habitat quality is also being degraded by the spread and dominance of invasive plants, most prominently by Elm-leaf Blackberry Rubus ulmifolius, Maqui Aristotelia chilensis and Murtilla Ugni molinae (Anon. 2005). Introduced predators, such as rats, cats and coatis, have been implicated in the mortality of some birds and may be responsible in part for its decline (Roy et al. 1999, Hahn and Römer 2002). Cats have been documented killing firecrowns in town during the non-breeding season (Hodum in litt. 2007, 2008). Austral Thrush Turdus falcklandii has been observed predating firecrown nests and may represent a threat (Hahn et al. 2011a). As is true with many island species, firecrowns are easily approached, thus rendering them highly susceptible to predation. Additionally, during its nocturnal torpor, this species is presumed to be very vulnerable to predation (Hahn and Römer 2002). Males are able to defend territories with highly productive resources, but the smaller females are possibly being indirectly outcompeted by S. sephaniodes (Roy et al. 1999, Wolf 2008). Observations of interactions between the two species in 2006-	habitat loss and degradation, invasive species

			2007 found no evidence that male fernandensis were negatively affected by S. sephaniodes, but that female fernandensis may suffer from interference competition and may be marginalised from high quality foraging habitat (Wolf and Hagen 2012). S. sephaniodes prefers sites with denser vegetation, higher species diversity and located less high off the ground, and therefore may not constrain nesting habitat use by S. fernandensis; alternatively competitive displacement for nest site choices may already have occurred (Hahn et al. 2011a). A study in 2016 found a negative association between the abundance of the two species in the post-breeding season, with individuals of both species tending to congregate in area where the other was less abundant (Vizentin-Bugoni et al. 2017). Preliminary analyses of the population revealed some genetic variation, but significantly less than in S. sephaniodes (Roy et al. 1999). A devastating tsunami in February 2010, which destroyed the only town on Robinson Crusoe had a significant impact on the species, reducing the population to 740 individuals in March 2011 (I. Hahn in litt. 2015). Seasonally important populations of the endemic Cabbage Tree (Dendroseris litoralis) in the coastal zone were lost as a result of the tsunami which resulted in a reduction in the local abundance of Juan Fernandez Firecrown (Hahn et al. 2015). The disaster likely also reduced cat predation	

Spizella wortheni	Survey to identify additional breeding/wintering sites. Monitor known populations, and evaluate survival on natural and agricultural breeding areas (R. Canales del Castillo, I. Ruvalcaba Ortega and J. González Rojas in litt. 2016). Assess precise ecological requirements and understand local movements (Garza de Leon et al. 2007). Implement rotational grazing regimes at known sites (Wege et al. 1993). Identify main predators and their impact over the reproductive success of the species. Develop an environmental education programme to promote the value of the ecosystem (Garza de Leon et al. 2007), and the importance of appropriate grazing regimes	breeding area, survival, ecological requirements, area management, reproductive success, environmental education, monitor the population	Open shrub-grasslands have been greatly reduced by agriculture and grazing, and the rate of habitat conversion is increasing, primarily for production of potatoes (M. A. Cruz-Nieto in litt. 2007). There has been a progressive loss of habitat even on the Coahuila-Nuevo León border, especially in the El Potosí Valley (M. A. Cruz-Nieto in litt. 2007). Grazing and the use of chemicals modify and reduce the quality of the habitat and disturb nesting birds (Garza de Leon et al. 2007). It seems unlikely that large tracts of habitat remain near the currently known sites (Wege et al. 1993, Garza de Leon et al. 2007, Canales del Castillo et al. 2010). Reported reproductive success is very low, only 14% in La India, and 18.3% overall based on monitoring of 175 nests (R. Canales del Castillo, I. Ruvalcaba Ortega and J. González Rojas in litt. 2016); predation (Garza de Leon et al. 2007, Ruvalcaba-Ortega et al. in prep.) and livestock disturbance (Canales del Castillo et al. 2010) seem to be the main causes, but it is not known how this affects populations (Garza de Leon et al. 2007). Snakes, birds and coyotes are thought to predate nests (Ruvalcaba-Ortega et al. in prep., M. A. Cruz-Nieto in litt. 2007)	habitat loss and degradation
Sporophila iberaensis	NA	NA	This species is threatened by habitat loss and destruction from forestation and agriculture, and may also be affected by capture for trade (A. Di Giacomo in litt. 2016)	habitat loss and degradation, illegal trade
Synallaxis courseni	Monitor the population. Assess the impact of current activities on the status of this species. Develop a conservation education programme at Ampay National Sanctuary and erect signposts to discourage damaging activities (T. Valqui in litt. 1999). Conduct further	monitor the population, evaluate the threats, environmental education, population size, distribution	Podocarpus trees continue to be cut on the Nevada Ampay (T. Valqui in litt. 1999). Large numbers of people visit the sanctuary at the weekend, some with slingshots, and disturbance is considerable (T. Valqui in litt. 1999). Grazing is an additional threat, with livestock farming commonplace even inside the protected area (J. Valenzuela in litt. 2012)	habitat loss and degradation, livestock disturbance

