




EDITORIAL

Conservation in the maelstrom of Covid-19 – a call to action to solve the challenges, exploit opportunities and prepare for the next pandemicK. L. Evans¹ , J. G. Ewen², G. Guillera-Aroita³ , J. A. Johnson⁴ , V. Penteriani⁵ , S. J. Ryan^{6,7,8} , R. Sollmann⁹ & I. J. Gordon^{10,11,12,13} 

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As we sit in the vortex of the Covid-19 outbreak, individual energies are focused on staying safe and juggling the personal, social and financial impacts of the pandemic and political responses to it. These impacts are profoundly re-shaping our lives, with many commentators suggesting that 'normality' will be permanently redefined for all sectors of society. The future is not clear because the maelstrom is so intense that it is unlikely that the dust will settle any time soon. This pandemic will be one of the major game changers for humanity in the 21st century. The conservation impacts are set to be huge, and this is an understatement. It is remarkable how little past attention has been given to identifying the conservation impacts of human responses to pandemics and preparing for these, especially given considerable investment in global biodiversity and conservation-focused horizon scanning exercises over the last decade (e.g. Sutherland *et al.*, 2020). Conservation scientists, practitioners and policy-makers must urgently address this lack of preparation and innovate solutions to confront the challenges arising from the radically altered economics, attitudes and behaviours imposed by Covid-19. Our job is to think creatively and collaboratively with other sectors of society to ensure that recent progress in implementing effective conservation and protection of nature is not lost. We must also insist that conservationists contribute to re-shaping the future post-

Covid-19 world, to ensure that potential benefits to nature conservation and protection are realized. We identify three broad challenges and a diverse set of potential positive developments that require urgent attention and strategy development. We cannot afford to sit back and wait to see what happens as the new world emerges, or to be unprepared when the next pandemic hits.

Funding

Conservation action works. In many cases, we already know how to reduce species' extinction rates (Hoffmann *et al.*, 2010; Monroe *et al.*, 2019) and make progress in ecosystem restoration (Crouzeilles *et al.*, 2017; Strassburg *et al.*, 2019). Funding, coupled with its effective use, is key to these successes. As economies contract in response to the fight against Covid-19, all areas of expenditure by individuals, industry and government will be squeezed. Previous investments in conservation are unlikely to be maintained, and there seem to be vanishingly small prospects of substantial increases in investment to the levels required to meet globally agreed conservation targets (McCarthy *et al.*, 2012). Conservation funding shortfalls will be compounded by increased competition with humanitarian-focused charities and the collapse of the global ecotourism market due to

Covid-19 travel restrictions. Countless individual decisions on how to replace livelihoods previously gained via ecotourism will need to be made – and in many cases may well result in shifts back towards more environmentally destructive practices. In the longer term, austerity measures that are likely to be introduced once Covid-19 is under control are bound to further reduce investment in conservation agencies and conservation research. The glaring paradox with these financial constraints is that intact functioning ecosystems, with low rates of conversion from natural habitats, are critical for delivering ecosystem services including regulating zoonotic disease outbreaks and providing other health benefits (Cunningham *et al.*, 2017; Faust *et al.*, 2018; MacDonald & Mordecai, 2019). Conservationists must make the health and well-being benefits of the natural world increasingly clear and advocate that responses to the current crisis must have minimal impact on longer-term disease risks associated with environmental destruction. Mitigating the risk of future zoonotic diseases absolutely requires better care of the natural world.

