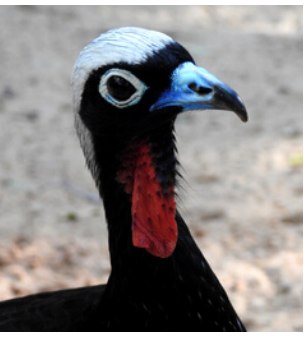



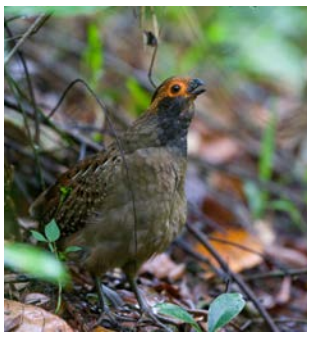
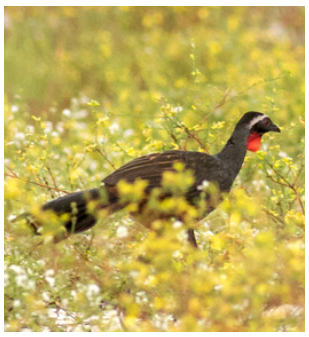
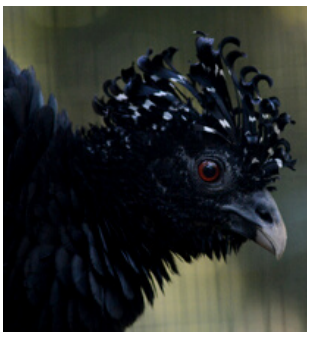

FINAL REPORT

EX SITU ASSESSMENT FOR INTEGRATED CONSERVATION PLANNING FOR GALLIFORMES AND TINAMIFORMES IN BRAZIL

Foz do Iguaçu, Paraná, Brazil | 12–16 February, 2020

PARQUE DAS AVES

IUCN SSC Species Survival Commission

CONSERVATION PLANNING SPECIALIST GROUP Changing the Future for Wildlife

CSS BRAZIL Center for Species Survival

ICMBio INSTITUTO CHICO MENDES MMA

CEMAVE

Workshop organised by Parque das Aves, IUCN SSC Conservation Planning Specialist Group (CPSG), and The National Center for Bird Conservation and Research (CEMAVE)

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Upper: Iguazu Falls (Fabiana Lopes Rocha). **(L-R):** *Aburria jacutinga* (Ben Phalan), *Crypturellus noctivagus noctivagus* (José Kachimareck), *Ortalis* [*guttata*] *remota* (Marco Silva), *Crax fasciolata* (Ben Phalan), *Tinamus solitarius* (Marco Silva)
Lower: Atlantic Forest (Leila Melhado Canva Pro). **(L-R):** *Odontophorus capueira plumbeicollis* (Ciro Albano), *Penelope superciliaris alagoensis* (Arthur Andrade), *Crax blumenbachii* (Ben Phalan), *Crypturellus strigulosus* (Douglas Fernandes), *Crax* [*fasciolata*] *pinima* (Gustavo Gonsioroski)

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Abbreviations and acronyms

AL	State of Alagoas
BA	State of Bahia
CE	State of Ceará
CEMAVE	National Centre for Bird Conservation and Research (Centro Nacional de Pesquisa e Conservação de Aves Silvestres), part of ICMBio
CESP	São Paulo Power Company (Companhia Energética de São Paulo)
CETAS	Centre for Triage of Wild Animals (Centro de Triagem de Animais Silvestres)
CPSG	Conservation Planning Specialist Group, of IUCN
CR	Critically Endangered
CRAS	Centre for Rehabilitation of Wild Animals (Centro de Recuperação de Animais Silvestres)
EN	Endangered
ES	State of Espírito Santo
GAT	Technical Advisory Group of National Action Plan (Grupo de Assessoramento Técnico)
IBAMA	Administrative arm of MMA (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis)
ICMBio	The Brazilian government agency for biodiversity conservation (Instituto Chico Mendes de Conservação da Biodiversidade)
IUCN	International Union for Conservation of Nature
MG	State of Minas Gerais
MMA	Brazilian Environment Ministry (Ministério de Meio Ambiente)
NT	Near Threatened
OEMA	State environmental agency (órgão estadual de meio ambiente)
PAN	National Action Plan (Plano de Ação Nacional)
PE	State of Pernambuco
PR	State of Paraná
REBIO	Biological Reserve (Reserva Biológica)
REGUA	Guapiaçu Ecological Reserve (Reserva Ecológica de Guapiaçu)
RJ	State of Rio de Janeiro
RS	State of Rio Grande do Sul
SC	State of Santa Catarina
Sp.	Species
SSC	Species Survival Commission, of IUCN
UEMA	Maranhão State University (Universidade Estadual do Maranhão)
UENF	North Fluminense State University (Universidade Estadual do Norte Fluminense)
VU	Vulnerable

Executive summary

The purpose of this workshop was to evaluate ex situ roles and plan for integrated conservation actions associated with these, for a selection of ten species or distinctive subspecies of Galliformes and Tinamiformes in Brazil.

We focused on these two orders as there is already a great deal of knowledge and expertise in keeping and breeding these birds. For many of them, methods and challenges are likely to be similar. The species were selected mainly on the basis of their inclusion in the National Action Plan for Conservation of Atlantic Forest Birds (ICMBio 2018a), plus a Critically Endangered (CR) species from the National Action Plan for Conservation of Amazonian Birds (ICMBio 2018b). These action plans called for assessment of ex situ needs for most of the species considered.

The workshop was facilitated by the Conservation Planning Specialist Group of IUCN SSC and held over five days in February 2020 at Parque das Aves in Foz do Iguaçu. Participants included most of the leading specialists in the focal species in Brazil, with experience of both ex situ and in situ conservation (full list of participants and institutions: Appendix A; agenda: Appendix B).

For four taxa, participants considered ex situ conservation actions to be of high priority. For the black-fronted piping-guan *Aburria jacutinga* (globally Endangered, EN), there is already a well-established captive population linked to an ongoing program of reintroduction and population reinforcement. Recommendations were made to continue and strengthen these efforts. The red-billed curassow *Crax blumenbachii* (globally EN) has also been the subject of ex situ conservation, but conservation efforts for this species have not progressed as planned. It was recommended that the ex situ breeding program be reactivated and restructured.

The Belém curassow *Crax* [*fasciolata*] *pinima* (endemic to Brazil and globally CR) is down to a few individuals in the wild, and possibly 2–4 individuals in captivity (to be confirmed). For now, the focus should be on developing the requisite skills, methods and facilities to receive individuals of this species, and the opportunistic rescue of individuals if evaluation of risks and potential benefits is favourable. The northeastern subspecies of spot-winged wood-quail *Odontophorus capueira plumbeicollis* (endemic to Brazil and nationally CR) has declined alarmingly. There is no ex situ population, and establishing one to serve as an insurance population and source for future reinforcement or reintroduction should be a priority.

For a further three species, ex situ conservation roles were rated lower priority. The bare-faced curassow *Crax fasciolata* (globally Vulnerable, VU) remains relatively widespread, although it has been extirpated from parts of its former range. Reinforcement and reintroduction were not identified as national-level conservation priorities, but could play a role at local level in restoring ecological communities and functions. The southern subspecies of yellow-legged tinamou *Crypturellus noctivagus noctivagus* (endemic to Brazil and nationally VU), similarly, was not highlighted for urgent conservation action, but reinforcement and reintroduction could be valuable in local ecological restoration efforts. The same is true for the solitary tinamou *Tinamus solitarius* (globally Near Threatened, NT), which is not at high risk of global extinction. In the case of this last species, there are indications that the

putative northeastern subspecies, *T. s. pernambucoensis*, whose validity had been had been dismissed, should be revisited. If it is a valid taxon, it would likely qualify as CR and require urgent conservation action.

For a further three taxa, no ex situ conservation roles were recommended at present, as for *T. s. pernambucensis*, but the suggestion was to revisit these cases when more information is available. The "Paraná" subspecies of speckled chachalaca *Ortalis [guttata] remota* (endemic to Brazil and nationally CR) does not appear to be declining, and ex situ conservation was not recommended at this time. Research to clearly define the taxonomic and distributional limits of the Alagoas guan *Penelope superciliaris alagoensis* (endemic to Brazil and nationally CR) was recommended, before deciding whether to develop a national ex situ program. The Brazilian tinamou *Crypturellus strigulosus* (globally Least Concern, LC) is not at risk of extinction overall, but its population and distribution in the Atlantic Forest is extremely small. Research is needed to define whether this population should be treated as an evolutionarily distinct unit meriting specific conservation action.

A number of general or multi-species recommendations were put forward:

- Better standards and criteria for releases
- Inventory of existing ex situ populations of all focal taxa
- Better integration of breeding centres into conservation programs
- Development of best practice protocols for management and translocation
- Training in demographic, genetic, health and nutrition management
- Structuring of ex situ populations with studbooks
- Combined efforts to reintroduce species with overlapping distributions
- Improved representation of different parties in the National Action Plans
- Protocols for safe collection and storage of biological samples
- Genetic and taxonomic research to respond to specific uncertainties that impede conservation planning
- Development of identification materials
- Collaboration with other researchers using camera traps and autonomous recorders, for exchange of data relevant to Galliformes and Tinamiformes.

Igor Alecsander (Canva Pro)

Finally, suggestions were made for how the recommendations from the workshop can be added to, or linked to existing actions of the National Action Plans for birds of the Atlantic Forest, Caatinga, and Amazonia. These suggestions will sent to the Technical Advisory Groups of the Plans so the recommendations can be formally reviewed and incorporated during their next monitoring meetings.

Background, scope and methodology

This workshop was planned to fulfil some of the demands identified in National Action Plans for biodiversity in Brazil.

Purpose

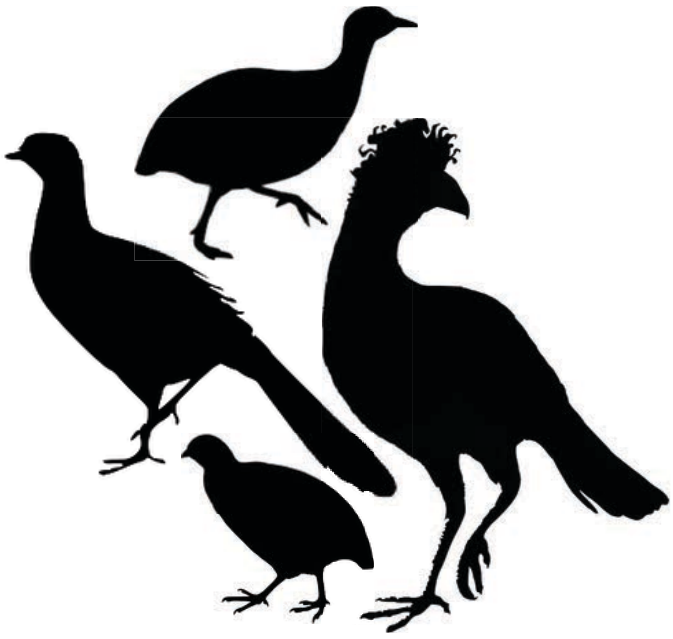
To identify priority population management conservation actions for ten bird species and distinctive subspecies of the orders Galliformes (guans, curassows and wood-quail) and Tinamiformes (tinamous). We focused on how ex situ actions might contribute to the conservation of taxa in these two orders, as there is already considerable knowledge and expertise in keeping and breeding these birds in human care. For many of the species, the challenges and solutions are likely to be similar.

Aim

To contribute to integrated conservation for these birds by bringing together experts in both in situ and ex situ conservation of the focal taxa. We evaluated possible ex situ actions alongside other conservation actions for each taxon, drawing on the best available scientific knowledge and following IUCN guidelines for ex situ management and for conservation translocations. This report documents this evaluative process and presents the resulting recommendations in a transparent manner. This document provides information to help national and international institutions to work more effectively together to conserve the focal taxa. Decisions and actions will be monitored, reassessed, and improved whenever possible.

Included taxa

Most of the taxa were selected on the basis of their inclusion in the National Action Plan for birds of the Atlantic Forest (*Aburria jacutinga, Crax blumenbachii, Odontophorus capueira plumbeicollis*, *Ortalis* [*guttata*] *remota, Penelope superciliaris alagoensis* and *Tinamus solitarius*). Two further taxa, *Crypturellus noctivagus noctivagus* and *Crypturellus strigulosus*, are not named specifically in the National Action Plan but are Atlantic Forest species listed as nationally threatened or Near Threatened, and were included in this evaluation on this basis. *Crax* [*fasciolata*] *pinima*, a globally CR taxon and Brazilian endemic featured in the National Action Plan for Birds of Amazonia, was included, given the urgency of its situation and close similarities with other taxa considered. *Crax fasciolata* was included on the basis of its close relationship (as parent or sister species) with *Crax* [*fasciolata*] *pinima* as well as existing plans to reintroduce the taxon in parts of Brazil and Argentina. One of the taxa, *Odontophorus capueira plumbeicollis*, is also included in the National Action Plan for birds of the Caatinga. One relevant species, Alagoas curassow *Pauxi mitu*, was not included, because of difficulties in ensuring that the most relevant experts could be present at the workshop.



Methodology

The five-day workshop was facilitated by the IUCN SSC Conservation Planning Specialist Group and hosted by Parque das Aves in Foz do Iguaçu, Paraná, Brazil. Twenty-two species experts and ex situ specialists participated in the process (two remotely) to evaluate actions for the ten taxa. Participants consisted of most of the leading specialists in Galliformes and Tinamiformes in Brazil, and included representatives from the National Center for Bird Conservation and Research (CEMAVE/ICMBio), the Association of Zoos and Aquariums of Brazil (AZAB), the BirdLife partner in Brazil (SAVE Brasil) and several universities (see Appendix A). We also invited a geneticist and several private breeders, but they were unable to participate.

For each of the ten taxa (species and distinctive subspecies), information on their status in the wild and ex situ, threats, ecology, and conservation actions underway was collated before the workshop with the collaboration of relevant experts. These data were compiled into species datasheets to support workshop discussions. The workshop followed the five-step decision-making process of the IUCN Species Survival Commission Guidelines on the usea of Ex situ Management for Species Conservation (IUCN/SSC 2014), which includes: 1) status review and threat analysis; 2) identification of potential ex situ conservation roles; 3) discussion of program characteristics needed for each potential role; 4) evaluation of resources, risks and feasibility for each role; and 5) recommended ex situ roles, if any, based on steps 1–4.

After an overview of the ex situ roles and workshop process, participants evaluated each of the ten taxa in turn. Participants considered each of the potential ex situ conservation roles (see Appendix C) and listed those roles that appeared to have potential conservation value for the focal taxon. Each of these roles was then evaluated for each taxon individually, with discussion of characteristics, resources, risks, and feasibility and benefits, to reach recommendations for ex situ activities. Subsequently, common actions relevant to most or all of the species were established, and responsible parties and timelines were identified.


Kristin Leus


Kristin Leus

This report

This report is designed to provide a basis for ex situ actions to be developed that best contribute to conserving these species in the wild, based upon best available data and logical decision making and evaluation within a transparent, collaborative process involving both in situ and ex situ experts. More detailed plans will be prepared by taxon specialists and other stakeholders using the information presented in this report.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Process for evaluation of ex situ options

The IUCN Species Survival Commission Guidelines on the Use of Ex Situ Management for Species Conservation (IUCN/SSC 2014) outline a process for identifying and evaluating potential ways in which ex situ individuals or activities may contribute to the overall conservation of a species. For these purposes, "ex situ" is defined as conditions in which individuals are spatially restricted, removed from many of their natural ecological processes, and are managed on some level by humans. In summary, **ex situ refers to individuals (or live biological samples) that are held in artificial, human-controlled settings, from highly artificial environments to semi-natural conditions, and whether they are held temporarily or long-term.** Such settings include zoos, aquariums, botanical gardens, wildlife rescue or rehabilitation centers, and other facilities that hold animals or plants in ex situ conditions for any length of time.

Ex situ conservation has potential to help reduce or mitigate primary threats, to offset the effects of threats, to restore wild populations, and to prevent species extinction by buying time for threat abatement.

Such activities can complement other conservation activities focused on wild (in situ) populations and conditions so that species do not disappear before suitable conditions in the wild are restored. Integration of in situ and ex situ conservation plans is important to assure that, whenever appropriate, ex situ conservation is used to support in situ conservation in the best possible manner.

In some cases, ex situ management will be a critical component of a species conservation strategy; in others, it will have a secondary relevance, supporting other interventions; or it may have no conservation role to play. It is necessary, therefore, to consider how ex situ management can contribute towards the general goals of conservation established for the species, and to clearly document this. The involvement of all stakeholders and all populations of a species in developing an integrated conservation strategy is known as the One Plan Approach (Byers et al. 2013).