	surveys for the species outside the sanctuary. Complete a full population census			
Synallaxis fuscorufa	The species is considered Vulnerable at the national level in Colombia (Renjifo et al. 2002). It is found within the Sierra Nevada de Santa Marta National Park (Córdoba and Renjifo 2002). Research is currently being carried out on the conservation of habitats for birds resident to the sierra (Córdoba and Renjifo 2002)	area protection	Habitats are seriously threatened by illegal agricultural expansion, logging and burning (Dinerstein et al. 1995, Córdoba and Renjifo 2002). Only 15% of the sierra's original vegetation is currently unaltered (Stattersfield et al. 1998), and the species has lost 59% of its habitat (Córdoba and Renjifo 2002). The best known area, the Cuchilla de San Lorenzo, is not within the Sierra Nevada de Santa Marta National Park (Córdoba and Renjifo 2002)	habitat loss and degradation
Synallaxis hypochondriaca	Survey to determine this species's precise distribution. Study its habitat requirements. Assess the impact of threats. Protect suitable habitat against clearance and degradation	distribution, ecological requirements, evaluate the threats, area protection	It is highly likely that this species's habitat is under pressure (Fjeldså and Krabbe 1990). The Marañón drainage has been under cultivation for a long time and habitat in the valley has progressively deteriorated. The spread of oil-palms, cattle-ranching and logging are all serious threats to remaining habitat, with oil extraction a potential future problem (Dinerstein et al. 1995)	habitat loss and degradation
Synallaxis infuscata	Survey sites with historical records of this species and any other remnant patches of habitat in Alagoas and Pernambuco. Designate Murici as a biological reserve and ensure its de facto protection. Continue the reforestation programme and de facto protection at Pedra Talhada Biological Reserve	distribution, area protection, area management	There has been massive clearance of Atlantic forest in Alagoas and Pernambuco, and it is estimated that only 2% of the original forested area remains in the range of the species. Also, most forest fragments the species occur are smaller than 500 ha. The extent of forest at Murici has been reduced from 70 km2 in the 1970s, to a mere 30 km2 of highly disturbed and fragmented habitat in 1999 (J. M. Goerck in litt. 1999), largely as a result of logging and conversion to sugarcane plantations and pastureland. In January 1999, new logging roads were evident and such forest fragments are still severely threatened by fires spreading from adjacent plantations (J. M. Goerck in litt. 1999, A. Whittaker in litt. 1999)	habitat loss and degradation
Synallaxis zimmeri	Survey to identify priority areas for	distribution, status,	Dense undergrowth habitat within its range is severely threatened	habitat loss and

