

Institution: Manchester Metropolitan University		
Unit of Assessment: B7 Earth Systems and Environmental Sciences		
Title of case study: Protecting threatened birds and their habitats across the tropics		
Period when the underpinning research was undertaken: 2000 - 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Stuart Marsden	Lecturer to Professor	1998 - present
Alexander Lees	Lecturer, Senior Lecturer	2016 - present
Christian Devenish	Research Associate	2018 - present
Period when the claimed impact occurred: 1 August 2013 – 31 December 2020		
Is this case study continued from a case study submitted in 2014? No		
<p>1. Summary of the impact</p> <p>Overall, our body of published research has provided evidence to underpin the IUCN red list classifications for 71 species of topical landbirds, including 64 species classified as globally-threatened, or approximately 6% of all threatened tropical landbirds. Notably, our discovery of dramatic declines in African Grey Parrot populations was instrumental in the 2016 Appendix I global trade ban under the Convention on International Trade in Endangered Species (CITES). Research findings have also directly informed reforestation legislation in Brazil and management planning for protected areas (including a UNESCO World Heritage Centre) in the Philippines and Peru. We have trained hundreds of local conservationists in our validated distance sampling techniques in 15 countries. In the Philippines, our methods helped to shape design of the LAWIN biodiversity monitoring system, now mandated by the government to monitor 6,000,000ha of protected land. A mobile app has captured data from over 100,000km of forest patrols using our methods and is accredited with a downward trend in conservation threats.</p>		
<p>2. Underpinning research</p> <p>Around half of all bird species are exclusively tropical and 80% of threatened bird species are found in lowland or montane tropical forests. These habitats are subject to high rates of habitat loss, fragmentation and degradation, and many species are subject to direct persecution. Since 2000, researchers at Manchester Metropolitan University have produced around 150 peer-reviewed papers directly related to the conservation of threatened tropical birds and the complex relationships between habitat alteration, direct exploitation and avian biodiversity. Underpinning much of the work has been the development and validation of context-appropriate ecological and analytical techniques, especially low-tech distance sampling to assess abundance, abundance change, ecological requirements and threats to endangered species. The extensive work on distance sampling methods is described in five key peer-reviewed papers published between 2002 and 2015, which have collectively accrued 228 citations in academic literature (Scopus, accessed December 2020).</p> <p>Our work on parrots spans more than 20 years; it is pantropical in scope and described in 27 peer-reviewed papers that reveal key limiting aspects of parrot ecology, and reactions to land use change and trapping. In recent work in Ghana, Marsden innovatively used methods standardised to baseline studies from the 1990s to estimate decline of the African Grey Parrot (<i>Psittacus erithacus</i> and <i>Psittacus timneh</i>). Such long-term evidence of multi-decadal declines in tropical wildlife is extremely rare. From over 150 days of fieldwork the researchers estimated declines of 90%-99% in the species – the first robust evidence that trade and habitat loss were pushing the species to the verge of extinction in Ghana [1].</p> <p>In the Philippines, Marsden led multi-species ecological research to assess the country's performance in relation to Aichi Target 11. By comparing data on the country's protected areas with data collected from key biodiversity areas, Marsden and colleagues showed serious underperformance towards meeting the target, for example a mismatch between the zonation of protected land and the conservation needs of key species. The analysis pointed to a need for better alignment between area protection and key biodiversity areas, and suggested reform of protected area management systems [2].</p> <p>The team also collected 400 person-days of habitat-specific bird density data from the Puerto Princesa Subterranean River National Park, a UNESCO World Heritage Centre. Numerical simulations showed how five different management scenarios would have complex effects on focal bird populations, for example, that just two additional square kilometres of shifting</p>		

cultivation could reduce primary forest species by 20%, but increase others. The work indicated that the Park should revise its zoning, and shift some buffer zones into the Park's core [3].

Substantial multi-species research has taken place in tropical South America. By way of example, in the Tumbesian Endemic Bird Area (EBA) of Peru (as defined by BirdLife International), our researchers recorded abundance data across the full ranges of 14 dry forest bird species. Using generalised additive models, they found extreme, complex and non-linear site-specific variation in bird densities, correlated to factors, such as logging, altitude and tree diversity. The study suggested that conservation of high local abundances of key species would require multiple reserves for full assurance [4].

