



Figure 4 | Effects of predictors on species-level abundance changes in 293 waterbird species that were recorded in at least ten grid cells. **a**, Estimated coefficients with 95% and 50% (thick lines) credible intervals; those not overlapping with zero are shown in red. **b–d**, Relationship at the species level between abundance changes and GDP growth rates (**b**), proportion of sites covered by protected areas (**c**) and body mass (**d**). Values and regression lines for species in areas with more (above median) and less (below median) effective governance are shown in blue and red, respectively, in **c**. See Supplementary Data 2 for details of the 293 species.

governance. Governance is now recognized to be essential for economic growth, social development and the eradication of poverty and hunger⁴. Efforts to better understand and improve governance, as well as to find means of improving the effectiveness of specific measures when governance is weak, therefore provide common ground for conservationists, social scientists, policy makers and the public for achieving sustainable development.

Online Content Methods, along with any additional Extended Data display items and Source Data, are available in the online version of the paper; references unique to these sections appear only in the online paper.

Received 15 May; accepted 16 November 2017.

Published online 20 December 2017.

1. The Ramsar Convention on Wetlands. *Wetland Ecosystem Services*. http://archive.ramsar.org/cda/en/ramsar-pubs-info-ecosystem-services/main/ramsar/1-30-103%5E24258_4000_0_ (2011).
2. Dudgeon, D. *et al.* Freshwater biodiversity: importance, threats, status and conservation challenges. *Biol. Rev. Camb. Philos. Soc.* **81**, 163–182 (2006).
3. Millennium Ecosystem Assessment. *Ecosystems and Human Well-Being: Wetlands and Water Synthesis* (World Resources Institute, 2005).
4. United Nations General Assembly. *Transforming Our World: the 2030 Agenda for Sustainable Development. Resolution Adopted by the General Assembly on 25 September 2015* (United Nations, 2015).
5. Young, H. S., McCauley, D. J., Galetti, M. & Dirzo, R. Patterns, causes, and consequences of Anthropocene defauna. *Annu. Rev. Ecol. Evol. Syst.* **47**, 333–358 (2016).
6. Balmford, A., Green, R. E. & Jenkins, M. Measuring the changing state of nature. *Trends Ecol. Evol.* **18**, 326–330 (2003).
7. Margules, C. R. & Pressey, R. L. Systematic conservation planning. *Nature* **405**, 243–253 (2000).
8. Convention on Biological Diversity. *Decision X/2. The Strategic Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets* (Secretariat of the Convention on Biological Diversity, 2010).
9. Intergovernmental Platform on Biodiversity and Ecosystem Services. *Generic Scoping Report for the Regional and Subregional Assessments of Biodiversity and Ecosystem Services* (Intergovernmental Platform on Biodiversity and Ecosystem Services, 2015).
10. Pimm, S. L. *et al.* The biodiversity of species and their rates of extinction, distribution, and protection. *Science* **344**, 1246752 (2014).
11. WWF. *Living Planet Report 2016. Risk and Resilience in a New Era* (WWF International, 2016).
12. Bowler, D. E. *et al.* Cross-realm assessment of climate change impacts on species' abundance trends. *Nat. Ecol. Evol.* **1**, 0067 (2017).
13. Barnes, M. D. *et al.* Wildlife population trends in protected areas predicted by national socio-economic metrics and body size. *Nat. Commun.* **7**, 12747 (2016).
14. The Ramsar Convention on Wetlands. *Classification System for Wetland Type* http://archive.ramsar.org/cda/en/ramsar-documents-guidelines-strategic-framework-and/main/ramsar/1-31-105%5E20823_4000_0_#B (2012).
15. Boere, G. C., Galbraith, C. A. & Stroud, D. A. eds. *Waterbirds Around the World* (The Stationery Office, 2006).

16. Pekel, J.-F., Cottam, A., Gorelick, N. & Belward, A. S. High-resolution mapping of global surface water and its long-term changes. *Nature* **540**, 418–422 (2016).
17. Smith, R. J., Muir, R. D. J., Walpole, M. J., Balmford, A. & Leader-Williams, N. Governance and the loss of biodiversity. *Nature* **426**, 67–70 (2003).
18. Urnemiya, C., Rametsteiner, E. & Kraxner, F. Quantifying the impacts of the quality of governance on deforestation. *Environ. Sci. Policy* **13**, 695–701 (2010).
19. Ceddia, M. G., Bardsley, N. O., Gomez-y-Paloma, S. & Sedlacek, S. Governance, agricultural intensification, and land sparing in tropical South America. *Proc. Natl Acad. Sci. USA* **111**, 7242–7247 (2014).
20. Harring, N. Understanding the effects of corruption and political trust on willingness to make economic sacrifices for environmental protection in a cross-national perspective. *Soc. Sci. Q.* **94**, 660–671 (2013).
21. Sundström, A. Covenants with broken swords: corruption and law enforcement in governance of the commons. *Glob. Environ. Change* **31**, 253–262 (2015).
22. Miller, D. C., Agrawal, A. & Timmons Roberts, J. Biodiversity, governance, and the allocation of international aid for conservation. *Conserv. Lett.* **6**, 12–20 (2013).
23. Nourani, E., Kaboli, M. & Collen, B. An assessment of threats to Anatidae in Iran. *Bird Conserv. Int.* **25**, 242–257 (2015).
24. Brandolin, P. G. & Blendinger, P. G. Effect of habitat and landscape structure on waterbird abundance in wetlands of central Argentina. *Wetl. Ecol. Manag.* **24**, 93–105 (2016).
25. Brochet, A.-L. *et al.* Preliminary assessment of the scope and scale of illegal killing and taking of birds in the Mediterranean. *Bird Conserv. Int.* **26**, 1–28 (2016).
26. Morrison, R. I. G. *et al.* Dramatic declines of semipalmated sandpipers on their major wintering areas in the Guianas, Northern South America. *Waterbirds* **35**, 120–134 (2012).
27. Lockwood, M. Good governance for terrestrial protected areas: A framework, principles and performance outcomes. *J. Environ. Manage.* **91**, 754–766 (2010).
28. Kirby, J. S. *et al.* Key conservation issues for migratory land- and waterbird species on the world's major flyways. *Bird Conserv. Int.* **18**, S49–S73 (2008).

Supplementary Information is available in the online version of the paper.

Acknowledgements We thank the coordinators, thousands of volunteer counters and funders of the International Waterbird Census and Christmas Bird Count (see Supplementary Notes for information on funders); D. Unterkofler for preparing the NWC data, H. Okamura for statistical advice, J. P. González-Varo for his comments on an earlier draft and M. Amano for long-standing support.

Author Contributions T.A., T.S. and W.J.S. designed the study. T.A., T.S., B.S., S.N., T.M., T.L., D.B. and C.U.S. collected and prepared data for the analyses. T.A. analysed the data and wrote the paper. All authors discussed the results and commented on the manuscript at all stages.

Author Information Reprints and permissions information is available at www.nature.com/reprints. The authors declare no competing financial interests. Readers are welcome to comment on the online version of the paper. Publisher's note: Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations. Correspondence and requests for materials should be addressed to T.A. (amatatsu830@gmail.com).

Reviewer Information *Nature* thanks R. Fuller and the other anonymous reviewer(s) for their contribution to the peer review of this work.