	conservation action within its range and further define its current distribution. Assess populations at known sites. Establish at least one protected area to benefit the species	new protected areas	by cattle-grazing and clearance for farm expansion	degradation
Tangara fastuosa	Survey sites without recent records, especially São Miguel dos Campos, Tapacurá, Saltinho and João Pessoa, and any other remnant habitat fragments. Pursue conservation initiatives for the most important previously unreported populations, especially Usina Serra Grande, Mata da Macambira, Usina Utinga-Leao and Usina Santo Antonio (Silveira et al. 2003). Ensure the de facto protection of the Murici biological reserve. Enforce legal measures to prevent trade. Develop captive breeding programmes to support future reintroduction and population supplementation efforts	species conservation project, area protection, monitor illegal activities, captive breeding	Heavy trapping for trade results from the high prices commanded by the species's exceptional plumage; illegal capture remains a threat (Pereira et al. 2014). There has been massive clearance of original Atlantic forest in north-east Brazil with just 2% remaining (Silveira et al. 2003), largely as a result of logging and conversion to sugarcane plantations and pastureland. None of the remaining forest fragments is larger than 4,000 ha, with most of this still subject to selective logging and poaching (Silveira et al. 2003). For example, forest at Murici reduced from 70 km2 in the 1970s, to a fragmented 30 km2 in 1999 (J. M. Goerck in litt. 1999). The site is severely threatened by fires spreading from adjacent plantations and further logging, with new roads evident in January 1999 (J. M. Goerck in litt. 1999, A. Whittaker in litt. 1999)	illegal trade, habitat loss and degradation, hunting
Taphrolesbia griseiventris	distribution between known sites (T. Züchner in litt. 1999 F. Angulo in litt. 2012). Assess the population status at known sites (T. Züchner in litt. 1999). Research the biology and habitat preferences of the species (T. Züchner in litt. 1999). Protect known sites (T. Züchner in litt. 1999). A new protected area for the species has been proposed (Angulo et al. 2008). Develop a land management strategy (possibly	distribution, status, ecological requirements, area protection, new protected areas, area management, integrate local people, environmental education	It is threatened by deforestation, burning of its habitat (especially shrubby areas to stimulate regeneration of pastures), agriculture and livestock raising (F. Angulo in litt. 2012). It has apparently disappeared from the most heavily populated areas within its range. It seems to tolerate some degree of habitat alteration, but whether it can complete its life-cycle or occur at normal densities in heavily cultivated areas is not known. There are plans to construct a damn at rio Chonta, which would probably destroy the species's habitat there (F. Angulo in litt. 2012)	habitat loss and degradation

	introducing a rotational grazing regime fencing off some breeding and foraging areas) for the Rio Chonta area (near Otuzco village) (H. Lloyd in litt. 2007). Identify preferred food sources and encourage the planting of these by farmers and local communities (H. Lloyd in litt. 2007). Implement an environmental education on the species in schools and colleges in Cajamarca (H. Lloyd in litt. 2007). Survey the Sunchubamba Hunting reserve to determine whether the species is found there (F. Angulo in litt. 2012)			
Terenura sicki	Survey Novo Lino and any other remnant patches of habitat in Alagoas and Pernambuco to ascertain the species's presence, and identify suitable areas for conservation action. Ensure the de facto protection of Murici Ecological Station, and protect Mata do Estado and Pedra Dantas (S. Roda in litt. 2007). Continue the reforestation programme and de facto protection at Pedra Talhada	distribution, area protection, area management	There has been massive clearance of Atlantic forest in Alagoas and Pernambuco, largely as a result of logging and conversion to sugarcane plantations and pastureland. Forest at Murici has been reduced from 70 km2 in the 1970s, to a mere 30 km2 of highly disturbed and fragmented habitat in 1999 (J. M. Goerck in litt. 1999). The site is severely threatened by fires spreading from adjacent plantations and further logging (new roads were evident in January 1999) (J. M. Goerck in litt. 1999, A. Whittaker in litt. 1999). Just one pair has been encountered here in recent years, and the species is feared to be disappearing from the reserve (Albano 2009). There is significant (and largely unsurveyed) forest remaining at Usina Serra Grande (A. Whittaker in litt. 1999), but the current condition of forest at Água Azul and in Novo Lino is unknown	habitat loss and degradation