Since his arrival at Manchester Metropolitan in 2016, Lees has published eight studies that enhance models of how changes in Amazonian land use affect biodiversity, ecosystem services and the trade-offs with economic development. Lees is one of the seven members of the steering committee for the Sustainable Amazon Network (SAN), a multinational collective of 30 institutions involved in Amazonian ecological research. He led data collection and shaped key analyses of the largest single spatial sampling of avian diversity across a gradient of land-cover change ever undertaken in the tropics. This data was integrated into a major study investigating tropical carbon-biodiversity relationships and trade-offs along a forest-disturbance gradient. The study found biodiversity was positively associated with carbon in secondary forests and highly-disturbed primary forests. However, the positive carbon-biodiversity relationships dissipated once carbon stocks reached 100MgC/ha, suggesting that simulated carbon conservation schemes failed to protect many species in the most species-rich forests. The findings indicated the need for care in prioritising carbon without considering biodiversity in reforestation plans [5].

Lees, with Manchester Metropolitan colleagues Mallon and Squires, were selected among 28 internationally-leading avian evaluators to participate in, and co-author an innovative study to evaluate the contribution of conservation interventions to prevent global extinction of 39 bird species. Using a Delphi methodology, the study concluded that conservation action had prevented 21-32 bird extinctions since 1993 (9-18 since 2010) and that extinction rates would have been 2.9-4.2 times greater without conservation action [6]. The paper highlighted the survival of the Bali myna, a species in which Manchester Metropolitan staff are directly involved in participative conservation research, with funding from the Silent Forest campaign led by the European Association of Zoos and Aquaria (EAZA).

3. References to the research

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2. Mallari NAD, Collar NJ, McGowan PJK, **Marsden SJ**, (2016). *Philippine protected areas are not meeting the biodiversity coverage and management effectiveness requirements of Aichi Target 11*. Ambio 45:313-322. DOI: 10.1007/s13280-015-0740-y.
3. Mallari NAD, Collar NJ, McGowan PJK, **Marsden SJ**, (2013). *Science-driven management of protected areas: a Philippine case study*. Environmental Management 51:1236-46. DOI: 10.1007/s00267-013-0053-5.
4. **Devenish C**, Buchanan G, Smith G, **Marsden SJ**, (2017). *Extreme and complex variation in range-wide abundances across a threatened Neotropical bird community*. Diversity & Distributions 23: 910-921. DOI: 10.1111/ddi.12577.
5. Ferreira J, Lennox GD, Gardner TA, Thomson JR, Berenguer E, **Lees AC**, Mac Nally R, Aragão LEOC, Ferraz SFB, Louzada J, Moura NG, Oliveira VHF, Pardini R, Solar RRC, Vieira ICG, Barlow J, (2018). *Carbon-focused conservation may fail to protect the most biodiverse tropical forests*. Nature Climate Change 8(8):744-749. DOI: 10.1038/s41558-018-0225-7.
6. Bolam FC, Mair L, Angelico M, Brooks TM, Burgman M, Hermes C, Hoffmann M, Martin RW, McGowan PJK, Rodrigues ASL, Rondinini C, Westrip JRS, Wheatley H, Bedolla-Guzmán Y, Calzada J, Child MF, Cranswick PA, Dickman CR, Fessl B, Fisher DO, Garnett ST, Groombridge JJ, Johnson CN, Kennerley RJ, King SRB, Lamoreux JF, **Lees AC**, Lens L, Mahood SP, Mallon DP, Meijaard E, Méndez-Sánchez F, Percequillo AR, Regan TJ, Renjifo LM, Rivers MC, Roach NS, Roxburgh L, Safford RJ, Salaman P, Squires T, Vázquez-Domínguez E, Visconti P, Woinarski JCZ, Young RP, Butchart SHM (2020). *How many bird and mammal extinctions has recent conservation action prevented?* Conserv. Lett. 2020:e12762. DOI: 10.1111/conl.12762.