The IUCN guidelines outline a five-step decision process to assess the value and appropriateness of ex situ management as a conservation tool, as follows:

1 Compile a review of the status and threats of the species

To inform discussion of conservation actions, it is necessary to review and collate all relevant information on the species, both in the wild and ex situ. This information is used to assess the viability of the population and to identify and understand the threats that impact the species.

2 Define the role or roles that ex situ management could play in the overall conservation of the species

The potential ex situ management strategies proposed should address one or more specific threats or constraints to the viability and conservation of the species, as identified in the status review and threat analysis, and target improving its conservation status.

3 Determine the characteristics and dimensions of the ex situ population or program required to fulfill the identified conservation role(s)

The identified conservation purpose and function of the ex situ program will help determine its required nature, scale and duration.

4 Define the resources and expertise needed for the ex situ management program to fulfill its role(s) and assess the feasibility and risks

It is important to evaluate the required resources; the feasibility of successfully managing such a program; the likelihood of success in all steps, including, if relevant, any releases to the wild; and the risks, including risks to the species in the wild and to other conservation activities. These factors should be balanced against the risks of not adopting appropriate conservation measures.

5 Make a decision that is well informed (using the information gathered above) and transparent (showing how and why the decision was made)

The decision to include ex situ management in the species conservation strategy should be determined by weighing the potential benefit to the species, along with the likelihood of success, against the overall costs and risks. The potential benefits, costs and risks of alternative conservation actions, and of inaction, should also be considered.

If the decision is made to implement an ex situ management program for conservation, then the following considerations are important in the development of this program:

- Formulate the actions required for the program to meet its conservation goals
- Develop protocols for data collection and management for adequate monitoring
- Develop the ex situ management program according to existing national and international conservation plans, agreements, and policies
- Consult throughout the process with all stakeholder groups and organizations
- Establish a timeline with clear and achievable deadlines for implementing the actions

The IUCN guidelines suggest regular evaluation of the ex situ program so that its performance can be measured, and so that it can be adjusted and improved whenever necessary. This includes not only evaluation of the program's success but also its role within the overall conservation strategy for the species, which is likely to change over time. Regular reporting on ex situ activities is also important to generate awareness and support, meet any legal requirements, and contribute to knowledge on ex situ management for conservation.

We followed the process described above to develop an ex situ plan for each focal taxon. The ex situ roles considered in this workshop included all of those identified in the IUCN guidelines and/or Amphibian Ark Conservation Needs Assessment Process (Amphibian Ark 2012). Of these, six potential roles were identified for further discussion. These are discussed in more detail in the next section. A description of each of the roles, including those which were considered but not identified as important for any of the workshop focal species, is provided in Appendix C.

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LeoMercon (Canva Pro)

Overview of recommendations from workshop

Workshop participants identified six potential roles through which ex situ populations of the focal taxa might contribute to conservation of the species. None of these roles were deemed relevant to all ten taxa. The roles highlighted for further discussion were (see Appendix C for role descriptions):

- Rescue population
- Insurance population
- Population reinforcement
- Reintroduction,
- Research and training
- Conservation education

Relevant roles were then discussed further to define their conservation benefit and discuss the program characteristics, resources required, risks and other aspects of feasibility and implementation. A summary of the ex situ roles discussed and recommended for each taxon is provided in Table 1.

Participants prioritised ex situ roles that could help to improve the conservation status of focal taxa at the national (or international) level. Of the ten focal taxa, the four for which ex situ actions were identified as being of highest priority at national level were *Aburria jacutinga, Crax blumenbachii, Crax* [*fasciolata*] *pinima* and *Odontophorus capueira plumbeicollis*.

If the taxonomic distinctiveness of *Tinamus solitarius pernambucensis* is validated, it would also be a similarly high priority for ex situ conservation at national level. In the case of three taxa – *Ortalis* [*guttata*] *remota*, *Penelope superciliaris alagoensis* and *Crypturellus strigulosus* – no ex situ roles were considered to be of priority at this time, with the exception of collecting biological samples should the opportunity arise. These decisions should be re-evaluated when more information is available. For the remaining taxa, while ex situ actions might contribute to conservation at a local level, they were not considered to be priorities at a national level. Detailed information for each taxon is provided in this report.

Some common or overarching actions were identified as relevant to most or all of the focal taxa. These are detailed further below.

1.Better standards and criteria for releases

Participants expressed concern about the issue of improper releases of birds and other species, which can have negative impacts on individual wellbeing and the health of wild populations, and result in lost conservation opportunities. Publication of supplementary bill of law LC No. 140, which delegates responsibility for releases to the State level, has created substantial uncertainties.

Releases can have low value to conservation (or even have negative impacts) unless they are carefully planned, coordinated with other conservation actions, and follow strict protocols relating to health, behaviour and other issues. Because of differences in legislation and criteria between states, conservation projects that have planned releases encounter difficulties with implementation. The workshop participants developed a declaration on improper releases, to be sent to state environmental authorities and other institutions responsible for regulating releases of wild species (Appendix D).

Some workshop participants will participate in a meeting in October 2020 *[post workshop note: meeting postponed because of coronavirus pandemic]* to develop best-practice guidelines for translocations, organised by CPSG Brasil in partnership with the IUCN SSC Conservation Translocation Specialist Group, ICMBio, Fundação O Boticário, Parque das Aves and Grupo Cataratas. A document detailing technical guidelines and recommendations for translocation will be prepared by Carlos Ruiz (UENF), Pedro Develey (SAVE Brasil), Flávio Ubaid (UEMA) and Antonio Eduardo Araujo (ICMBio), to be presented at that meeting during a dedicated forum. Specific protocols for releases of each species will be developed by Parque das Aves, UEMA, CEMAVE, SAVE Brasil and AZAB, with input from Carlos Ruiz and Pedro Scherer-Neto. It was also agreed to organise a practical course on the planning and implementation of translocation projects (including reintroductions).

2. Inventory of ex situ populations

A recommendation with relevance to all focal taxa was to survey the ex situ populations of Galliformes and Tinamiformes within all relevant institutions in Brazil, including zoos, private breeders, and centres for rescue and rehabilitation.

No central source of this information exists. ZIMS (Species360 2020) provides information for some zoos, but this database is not used by all. Information has been collated for the state of São Paulo under the auspices of the National Action Plan for Atlantic Forest Birds (C. Vanin, personal communication), but such a compilation is not available for other states. In some cases (e.g., *Ortalis* [*guttata*] *remota*, *Crypturellus strigulosus*) there are not believed to be any individuals in captive collections, but the possibility remains open that even such species could be delivered to a rescue centre. The survey should include an evaluation of the age and sex structure of individuals of each species, information on reproductive success, and identification of subspecies and hybrids where relevant. Those responsible for this and the other actions are listed in a supplementary spreadsheet that accompanies this report.

3. Inclusion of ex situ institutions in conservation programs

During discussions on reintroductions, some participants pointed out the need to strengthen collaboration among different institutions engaged in the conservation of focal species, including all institutions that keep the species in captivity. The current demand for birds for release is greater than the number of birds available at institutions that are already actively involved in reintroduction programs. Therefore, the participation of additional institutions could make an important contribution to ex situ conservation efforts. Institutions with experience and success in the reproductive management and release of some focal species of this workshop (and thus potential for collaboration) are known. In addition, institutions with closely-related birds (species or genus) will be invited to share information and experience that may be relevant to the taxa considered here. A working group was

established to develop a strategy for integrating other institutions into conservation efforts for these species.

4. Best practice protocols for management and translocation

A need was identified to bring together best practice protocols for management and translocation of Galliformes and Tinamiformes. Much experience exists, but it is not readily accessible. It was suggested to develop specific protocols for each species, based on the experience gained from institutions and projects that have worked with those species.

5. Training in demographic, genetic, health and nutrition management

To improve standards of management and care, it was suggested to offer training in different aspects of husbandry, including demographic, genetic, health and nutrition management. There is now a great deal of technical knowledge on these topics, which can be crucial for the successful implementation of an ex situ program (for example, genetic management to avoid loss of genetic diversity).

6. Structuring of ex situ populations with studbooks

A studbook to record the life events and pedigree of each individual has been established for only one of the ten species evaluated (*Aburria jacutinga*). Workshop participants identified a need to better structure captive breeding efforts for the other species also, except those for which no ex situ population is known or envisaged (*Ortalis* [*guttata*] *remota* and *Crypturellus strigulosus*). Ideally, a studbook would be established for each taxon, but as managing a studbook requires considerable resources, the main priorities in addition to *Aburria jacutinga* were *Crax blumenbachii*, *Crax* [*fasciolata*] *pinima* and *Odontophorus capueira plumbeicollis*. There was discussion of creating a role, with costs perhaps divided between AZAB and Parque das Aves, for a person who could coordinate ex situ populations of some of these species. This person would contribute to one or all of the following three areas of activity: (1) collating and maintaining studbook data (studbook keeper), (2) coordinating ex situ programs, and (3) interpreting the data through the lens of population biology to make recommendations. Studbooks would be instituted by ICMBio, kept by AZAB, with a genetic focal point of Mercival Francisco, and advice from Paloma Bosso (the studbook keeper for *Aburria jacutinga*) and Flávia Chaves.

7. Combined efforts to reintroduce species with overlapping distributions

Some of the taxa considered are at lower risk of extinction than others, but there may still be benefits in releases of such species, especially where such activities can be coordinated with efforts to reintroduce more highly-threatened species. Such coordination could be cost-efficient; could help in development of methods, expertise and infrastructure; and could restore ecological functions such as seed dispersal. For example, in the interior Atlantic Forests, releases of *Crax fasciolata* and *Tinamus solitarius* could be coordinated alongside releases of *Aburria jacutinga*, and where appropriate, *Crax blumenbachii*. Releases of *Crypturellus noctivagus noctivagus* could be coordinated with releases of other species in the southeast, including *Aburria jacutinga*. In the northeast of Brazil, releases of *Penelope superciliaris alagoensis*, *Tinamus solitarius pernambucensis*, *Odontophorus capueira plumbeicollis* and *Crypturellus strigulosus* could potentially be coordinated in the future.

8. Representation in the Technical Advisory Group

Participants highlighted the need to ensure that diverse profiles are represented in the Technical Advisory Group (GAT) of the National Action Plan for Conservation of Atlantic Forest Birds. These profiles should include geneticist, field biologist, taxonomist, and coordinator of conservation projects, among others, so that a range of perspectives and experience is incorporated into the work of the Technical Advisory Group. The coordinator of the National Action Plan for Conservation of Atlantic Forest Birds, Eduardo Barbosa, will endeavour to address this point.

9. Protocols for biological samples

Collection of biological samples (e.g., feathers, blood, tissue, sperm) is of great importance in securing material for analyses of genetic variation, relatedness and taxonomy, and for preserving the genetic information of a species in the event of its extinction. It is essential that samples are collected without harm to the individuals concerned, and that they are stored and transported appropriately, which can be challenging in remote settings. Methods for preserving and utilising such samples are constantly improving. A group of workshop participants, including AZAB, Flávio Ubaid, Gustavo Gonsioroski, ICMBio and Paloma Bosso agreed to develop protocols for the collection, transport and storage of biological samples to address these requirements.

10. Taxonomic research

Some of the taxa considered in this workshop are currently considered subspecies but might in fact be eligible to be elevated to species level. In some cases, authorities disagree about the taxonomic status of these taxa. For example, Belém Curassow is recognised as a species by BirdLife International, but maintained as a subspecies of Bare-faced Curassow on the National Red List. *Ortalis remota* has been named as a species by Silveira et al. (2017), but is not yet recognised as such by national or international authorities. *Odontophorus capueira plumbeicollis* and *Penelope superciliaris alagoensis* have not been identified in publications as species, but specialists with knowledge of these taxa believe that they might qualify. The population of *Crypturellus strigulosus* in the Atlantic Forest has not been described as a distinct taxon from that in Amazonia, but given its disjunct distribution, the paucity of specimens and the precarious situation in the Atlantic Forest, this is a question worthy of further investigation. *Tinamus solitarius pernambucensis* has been discredited as a distinct taxon on the basis of morphology, but evidence from ectoparasites suggests that this conclusion should be revisited, preferably with the aid of genetic analysis. In the case of *Crypturellus noctivagus noctivagus*, there is no suggestion that this subspecies should be elevated to species level, but research to understand the degree of genetic variation and potential hybridisation with the other subspecies in captivity would be of value.

11. Improving identification capacity

Workshop participants identified a need to improve the capacity of staff in Centres for Triage and Rehabilitation of Wild Animals (CETAS and CRAS) and other ex situ facilities to distinguish similar taxa, and recommended the production of an identification poster. Provisionally, this will include illustrations of the following 20 taxa:

- **Piping-guans:** *Aburria jacutinga, A. cumanensis* and *A. cujubi*
- **Curassows:** *Crax fasciolata fasciolata, C. f. grayi* and *C.* [*f.*] *pinima*
- **Wood-quails:** *Odontophorus capueira capueira* and *O. c. plumbeicollis*
- **Chachalacas:** *Ortalis guttata, O.* [*g.*] *remota, O. squamata* and *O. araucuan*
- **Guans:** *Penelope superciliaris, Penelope s. alagoensis,* and *Penelope jacucaca*
- **Yellow-legged tinamous:** *Crypturellus noctivagus noctivagus* and *C. n. zabele*
- **Brazilian tinamou:** *Crypturellus strigulosus*
- **Solitary tinamous:** *Tinamus solitarius solitarius* and *T. s. pernambucensis (*subject to confirmation that these subspecies are valid)

Additional species of *Penelope, Crypturellus*, and *Tinamus* may also need to be included to avoid confusion with the focal taxa. Were all species of Galliformes and Tinamiformes from Brazil to be included, this would comprise 51 species (28 + 23), with a further 61 sub-specific forms within these taxa (33 + 28) (Piacentini et al. 2015).

12. Collaboration with camera trap and autonomous recorder studies

Participants identified an opportunity to collaborate with mammalogists, herpetologists or other researchers using camera traps and automated sound recorder to monitor biodiversity. Such devices can incidentally detect species of Galliformes and Tinamiformes, but if birds are not the focus of study, such detections may never be recorded or made available to other researchers. A general recommendation of the workshop was for researchers on these species to reach out to projects using these technologies and explore opportunities to use existing images and sounds to supplement other field data. This recommendation will be pursued by Flávio Ubaid in the case of the Belém curassow.

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Table 1. Summary of ex situ management roles recommended for each of the focal taxa

Ex situ roles	*Aburria jacutinga*	*Crax blumenbachii*	*Crax fasciolata*	*Crax [fasciolata] pinima*	*Odontophorus capueira plumbeicollis*	*Ortalis [guttata] remota*	*Penelope superciliaris alagoensis*	*Crypturellus noctivagus noctivagus*	*Crypturellus strigulosus*	*Tinamus solitarius*
Priority for ex situ actions	National	National	Local	National	National	Not at present	Not at present	Local	Not at present	Local [National?*]
Rescue population	No	No	No	Yes	No	No	No	No	No	No
Insurance population	Yes	Yes	No	Not at this time – re-evaluate in future	Yes	Not at this time – re-evaluate in future	Not at this time – re-evaluate in future	No	Not at this time – re-evaluate in future	Not at this time – re-evaluate in future for NE Brazil*
Population reinforcement	Yes	Yes	Yes	Possibly – depending on availability of rescued individuals	Yes – when an ex situ population has been established	Not at this time – re-evaluate in future	Not at this time – re-evaluate in future	Yes – in conjunction with other programs	Not at this time – re-evaluate in future	Yes – in conjunction with other programs; in NE Brazil*
Reintroduction	Yes	Yes	Yes	Possibly – depending on availability of rescued individuals	Yes – when an ex situ population has been established	Not at this time – re-evaluate in future	Not at this time – re-evaluate in future	Yes – in conjunction with other programs	Not at this time – re-evaluate in future	Yes – in conjunction with other programs; in NE Brazil*
Research and training	Yes – diseases, myopathy, release methods	Yes – release methods	Yes – to understand extent of hybridisation	Yes – management methods, understand extent of hybridisation	Yes – disease (with the nominate subspecies), reproductive management	No	Yes – genetic studies	Yes – to understand extent of hybridisation	Yes – genetic studies	Yes – release methods
Education for conservation	Yes - role as ambassador for cracids and tinamids (to reduce hunting and demand for illegally harvested palmito)	No specific role identified at present (could have ambassador role for general threats)	No specific role identified at present (could have ambassador role for general threats)	Possibly – to help reduce hunting in indigenous areas where species occurs	No specific role identified at present	No specific role identified at present	No specific role identified at present	No specific role identified at present (could have ambassador role for general threats)	No specific role identified at present	No specific role identified at present (could have ambassador role for general threats)

* If subspecies *Tinamus solitarius pernambucensis* is validated

Black-fronted piping-guan

Aburria jacutinga

Global Red List: EN (2018)
National Red List: EN (MMA 2018)
State Red Lists:
BA: RE (2017) **MG: CR** (2010)
ES: RE (2019) **RJ: PE** (2000)
SP: **CR** (2018) **PR: EN** (2018)
SC: CR (2011) **RS: CR** (2014)

Map of recent and historical records of *Aburria jacutinga* in Brazil (ICMBio 2018c)

Parque das Aves

Status in the wild

Occurs in northeast Argentina, southeast Paraguay, and southern and southeastern Brazil, from Rio Grande do Sul to Minas Gerais. Extirpated from the states of Rio de Janeiro (1980), Espírito Santo (1973) and Bahia, but reintroduced in Rio de Janeiro. ICMBio (2018c) present a list of protected areas with recent and older records. This species is dependent on large contiguous blocks of forest and has difficulty in crossing deforested areas (ICMBio 2018c).