Thalurania ridgwayi	Conduct surveys to determine the species's precise distribution and obtain an estimate of its population size. Investigate its ecological requirements. Assess the severity of the threat from habitat destruction. Increase the area of suitable habitat that has protected status	distribution, population size, ecological requirements, new protected area	The reasons for this species's patchy distribution, as well as its precise ecological requirements, are poorly understood. The avoidance of edge habitats indicates that it is probably threatened by habitat destruction. Forests within its range are cleared mainly for conversion into plantations for sun coffee	habitat loss and degradation
Thalurania watertonii	Effectively protect and manage protected areas where the species occurs. Study its ecology and its ability to persist in degraded and fragmented habitats. Attempt to obtain an accurate estimate of its population size and trends	area management, ecological requirements, survival	Widespread and continuing disappearance of lowland forest in north-eastern Brazil is likely to be causing declines, the Atlantic forests north of the Sao Francisco river having been drastically reduced, with less than 4% remaining by 1995. It seems able to accept man-made habitats as long as patches of forest or stands of scattered trees remain	habitat loss and degradation
Thripophaga amacurensis	NA	NA	In the eastern part of its range there appear to be no immediate threats (Fjeldså and Sharpe 2016), but in the west deforestation may be affecting this species. Logging, oil exploration and clearance for agriculture are particular threats (Hilty et al. 2013, Lentino and Sharpe 2015); and by April 2010 the most westerly of its four sites had been deforested (Lentino and Sharpe 2015)	habitat loss and degradation
Thripophaga macroura	distribution to locate additional populations. Monitor known populations. Ensure continued protection of the four reserves where it occurs. Protect other key sites for the species	distribution, monitor the population, area protection	Widespread and continuing habitat destruction has severely fragmented this species's range. Although it has been observed in degraded forest, it may be dependent on the presence of dense vine-tangles, which are likely to occur only in little-disturbed and mature secondary forests	habitat loss and degradation

Thryophilus nicefori	Conduct field surveys to determine its population size and distribution. Study its ecological requirements and natural history. Assess threats to the species. Use any new data collected to draft and execute a conservation strategy for the species. Raise the profile of this species in Soata and promote an environmental pride campaign to facilitate its conservation (O. Cortes in litt. 2007). Protect areas of dry forest within its range	ecological requirements, population size, distribution, evaluate the threats, species conservation project, integrate local people, new protected areas	This species is a habitat specialist, and its distribution is limited to Tricanthera spp and Pithecellobium dulce premontane forest along the River Chicamocha (O. Cortes in litt. 2012) . The greatest threat to the survival of this species is the destruction of these forests. The current threats to habitat in Chicamocha area are: cattle grazing, which has probably restricted the Tricanthera woodlands to steep slopes, inaccessible to cattle, and caused major fragmentation of the forest; burning for agriculture, which has caused a considerable reduction in the amount of vegetative cover; landslides; and firewood cutting, which has been one of the factors causing the destruction of the chicamocha forest in the past and present (O. Cortes in litt. 2012). Acacia scrub is threatened by goat- and cattle-grazing, seasonal burning for farming (P. G. W. Salaman in litt. 1999) and cutting for fuelwood (O. Cortes in litt. 2007, Cortes et al. in press). Areas grazed by goats near to the Santander population were devoid of the species due to a lack of dense understorey and leaf litter (S. Valderrama in litt. 2008, 2010)	habitat loss and degradation, livestock disturbance