Funding

Since 2000, Marsden has received over GBP700,000 in research funding, typically small awards from NGOs, conservation and zoological societies. This includes repeat awards from Loro Parque Fundación, (seven awards, GBP227,002), ZGAP (three awards, GBP33,875) and the EAZA (two awards, GBP61,558). Key awards include:

- World Pheasant Association, 2005-2008. GBP75,190. PI: Marsden (Philippines)
- World Pheasant Association, 2008-2009. GBP12,345. PI: Marsden (Philippines)
- Loro Parque Fundación, 2011-2014. GBP68,927. PI: Marsden (Grey Parrots)
- Parrots International, 2012-2015: GBP18,723. PI: Marsden (Grey Parrots)
- 239489: BNP Paribas Foundation, 2020-2022. 'Sustainable Pathways to climate-resilient Amazonian livelihoods and ecosystems'. Total award: EUR889,795. Award to Manchester Metropolitan: EUR129,265. Lead: Lees (Amazon reforestation)

Additional indicators of research quality

- According to WoS (Dec 2020), reference [1] has 23 citations (Expected Citations: 8.79). The paper's Altmetric Score is 187 and it is in the 99th percentile of 16.7 million research outputs ever tracked. Altmetrics ranks the paper #10 of all 2,161 outputs published in the journal.
- Lees is a co-author for chapters in the forthcoming UN Amazon report.
- Findings from [6] were included in Global Biodiversity Outlook 5, the flagship report of the Convention on Biological Diversity that summarises biodiversity status and trends data. The report reiterated the finding that conservation action substantially reduces extinction rates.

4. Details of the impact

Our methods and research evidence on bird species abundance and habitat threats have driven substantial conservation action across the tropics through international agreements, state legislation, land management planning, and capacity-building for conservation action.

International Union for Conservation of Nature (IUCN) red listings

The reach of impact is evident in the extent to which the whole body of research supports the 2020 IUCN red listing status of 98 species of tropical landbirds (145 species in the COVID-19 delayed Red List update). A total of 46 peer-reviewed journal publications from 13 Manchester Metropolitan researchers have contributed underpinning evidence on abundance, habitats and threats for 71 species (36 species since 2013); supplementary *in litt.* data is cited for 32 species. Three papers informed assessments for 18 additional species for the 2021 update. The Red List quantifies extinction risk in taxa; it is the *de facto* reference used around the world to prioritise conservation action for threatened species. Our research provided evidence on distribution and population for 52 species, on threats for 35 species, classification justification for 26 species and conservation actions for 21 species [A].

Analysis of BirdLife Data Zone shows that our evidence helped to profile 64 species classed as globally-threatened (vulnerable, endangered, critically endangered, critically endangered (possibly extinct)) in 2020 and added 20 more to the list in the 2021 update [A]. This represents approximately 6% of all threatened tropical landbirds species [B]. Between 2013 and 2020, our research contributed directly to Red List risk change for 19 species (including uplisting to endangered for the Sao Tome Green-pigeon, Green Racquet-tail, Grey Parrot and Timneh Parrot [C]; and downlisting for Tongan Scrubfowl, Pink Pigeon, and Peruvian Plantcutter) [A,B].

A recent BirdLife study (DOI: org/10.1098/rsbl.2019.0633) shows that the Red List status of a species affects its survival chances; for example, Critically Endangered species are now twice as likely to improve in status and move to a lower threat category as they are to deteriorate and become extinct, thanks to the increased effort in saving the species. The Director of Science, Policy & Information at BirdLife International remarks: "*Abundance surveys and habitat evaluations such as those conducted by MMU are vital to the IUCN species extinction risk evaluation process that is the key driver of conservation activity around the globe*" [B].