Declining (BirdLife International 2020). Considered common or abundant in the past, the population has been declining sharply since the end of the 19th century, having been extirpated in most places where it was once recorded. It is estimated that there are currently fewer than 2,500 mature individuals of this species in Brazil, with fewer than 250 of them in each subpopulation (ICMBio 2018c). Global population is between 1,500 and 7,000 (BirdLife International 2020). The main threats to the species are habitat loss, overexploitation of jussara palm hearts, and hunting.

Ex situ status

We estimate that there are around 200 black-fronted piping-guans in ex situ institutions in Brazil. There are 41 individuals in zoos in Brazil according to the ZIMS database (Species 360 2020), and more individuals not listed in that database. In the state of São Paulo, scientific breeding centres have 53 more individuals (Sistema Integrado de Gestão de Fauna Silvestres do Estado de São Paulo, per. C. L. Vanin). Other breeding centres hold the species, but we do not have information on numbers. Outside Brazil, there is only one individual registered, in Walsrode, Germany.

This is the only workshop species for which there is an active studbook. The studbook is being developed under an agreement between the Association for Zoos and Aquaria in Brazil (AZAB) and its partner institutions. Paloma Bosso, the technical director of Parque das Aves, is the studbook keeper for black-fronted piping-guan. Of 50 individuals for which demographic data are available, there are 25 males, 18 females and 7 unknown; and 21 adults (>3 years old), 14 juveniles and 15 of unknown age. Relatively few institutions breed the species, and for this reason, most of the ex situ population in Brazil is likely to have the same origin. Genetic data were not available for this workshop. However such data were likely collected for the first version of the studbook for the species. Ana Raquel Faria Gomes will see if these data can be located.

Institutions believed to hold the species in Brazil (including some which do not participate in the studbook agreement for the species) are: Zoológico de Brasília (DF), Fundação Crax (MG), Parque Estadual de Dois Irmãos (PE), Zoológico Municipal de Curitiba (PR), Parque das Aves (PR), Guaratuba (PR), Zoológico Roberto Ribas Langue (PR), Criadouro Tropicus (RJ), BioParque do Rio (RJ), Universidade Estadual do Norte Fluminense (RJ), Zoológico de Pomerode (SC), Complexo Ambiental Cyro Gevared (SC), Zoológico do Beto Carrero World (SC), Parque Zoológico Quinzinho de Barros em Sorocaba (SP), Fundação Parque Zoológico de São Paulo (SP), Zooparque Itatiba (SP), Zoológico Municipal de Presidente Prudente - Parque Ecológico Cidade da Criança (SP), Criadouro Científico para Fins de Conservação CESP Paraibuna (SP), Criadouro Científico para Fins de Conservação Alessandro D'Angieri (SP), and Criadouro Paraiso das Aves (SP).

Conservation actions underway

The black-fronted piping-guan is included in the National Action Plan for Conservation of Atlantic Forest Birds. There have been several reintroduction experiments. Projeto Jacutinga (Program for Conservation of Game Birds of the Atlantic Forest: Reintroduction and Monitoring of black-fronted piping-guans), executed by SAVE Brasil, has released 30 individuals in the Serra da Mantiqueira and Serra do Mar in São Paulo and in the Guapiaçu Ecological Reserve in Rio de Janeiro since 2016. Some reproductive behaviours have been observed amongst the birds released, but without confirmed breeding success so far. SAVE Brasil has a campaign on responsible pet ownership in one of the release areas, with questionnaires, lectures, leaflets, posters and provision of free collars and identification tags.

In Minas Gerais, Projeto Mutum of Fundação Crax (Society for Research on the Management of the Reproduction of Wild Fauna), released 480 birds between 1990 and 2018, of the species *A. jacutinga*, *T. solitarius*, *O. capueira*, *C. noctivagus* and *C. blumembachii*, in Macedônia Farm, in the municipality of Ipaba. The area of native forest of the farm is around 1500 hectares, including riparian forest, a permanent preservation area, and a private reserve (Brazilian acronym RPPN) of about 560 ha. Monitoring data from 2018 indicated the hatching of nine juveniles of *C. blumembachii*, three of *T. solitarius* and six of *A. jacutinga* (CENIBRA 2018).

There is a need for population reinforcement and reintroduction in other areas. These efforts will require in situ research, as well as additional support from ex situ institutions to provide individuals for release.

Parque das Aves

Ex situ recommendations for black-fronted piping-guan

The following ex situ management roles were recommended for black-fronted piping-guan: insurance population, population reinforcement and reintroduction, research and training, and conservation education. Workshop participants chose not to recommend demographic manipulation at this time due to lack of data, but this role can be revisited in the future. Details of discussions on the recommended roles follow.

Insurance population

Wild populations of black-fronted piping-guan face a range of threats, which might not be mitigated in time for natural restoration. Therefore, participants recommended the establishment of an insurance population, while there are still viable wild and ex situ populations.

According to our survey, there are currently approximately 200 captive individuals in Brazil in zoos and breeding centres. Many of them are suspected to have the same origin, although there are suggestions that breeders from different states have used different sources. Some of the institutions that hold the species have experience and success in reproductive management and releases. However, the total number of captive individuals is uncertain, and there are difficulties in integrating all institutions into an ex situ program.

There is a need to organise the captive population, focusing on reproductive management to ensure its viability and genetic diversity, since it will also be the source for population reinforcement and reintroduction. There is concern about the possible existence of hybrid, or wrongly identified, birds, because some collections also include the closely-related species *Aburria cumanesis*.

A challenge to be confronted is the establishment of collaborative agreements with and between institutions that keep the species in captivity, to provide individuals for reintroduction or reinforcement. Another challenge that was highlighted is in relation to physical restraint. To perform certain procedures, physical restraint is necessary, but the stress of capture can result in capture myopathy, which can occasional result in the death of individuals. It is necessary to test the use of conditioning techniques to reduce the need for physical restraint.

Recommendations about this role

A working group, coordinated by Paloma Bosso (Parque das Aves) and Ana Raquel Faria (AZAB), was created with the support of ICMBio to carry out a survey of captive individuals and institutions. A formal invitation to join the cooperative management program will be prepared by SAVE Brasil and Parque das Aves, and a summary of the recommendations of this workshop will be presented. This invitation will be delivered by AZAB and ICMBio through the cooperation agreement.

The insurance population will be coordinated through the Technical Cooperation Agreement No. 3202386, signed between AZAB, ICMBio and the Ministry of Environment (MMA), process no. 02070.003869/2018-45, published in the Official Gazette on June 5, 2008 (106[3]: 108), which aims to establish ex situ management programs for 25 threatened animal species in Brazil.

The health status of captive individuals will be evaluated by a working group, to be created by Alecsandra Tassoni, coordinator of Projeto Jacutinga. This group will study potential diseases both in the wild and ex situ, with the aim of identifying which diseases should be used as criteria for release. A health protocol, including guidelines for sampling, will be created.

A consultative and collaborative ex situ management working group, formed by Parque das Aves, SAVE Brasil, Carlos Ruiz (UENF), AZAB and ICMBio, was created with the objective of developing breeding protocols for institutions willing to take part in the program, including guidelines for the necessary infrastructure.

Ex situ recommendations for black-fronted piping-guan

Population reinforcement and reintroduction

For the black-fronted piping-guan the benefit of population reinforcement and reintroduction is to increase the viability of existing wild populations, restore the species in areas where it had been extirpated, and as a result improve the conservation status of the species. Recovery of the population will also restore the species' ecological functions, including seed dispersal.

For the reinforcement and reintroduction of this species to be sustained, sufficient numbers of individuals are needed for release. According to the Population Viability Analysis of Black-fronted Piping-guan, for São Francisco Xavier, one of the areas where **Projeto Jacutinga** carries out releases, the release of 20 individuals per year for three years is required. To produce this number of juveniles, we estimate that an ex situ population of at least 250 individuals is required. This number can be readjusted according to the progress of the program and as more data become available.

Projeto Jacutinga has focused reintroduction efforts in São Francisco Xavier, but other potential release areas need to be studied, including assessments of their carrying capacity. The necessary human and financial resources for the reinforcement and reintroduction program need to be analysed and optimised. Because of the limited time available for discussions of each species during the workshop, no detailed assessment of the risks and feasibility of the reinforcement and reintroduction program for black-fronted piping-guan was conducted. Detailed discussion of these aspects is needed, considering also the results the Population Viability Analysis being conducted for the species, for the development of appropriate actions. In the short term, the continuation of reintroductions will be prioritised, with the current partner institutions as a source of individuals

Projeto Jacutinga

Projeto Jacutinga has focused reintroduction efforts in São Francisco Xavier.

Parque das Aves

Research and training

The ex situ research and training needs highlighted for black-fronted piping-guan were:

a) to improve and develop reproductive management techniques, including studies on fertility and possible use of artificial insemination techniques;
b) to understand the health situation of the population, with emphasis on diseases that may prevent the release of individuals;
c) to review existing studies and identify the need for new studies on the genetic diversity of the population;
d) to carry out a more detailed study of reproductive behavior, since the hypothesis was raised that the species is not totally monogamous;
e) to assess extent of hybridisation (if any) in the ex situ population with *Aburria cumanensis*;
f) to research capture and conditioning techniques that can mitigate capture myopathy;
g) to evaluate the relative benefits of releasing birds as individuals, pairs or groups;
h) to improve training protocols for release from an acclimatization facility;
i) to develop an ex situ management protocol for reintroduction.

Recommendations about this role

A best-practice protocol for management of birds for release will be prepared by Alecsandra Tassoni, with the technical support of Parque das Aves. This material will address, among other aspects, the management guidelines for individuals earmarked for release. It was suggested that the recommended actions be implemented by institutions with sufficient numbers of birds for an assessment of the reliability of the results. Alecsandra Tassoni and Carlos Ruiz will develop a document with general guidelines for Research and Training.

Education for conservation

Educational roles identified for captive birds included education efforts aimed to reduce hunting of the species, encourage consumption of legally and sustainably harvested palmito, and responsible pet ownership. A Conservation Education Plan will be developed as part of the agreement between ICMBio and AZAB for all target species of the agreement. Conservation education actions for black-fronted piping-guan will be included as part of this plan.

Parque das Aves

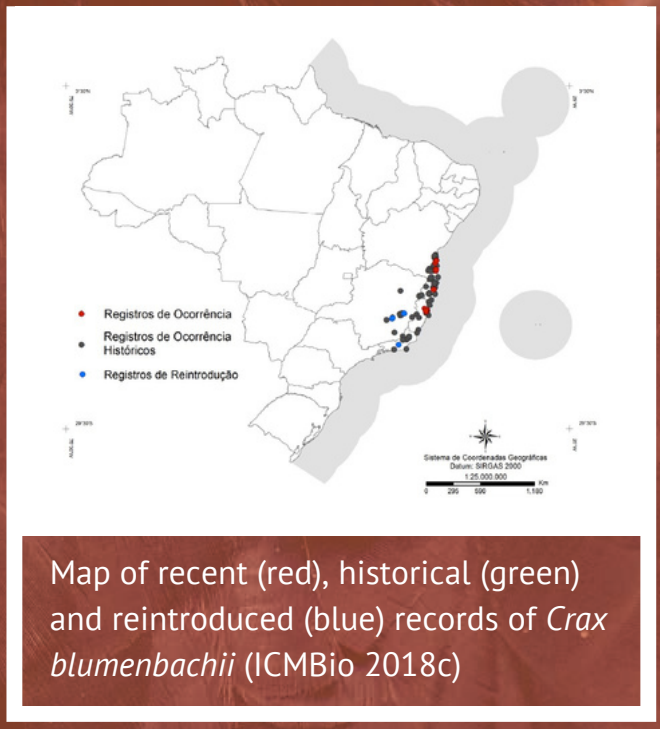
General recommendation for black-fronted piping-guan

An implementation group, composed of Pedro Develey, Alecsandra Tassoni, Carlos Ruiz, Paloma Bosso and Eduardo Araújo (ICMBio/CEMAVE) was created. The group's objective is to coordinate actions, monitor updates and articulate with specialists to ensure effective implementation of actions.

Red-billed curassow

Crax blumenbachii

Global Red List: EN (2019)
National Red List: CR (MMA 2018)
State Red Lists:
BA: CR (2017) **MG: CR** (2010)
ES: CR (2019) **RJ: PE** (2000)
SP: CR (2017)



Map of recent (red), historical (green) and reintroduced (blue) records of *Crax blumenbachii* (ICMBio 2018c)

Status in the wild

Previously occurred from Rio de Janeiro to Bahia, in lowland and tableland forests. Recent records of native populations in 6 locations in Espírito Santo and 11 locations in Bahia, with at least 500 native individuals (Table 2). The species was extirpated from Rio de Janeiro in the 1960s, and from Minas Gerais at the beginning of the 20th century, but today there are reintroduced populations in both states (ICMBio 2018c).

Combining different modeling tools, the minimum size of a forest fragment capable of housing a viable curassow population has been estimated at 3,141 ha (Bonfim et al 2019).

Currently, there are 71 forest fragments within the species' distribution larger than 3,141 ha, 17 of which are classified as "highly suitable". All populations in Bahia have fewer individuals than are estimated as required for a viability in the long term, even in an optimistic scenario without hunting (minimum viable population = 56 individuals). The largest population is in the Vale Nature Reserve, in Espírito Santo (Alves et al. 2017). According to BirdLife International and the Ministry of Environment, the total population of red-billed curassow is declining, but this needs to be confirmed. The most important threat to the species nowadays is hunting (Rios et al. in press).

Table 2. Sites with recent records of native red-billed curassow populations, with numbers where known. There are also two reintroduced populations, in Minas Gerais (Fazenda Macedônia) and Rio de Janeiro (REGUA).