Legislation, regulation and enforcement

With political attention focused on mitigating Covid-19's societal and economic impacts, there is mounting evidence of everything else that troubles the world being ignored. For example, with climate change, the 26th session of the Conference of the Parties has been postponed until 2021.¹ Despite recent short-term falls in greenhouse gas emissions due to economic shutdowns, this still significantly eats into the narrow time margin available to keep climate change within 'safe' limits (Lamontagne *et al.*, 2019). Dates for the UN 2020 Biodiversity Conference, and some associated working groups, have also been pushed back – delaying the critical task of agreeing the post-2020 global biodiversity framework.² At regional levels, implementing the EU's 'farm to fork' strategy, aimed at reducing agricultural pollution, has been further delayed in response to pressures on the farming sector. UK cities are postponing clean air zone plans due to the Covid-19 crisis.³

There is mounting evidence that illegal wildlife persecution is growing, including increases in raptor persecution in Europe,⁴ illegal hunting in Malta and bushmeat and ivory poaching in Africa and Asia.⁵ In Brazil, illegal deforestation rates for agricultural expansion and mining appear to be increasing as enforcement agencies scale back deployment due to Covid-19.⁶ These trends are generally driven by reduced risk of crimes being detected due to restricted access to the countryside, combined with reduced enforcement activity, but in some cases will also be driven by the collapse of alternative, more environmentally friendly livelihoods. As economies attempt to recover from the pandemic's financial impact, there is an increasing risk that environmental and climate regulations will be pushed back. Some individuals and organizations are already taking the opportunity to weaken these regulations while public attention is directed elsewhere, providing a foretaste of this potential future. The

US Environmental Protection Agency, for example, issued a sweeping suspension of its enforcement of environmental laws on 26 March, telling companies they would not need to meet the full set of environmental standards during the coronavirus outbreak.⁷ Similarly, Indonesia has ceased the certification scheme for legal timber, reportedly in response to falling timber exports, stoking fears of an illegal logging boom.⁸ Some of these trends, especially spikes in bushmeat trade and deforestation, will increase the risk of future zoonotic disease outbreaks (Cunningham *et al.*, 2017; Faust *et al.*, 2018).

Travel restrictions

The first reaction of many governments and institutions to Covid-19 has been to reduce the risk of spreading the infection. Social distancing and non-essential travel/work rules have meant that many (albeit not all) field trips and field seasons have been cancelled or postponed. In addition to the direct impacts on many research projects and postgraduate research students, this means that many species recovery programmes and site restoration initiatives are unable to continue critical work. The New Zealand Government, for example, has halted invasive predator trap checks on public land.⁹ Monitoring programmes of wildlife populations, communities and ecosystems are also not taking place. This will have long-term consequences for our understanding of biodiversity dynamics through the loss of data sequences that have run for decades. This is especially distressing because we are missing the opportunity to capture biodiversity responses to relaxation of anthropogenic pressures arising from Covid-19, such as reduced road traffic, air pollution, and numbers of people visiting the countryside and protected areas. Now is the time to step up development and investment in new ways of observing nature remotely, for example through advances in robotics or acoustic recording systems, that do not rely on researchers being present on the ground to gather data. This is the only way to ensure that future pandemics do not puncture long-term monitoring datasets.

A second issue is that many community-based conservation projects in countries with low gross national income per capita are reliant on the input, financial and otherwise, from individuals and institutions from elsewhere within those countries and more affluent ones. With travel restrictions reducing engagement with these communities, there is the potential for community conservation and education projects to fold, or local communities to seek other livelihoods including from wildlife exploitation. As universities cancel summer field schools and study abroad programmes wholesale, significant financial support is also lost to field research centres and local communities.

Finally, ecotourism is a major revenue earner for many communities. The lack of travel and the impact that this has on tourism infrastructure, think closure of airlines and air routes, will remove that source of livelihoods for these individuals and communities. There is a significant risk that they, and others facing increasing poverty, will turn to alternative means of monetizing the wildlife that lives in these regions. Their ability to do so will be facilitated by reduced

investment of ecotourism funds in the enforcement of natural resource management rules.