Thryophilus sernai	Assess more thoroughly the projected large impact that the reservoir's construction will have on this species, and investigate and implement any possible actions that could limit the severity of the impact on this species as soon as possible	evaluate the threats, species conservation project	The species is suspected to be declining as a result of historical and continuing habitat alteration (Lara et al. 2012), as land has been converted for mining, agriculture, pasture, road construction and urban areas (Lara et al. 2012, O. Cortes-Herrera in litt. 2016). Additionally, a large amount of its range may be lost to flooding due to construction of the Pescadero-Ituango hydro-electric dam (Lara et al. 2012) due for completion in 2018. The predicted extent of the reservoir would represent c.53% of its habitat being affected just by this threat	habitat loss and degradation
Touit melanonotus	distribution in Bahia and Espírito Santo to clarify distribution and status. Determine seasonal abundance at different elevations. Consolidate protected areas where it occurs	distribution, population size, new protected areas	Agricultural conversion and deforestation for mining and plantations have historically threatened its habitats (Fearnside 1996). Current key threats are urbanisation, agricultural expansion, colonisation and associated road-building (Dinerstein et al. 1995). Although the lower montane slopes have suffered comparatively less destruction than adjacent lowlands (Stattersfield et al. 1998), it has not been found at these elevations in São Paulo	habitat loss and degradation, urban intensification

Touit surdus	Survey historical localities and suitable habitat to clarify distribution. Research ecology and seasonal movements. Designate Murici in Alagoas as a biological reserve and ensure its de facto protection. Consolidate protected areas in which it occurs	distribution, ecological requirements, area protection	Extensive deforestation throughout its range is regarded as the principal cause of its rarity, and the north-east population is most threatened because sugarcane plantations have replaced virtually all lowland forest in Alagoas, leaving just 2% of original forest cover (Brown and Brown 1992) in severely fragmented blocks, averaging 1.5 km2 or less (Conservation International et al. 1995). Further south, the situation is little more encouraging: in Bahia, less than 10% of forest is intact, and in the rest of its range suitable habitat has been reduced to less than 20% of its original extent (Conservation International et al. 1995). Lowland forests were historically threatened by agricultural conversion and deforestation for mining and plantations (Fearnside 1996). Current key threats arise from urbanisation, agricultural expansion, colonisation and associated road-building (Dinerstein et al. 1995)	habitat loss and degradation, urban intensification

Toxostoma guttatum	Urgently survey in the breeding season (when it is most conspicuous) to determine whether the species is still extant and identify appropriate conservation measures. Investigate its former status and ecology through interviews with local people to ascertain the reasons for its decline. Conduct an awareness raising campaign to raise the profile of this species and educate visitors about the risk of damaging the island's ecosystem (Curry and Martínez-Gómez 2005). Establish formal protection for interior lands on Cozumel (Curry and Martínez-Gómez 2005)	Distribuição,environmental education , area protection, status	Hurricane Gilbert appears to have had a severe effect on the species, whose status may have deteriorated further following Hurricane Roxanne in 1995 and Hurricanes Emily and Wilma in 2005 (Macouzet and Escalante Pliego 2001, Curry et al. 2006). Further hurricanes are likely, as Cozumel lies within the area of Mexico most frequently hit by hurricanes (Stattersfield et al. 1998), and may extirpate any surviving, small populations. However, this seems an unsatisfactory explanation of its current rarity, because it must have evolved with a relatively high hurricane frequency. The reasons behind its decline are poorly understood, but boa constrictors introduced in 1971, as well as introduced cats and other mammals, are the leading hypothesised threat (Curry et al. 2006, J. E. Martínez-Gómez in litt. 2016), while habitat fragmentation as a result of the development of tourism on the island may also be impacting the species (J. E. Martínez-Gómez in litt. 2016). Having a distribution on a relatively low-lying island, this species is potentially susceptible to climate change through sea-level rise and shifts in suitable climatic conditions (Şekercioğlu et al. 2012, BirdLife International unpubl. data)	habitat loss and degradation, climate change, introduced species