STATE	REGION	SITE	ESTIMATED NUMBER OF INDIVIDUALS	YEAR OF MOST RECENT REPORT	REFERENCE
BAHIA	Serra Grande	Barra do Tijuípe	?	2015 (1 pair)	Bernardo & Canale, 2015
	Camacan	Fazenda Nossa Senhora Auxiliadora	?	2014 (1 male)	C.S.S. Bernardo, pers. comm.
	Parque Nacional Descobrimento (min. 40 ind)	Parque Nacional Descobrimento	33	2009	Alvarez & Develey (2010)
		Fazenda Caliman	?	2009	Alvarez & Develey (2010)
		Fazenda Guadalupe	?	2006	Alvarez & Develey (2010)
		Parque Nacional Pau Brasil	?	2015 (1 female)	C.S.S. Bernardo, pers. comm
	Parque Estadual Conduru (min. 30 ind)	Reserva Capitão (norte PESC)	?	2013	Rocha et al. (2019)
		Sul do PESC	?	2013	Rocha et al. (2019)
	Una	Reserva Biológica Una	Min. 15	2013	Rocha et al. (2019)
	Ituberá forests (min. 20)	Reserva Ecológica Michelin	?	2010	K. Flesher, pers. comm.
		Fazenda Reunidas Vale do Juliana	?	2013	Rios et al. (in press)
ESPIRITO SANTO	Linhares-Sooretama complex (min.385)	Reserva Natural Vale	325	2013	Alves et al. 2017
		Reserva Biológica Sooretama	?		IBAMA (2004)
		Fazenda Cupido	?	2010	Alvarez & Develey (2010)
		Fazenda Refúgio	?		Alvarez & Develey (2010)
		RPPN Mutum Preto	?		Alvarez & Develey (2010)
		RPPN Recanto das Antas	?		Alvarez & Develey (2010)

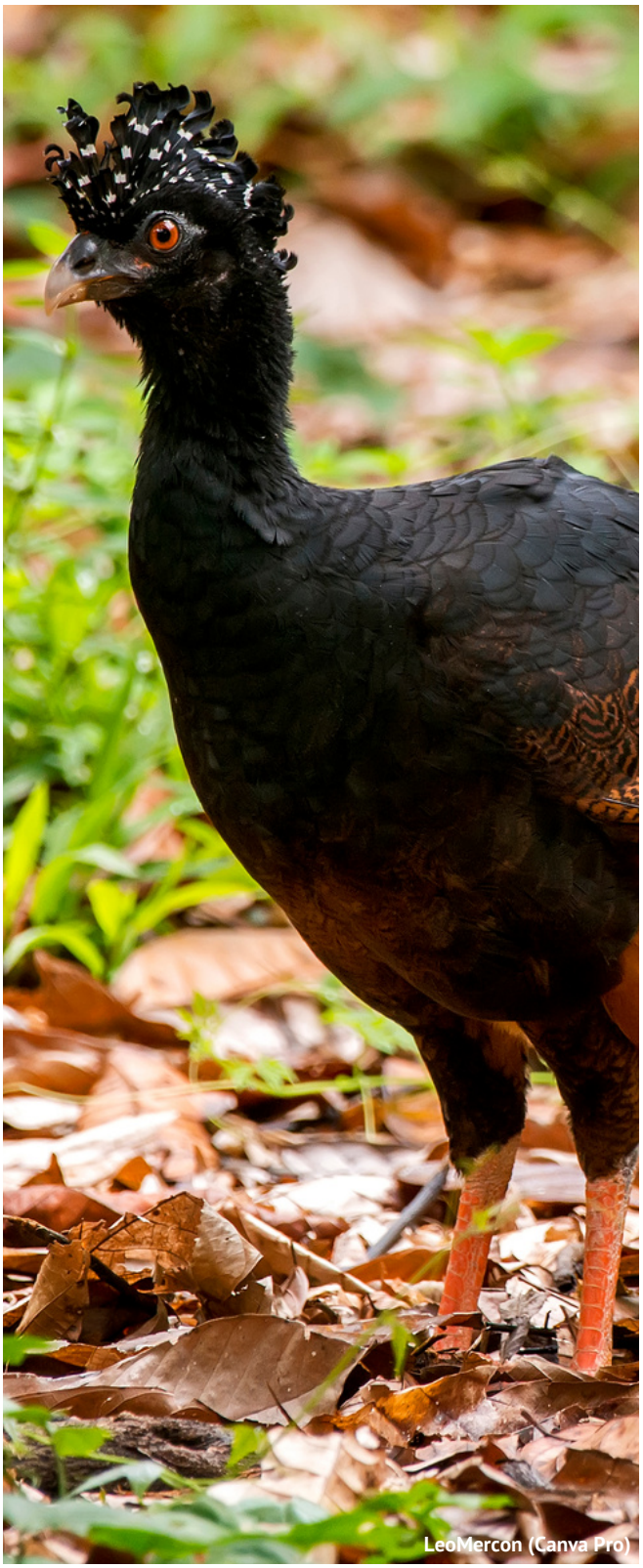
Ex situ status

In Brazil, there are currently 36 documented individuals in zoos (Species360 2020), and an unknown number in breeding centres. The total number of captive individuals in 2010 (including those abroad) was 637 (IBAMA/MMA 2004). Fundação Crax (Crax Foundation) has the largest captive population of red-billed curassow. This population is descended from eight founders from Bahia and Espírito Santo (Bernardo 2010). As of 2004, 28 institutions in the world held the species, but more recent detailed information is lacking (Bernardo 2010). There was a studbook (Bernardo 2010), and data on genetic variability in the captive population (Pereira & Wajntal 2001), but this information also needs to be updated.

Conservation actions underway

The species had its own National Action Plan during the years 2004 to 2014, with the objective of promoting its recovery and restoring populations within the original area of occurrence. The plan was terminated with 63% of the actions implemented (ICMBio 2014). The species is now included in the National Action Plan for Conservation of Atlantic Forest Birds.

Since the first releases in 1991, there have been four reintroduction projects in Minas Gerais (IBAMA 2004), with at least 180 birds reintroduced – the result of much effort by Fundação Crax (Simpson et al. 1997). The curassows were observed to reproduce in the wild after the releases (Brooks & Strahl 2000). In Rio de Janeiro, reintroductions started in 2006 at the REGUA reserve (Bernardo et al. 2011). The birds were fitted with radio transmitters and their survival and movements were monitored. The released individuals had a 75% survival rate after the release, with higher vulnerability during the first year, and started breeding. In Bahia, a long-term monitoring program has been established at the Michelin Ecological Reserve, along with an environmental education program (BirdLife International 2020).



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Ex situ recommendations for red-billed curassow

Insurance population

As the long-term viability of the red-billed curassow in the wild is still precarious, with only one subpopulation large enough to be secure in the long term, participants agreed on the importance of establishing and organizing an insurance population. The objectives of this insurance population are to preserve genetic variability, serves as a source of individuals for release, and to maintain a self-sustaining ex situ population in the event of further population declines in the wild.

In 2014 the MMA/ICMBio launched the Ex situ Breeding Program of the Alagoas curassow and the red-billed curassow, with recommendations for breeding of the two species, and with the objective of expanding the viable, demographically and genetically managed captive population to support reintroductions (MMA/ICMBio 2014). However, as reported by the participants of this workshop, there were difficulties in the implementation of the program, including failure of some institutions to collaborate, and responsibilities adopted by or assigned to people who were already overloaded. As a result, it was not possible to organise the captive program as had been planned. Attempts to bring together and engage the people and institutions involved were made, but without success. The majority of birds in the ex situ population are in institutions that are not well integrated into the program, a situation that may make translocation actions impossible. A further complication is that this species was not included in the cooperation agreement between AZAB and ICMBio because it already had its own captive program, despite the fact that this program has not developed as hoped.

Workshop participants recommended that the Ex situ Breeding Program be reactivated and restructured, and additional people trained so that key responsibilities could be better distributed. A working group, composed of Christine São Bernardo, Flávio Ubaid, Alecsandra Tassoni, Fábio Olmos and Flávia Chaves, was created for this recommendation. This same group will also discuss and recommend the design of the release program.

The general recommendation to improve the integration of breeding centres into the conservation program will be essential for this species (see page 9). It was suggested that AZAB appoint a new studbook keeper, considering that the studbook keeper for this species has been unable to fulfill their duties because of competing demands on their time.

LeoMercon (Canva Pro)

Translocation: reintroduction and reinforcement

The potential benefits of translocations for species recovery are that they can help restore the species in areas where the population has fallen to very low levels or disappeared, and integrate isolated individuals back into the population who would otherwise be lost. Some populations in Bahia are under heavy hunting pressure and are in isolated fragments. The smallest and most vulnerable of these might be appropriate sources of birds for wild-to-wild translocation, while larger fragments in which hunting can be controlled could be priority areas for population reinforcement. A study has already identified and prioritised the most suitable areas for releases (Bonfim et al. 2019). The implementation group for red-billed curassow will discuss in detail the planning of this action, risks, and feasibility. The recommendation was to list the areas where threats appear most imminent, primarily in Bahia, as well as the possible areas for releases.

In addition to the areas identified by Bonfim et al. (2019), an assessment of the Research Institute at the Rio de Janeiro Botanical Garden was suggested, as a potential area for reintroduction (see Appendix E). During the workshop the role was identified as assisted colonization, but after the workshop it was ascertained that the area is within the species' historical distribution. Because of time limitations, it was not possible to conduct a detailed discussion of these actions, nor the risks and feasibility.

The risks and viability will be evaluated by a group composed of Antonio Eduardo Araújo, Christine S. São Bernardo, Fábio Olmos, Carlos Ruiz, Fernando Pinto (articulator of the actions within the National Action Plan for this species) and Luís Fábio Silveira (interlocutor). The following institutions were listed as potential supporters to be contacted: Guapiaçu Ecological Reserve (REGUA), Refauna Project (Fernando Fernandez), Research Institute of Rio de Janeiro Botanical Garden, Tijuca National Park, Golden Lion Tamarin Association, Una Biological Reserve, Poço das Antas Biological Reserve, the State Environment Institute for Rio de Janeiro (INEA), Universidade Estadual do Norte Fluminense, and Fundação Crax.

The participants suggested further discussion after the workshop to detail each stage of the process: before, during and after the releases. Pre-release issues such as necessary ex situ infrastructure and environmental education should be considered. Other aspects that need consideration include fundraising, research questions, and partnerships that could be developed with other ongoing research projects, including longterm projects.

Training and research

The training and research actions for red-billed curassow are included within the general recommendations for research on multiple species (see pages 8–12).

Bare-faced curassow

Crax fasciolata

Global Red List: VU (2019)
National Red List: LC (MMA 2018)
State Red Lists:
PR: CR (2018)
SP: CR (2010)
MG: EN (2010)

Map of recent records of *Crax fasciolata* (including *Crax* [*fasciolata*] *pinima*) in Brazil (CC-BY-NC-SA, WikiAves 2020)

Status in the wild

Extensive distribution in the southeastern Amazon, Cerrado and Pantanal, extending to Bolivia, Paraguay and Argentina (WikiAves 2020). Extirpated from Paraná (there are reports of the species in the Ilha Grande National Park, on the edge of Mato Grosso do Sul). Close to having been extirpated in São Paulo. In Argentina, present in Chaco and Formosa, but gone from Corrientes, Misiones and Santa Fe. Inhabits humid, semideciduous and gallery forests, and is frequently recorded near forest edges (del Hoyo et al. 2020a). Population size unknown; Argentina has >2,500 mature individuals. Decline of 30–49% suspected, considering habitat fragmentation and loss, edge effects, and hunting (BirdLife International 2020). Main threats are habitat loss and hunting (del Hoyo et al. 2020a). Hunting pressure is a problem in Goiás, Tocantins and southern Pará, but the species is not considered particularly threatened in Brazil (BirdLife International 2020).

Ex situ status

There are at least 17 individuals in four institutions in Brazil, including Parque das Aves (with 7), Belo Horizonte, Rio de Janeiro and Sorocaba. There is an unknown number in other institutions, including Itaipu Binacional and breeding centres. According to ZIMS, there are an additional 56 individuals in zoos outside Brazil (Species360 2020).

Conservation actions underway

There is a reintroduction program for bare-faced curassow in Iberá, Argentina, which started with ten individuals from the Bela Vista Biological Refuge/Itaipu Binacional in Brazil. SAVE Brazil is assessing the need for population reinforcement in São Paulo with a population survey and investigation of the suitability of forest fragments.

Parque das Aves

Ex situ recommendations for bare-faced curassow

Crax fasciolata is listed as globally Vulnerable, and in evaluating the need for an ex situ management program for the species, there was consensus among participants that this is not a high priority in Brazil. This conclusion was reached mainly because of the possibility of competition for resources with other species facing a higher risk of extinction. It was recommended that initiatives in partnership with in situ conservation projects be supported. The inclusion of this species in this workshop was suggested due to the interest of Aves Argentinas in reintroducing the species at sites in Argentina, and also for its taxonomic proximity to Belém curassow, but unfortunately the experts responsible for the reintroduction project could not participate in this workshop. Therefore, the participants opted to support in situ actions, in partnership with ongoing programs for other species

Insurance population

At this time, the establishment of an insurance population is not considered necessary for the conservation of the bare-faced curassow. It was suggested to evaluate the existing ex situ population to understand its demographic and genetic structure and the number of individuals potentially available. It will also be necessary to effectively manage the population and check for hybridisation. Workshop participants identified the need for individuals for reintroduction, but this does not necessitate the formation of an insurance population.

Translocation: population reinforcement and reintroduction

Neither population reinforcement nor reintroduction of bare-faced curassow were considered priorities at the national level, in the context of many other species in more urgent need of limited conservation resources. However, local initiatives that do not compromise priority species are to be supported in large patches of inland Atlantic Forest in the states of São Paulo and Paraná, especially in areas close to large remnants and protected areas. The Iguaçu National Park, west of the state of Paraná, was cited by participants as a possible area for reintroduction. There is no historical documentation of the species in the National Park, but the species was reportedly common in Misiones at the end of the 19th century, with one record from Arroyo Uruzú from 1986 (del Hoyo et al. 2020a). There are two records of a male in the Caiuá Ecological Station, Diamante do Norte, Paraná, and flocks have been observed on islands of the Ilha Grande archipelago in the Paraná River (P. Scherer, pers. comm.). As for the origin of the birds for local reintroductions, more detailed discussions should be held in due course.

Research and training

Participants suggested investigating the occurrence of hybridisation between bare-faced curassow and closely related species in captivity. Considering the resources needed for this action, and that this is not a priority species for conservation actions, such investigations should only be implemented if they can add value to efforts to locate and confirm the identify of Belém curassows in captivity.

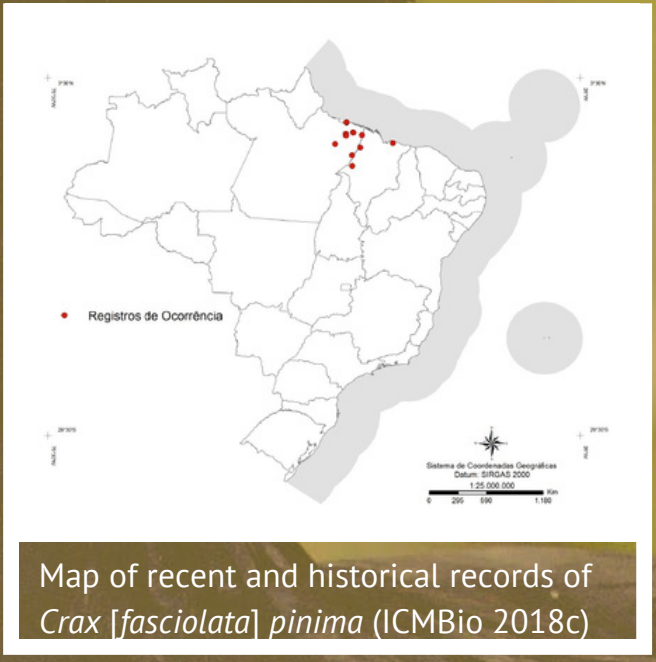
Parque das Aves

Belém curassow

Crax [fasciolata] pinima

Global Red List: CR (2019)
National Red List: CR (2018)
State Red Lists:
PA: EN (2008)

Taxonomy: Considered a full species in the taxonomy used by BirdLife International, but listed as a subspecies of Crax fasciolata in the national red list.



Map of recent and historical records of *Crax [fasciolata] pinima* (ICMBio 2018c)

Gustavo Gonsioroski

Status in the wild

The Belém curassow is restricted to the forests in the Belém Centre of Endemism, in the eastern Amazon. There are recent records in three areas in the states of Pará and Maranhão: in the Mãe Maria Indigenous Territory, Bom Jesus do Tocantins, Pará; in the Gurupi Biological Reserve/Alto Turiaçu Indigenous Territory, Centro Novo do Maranhão, Maranhão; and near the Rio Pindaré Indigenous Territory, Alto Alegre do Pindaré, Maranhão (Alteff et al. 2019). There were no confirmed sightings between 1978 and 2017, when the bird was rediscovered in the Gurupi Biological Reserve. The population is considered to have fewer than 50 individuals (ICMBio 2018c, Birdlife International 2020). Hunting (by indigenous and non-indigenous peoples) represents a significant threat. The crest feathers of female curassows are in demand for an indigenous cultural ritual (of the Ka'apor indigenous group, in Alto Turiaçu Indigenous Territory), and as a possible result of this, the sex ratio appears to be skewed (more males than females). The population decline due to habitat loss and hunting is suspected to have been greater than 80% in three generations (35 years).

A summary of the known information and knowledge gaps for this species was developed during the workshop (Table 3).

Table 3. Summary of known information and knowledge gaps or uncertainties for Belém curassow

KNOWN INFORMATION	KNOWLEDGE GAPS OR UNCERTAINTIES
• Illegal hunting is a major threat • Females are especially sought after • The population is small and in decline • Methods of transport, management and captive breeding exist for *Crax* spp.	• If there is any area safe from hunting • Population size • If there are still any individuals in captivity • Effect of rescue of individuals on the remaining wild population • Possibilities to change human behavior • Legally possible to capture birds on indigenous lands

Vladimir Loschi (Canva Pro)

Ex situ status

In 2009, five individuals (three females, plus two males potentially of this species) were seized from illegal trade and sent to a breeding centre in Santa Catarina. Two other females were subsequently located at a breeding centre in Minas Gerais (Laganaro 2013). All of these individuals (from Santa Catarina and Minas Gerais) later died (L. F. Silveira, pers. comm. 2020). There are also at least two individuals in captivity in the homes of indigenous people in the region where the species occurs (Alteff et al. 2019). The situation of these individuals needs to be investigated urgently, as the last confirmation was in 2017. During the workshop, we received news that the Onça Pintada Breeding Centre received a pair, apparently of this species, from the BioParque Rio (Patrick Pina to confirm). Subsequent to the workshop, we learned of another possible pair in captivity in the northeast of Brazil. The identity of these birds is being investigated.