CITES Appendix 1 protection for the African Grey parrot

Marsden's findings on the dramatic decline of the wild African Grey Parrot (reference [1]) provides a specific example of significant global protection action taken, based on the research evidence. This bird is a popular pet and was the world's third most-traded bird; our study revealed that despite a CITES ban on the trade of wild-caught birds, poaching and illegal trafficking were having a devastating effect. As described, the research was pivotal to the uplisting of this species from 'vulnerable' to 'endangered' in 2016 [A-C]. Faced with such stark declines, CITES also acted fast and proposed to add the species to CITES Appendix 1 (total

global trade ban), citing the research [B-D]. The proposal was passed by 183 countries at the Conference of the Parties in 2016 (CoP17) [B,D]. As one of the ‘seven big decisions’ at CoP17, this top-tier protection was met with ‘cheers and applause’ from delegates, an indicator of the significance of the decision and international consensus on securing the species’ survival [D]. The Appendix I listing reduced the number of legal exports from a peak of nearly 142,000 birds in 2016 to just 192 in 2019 [E]. Since 2016, over 1,000 trafficked birds have been intercepted and at least ten traffickers have been arrested [E].

Despite these successes, illegal trafficking and capture of wild birds continues. The species has thus become a ‘poster child’ for international activism and campaigning against trafficking, another indicator of a significant NGO response to our research in Ghana. The Wildlife Conservation Society (WCS) featured the Grey Parrot on its ‘Parrots in Peril’ campaign page, while World Parrot Trust (WPT) and World Animal Protection (WAP) spotlighted the species in its ‘Wildlife. Not pets’ campaign against exotic pet trade and trafficking [F]. After a WAP exposé and a petition with 188,099 signatories, the air freight company, Turkish Airlines, agreed to collaborate with WAP to help to intercept consignments of African Grey Parrots, smuggled from the Democratic Republic of Congo, regarded as a trafficking hub for this species [F].

Providing evidence-based regional and local conservation action

Our habitat research and abundance estimation methodologies underpin conservation and management planning for protected areas in several countries, for example, references [2] and [3] for the Puerto Princesa Subterranean River National Park (PPSRNP) Management Plan. The President and Chief Scientist, the Center for Conservation Innovations says, “*the Plan drew directly from findings of my research and the surveys I conducted using Marsden’s techniques. Particularly, the density estimates... allowed a reassessment of the zonation of the park, with emphasis for the first time, on matching zonation to presence and abundance of key species that the park was set up to protect.*” [G]. This shift to an evidence-based approach for sustainable park management has proven largely successful; in 2018, the IUCN World Heritage Outlook, which cites [2], concluded that the outlook for the park was “*good with some concerns.*” [G]. This has been achieved in spite of annual visitor numbers increasing each year from around 150,000 (2011) to over 400,000 (2018), and a ten-fold increase in both income and staff after PPSRNP won the enviable accolade as one of the Seven New Wonders of Nature in 2011 [G].

The research continues to underpin local and national parks management planning. It has recently informed an update to the PPSRNP Management Plan (accepted by the Protected Area Management Board, October 2020) that includes key biodiversity and flagship species performance indicators, and revised management zones. The research also underpins evidence-based best practice embedded in the draft Philippines Protected Area Master Plan 2021-2031 (currently awaiting approval at national level) [G].

The Peruvian government’s Service for Natural Protected Areas (SERNANP) is also taking an evidence-based approach to its work. Not only did our research contribute to the IUCN downlisting of the Peruvian Plantcutter (see earlier), but also new policies on grazing measures for cattle and goats, and the extension of six key areas in the Tumbesian protected area network (based on findings from [4]). The Director of SERNANP confirms that five Manchester Metropolitan papers, including [4], have shaped the forthcoming National Protected Areas Masterplan 2020-2030 (approval delayed due to the pandemic) [H].

Finally, the research of Lees and the SAN (reference [5]) directly influenced commitments by the State of Pará, Brazil to increase secondary reforest cover to 5,650,000ha by 2030, to help to reach net zero climate targets. This area is almost half of the target for all of Brazil under its Nationally Determined Contributions from the Paris Agreement of the UNFCCC. An official state decree enshrines the commitment in state law; it uses three publications by Lees (including [6]) in its calculations of carbon accumulation [H].

Methods development and capacity building for local, evidence-based action

Such extensive field investigations of at-risk tropical bird species have enabled the group to develop and adapt a suite of robust field methods to support practical and locally-appropriate conservation and species monitoring efforts across the tropics. Notably, five key methods papers have been cited in studies contributing to 26 further IUCN Bird Red List assessments [A].