Troglodytes monticola	Conduct surveys to assess the range and abundance of this species in order to generate a more accurate population estimate. Improve the level of habitat protection throughout its range, particularly within Sierra Nevada de Santa Marta National Park. Monitor changes in population size in relation to continuing habitat degradation. Immediately seek to supply local people with firewood, in order to avoid further habitat destruction (N. Krabbe in litt. 2012)	population size, distribution, area protection, monitor the population, sustainable activities	There is a long history of severe deforestation and degradation of this species's páramo and timberline habitat (Kroodsma et al. 2015). Less than 15% of the original forest cover remains within the massif, and despite substantive protection status on paper, in reality extremely high rates of habitat loss continue owing to human colonisation and cultivation. In some areas deforestation has reached the species's elevation range (O. Cortes in litt. 2011) and streamside vegetation is unsustainably cut for firewood in some places (N. Krabbe in litt. 2010). The wren's habitat within Río Frío valley is extremely isolated, owing to burning and overgrazing, and more information is required concerning the habitat condition of other páramo and high montane forests elsewhere on the massif (Strewe and Navarro 2004)	habitat loss and degradation
Troglodytes tanneri	Carry out surveys to obtain an up-to-date population estimate. Monitor population trends through regular surveys. Eradicate introduced rabbits from Clarión. Continue to prevent the introduction of mammalian predators	population size, control programme for invasive species, monitor the population	Introduced herbivores have extensively modified the native vegetation on Clarión (Stattersfield et al. 1998), but this has not had an impact upon this species. However, introduced rabbits Oryctolagus cuniculus may subsidise native predators, such as Burrowing Owl Athene cunicularia and racer snake Coluber sp. and increase their impact on wren populations. The introduction of a mammalian predator would have extremely serious consequences. The possibility of a cat introduction is small, but mouse or rat introductions are more likely (B. Tershy in litt. 1999), and there is no active introduction prevention plan in place (B. Tershy and B. Keitt in litt. 2007)	introduced species

Vireo caribaeus	Clarify its distribution, abundance and ecological requirements. Assess the extent and status of native habitat remaining. Identify realistic plantation management practises that will favour this species. Monitor changes in land use and consider active measures to protect remaining habitat. Dry scrubland habitat, which is vital for breeding and currently unprotected, should be conserved (Gómez-Montes and Moreno 2008)	distribution, population size, ecological requirements, area management, area protection, new protected areas	San Andrés is densely populated and developed, with little natural vegetation remaining. The northern 20% of the island is highly urbanised, with tourist developments south of the urban zone. The habitat on most of the remainder of the island has been converted for agriculture and coconut-palm cultivation, but within this area, small and scattered patches of remnant habitat (mostly associated with inland mangroves) and scrub are found. Suitable habitat is highly fragmented. Human population, tourism and agriculture are expanding. Coastal mangroves are being destroyed by waste oil and hot-water outflow, although the extent to which the species is affected is unknown. Exceptional events during the breeding season, such as slash-and-burn and hurricanes, may have an impact on the breeding population (Rosselli 1998)	habitat loss and degradation, urban intensification

Xenoglaux loweryi	distribution on each of the isolated ridges in the region. Follow up local reports of the species from Wichim, Cordillera de Colán, using playback surveys. Effectively protect the Alto Mayo Protected Forest, and ensure that high-elevation forest is included within its boundaries (Dillon and Sánchez Vega 1999, Hornbuckle 1999, J. Hornbuckle in litt. 1999). Establish a protected area in the Cordillera de Colán, and search for the species on its eastern side (Davies et al. 1997, F. Angulo Pratolongo in litt. 2012)	distribution, area protection, new protected areas	Remaining areas of suitable habitat are being cleared for timber, agriculture and to secure ownership of the land, gradually around Abra Patricia, but more rapidly in the Cordillera de Colán, where locals had estimated in 1994 that all the forest on the Cordillera de Colán could be cleared by 2004 (Davies et al. 1997, Dillon and Sánchez Vega 1999, J. Hornbuckle in litt. 1999). More recent surveys have confirmed that habitat destruction in the region continues unabated (Dillon and Sánchez Vega 1999). Abra Patricia is under pressure owing to road improvements and recent immigration and population growth in the area (G. Engblom in litt. 1998, Hornbuckle 1999, J. Hornbuckle in litt. 1999). Mining activities around Yambrasbamba also contribute to habitat destruction, both directly and by opening new roads that facilitate colonisation (F. Angulo Pratolongo in litt. 2012)	habitat loss and degradation