A picture supposedly of Belém curassow at a breeding centre in Mexico in 1993 (del Hoyo et al. 2020b) shows, in fact, *Crax fasciolata grayi* (L. F. Silveira, pers. comm. 2020). There is no record of *Crax* [*fasciolata*] *pinima* in the ZIMS database (Species360 2020). For the species *Crax fasciolata*, there are records of 17 individuals in three zoos in Brazil, and a further 56 individuals in other countries. The possibility remains that other captive individuals of Belém curassow may exist, identified as bare-faced curassows.

Conservation actions underway

The Belém curassow is included in the National Action Plan for Conservation of Birds in the Amazon, which foresees the creation of an ex situ program for this taxon if remaining wild populations can be identified; environmental education actions are also foreseen (ICMBio 2018b). The capture of birds to initiate an ex situ management and conservation program has also been called for by specialists working on the species (Alteff et al. 2019).

Ex situ recommendations for Belém curassow

Rescue population

The value of a rescue population is in removing individuals (or eggs) from a dangerous situation, where they have a high probability of being hunted, to an ex situ situation, where they have a better chance of surviving and reproducing. The likelihood of this species recovering without intervention appears low. An exclusive focus on protecting and monitoring the species in the wild was considered, but workshop participants concluded that the balance of risks and benefits leans in favour of rescuing individuals. One advantage of a rescue population is that a well-managed captive breeding program that implements genetic management offers greater capacity to slow the loss of genetic diversity and inbreeding than would be the case in nature.

Any efforts at rescue will depend on opportunity and will involve very small numbers of birds, considering that access and logistics are difficult. The small population is dispersed across a large area, making it difficult to localise and rescue individuals. Efforts will also depend on collaboration with indigenous agencies and community leaders. It was reported that a confiscated individual was raised for a week with birdfeed and corn, before being sent to a breeding centre, without presenting any management challenges. It seems that this species does not present great management difficulties, and individuals have already been sighted being raised with chickens in indigenous communities.

There was consensus among participants that the rescue of individuals is an urgent priority, and that until the threats in the wild are mitigated, the best alternative is to secure and maintain some birds in captivity. In one of the areas, the Mãe Maria Indigenous Territory, it is considered that the viability of an ex situ program will be highest, and that it is possible to count on the help of the indigenous community, because they have knowledge of management and know how to find nests of the species.

As for the structure necessary for the management of the birds rescued, consideration was suggested for the construction of an enclosure in the Mãe Maria Indigenous Territory, as an action that could be developed in the long term. In the short term, it was suggested that any rescued birds should be sent to the Carajás Zoo, Pará, which is 223 km from the Mãe Maria Indigenous Territory. This institution will be contacted to explore the possibility of developing a collaboration agreement.

There was consensus that rescued birds should be brought into human care rather than translocated to a new location in the wild, if possible, but wild-to-wild translocation can be considered if a safe release area is identified and if it is felt that the ex situ program is not ready to receive birds.

The benefits, feasibility and risks of implementing an ex situ program for rescue of Belém curassow will be further discussed. It is essential to analyse the risks of rescuing a part of the population and potentially harming the remaining population in the wild, and to articulate with indigenous groups so this project can be pursued in compliance with their Indigenous Territorial and Environmental Management Plans, if they have them. To ensure part of the financial viability of this action, it was suggested to seek exclusive research grants for action with indigenous communities. Some points were raised to be better discussed after the workshop, by those responsible for implementing the actions: protocols for egg rescue, biological sampling, and assisted reproduction techniques to be applied ex situ.

Responsible parties and next steps

The rescue and transportation plan will be prepared by Gustavo Gonsioroski, Flávio Ubaid, AZAB, and ICMBio, with Parque das Aves as a focal point for cracid husbandry. Potential collaborators to be invited: Onça Pintada Breeding Centre, Carajás Zoo, and Bela Vista Biological Refuge in Foz do Iguaçu. This same group will create a protocol for preservation and collection of samples from any bird that dies. A partnership between ICMBio and the National Indian Foundation (FUNAI) was suggested to make this action feasible. ICMBio would be responsible for ex situ management of the birds.

Flávio Ubaid and Gustavo Gonsioroski, with the support of AZAB and CEMAVE/ICMBio, will structure the management program for the species, with any rescue attempts dependent on this action. Tarcísio Rodrigues, the biologist at Carajás Zoo, was suggested as the contact point with that institution. It was suggested to contact Mercival Roberto Francisco regarding analysis of any biological samples.

In parallel with planning ex situ actions, monitoring in the wild will be continued to gather more information on the situation facing the population. Pedro Develey offered to assist with fundraising proposals for monitoring the wild population of Belém curassow.

Education for conservation

Engaging with the indigenous community is crucial for the successful conservation of the Belém curassow. If birds are held in the future at the Carajás Zoo, or in enclosures within or near indigenous territories, these could offer important opportunities to build pride amongst local communities and educate to reduce the impacts of hunting. It was reported that the Mãe Maria Indigenous Territory received subsidies from a compensation program of the Vale mining company, and that this benefit ceased. The generation of income alternatives associated with the conservation program would increase the safety of the species in its natural habitat. This possibility will be explored by the State University of Maranhão. Gustavo Gonsioroski, Flávio Ubaid and Tarcilla Valtuille are responsible for the progress of this action, and will seek support from the state environment agency (OEMA) and CEMAVE/ICMBio, with the collaboration of FUNAI, the local indigenous association and Carajás Zoo.

Spot-winged wood-quail (northeastern)

Odontophorus capueira plumbeicollis

Global Red List: LC (Sp.) (2019)
National Red List: CR (2014)
State Red Lists: Not listed

Weber Girão presented genetic, bioacoustic and morphological evidence for consistent differences between O. c. plumbeicollis and O. c. capueira, but the case to treat the taxon as a full species has not yet been published.

Map of recent (red) and historical (green) records of *Odontophorus capueira plumbeicollis* (ICMBio 2018c)

Ciro Albano

Status in the wild

Endemic to Northeast Brazil, inhabiting lowland and upland Atlantic Forest in the states of Ceará, Paraíba, Pernambuco and Alagoas (Albano & Girão 2008). It has been recorded within the last ten years in protected areas in Ceará (APA of Serra de Baturité – recorded in 2020), Paraíba (Guaribas Biological Reserve – recorded in 2014); and Alagoas/Pernambuco (Pedra Talhada Biological Reserve – recorded in 2020). There are older records in other protected areas in Pernambuco (RPPN Frei Caneca) and Alagoas (ESEC de Murici).

Hunting seems to be the biggest threat to this taxon across its distribution. It may have been decimated by hunters in the mountains of Aratanha and Maranguape, in Ceará, where it is known to locals but there are no recent records of the species (Albano & Girão 2008). Habitat loss also threatens the species, as well as predation, and domestic birds (chickens) could transmit as-yet unidentified diseases (a hypothesised reason for the disappearance of wood-quails from the Ibiapaba Plateau in Granja/Viçosa). Predators include domestic dogs, tortoises (in Serra de Baturité, release of native tortoises lead to egg predation), and tegu lizards (one hypothesis is that tegus have moved higher up hills after seven years of drought). All of these threats have resulted in ongoing decline, with local populations dying out (ICMBio 2018c). According to ICMBio (2018c), the total population does not exceed 250 mature individuals. In a quantitative study by Albano & Girão (2008), an encounter rate of 31 individuals/100 hours of observation was recorded in Serra de Baturité, Ceará, while in 2017 a repeat survey using the same methods showed a drop to 17 individuals/100 hours of observation (Boticário Aves da Serra de Baturité project, per F. Nunes).

Ex situ status

There is no known ex situ population of this subspecies. At least eight individuals of the species (probably all from the nominal subspecies) are held in captivity, in the Sérgio Polezel Commercial Breeding Centre (4), Parque das Aves (1), Criadouro Onça Pintada (2), and Americana Municipal Zoo – Engenheiro Cid Almeida Franco (1) (Species360 2020, C. L. Vanin in litt.). With the nominal subspecies, there is experience with reproduction under human care, at São Paulo Zoo, the Sérgio Polezel Commercial Breeding Centre, and Parque das Aves. From three reproductive individuals at São Paulo Zoo in 2001, 2003 and 2004, 24 eggs were artificially incubated. Three did not develop and were discarded. After 26 days, 21 chicks hatched. Another 15 chicks hatched from eggs incubated by their parents. Of the 36 chicks in total, two died while hatching, ten died before the 12th day after hatching, and one was euthanized (Vaz et al. 2007). This suggests that the first 12 days after hatching are critical. While the young are nidifugous, careful temperature control and food stimulation several times per day are needed in this initial period.

Conservation actions underway

The northeastern subspecies of spot-winged wood-quail is included in the National Action Plan for Conservation of Atlantic Forest Birds, as well as in the National Action Plan for Conservation of Birds of the Caatinga. Control of hunting at ESEC Murici, one of the sites at which the taxon has been recorded, has improved greatly in the last two or three years. The Pedra Talhada Biological Reserve was effectively unmanaged until 2019, but this has now changed, and control of hunting will likely improve there as well.

Ex situ recommendations for northeastern spot-winged wood-quail

Insurance population

There was group consensus that ex situ actions will be essential to ensure the survival of the species, considering that appropriate ex situ techniques are understood and that the biological characteristics of the species are favourable. The population of *O. c. plumbeicollis* is already small and declining. With the additive effects of hunting, predation and possible diseases (and the possibility that the reproductive success of *O. c. plumbeicollis* is density-dependent), there is a risk that the subspecies will be driven to extinction within a few years. Strategies for the protection of the species in the wild were evaluated. Some initiatives appear to be showing positive results in the region of Quebrangulo, and there is the possibility of partnerships for conservation action in other areas of occurrence. However, the threats to the species will not be controlled in the short term. Taken together, these considerations led the experts to recommend the establishment of an insurance population.

The knowledge to maintain and breed the spot-winged wood-quail under human care exists. The challenge will be to find eggs in the wild. Most of the nests found so far had been predated. The spot-winged wood-quail has a relatively short generation time (4 years), so an ex situ population will lose genetic diversity relatively quickly. This implies the need for a large insurance population, and/or the frequent inclusion of new individuals from the wild to increase genetic diversity. The question of whether or not to mix birds from different subpopulations was discussed. On the one hand, doing so could increase genetic diversity in small subpopulations. On the other hand, there might be local adaptive variation in different populations that could be compromised by cross-breeding. For the establishment of a captive population, if some subpopulations are not represented, genetic diversity in these subpopulations will not be protected. There is a major geographical barrier (Caatinga) between the Quebrangulo and Serra de Baturité populations, but insufficient information to know if there are distinct differences that should be preserved.

Recommendations about this role

There are no captive individuals of this subspecies; the recommendation is to collect eggs from the wild for captive breeding. It is believed that egg removal will have minimal impact on the wild population because of the high natural rate of egg predation. Two strategies can be used: artificial incubation and cross fostering with *O. c. capueira*. Additional discussions should be held to outline the protocols for egg collection and transport. It was suggested that the collected eggs should be sent to the Tibagi Breeding Centre. Parque das Aves offered technical support for this action. Regarding the number of founders, the key considerations are to minimise any negative impact on the wild population, while ensuring that sufficient genetic diversity is incorporated into the ex situ population.

A working group was formed to create the implementation guidelines for the insurance population: Weber Girão, Fábio Nunes, Flávio Ubaid, Parque das Aves, AZAB, CEMAVE/ICMBio and Tarcilla Valtuille. Anita Studer will be consulted.

Ex situ recommendations for northeastern spot-winged wood-quail

Population reinforcement and reintroduction

Two areas were suggested as the most suitable for population reinforcement: Serra do Baturité and Quebrangulo, both isolated areas of Atlantic Forest separated by Caatinga. Pedra Talhada would also be an option, but currently there is no infrastructure and the protected area is abandoned. Serra da Aratanha presents a similar habitat to Serra do Baturité, but more research is needed in this area, alongside efforts to mitigate threats.

The recommendations in relation to reinforcement and reintroduction were that it is essential to first mitigate threats, before any release of birds. The number of birds required, and over what time period, will need to be estimated, as well as further work to identify the most suitable areas.

Research and training

Important topics for research with birds in human care were identified, as follows:

- Investigation of diseases (caused by parasites or malnutrition) that impact the survival of the species. Because of the possibility that the observed population decline in Serra do Baturité was caused by disease, investigation of common diseases in domestic birds (both current and historical) was suggested.
- Analysis of genetic variation between subpopulations, to inform the management of the ex situ population and decisions about release locations;
- Clearer determination of generation length.

Research in the field with the wild population should be encouraged, including investigations based on the species distribution model developed for the subspecies. Among the priorities for field-based studies is to refine understanding of the number of populations of the species, and to estimate the total population size. Because of time limitations, there was no detailed discussion of these topics. It will be necessary to develop each action in more detail, as well as to evaluate risks and feasibility.

Ex situ roles discussed but not recommended for the northeastern subspecies of spot-winged wood-quail

Education for conservation

The actions outlined in the National Action Plan for Conservation of Atlantic Forest Birds concerning environmental education address the needs of this subspecies. The specific use of birds in human care was not recommended to implement specific environmental education actions for the northeastern subspecies of spot-winged wood-quail.

Jaboticaba (CanvaPro)

Speckled chachalaca ("Paraná")

Ortalis [*guttata*] *remota*

Global Red List: LC (Sp.) (2019)
National Red List: CR (MMA, 2018)
State Red Lists:
SP: CR (2018)

Considered a full species by Silveira et al. (2017) but neither BirdLife International nor the Brazilian Ministry for the Environment has adopted this taxonomic change.

Map of records of *Ortalis* [*guttata*] *remota* (ICMBio 2018c)

Marco Silva

Status in the wild

Endemic to Brazil, inhabiting riparian forests in the north of São Paulo state (Silveira et al. 2017). Described from specimen collected in eastern Mato Grosso do Sul. According to the National Red List (ICMBio 2018c), it also occurs in Minas Gerais, but the map in the same does not show any points of occurrence in that state. Because of the paucity of records of this subspecies (WikiAves 2020) and considering that most of its distribution is well sampled by ornithologists and bird watchers, it is estimated that the current population does not exceed 300 individuals. Subpopulations are isolated because of the legacy of extensive deforestation. As the dispersal ability of the species is limited across non-forest matrix areas, it is believed that there is severe fragmentation of the remaining population (ICMBio 2018c).

The loss of habitat is the greatest threat to the taxon. Its range has been largely converted to agricultural land uses (soy, sugarcane and pastures) and urban areas (ICMBio 2018c). A very important threat is the flooding of riparian forests after the construction of dams. Silveira et al. (2017) estimated that 78% of the main channels of the Tietê, Grande and Paranaíba rivers have been inundated by dams.

Ex situ status

There is no record of *Ortalis remota* or *Ortalis guttata remota* in captivity in the ZIMS database (Species360 2020).

Looking at other *Ortalis*, there is one individual of *Ortalis guttata* listed in captivity in Brazil, in Pomerode, Santa Catarina, and three in Colombia (all listed under the old name, *Ortalis motmot guttata*). Pomerode is within the distribution area of *Ortalis squamata* according to the updated taxonomy, so the identity of this individual needs confirmation. There are 159 individuals of other *Ortalis* species in zoos in several countries, including Temaiken in Argentina.

Conservation actions underway

This taxon is included in the National Action Plan for Conservation of Atlantic Forest Birds. Research in the field is focused on identifying where the species occurs, studying natural history, and estimating numbers.

Bitenka (Canva Pro)

Ex situ recommendations for the for the "Paraná" subspecies of speckled chachalaca

The specialists in the workshop do not currently recommend any ex situ management role for *O.* [*guttata*] *remota*. The situation of this taxon seems to be more secure than some of the other species discussed. The species is not known from protected areas, but most or all of the sightings have been in Areas of Permanent Protection – areas of native vegetation on private land that are legally protected from clearance. Deforestation rates in the state of São Paulo have declined and some areas have benefited from restoration programs.

Wild-to-wild translocation was discussed, prioritizing the capture of pairs in more isolated and fragmented areas to translocate to more suitable areas. However, this taxon is more frequent in small fragments than larger fragments, perhaps because of differences in hunting pressure. Therefore, identifying the most suitable areas might not be straightforward. There was consensus among the participants that translocation is not a priority for the conservation of the species at this time.

One of the options discussed was to alert rescue centers that might conceivably receive individuals of this taxon. There is a risk is that once some individuals are held in captivity, there would be the temptation to set up a captive breeding program, without necessarily thinking about whether it is essential. It may be best to release such individuals, whenever possible, back into the wild population, ensuring that such translocations or releases are done according to relevant protocols and directed to appropriate sites.

These recommendations will be reviewed within two years.

AdventurePicture (Canva Pro)

General recommendations for the "Paraná" subspecies of speckled chachalaca

The "Paraná" subspecies of speckled chachalaca is included in the general action proposed in this workshop to elaborate identification materials. Possible errors of identification could mean that captive individuals are not correctly identified (see page 12). In addition, the taxon is included in the general action proposed for opportunistic biological sampling, following the protocol to be elaborated by an expert group (see page 11).