According to the Director of Science, Policy & Information at BirdLife International, the IUCN authority for birds, Marsden: “*has been at the forefront of bringing new methods for assessing population sizes, defining distributions, and examining habitat associations into the NGO sector.*”

Distance sampling methods and specifically their use in studies of threatened tropical birds have been pioneered by Professor Marsden over the last 20 years – these have become the standard method for assessing population densities and sizes for threatened birds in most areas of the tropics” [B]. Since 2009, Marsden has supervised eight PhD students who have gone on to transfer his research methods to their respective employers or NGOs in key bird-rich countries.

The research team has also delivered census methods training courses to BirdLife partners, for example to Burung, BirdLife’s partner in Indonesia. Three former attendees are today employed as Biodiversity Conservation Officers for Burung, using Marsden’s methods to support ecological and conservation projects on threatened birds in Java and Sangihe [B].

Since 2013, Marsden and colleagues have delivered research-informed training courses, assisted with project planning and implementation, and/or supervised staff or students from 15 NGOs, representing around one-third of BirdLife partners operating in the tropics [B]. Evidence of research-informed change in professional practice is also given by the President and Chief Scientist of the Center for Conservation Innovations: *“Our rangers are all fully trained in how to conduct abundance and biodiversity surveys. I estimate that around 100 people are direct beneficiaries from Manchester Metropolitan University research and active practitioners in conservation monitoring and management”* [G].

This same individual (one of Marsden’s former PhD students) led the team on a USAID project (2014-2017) to develop the LAWIN forest and biodiversity smart monitoring system, integrating mobile applications to optimise biodiversity recording across the Philippines. *“The inspiration for the app came from my research studies, in particular the walking transect and observation technique developed by Marsden,”* he confirms [G]. In 2018, the Department of Environment and Natural Resources formally adopted the system into its national strategy for biodiversity protection [G,J]. The app, linking to mapping and real-time data analysis tools, now monitors biodiversity and threats across 6,800,000ha of protected forest in 17 regions; it is used by 3,000 forest patrollers and has captured data from 100,000 patrol kilometres. Its adoption has supported a downward trend in conservation threats [G,J].

5. Sources to corroborate the impact

- A.** BirdLife Datazone analysis gives evidence of Manchester Metropolitan research contribution to IUCN red listing classifications for tropical landbird species.
- B.** Statement from Director of Science, Policy & Information, BirdLife International, provides evidence that our research influenced IUCN red listing; robust bird census methods and habitat assessments; and training of local conservation teams.
- C.** BirdLife International (2020) species factsheets for *Psittacus timneh* and *Psittacus erithacus* evidence the contribution of the Ghana research to their IUCN uplisting to ‘Endangered’.
- D.** Copy of CITES proposal for Appendix 1 uplisting, the current Appendix I listing and a report by *The Guardian* provide evidence of the contribution of the research, the current trade ban and the response of CoP17 delegates to the decision.
- E.** Extract from CITES trade database provides data on African Grey Parrot exports 2016-2019. News reports give numbers on bird seizures and arrests of suspects.
- F.** World Conservation Society and World Animal Protection campaign materials spotlight the plight of the African Grey Parrot, citing research findings, and reporting on the success of the Turkish Airlines exposé and petition.
- G.** Statement from President and Chief Scientist, Center for Conservation Innovations PH and UNESCO World Heritage Outlook (2018) indicate development of evidence-based protected area management planning, contribution to the Philippines national LAWIN system and the UNESCO assessment of “Good with some concerns” for PPSRNP.
- H.** Statement from Director of SERNANP (in Spanish) confirms the body of research has informed key actions in the forthcoming Protected Areas Masterplan 2020-2030.
- I.** Official State Decree (No. 941, in Portuguese) enshrines the reforestation commitment in State law, using evidence-based rates of carbon accumulation.
- J.** Philippines government administrative order, LAWIN project evaluation and presentation, give evidence of official national adoption, extensive use by patrols and the system’s contribution to reducing conservation threats.