Xenospiza baileyi	Monitor remaining populations (L. Cabrera in litt. 2000). distribution in Durango. Integrate local people in developing appropriate grassland management strategies, including fire management (L. Cabrera in litt. 2000). Ensure that grain storage prevents potential infection by micotoxins (Oliveras de Ita et al. 2001). Protect remaining habitat fragments	area management, area protection, monitor the population, integrate local people, prevent disease	There is widespread anthropogenic burning of habitat, mostly to promote new growth of grazing pasture for sheep and cattle (Oliveras de Ita et al. 2001). There is also conversion to agriculture (mainly oats), bunch-grass is sometimes cut for thatch and brushes and a degree of urban encroachment is occurring. Most remaining habitat is close to volcanic rock outcrops or on slopes where it is difficult to operate a tractor (Oliveras de Ita et al. 2001). However, rock extraction at La Cima suggests that many of these areas are likely to be converted to agriculture (Oliveras de Ita et al. 2001). La Cima has been planted with pines and, if these survive, the sparrow will be extirpated from this site (M. Grosselet in litt. 2011). Autopsies on two individuals showed that organ systems had collapsed as a result of mycotoxins from contaminated grain (Oliveras de Ita et al. 2001). There is a high level of nest failure owing to heavy predation which may be exacerbated by habitat fragmentation (P. Escalante in litt. 2006). Loss of water sources owing to extraction for livestock and human uses poses an additional threat (Aguirre et al. 2012)	habitat loss and degradation, urban intensification, loss of water sources
Xiphocolaptes falcirostris	Survey, and seek the creation of new reserves, on the left bank of the rio São Francisco, from Barra in Bahia to Itacarambi in Minas Gerais, including patches along the rios Grande and Preto in north-west Bahia, and in south Piauí and central Maranhão (da Silva and Oren 1997). Map and ecologically evaluate extant patches of dry forest (da Silva and Oren 1997). Conduct long-term studies on the ecology of dry forests (e.g. succession and the effects of selective logging) to develop viable strategies for	new protected areas, area management, sustainable forest management	Clearance for irrigated and dry field agriculture has removed extensive tracts of forest that are also an important source of charcoal for steel and pig-iron industries (da Silva and Oren 1997). Eucalyptus sp. plantations were farmed as a substitute source of charcoal, but the recent rise in the value of these plantations for the paper pulp industry has increased pressure on native forests for charcoal. Forest at Coribe was extensive and undisturbed in 1987, but had been entirely destroyed by 1993 (da Silva and Oren 1997). International financing agencies have accelerated the rate of deforestation in the south of its range by underwriting irrigation projects (da Silva and Oren 1997)	habitat loss and degradation