Alagoas guan

Penelope superciliaris alagoensis

Global Red List: LC (Sp.) (2019)
National Red List: CR (MMA, 2018)
State Red Lists: Not listed

Map of records of *Penelope superciliaris alagoensis* (ICMBio 2018c)

Arthur Andrade

Status in the wild

Endemic to the Pernambuco Centre of Endemism, with records in forest habitat from Rio Grande do Norte to Alagoas (ICMBio 2018c). Typically at low densities, even in the protected areas in which it occurs, including Guaribas Biological Reserve, RPPN Frei Caneca and ESEC de Murici (ICMBio 2018c). Population estimated at fewer than 250 mature individuals, with fewer than 50 of them in each subpopulation (ICMBio 2018c). In the past, habitat loss was a very important threat. More than 95% of the potentially suitable habitat for this taxon has already disappeared (Silveira 2008). Today, we speculate that the most important threat may be hunting.

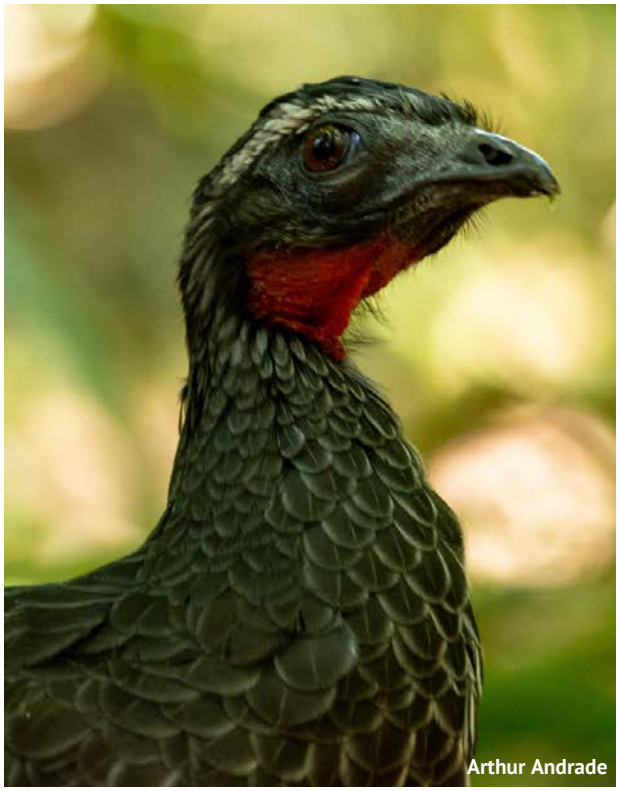
Ex situ status

There is no record of *Penelope alagoensis* or *Penelope superciliaris alagoensis* in the ZIMS database (Species360 2020). The population of this taxon in captivity consists of six individuals in a private breeding centre in Alagoas (L. F. Silveira, pers. comm. 2020).

Looking to other subspecies of Rusty-margined Guan, there are also no records of the subspecies P. s. jacupemba, P. s. superciliaris or P. s. major in ZIMS. According to the same database, there is only one individual of the species Penelope superciliaris registered in Brazil, at Parque das Aves, with no records in other countries. Drawing on another source of data specific to the state of São Paulo, there are records of 63 individuals of the species Penelope superciliaris in 9 institutions, most of them in the Scientific Breeding Centre for Conservation CESP Paraibuna (40) and Marcelo Nascimento Breeding Centre (10), but also in the Zoológico Municipal de Americana-Parque Ecológico Engenheiro Cid Almeida Franco, Municipal Zoo of São José do Rio Preto, Jequitibás Forest Zoo - Campinas, Mantenedor de Fauna Silvestre Fabio de Albuquerque, Mantenedor de Fauna Silvestre Eugênio Paceli Lopes, ASM Fazenda Cambuhy Agricola Ltda and CETAS Lorena (Integrated Wildlife Management System of the State of São Paulo, per. C. L. Vanin, 2020).

Conservation actions underway

The subspecies is included in the National Action Plan for Conservation of Atlantic Forest Birds. Regulation of hunting at ESEC Murici has improved in the last two or three years, which will help maintain the population of the species. However, even with these new enforcement efforts at ESEC Murici, manager Marcos Freitas reported a recent case of the species being hunted there.


Arthur Andrade

Ex situ recommendations for Alagoas guan

Although there have been recommendations to capture individuals to begin an ex situ program (ICMBio 2018c), there was consensus among participants that at this time important information is lacking for such a program to be initiated. It was suggested that discussion of such a program be taken to the next monitoring meeting of the National Action Plan for Conservation of Atlantic Forest Birds. Meanwhile it is clear that threats to this taxon in the wild, especially hunting, need to be addressed.

Arthur Andrade

General recommendations for Alagoas guan

Taxonomic study to resolve the degree of divergence of Alagoas guan from rusty-margined guan was indicated as a priority. It is also essential to determine the precise geographic limits of the distribution of this taxon, which are not well defined. These uncertainties impede confident decision-making for the conservation of the taxon. Monitoring of the wild population was recommended. Discussions of the possible contribution of ex situ management roles for this species should be resumed within two years (by 2022).

A suggestion was made to test the benefits of supplementary feeding for the wild population, as an aid to the species and to help monitoring. This technique has been used with apparent success in the case of the white-browed guan *Penelope jacucaca* in Reserva Mãe-da-Lua, Ceará (see: www.mae-da-lua.org). Effective control of hunting is essential in such a scenario. The risk of attracting hunters, as well as the risk of compromising the ecological function of seed dispersal, should be assessed. If implemented, supplementary feeding should only take place in areas with a long-term commitment to full protection from hunting.

The Alagoas guan is included in the general action proposed during this workshop for the elaboration of identification material (see page 12). Identification errors are common with *Penelope* guans, and for this reason, it is conceivable that there are further unknown individuals already in ex situ collections.

A working group was created to discuss conservation actions, both ex situ and in the wild. Weber Girão, Antonio Emanuel, Eduardo Barbosa, Tarcilla Valtuille, Flávio Ubaid, Benjamin Phalan and SAVE Brasil are responsible for continuing these discussions.

Yellow-legged tinamou (southern)

Crypturellus noctivagus noctivagus

Global Red List: LC (Sp.) (2019)
National Red List: CR (MMA, 2018)
State Red Lists:
BA: VU (2017) **MG: EN** (2010)
ES: CR (2019) **RJ:** PE (2000)
SP: EN (2018) **PR: EN** (2018)
SC: EN (2011) **RS: CR** (2014)

Map of recent and historical records of *Crypturellus noctivagus noctivagus* (ICMBio 2018c)

Jose Kachimareck

Status in the wild

Endemic to Brazil, occurring in tropical forests and gallery forests from Bahia to Rio Grande do Sul (Cabot et al. 2020a). Most of the population is found in the large block of preserved forest of the Serra do Mar, with other subpopulations in isolated fragments (Tomotani & Silveira 2016, Corrêa et al. 2019). In Rio Grande do Sul a relictual subpopulation is known from a forest fragment of about 450 ha within the Pampas grasslands (Corrêa et al. 2010, Corrêa & Petry 2018). This subpopulation was estimated at about 18 adult individuals and is thought to be the only remaining site with this species in the state (Corrêa et al. 2020a). The sex ratio is skewed, with more males than females (Corrêa et al. 2020b). There is a lack of other population studies, but the total population has been estimated at ⩽10,000 mature individuals (ICMBio 2018c).

The population is estimated to have declined by at least 10% in 21 years (three generations) because of hunting pressure, deforestation and forest degradation (ICMBio 2018c). The species has specific micro-habitat requirements for breeding. Nests have been found in foothills, in high areas, and distant from areas used for foraging, always associated with large trees with buttress roots. The species was common in the past, but is now rare and local (Cabot et al. 2020a), and has been extirpated from coastal Bahia, interior of Paraná, Rio de Janeiro and most of Rio Grande do Sul (Bencke et al. 2003).

Ex situ status

There are five individuals of *Crypturellus noctivagus* in the Belo Horizonte Zoo (Species360 2020) but without information about the subspecies. According to the zoo, they are old and past their reproductive age. There are also breeding centres with the species, including four commercial breeders as well as Fundação Crax, Sérgio Polezel bird breeding centre and CESP, but we have no information on the number of individuals in these institutions.

Conservation actions underway

Crypturellus noctivagus noctivagus is included in the National Action Plan for Conservation of Atlantic Forest Birds, and is also included in the National Action Plan for Conservation of Threatened and Socioeconomically Important Species of the Mangrove Ecosystem. The subpopulation in Rio Grande do Sul, although not within a formally protected area, is effectively protected from hunting by landowners. There was a reintroduction plan at REGUA, Poço das Antas or another site in the state of Rio de Janeiro, using birds from Fundação Crax, but it did not go ahead.

LeoMercon (Canva Pro)

Ex situ recommendations for Yellow-legged tinamou (southern)

For the conservation of the southern subspecies of yellow-legged tinamou, the following ex situ management roles were discussed: reintroduction, population reinforcement and reintroduction, and research and training. The group agreed that since the subspecies is not at high risk of global extinction, the importance of these actions is primarily in restoring ecological functions at the local level. Actions do not have national priority by themselves, but where there are opportunities to integrate these actions with other projects, they should be considered.

Population reinforcement and reintroduction

It is believed that the subpopulation in Rio Grande do Sul is not reproducing with much success, because although the size of the subpopulation appears to be stable, neither eggs nor young have been found during years of fieldwork (L. Corrêa, personal observation). The idea of population reinforcement would be to introduce younger individuals to balance age structure of the subpopulation and reduce the risk of extirpation. It was suggested that individuals from other states with stable populations be translocated to Rio Grande do Sul. As for the source of individuals for translocation, the advantages and disadvantages of capturing individuals in the wild or receiving captive individuals were discussed (Table 4). Some of these factors may be more important than others, and there may be stronger differences between the two sources in some cases than in others.

The state of Rio de Janeiro was highlighted by experts as a possible reintroduction site, because there appear to be known areas with suitable habitat and microhabitat. One option discussed was the experimental reintroduction in Poço das Antas Biological Reserve.

Regarding the feasibility of this action, participants reported that *C. n. noctivagus* is a taxon that does not present major husbandry challenges. Ex situ institutions already manage this taxon successfully in captivity, and articulation with these institutions would be necessary (CESP, Fundação Crax, Criadouro de Aves Sérgio Polezel, and Belo Horizonte Zoo). Fundraising for a reintroduction program would be facilitated by the possibility of integration into other ongoing projects in Rio de Janeiro state.

LeoMercon (Canva Pro)

Table 4. Factors to be considered in decisions about the source of individuals for translocation, with an initial assessment of pros and cons of the two sources (+ point in favor; - point against). Note that captive-sourced birds are assumed here to be already available from breeders.

FACTOR	SOURCE: WILD	SOURCE: CAPTIVITY
Cost (minimise field and translocation costs)	-	+
Numbers of individuals available	+	-
Independence from concerns about cooperation of breeders	+	-
Avoid removals of birds from wild population	-	+
Avoid risk of death from capture myopathy	-	+
Demographic control of translocated individuals	-	+
Genetic diversity	+	-
Avoid hybridization with subspecies *C. n. zabele*	+	-
Adaptation of individuals without additional training	+	-
Probability of survival after release	+	-

Research and training

Crypturellus noctivagus noctivagus is included in the general action proposed in this workshop to develop identification material. In particular, captive individuals might not be correctly identified at subspecies level, and there is also the possibility of hybridisation between the two subspecies in captivity (see pages 11–12). It will be important to identify any hybridisation when selecting individuals for release. The data obtained from the survey of individuals in ex situ institutions (see page 9) will be useful for a study of genetic diversity and hybridisation, which will be conducted by Luiz Corrêa and Flávia Guimarães Chaves.

General recommendations for Yellow-legged tinamou (southern)

There was consensus among participants that there is no urgent need for a specific and proactive programme of reintroduction and population reinforcement for this taxon. However, they supported the idea of incorporating actions into other programs where this can be shown to be an effective use of resources, and as long as any releases adhere to best practices for reintroductions as defined by IUCN. The pros and cons of wild or ex situ sources were discussed (Table 4) and can help to inform a decision if a translocation opportunity arises. In the case of any individuals that appear in rescue centres, the distribution of the subspecies and micro-habitat requirements should be considered when deciding on a release location.

Brazilian tinamou

Crypturellus strigulosus

Global Red List: LC (2019)
National Red List: NT (2014)
State Red Lists: Not listed

Map of recent records of *Crypturellus strigulosus* in Brazil (CC-BY-NC-SA, WikiAves 2020)

Douglas Fernandes

Status in the wild

In the Atlantic Forest, there is only an isolated population in the states of Alagoas and Pernambuco. Wide distribution in the Amazon extending into Peru and Bolivia (Cabot 2020b). We focus here on the Atlantic Forest population, for which there are few published records: in Abreu e Lima, Pernambuco in 2012; Usina Porto Rico, Campo Alegre, Alagoas in 2008; Parque Dois Irmãos, Recife, Pernambuco in 2006; and Passo de Camaragibe, Alagoas in 1990 (WikiAves 2020, Xeno-Canto 2020). No records are included in eBird. It inhabits primary and secondary terra firme forests, apparently with some tolerance of habitat degradation. Apparently rare but no estimate of population size (Cabot et al. 2020b). It is suspected to be in decline due to habitat loss and hunting (Cabot et al. 2020b).

Ex situ status

No ex situ individuals are known. There are no records of Brazilian tinamou in the ZIMS database (Species360 2020).

Conservation actions underway

The species is included in the National Action Plan for Conservation of Atlantic Forest Birds, but there are no existing actions focused on the species.

Ex situ recommendations for Brazilian tinamou

After discussion of the conservation status of Brazilian tinamou in the Atlantic Forest, the workshop participants agreed that its status in the Atlantic Forest appears concerning, but that more information on the species is needed to decide whether or not an ex situ management program is needed or feasible. This possibility should be reviewed in the future as more data become available.

Brazilian tinamou is included in the action to elaborate identification materials for target species of this workshop, with the objective of locating any individuals that appear in rescue centres or similar settings. Any such individuals would be an invaluable source of information and potentially of biological samples. Weber Girão, Flávio Ubaid, Antonio Emanuel de Souza, with the support of ICMBio, will work on identification material for this species.

General recommendations for Brazilian tinamou

Research was recommended to understand the genetic divergence between the populations in the Amazon and the Atlantic Forest, to be coordinated by Christine São Bernardo and Flávio Ubaid. Weber Girão, Flávio Ubaid and Antonio Emanuel de Souza took responsibility for monitoring in the field to verify the continued occurrence of Brazilian tinamou in the Pernambuco Centre of Endemism, and, to the extent possible, estimate the size of the population. Glauco Alves Pereira will be invited to contribute to this action. Fabiana Rocha will help contact researchers who monitor mammal populations in the Pernambuco Centre of Endemism using camera traps, so that relevant images and data can be shared if possible.

Solitary tinamou

Tinamus solitarius

Global Red List: NT (2019)
National Red List: NT (2014)

State Red Lists:
PR: EN (2018) **SP: VU** (2018)
MG: EN (2007) **RJ: EN** (2007)
ES: EN (2019)

Map of recent records of *Tinamus solitarius* in Brazil (CC-BY-NC-SA, WikiAves 2020)

Parque das Aves

Status in the wild

Occurs in Atlantic Forest with more open understorey, from Northeast Brazil to southeast Paraguay and extreme northeast of Argentina (Cabot et al. 2020c). Estimated global population of 50,000 to 200,000 (BirdLife International 2020). Can occupy degraded forests if the canopy remains intact (Cabot et al. 2020c). The main threats are hunting and habitat loss and fragmentation, because of agricultural expansion, urbanization, industrialization, human invasion of forest areas, and road construction (Cabot et al. 2020c). Declining throughout its range (BirdLife International 2020), and has disappeared from many locations (Sick 2001).

In Northeast Brazil, there was an estimated population of 100 individuals in 1971 (Cabot et al. 2020c), but there are recent records only in Murici, Alagoas (WikiAves 2020). There is disagreement regarding the taxonomic status of the subspecies *T. s. pernambucensis* in the Northeast, with one study finding no consistent plumage characters to distinguish it from other *T. solitarius* (Amaral & Silveira 2004). This study was based only on morphometry and no genetic analysis was included. A study on lice described a distinct species of *Heptagoniodes* from a solitary tinamou specimen from Alagoas, which is morphologically closer to the ectoparasites found in *T. tao* in the Amazon than in *T. solitarius* in southeastern Brazil (Valim & Silveira 2014). That is suggestive, at least, of a long isolation of the Northeast population.


Marco Silva

Ex situ status

There are at least 20 individuals of this species in captivity in Brazil in four institutions, including 16 in Parque das Aves, in addition to another 39 individuals in Europe (Species360 2020). Paraibuna Center for the Conservation of Wild Birds/CESP has already bred in captivity and reintroduced 193 adults and about 25 juvenile solitary tinamous (Magina & Pina 2014) but there is no more recent information from that nor from other institutions in the state of São Paulo (Sistema Integrado de Gestão de Fauna Silvestres do Estado de São Paulo, per. C. L. Vanin). There are several individuals in the Onça Pintada Breeding Centre, Paraná.

Conservation actions underway

Solitary tinamou is included in the National Action Plan for Conservation of Atlantic Forest Birds (ICMBio 2018a). There have been several release programs for the species. The first between 1986 and 1995, with 59 individuals reintroduced in the areas of the Paraibuna-Paraitinga reservoir, in the state of São Paulo (Santiago 1996, cited in Magina & Pina 2014). An experimental management project released 18 individuals born in captivity at the Caiuá Ecological Station in the northwest of Paraná (Ribas & Scherer-Neto, cited in Magina & Pina 2014). A major challenge was post-release monitoring, which made it difficult to estimate success. Another project in 2013 released 12 individuals in the Jaceguava Municipal Natural Park, in the state of São Paulo, with a 40% survival rate after eight months of monitoring with radio transmitters. Predation was the main cause of mortality shortly after release (⩽ 5 days) and near the acclimatization aviary (⩽ 30 m) (Magina & Pina 2014).

Ex situ recommendations for solitary tinamou

The following ex situ management roles were discussed for solitary tinamou: insurance population, population reinforcement and reintroduction, and research and training. The species as a whole is not at high risk of extinction, and a national ex situ management program will not be prioritised. Local actions in conjunction with ongoing projects will be supported to restore ecological functions and avifauna at the local level. Assessment should be made of any such opportunities, including consideration of the best source of individuals.

In the case of the putative northeastern subspecies, the situation is very different, and this taxon may be close to global extinction. Further recommendations therefore depend on whether or not the taxon ***T. s. pernambucensis*** is valid, and are not recommended until this issue is resolved. **If that taxon is validated as a distinct subspecies, the following actions will need to be urgently discussed:**

a) assess options for improving protection in the wild;
b) evaluate the need for wild-to-wild translocation;
c) assess the need and feasibility of capturing wild individuals to establish an insurance population; and if that is done,
d) initiate reproductive management program for the subspecies.

Parque das Aves

Population reinforcement and reintroduction

Reintroduction and population reinforcement were not identified as priorities at a national level for the solitary tinamou. Although the species has been depleted and even lost in many areas, it retains a relatively large and widespread population overall. At local level, reintroduction and reinforcement of this species could be useful tools for restoring ecological function, especially if integrated alongside reintroductions of other species of greater conservation concern.

Participants suggested deferring any decision about reintroduction or population reinforcement in the northeast of Brazil until there is clarity about the taxonomic status of the isolated population there. If that population is indeed distinct, there will be an urgent need to consider translocation and other ex situ actions.

Research and training

An important role identified for the ex situ population of solitary tinamou is in testing and refining release methods and protocols. In the event that translocations are planned for the population in the northeast of Brazil, it will be useful to have already passed through the learning stage with birds from the non-threatened population in southern and southeast Brazil. This will provide a basis for later building management capacity in the northeast, if needed. Any further releases should be carefully documented and details made available through publication of reports or papers.

As indicated above (see also page 11), research on the taxonomic status of *T. s. pernambucensis* in the Pernambuco Centre of Endemism is of high priority, especially taking into consideration the recent study on lice. Current genetic tools are more accessible than they were in 2004. The authors of the 2004 study agreed that it would be worthwhile to revisit this issue. The main difficulty will be obtaining biological samples. The available specimens from the Pernambuco Center for Endemism are from 1979, and DNA extraction from such old specimens may present difficulties. The solitary tinamou is now very rare in the northeast, so obtaining samples from a wild individual would also be difficult. In captivity, it is possible that there are individuals with mixed origins, so while it would be worthwhile to sample putative captive individuals of *T. s. pernambucensis*, the inclusion of samples of known provenance will also be essential.

A working group was formed to define the next steps for research, made up of the following participants: Fabio Olmos, Pedro Scherer-Neto, Patrick Pina, Carlos Ruiz and Christine São Bernardo. The Centro de Fauna da Companhia Energética de São Paulo is a potential partner for this action. Following a study of the genetics of the ex situ population (P. Pina pers. comm.) it is believed that the holdings of this institution represent the best genetic diversity of the species.

Ex situ roles evaluated but not recommended at this time for solitary tinamou

Insurance population

There was consensus among the participants that at this time, the establishment of an insurance population is not a priority for the conservation of solitary tinamou, as it does not face a high risk of extinction in the wild in the foreseeable future. This decision can be reassessed in the future, when more information is available on the isolated population in the Pernambuco Centre of Endemism. An evaluation was recommended of the ex situ population of solitary tinamou, as one of the list of general and multi-species actions (see page 9). This will provide useful information on the availability of birds for any future ex situ efforts.

Monitoring of actions and recommendations for National Action Plans

After the workshop, it was suggested that monitoring the implementation of actions would be best achieved through reporting within existing National Action Plans. We reviewed those actions in the three National Action Plans relevant to the focal taxa and determined the need for any changes or additions. Some of the actions identified in this workshop are already contemplated in the National Action Plans. We have cross-referenced these actions to the relevant actions in the accompanying spreadsheet to facilitate reporting. In other cases, changes to existing actions or the addition of new actions were suggested. These suggestions are are subject to approval by the Technical Advisory Groups (GATs) of the National Action Plans.

LeoMercon (Canva Pro)

National Action Plan for Atlantic Forest Birds

The outcomes of this workshop fulfil the requirements of action 7.2 of the National Action Plan for Atlantic Forest Birds (ICMBio 2018a) in relation to the focal taxa, and lay the groundwork for actions 7.3, 7.5, and others. We suggested to include additional taxa in three of the existing actions within the National Action Plan for Birds of the Atlantic Forest (Table 5). Many of the actions suggested in the workshop can be reported on under existing actions in the National Action Plan. These are cross-referenced in the supplementary actions preadsheet. For others, we suggested the creation of new actions within the National Action Plan, subject to approval by the Technical Advisory Group.

Under action 2.7 of the National Action Plan for Birds of the Atlantic Forest (obtain demographic data), we suggested to add five taxa from this workshop: *Aburria jacutinga*, *Odontophorus capueira plumbeicollis*, *Penelope superciliaris alagoensis*, *Crypturellus strigulosus* and *Tinamus solitarius pernambucensis*. Under action 5.3 (implement programs to control feral dogs and cats, especially in areas of occurrence of...), we suggested to add one taxon: *Odontophorus capueira plumbeicollis*. Under action 7.3 (implement management programs for reinforcement and/or reintroduction) the taxa that were identified as being of highest priority for such programs were identified as *Aburria jacutinga, Crax blumenbachii* and *Odontophorus capueira plumbeicollis*.

The general actions identified on pages 8–12 of this report relate to the National Action Plan for Atlantic Forest Birds as shown in Table 6. Seven new actions are proposed, for consideration and possible modification by the Technical Advisory Group.

Table 5. Existing actions in the National Action Plan for Conservation of Atlantic Forest Birds relevant to eight focal taxa of this workshop (*Aburria jacutinga*, *Crax blumenbachii*, *Penelope superciliaris alagoensis*, *Ortalis* [*guttata*] *remota*, *Odontophorus capueira plumbeicollis*, *Crypturellus noctivagus noctivagus*, *Crypturellus strigulosus*, *Tinamus solitarius*) and suggested changes arising from this workshop.

Existing actions	Suggested changes
2.7 Obtain demographic data from taxa: *Neomorphus geoffroyi dulcis, Neomorphus geoffroyi geoffroyi, Nyctibius leucopterus, Ortalis guttata remota, Sporophila maximiliani, Morphnus guianensis, Strix huhula albomarginata, Buteogallus aequinoctialis, Harpia harpyja, Micrastur mintoni, Crax blumenbachii, Formicivora erythronotus, Myrmotherula snowi*.	**Add: *Aburria jacutinga, Odontophorus capueira plumbeicollis, Penelope superciliaris alagoensis, Crypturellus strigulosus, Tinamus solitarius pernambucensis.***
2.5 Conduct educational campaigns to prevent wildfires in areas of occurrence of species of the National Action Plan, especially *Formicivora paludicola, Formicivora littoralis, Ortalis guttata remota, Cercomacra brasiliana, Jacamaralcyon tridactyla*.	
2.9 Carry out ecological and epidemiological studies of the focal species of the National Action Plan.	
5.1 Identify the alien invasive species in the Atlantic Forest domain that affect the taxa listed in the National Action Plan, for the development of a list to inform control measures.	
5.3 Implement programs to control feral dogs and cats, especially in areas of occurrence of *Pauxi mitu, Crax blumenbachii, Aburria jacutinga* and *Tinamus solitarius*.	**Add: *Odontophorus capueira plumbeicollis*.**
7.2 Identify, in accordance with the IUCN One Plan Approach methodology, if species of the National Action Plan require integrated management.	[Workshop fulfilled this requirement for the taxa considered]
7.3 Implement management projects for the population reinforcement and/or reintroduction of focal species of the National Action Plan, considering the results from action 7.2.	**Add: Taxa identified as being of highest priority for integrated management are *Aburria jacutinga*, *Crax blumenbachii* and *Odontophorus capueira plumbeicollis***
7.5 Survey specimens of species of the National Action Plan currently held in wildlife enterprises, as well as institutions appropriate to receive them.	
7.6 Liaise with state environmental authorities so that individuals of focal species of the National Action Plan found in irregular situations or confiscated are directed to the institutions identified in action 7.5.	
7.7 Carry out studies of the health and diseases of National Action Plan species for which releases take place.	

Table 6. General or multi-species actions identified during the workshop (as outlined on pages 8–12 of this report), and their relationship to existing or suggested actions in the National Action Plan for Conservation of Atlantic Forest Birds.

Actions identified in workshop	Existing or suggested action in National Action Plan
Better standards and criteria for releases	Report progress under actions 4.2 and 4.5
Inventory of ex situ populations	Report progress under action 7.5
Inclusion of ex situ institutions in conservation programs	**New action: Strengthen collaboration among different institutions engaged in the conservation of threatened Atlantic Forest species, including all institutions that keep the species in captivity**
Best practice protocols for management and translocation	**New action: Develop improved release methods and protocols for threatened species of Galliformes and Tinamiformes, with species-specific protocols where appropriate**
Training in demographic, genetic, health and nutrition management	**New action: Provide training in ex situ population management of Galliformes and Tinamiformes, including demographic, genetic, health and nutritional aspects**
Structuring of ex situ populations with studbooks	**New action: Structure ex situ populations with studbooks (or re-activate studbooks) for *Crax blumenbachii*, *Crax fasciolata pinima* and *Odontophorus capueira plumbeicollis***
Combined efforts to reintroduce species with overlapping distributions	Report progress under action 7.3
Representation in the Technical Advisory Group	To be addressed by coordinator of National Action Plan
Protocols for biological samples	**New action: Develop protocol for biological sampling of threatened species of Galliformes and Tinamiformes**
Taxonomic research	**New action: Evaluate the taxonomic validity and limits of: *Penelope superciliaris alagoensis, Tinamus solitarius pernambucensis, Crypturellus strigulosus* [population in the Atlantic Forest], *Odontophorus capueira plumbeicollis***
Improving identification capacity	Report progress under action 3.4
Collaboration with camera trap and autonomous recorder studies	**New action: Collaboration with camera trap and autonomous recorder studies (including for mammals and amphibians) to maximise use of any data collected on birds, especially threatened species of large-bodied birds including Galliformes, Tinamiformes, Cuculiformes, Columbiformes and Accipitriformes**


Eugenia Cordero

National Action Plan for birds of the Caatinga

One of the focal taxa, *Odontophorus capueira plumbeicollis*, is included in the National Action Plan for Birds of the Caatinga as well in the National Action Plan for Atlantic Forest Birds. We proposed under action 3.15 of the Caatinga plan that additional options for reintroduction and reinforcement should be considered (Table 7). We also suggested to include some specific areas for searches for this taxon in action 3.24 (Serra da Aratanha and Quebrangulo). We suggested the inclusion of a new action relevant to this taxon: Study diseases relevant to *Odontophorus capueira plumbeicollis*, with *O. c. capueira* as a model.

Table 7. Existing Actions in the National Action Plan for Birds of the Caatinga relevant to *Odontophorus capueira plumbeicollis* and suggested changes arising from this workshop.

Existing actions	Suggested changes
3.9 Test in situ and ex situ methods to strengthen recruitment and population recovery (nest protection, supplementary feeding, captive breeding) of National Action Plan species.	
3.10 Apply those in situ and ex situ methods identified as appropriate in action 3.9 in priority areas.	
3.11 Control alien invasive species in areas where birds of the National Action Plan occur.	
3.14 Establish an ex situ backup population of *Odontophorus capueira plumbeicollis*.	
3.15 Establish a pilot project for reintroduction of captive-born *Odontophorus capueira plumbeicollis* in Serra da Aratanha, Ceará.	**Add: ...and evaluate other options for reintroduction and reinforcement**
3.24 Organise expeditions to search for new populations of focal species of the National Action Plan	**Add: ...including searches and population estimates for *Odontophorus capueira plumbeicollis* in understudied areas, including Serra da Aratanha and Quebrangulo**
4.1 Promote increased law enforcement in areas with hunting and protected areas where *Odontophorus capueira plumbeicollis* is found.	
4.9 Promote environmental education ... in schools and where birds of the National Action Plan occur.	
Add new action	**Study diseases relevant to *Odontophorus capueira plumbeicollis*, with *O. c. capueira* as a model**


Rob Atherton Canva Pro

National Action Plan for birds of Amazonia

One of the focal taxa, *Crax* [*fasciolata*] *pinima*, is included in the National Action Plan for Amazonian Birds. We suggested to add an additional action to the National Action Plan for this species: to develop a rescue plan and ex situ management program, and liaise with relevant institutions during this process (Table 8).

Table 8. Existing Actions in the National Action Plan for Birds of Amazonia relevant to *Crax* [*fasciolata*] *pinima* and suggested changes arising from this workshop.

Existing actions	Suggested changes
1.21 Search for individuals of *Crax fasciolata pinima* in the forest remnants of the Belém Centre of Endemism.	
3.3 Develop and implement ongoing programs in environmental education addressing the threats to *Tinamus tao, Crax fasciolata pinima, Crax globulosa, Cyanocorax hafferi, Penelope pileata, Psophia obscura, Psophia dextralis* [and other species] in conjunction with communities in the Belém Centre of Endemism, northeast of Roraima, Rondônia, the Madeira-Purus interfluvial, north of Mato Grosso, central Solimões and western Pará.	
Add new action	**Develop a rescue plan, including sampling and transport protocols, and liaise with ex situ institutions that could receive this species to plan an ex situ management program**

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APPENDICES

Parque das Aves

Appendix A: List of participants

Name	Position and Institution	Email address
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Weber Girão e Silva	Aquasis	weber@aquasis.org

Remote participation

Name	Position and Institution	Email address
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* Attempted remote participation, but unable to connect during the meeting

Facilitators and rapporteurs

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Additional contributions to species files

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Assessment of Ex Situ Activities and Integrated Conservation Planning for Galliformes and Tinamiformes in Brazil

AGENDA

Aim of workshop:

- To assess the value, roles, feasibility and characteristics of ex situ management for 10 taxa of Atlantic Forest birds, in order to maximize the contribution of ex situ tools to the conservation of these taxa, where this is appropriate.
- Where required/appropriate review relevant actions in the PAN, and identify associated or additional priority in situ actions (e.g. intensive management in situ, etc.)

For taxa with existing ex situ recommendations, activities or programs, we aim to focus on explicitly confirming/identifying the roles of ex situ management and on reviewing in sufficient detail the necessary program characteristics to meet those roles. This will also bring clarity and shared goals among all partners involved, ensure thorough integration with in situ activities (or identify new, related, in situ actions), and allow these programs to act as models/inspiration for the other taxa. For taxa without existing ex situ recommendations, activities or programs we aim to identify potential ex situ conservation roles and their relative value, characterize program structure needed for each, consider risks and feasibility, and make recommendations for ex situ management (if any) and identify next steps.

This workshop will use IUCN SSC's Guidelines on the Use of Ex situ Management for Species Conservation and Guidelines for Reintroductions and Other Conservation Translocations to guide this process.