	future economic utilisation (da Silva and Oren 1997). Create a system of conservation units (following mapping) that maximises the representation of the original dry forest fauna and flora (da Silva and Oren 1997)			
Xipholena atropurpurea	Survey all remnants of forest within its range. Monitor the population. Effectively protect key sites, especially the privately-owned Murici, Estação Vera Cruz and Linhares. Plant native trees in areas surrounding Sooretama and Linhares	distribution, monitor the population, area protection	This species is threatened by extensive and continuing deforestation, with nearly 60% of suitable habitat disappearing in the period 1980-1997. Many of the protected areas in which it occurs are still under threat and inadequately protected, such as Monte Pascoal in Bahia. Thirteen out of 29 fruiting trees included in its diet are exploited for timber. An analysis estimated that the proportion of forest lost from within the species's range from 2000-2012 was equivalent to 2.7% over three generation lengths (Tracewski et. al. 2016). The species is rarely found in bird markets, and is only opportunistically hunted. A widespread fire in July 1995 destroyed most of the forest at one site in Bahia (E. O. Willis and Y. Oniki in litt. 1999), and such instances are a potential threat to many sites	habitat loss and degradation, hunting
Zaratornis stresemanni	Determine its year-round distribution and population, and the extent of Polylepis in the central Cordillera Occidental (Fjeldså and Kessler 1996, G. Servat in litt. 1999). Implement the management plan for Huascarán (Frimer and Møller Nielsen 1989, Fjeldså and Kessler 1996). Protect Polylepis forests north of Oyón and in the Santa Eulalia Valley. Plant Polylepis in degraded areas. Plant buffer zones of firewood trees below Polylepis and supply coal for industry. Encourage local people to take leading roles in land-use management and restoration schemes (Fjeldså and Kessler 1996). Prevent over	distribution, population size, area protection, area management, integrate local people	Uncontrolled fires and heavy grazing prevent Polylepis regeneration. Cutting for timber, firewood and charcoal is locally destructive, but could be sustained if regeneration were allowed (Fjeldså and Kessler 1996) The Pacific slope cloud forest which is occupied in the non-breeding season is threatened by grazing goats which prevent forest regeneration (J. Fjeldså in litt. 1999, 2007). Other factors may include the change from camelid to sheep-farming and cattle-farming, and the inadequacy of afforestation projects, in particular the use of exotic plants (Fjeldså and Kessler 1996)	habitat loss and degradation, livestock disturbance, invasive species

	grazing by goats in the Pacific slope cloud forest non-breeding habitat (J. Fjeldså in litt. 1999, 2007)			
Zentrygon carrikeri	Carry out surveys to obtain a total population estimate for the species, and survey the Santa Marta Biosphere Reserve to determine the species's status within this protected area. Monitor population trends through regular surveys and develop a structured captive breeding programme. area management within its range. Expand existing protected areas, or designate new reserves, to cover more of the remaining forests in the sierra	population size, captive breeding, area management, new protected area	Destruction of the species's habitat is presumed to take place for timber, cultivation and pasture. On Volcán San Martín, 84% of the original forest area was lost by 1986, with 56% lost between 1967 and 1986 (Dirzo and García 1992). In 1992, it was predicted that only 8.7% of original habitat, restricted to the most inaccessible tracts and protected areas, would remain by 2000 (Dirzo and García 1992). At that time, it appeared that similar habitat loss was taking place on Volcán Santa Marta (Dirzo and García 1992). It is unknown whether this prediction has been fulfilled, but it is clear that there has been extensive forest clearance in the Sierra de los Tuxtlas. Pressures on the species's habitat may be abating, or at least stabilising at present levels (R. Ortiz-Pulido in litt. 2008)	habitat loss and degradation
Zimmerius villarejoi	Search for this species (or close relatives) in sandy soil forests in the Tarapoto-Moyobamba region of Peru, and perhaps in eastern Ecuador and Colombia. Determine the extent of occupied or suitable habitat, and estimate the population size. Determine the extent to which current threats are impacting the species. Grant protection to additional occupied sites and areas of suitable habitat. Improve the protection of varillal habitat in the Allpahuayo-Mishana National Reserve	distribution, population size, evaluate the threats, new protected areas, area protection	Most of the known range is within a protected area. However, the limited extent of appropriate varillal habitat, and the continuing extraction of trees for building materials and posts, means that much of the population is threatened or at least compromised. Outside the protected area, the few varillales in which the species is known to occur (on the upper Rio Nanay) are completely unprotected, and are currently being heavily exploited for timber and other products	habitat loss and degradation