Taxa to be discussed during the workshop:

Wednesday 12 February:	Black-fronted piping-guan (*Aburria jacutinga*)
Thursday 13 February:	Red-billed curassow (*Crax blumenbachii*) Bare-faced curassow (*Crax fasciolata*) Belém curassow (*Crax [fasciolata] pinima*)
Friday 14 February:	Rusty-margined guan, northeastern subspecies, (*Penelope [superciliaris] alagoensis*) Speckled chachalaca, Alto-Paraná subspecies (*Ortalis [guttata] remota*) Spot-winged wood-quail, northeastern subspecies, (*Odontophorus capueira plumbeicollis*)
Saturday 15 February:	Yellow-legged tinamou, southern subspecies, (*Crypturellus noctivagus noctivagus*) Brazilian tinamou (*Crypturellus strigulosus*) Solitary tinamou (*Tinamus solitarius*)
Sunday 16 February	Remaining species work as needed, review progress on PAN actions, wrap up, next steps

12 February, Wednesday

08.30 Welcome on behalf of Parque das Aves, ICMBio (CEMAVE), CPSG
Participant introductions

09.00 Introductory presentations:

- Overview of workshop aims and process (Parque das Aves, CPSG)
- Introduction to the extinction vortex, the One Plan Approach and relevant IUCN SSC guidelines on ex situ management and on conservation translocations (CPSG)
- Review and clarify understanding of each potential ex situ role

11.00 Ex situ assessment and planning for the black-fronted piping-guan (*Aburria jacutinga*)

- Overview of status in wild and survey (Alecsandra Tassoni, SAVE)
- Overview of ongoing conservation activities and recommendations (AT)
- Overview of ex situ population status and expertise (AT)
- Clarify/confirm participants' aims for this workshop's session on this taxon
- Identify/confirm current and potential additional ex situ conservation roles
- Review and characterize program structure of each
- Discuss challenges, risks, feasibility of each role
- Consider interactions / overlap of programs and role
- Identify potentially required adaptations to existing ex situ and reintroduction programs to better support current roles and/or expand to new roles
- Develop action steps and responsibilities to achieve recommended roles and programs

17.00 End of workshop for day. Evening Activity: Cocktail reception, Butterfly House

13 February, Thursday

08.30 Ex situ assessment and planning for red-billed curassow (*Crax blumenbachii*)

- Overview of status in wild, survey (Christine Steiner)
- Overview of ongoing conservation activities and recommendations (CS)
- Overview of ex situ population status and expertise (CS)
- Clarify/confirm participants' aims for this workshop's session on this taxon
- Identify/confirm current and potential additional ex situ conservation roles
- Review and characterize program structure of each

10.30 Continue with red-billed curassow assessment and planning

- Discuss challenges, risks, feasibility of each role
- Consider interactions / overlap of programs and role
- Identify potentially required adaptations to existing ex situ and reintroduction programs to better support current roles and/or expand to new roles
- Develop action steps and responsibilities to achieve recommended roles and programs

13.30 Ex situ assessment and planning for bare-faced curassow (*Crax fasciolata*)

- Overview of status in wild, survey, ongoing conservation activities (Fabio Olmos)
- Overview of ex situ population status and expertise (FO)
- Clarify/confirm participants' aims for this workshop's session on this taxon
- Identify potential ex situ conservation roles and relative value
- Characterize program structure needed for each, along with risks and feasibility
- Make recommendations for ex situ management (if any) and identify next steps

15.30 Ex situ assessment and planning for Belém curassow (*Crax [fasciolata] pinima*)

- Overview of conservation status, survey, ongoing conservation activities (Flavio Ubaid)
- Overview of ex situ population status and expertise (if any) (FU)
- Clarify/confirm participants' aims for this workshop's session on this taxon
- Identify potential ex situ conservation roles and relative value
- Characterize program structure needed for each, along with risks and feasibility
- Make recommendations for ex situ management (if any) and identify next steps

17.00 End of workshop for the day

14 February, Friday

08.30 Ex situ assessment and planning for rusty-margined guan, northeastern subspecies (*Penelope [superciliaris] alagoensis*)

- Overview of conservation status, survey, ongoing conservation activities (Tarcilla Valtuille)
- Clarify/confirm participants' aims for this workshop's session on this taxon
- Identify potential ex situ conservation roles and relative value
- Characterize program structure needed for each, along with risks and feasibility
- Make recommendations for ex situ management (if any) and identify next steps

11.00 Ex situ assessment and planning for speckled chachalaca (Paraná) (*Ortalis [guttata] remota*)

- Overview of status in wild, survey, ongoing conservation activities (Marco Silva)
- Clarify/confirm participants' aims for this workshop's session on this taxon
- Identify potential ex situ conservation roles and relative value
- Characterize program structure needed for each, along with risks and feasibility
- Make recommendations for ex situ management (if any) and identify next steps

14.30 Ex situ assessment and planning for spot-winged wood-quail, northeastern subspecies (*Odontophorus capueira plumbeicollis*)

- Overview of status in wild, survey, ongoing conservation activities (Weber Girão)
- Overview of ex situ population status and expertise (WG)
- Clarify/confirm participants' aims for this workshop's session on this taxon
- Identify potential ex situ conservation roles and relative value
- Characterize program structure needed for each, along with risks and feasibility
- Make recommendations for ex situ management (if any) and identify next steps

17.00 End of workshop for the day. Evening Activity: Short visit to Iguaçu Falls

15 February, Saturday

05.30 Pickup at hotel for birdwatching in National Park (optional)

09.30 Ex situ assessment and planning for yellow-legged tinamou, southern subspecies (*Crypturellus noctivagus noctivagus*)

- Overview of status in wild, survey, ongoing conservation activities (Luiz Corrêa)
- Overview of ex situ population status and expertise (LC)
- Clarify/confirm participants' aims for this workshop's session on this taxon
- Identify potential ex situ conservation roles and relative value
- Characterize program structure needed for each, along with risks and feasibility
- Make recommendations for ex situ management (if any) and identify next steps

12:30 Visit to Parque Das Aves (Cecropia aviary)

14.00 Ex situ assessment and planning for Brazilian tinamou (*Crypturellus strigulosus*)

- Overview of conservation status, survey, ongoing conservation activities (Ben Phalan)
- Clarify/confirm participants' aims for this workshop's session on this taxon
- Identify potential ex situ conservation roles and relative value
- Characterize program structure needed for each, along with risks and feasibility
- Make recommendations for ex situ management (if any) and identify next steps

16.00 Ex situ assessment and planning for solitary tinamou (*Tinamus solitarius*)

- Overview of status in wild, survey, ongoing conservation activities (Patrick Pina)
- Overview of ex situ population status and expertise (PP)
- Clarify/confirm participants' aims for this workshop's session on this taxon
- Identify potential ex situ conservation roles and relative value
- Characterize program structure needed for each, along with risks and feasibility
- Make recommendations for ex situ management (if any) and identify next steps

18.00 End of workshop for the day

16 February, Sunday

08.30 Develop recommendations in more detail, including integration of conservation actions into National Action Plan process

11.00 Final plenary discussion/next steps

12.00 Closing of workshop

13:30 Post-workshop optional activity: guided visit to Conservation Breeding Centre (chácara)

Appendix C: Descriptions of potential ex situ roles

The roles listed below are based on a combination of the role descriptions in the IUCN SSC Guidelines on the Use of Ex Situ Management for Species Conservation (IUCN/SSC 2014) the IUCN SSC Guidelines for Reintroductions and Other Conservation Translocations (IUCN/SSC 2013), and those in Appendix I of the Amphibian Ark Conservation Needs Assessment (Zippel et al. 2006).

Ark

Maintain a long-term ex situ population after extinction of all known wild populations and as a preparation for reintroduction or assisted colonization, if and when feasible.

Insurance population

Maintain a long-term, viable ex situ population to prevent predicted local, regional or global species extinction and preserve options for future conservation strategies. These are typically species that are threatened and/or declining and for which it is unsure whether in situ threat mitigation will have the sufficient effect in a sufficient timeframe to prevent species extinction or dramatic decline in individuals, populations and/or genetic diversity. An insurance population also may be used as a source population for genetic and/or demographic supplementation or other conservation translocations as required, but these are not yet actively planned in the foreseeable future.

Rescue (temporary or long term)

Establish an ex situ population for a species that is in imminent danger of extinction (locally or globally) and requires ex situ management, as part of an integrated program, to ensure its survival. The species may be in imminent danger because the threats cannot/will not be reversed in time to prevent likely species extinction, or the threats have no current remedy. The rescue may need to be long term (e.g., emerging disease, invasive species) or temporary (e.g., predicted imminent threats that are limited in time, such as extreme weather, oil spill). This role relates to the rescue of a population and not the rescue of injured or confiscated individuals.

Demographic manipulation

Improve a demographic rate (survival or reproduction) or status (e.g., skewed sex ratio) in the wild population, often related to a particular age, sex, or life stage. Examples include head-start programs that remove eggs or young from the wild to reduce high juvenile mortality and then subsequently return individuals to the wild.

Population restoration: Reintroduction

Serve as a source of individuals for population restoration to re-establish the species to part of its former range from which it has been extirpated.

Population restoration: Reinforcement

Serve as a source of individuals for population restoration to supplement an existing population, for demographic, behavioral, genetic or other purposes.

Conservation introduction: Ecological replacement

Introduce the species outside of its indigenous range to re-establish a lost ecological function and/or modify habitats. This may involve species that are not themselves threatened but that contribute to the conservation of other taxa through their ecological role.

Conservation introduction: Assisted colonization

Introduce the species outside of its indigenous range to avoid extinction, for example, if the species' original habitat is no longer suitable for the species.

Ex situ research and/or training

Use an ex situ population for research and/or training that will directly benefit conservation of the species, or a similar species, in the wild (e.g., develop monitoring methods; address data gaps in life history information, nutritional requirements, or disease transmission/treatment). The research or training addresses specific questions essential for success of the overall conservation strategy for the species. This can include cases in which a non-threatened species serves as a model for threatened species, or establishing ex situ populations of a threatened species to gain important species-specific husbandry and breeding expertise that is likely to be needed in the future to conserve the species.

Conservation education

Ex situ population forms the basis for an education and awareness program that addresses specific threats or constraints to the conservation of the species or its habitat. Education should address specific human behavioral changes that are essential for the success, and are an integral part, of the overall conservation strategy for the species. This primarily involves ex situ locations visited by the intended human audience and requires or is greatly benefitted by ex situ individuals or management.

Marco Silva

Appendix D: Declaration on improper releases

The participants gathered at this event express great concern about the procedures related to the destination of fauna (e.g., release) in the country. The publication of LC No. 140, which delegates this attribution to the states of the federation, generated uncertainties about the responsibilities related to this type of procedure.

This division of responsibilities can harm the conservation of biodiversity. Agencies tend to make pragmatic decisions about destination because no captive centers to receive them are found, means of transport to suitable locations are unavailable, and registered sites for release are lacking. These decisions often result in individuals being released into the wild in unsuitable sites (e.g., outside their original geographical distribution, or in an inappropriate habitat) and without an appropriate assessment of their health status. Additionally, the lack of monitoring makes the effect of these releases unknown.

Inadequate releases pose a potential risk to natural populations with few conservation benefits. In addition, opportunities to optimise biodiversity conservation efforts are lost. We have observed this problem mainly for individual animals captured illegally and/or from the breeding stock of different types of breeding centres, including conservationist breeding centres (e.g., jacutinga and red-billed curassow, among others).

We are of the conviction that when individuals are released into the wild, whether they are from threatened taxa or not, there must be integrated planning to minimize the risks for released individuals, as well as for natural populations. Also, captive breeding and animal release must be integrated and follow the recommendations of National Action Plans and ex situ conservation programs, to maximize the beneficial effects for biodiversity conservation. However, we are far from that reality.

Although some states, such as São Paulo, have created adequate procedures, the current management model for fauna in the country makes it difficult to standardise procedures for the destination of fauna. Our experience shows that the capacity for dialogue and coordination among the environmental agencies is limited. As a result, measures and procedures are implemented in isolation and in an ad-hoc manner.

Considering the collective efforts within several conservation projects to maximise the conservation value of each individual, without prejudice to their health, behavior, or genetic characteristics, we strongly believe that the destination of fauna in the Brazilian territory is a subject that needs to be addressed and discussed extensively with all the environment institutions of the states of the federation. Discussions on the standardisation and coordination of procedures must include consideration that inappropriate releases put at risk the effort of projects developed with more rigorous criteria.

This debate must be informed by scientific evidence and take advantage of lessons learned from both successful and unsuccessful projects and initiatives, in Brazil and other countries. The discussions must also be grounded in an understanding of the challenges of biodiversity conservation in a century where the human population demands ever more resources and the destruction of habitats, spread of invasive species, and climate change are accelerating.

Appendix E: Rio de Janeiro Botanical Gardens as a test site for releases of *Crax blumenbachii*

Post-workshop contribution by Fábio Olmos

The Botanical Garden of Rio de Janeiro Research Institute (Jardim Botânico do Rio de Janeiro) is a research institute and botanical garden located in the Jardim Botânico district in the southern part of the city of Rio de Janeiro, Brazil.

One of the most beautiful and well preserved green areas in the city, it is an example of the diversity of Brazilian and foreign flora. In about 6,500 species (some endangered) can be observed, within an area of 54 hectares, outdoors and in greenhouses. The Institute is responsible for the coordination of the List of Species of Brazilian Flora and for the evaluation of extinction risk for these species.

The Botanical Garden is adjacent to an extensive area of forest where the Tijuca National Park is located, an urban park of 3,200 ha covered by secondary tropical forest and enclosed by the city of Rio de Janeiro.

The Tijuca National Park was the site of pioneering forest restoration initiatives during the 19th century and, in the 1970s, bird reintroductions. This last project, led by Adelmar Coimbra-Filho and Antonio Aldrighi, succeeded in reestablishing populations of species such as rusty-margined guans Penelope superciliaris, ariel toucans Ramphastos vitellinus ariel and maroon-bellied parakeets *Pyrrhura frontalis* (Coimbra-Filho 2000, Coimbra-Filho & Aldrighi 1971, Coimbra-Filho & Aldrighi 1972, Coimbra-Filho et al. 1973), which are easily observed today in the Botanical Garden (fide Wikiaves 2020, Trindade & Rajão 2017).

Today, Tijuca National Park remains the focus of reintroduction efforts through the Refauna Project, which has already been successful with red-rumped agoutis *Dasyprocta leporina* and is working on other species such as brown howler monkeys *Alouatta guariba*, yellow-footed tortoise *Chelonoidis denticulata* and green-winged saltator *Saltator similis*.

The red-billed curassow *Crax blumenbachii* occurred historically in the outskirts of the city of Rio de Janeiro. Its type location is Fazenda Mandioca, Vila Inhomirim, in the current municipality of Magé, but previous records prove its presence in what would later become the city of Rio de Janeiro.

The oldest report is that of Jean de Lery, who was in Rio de Janeiro between 1557 and 1560. He visited only a few islands (such as Ilha do Governador) and localities in Guanabara Bay and describes the curassow. Later, Anthony Knivet, who lived in Rio between 1591 and 1601, describes the species from the area known today as Cachoeiras de Macacu (Pacheco 2013).

There is no doubt that the species occurred historically in what is now the city of Rio de Janeiro and in the entire forest area of Baixada Fluminense and adjacent low slopes. It is worth noting that the birds reintroduced in the Guapiaçu Ecological Reserve (REGUA) – exactly in Cachoeiras de Macacu – regularly used areas of Atlantic Forest up to 700 m in altitude, demonstrating that the species is not restricted to flat areas and low altitude.

Appendix E: Rio de Janeiro Botanical Gardens as a test site for releases of *Crax blumenbachii*

Curassows *Crax* spp. can reach high population densities even in secondary habitats if there is no hunting pressure. In fact, it is common to observe large groups of *Crax fasciolata* around farmhouses and inns dedicated to tourism in the Pantanal and Amazon, and the same occurred with *Crax blumenbachii* in REBIO Sooretama when there was a feeder for the birds.

Hundreds of nature lodges and conservation units around the world prove that the presence of animals habituated to human presence is a powerful instrument for environmental education and public relations, besides generating income [risks to habituated birds also need to be assessed].

At the same time, habituated birds are part of the reproductive population that can be more easily monitored and managed, and obviously produce juveniles that will colonise nearby areas. The use of habituated birds, however, has not been deliberately adopted as a conservation practice in Brazil.

The Botanical Garden of Rio de Janeiro is an interesting place to test the efficiency of "ultra-soft" releases of habituated *Crax blumenbachii* individuals to assess whether birds kept in semi-natural environment in contact with people can be used as founders of a free living population.

In fact, this proposal aims to repeat in a controlled manner and with adequate monitoring and evaluation a practice that has already been implemented in a countless number of properties in the country (cf. Nogueira-Neto 1973). It is also the current practice in breeding centres like Fundação CRAX (which keeps a large proportion of its Crax blumenbachii population loose and reproducing on the property) and uses aspects of the Fazenda Macedônia practice, where a population was reintroduced.

An interesting point in the use of birds used in a known and visited area like the Botanical Garden, besides the use for education and awareness activities about a species that is not familiar to most of the population, is that the most suitable individuals would be exactly those that would be considered inadequate for releases in other areas because they are too tame. This project would enable both the use of these birds and the reproduction of lineages that may be under-represented among the birds considered suitable for reintroductions.

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