Opportunities await

There is still considerable debate about the precise origins of Covid-19, although it is likely to have originated in bats and transmitted to humans via another species, potentially pangolins (Zhang *et al.*, 2020). Domestic animal, livestock and wildlife markets have long been identified as a major risk factor in promoting zoonotic outbreaks and are linked to the emergence of human infections by other viral pathogens including other coronaviruses and HIV type viruses (e.g. Woo *et al.*, 2006; van Heuverswyn & Peeters, 2007). While there is the potential for a public vendetta against species perceived to be the cause of the virus (Kingston, 2016), there is also an unprecedented opportunity to educate the public about the risks associated with the consumption of wildlife, and apply pressure to close down, or at least better regulate, wildlife markets. Some such Asian markets have already been temporarily shut, reducing the legal and illegal trade in wildlife species, but zoonotic disease emergence from wildlife trade and consumption could arise on any continent. While there is a risk of a resurgent black-market in wildlife trade, as happened when a ban was attempted in 2003 in response to the SARS outbreak,¹⁰ there are clear opportunities for reforming wildlife trade and easing pressure on wild populations. There is a more general notable opportunity for public education on the links between key pressures on biodiversity, such as deforestation and wildlife trade and consumption, and the risk of pandemics (Cunningham *et al.*, 2017; Faust *et al.*, 2018; MacDonald & Mordecai, 2019). Such education programmes combined with people's personal experience of the severe adverse impacts of pandemics could be a powerful force in lobbying decision-makers to enhance environmental protection.

Over one-third of the globe's human population is currently in some form of lock-down, with daily activities curtailed to their home or close surroundings. With limited sources of entertainment available, many of these people are finding solace in observing wildlife around their home and returning to home-based activities including gardening. There is great potential here for conservationists to help people through the lock-down by strengthening these bonds with nature, through garden-based citizen science programmes and encouraging more wildlife friendly management of gardens. Given increased urbanization and the inappropriate management of much urban greenspace, such changes are a key requirement for maximizing urban biodiversity (Aronson *et al.*, 2017). More generally, forging new long-term bonds with nature is a prerequisite for maintaining future donations to conservation funders (helping to meet the first challenge) and generating public pressure on politicians to include conservation objectives when planning the post-Covid-19 world (helping to meet the first and second challenges).

There are other ways in which humanity can do things differently post-Covid-19. The social distancing measures that currently accompany lock-downs are predicted to remain

in place in some form for many months – sufficiently long for new habits to form. Dare we hope that familiarity with home working, remote meetings and networking will deliver a new normal of significantly reduced commuting to work and international business travel, including by conservation biologists that enable some of the current marked falls in air pollution and greenhouse gas emissions to be maintained?

Humanity has demonstrated its resilience to global shocks, including bouncing back from two world wars and previous pandemics including the Great Plague and the 'Spanish' flu. Unfortunately, we also demonstrate failure to learn from our past mistakes under the false impressions that everything will be fine. The conservation community, like much of the world, seems to have been caught off-guard by the rapidly unfolding and escalating impacts of Covid-19. We must minimize the negative impacts as much as possible while remaining vigilant to identify and counter anti-environmental efforts, take advantage of the opportunities to enhance conservation, and ensure that the conservation community is better prepared for the next pandemic.

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Notes

- ¹ <https://unfccc.int/news/cop26-postponed> Accessed 24/04/2020.
- ² <http://sdg.iisd.org/events/2020-un-biodiversity-conference/> Accessed 24/04/2020.
- ³ <https://www.theguardian.com/world/2020/apr/16/uk-cities-postpone-clean-air-zone-plans-due-to-covid-19-crisis> Accessed 24/04/2020.
- ⁴ https://www.rarebirdalert.co.uk/v2/Content/Criminals_taking_advantage_of_COVID_19_crisis.aspx?s_id=690721291. Accessed 24/04/2020.
- ⁵ <https://www.conservation.org/press-releases/2020/04/21/conservation-international-reports-increase-in-poaching-and-tropical-deforestation-due-to-covid-19-restrictions> Accessed 24/04/2020.
- ⁶ <https://uk.reuters.com/article/us-brazil-environment/illegal-loggers-uncowed-by-coronavirus-as-deforestation-rises-in-brazil-id-UKKCN21S111> Accessed 24/04/2020.
- ⁷ <https://www.epa.gov/newsreleases/epa-announces-enforcement-discretion-policy-covid-19-pandemic> Accessed 24/04/2020.
- ⁸ <https://news.mongabay.com/2020/03/indonesia-timber-illegal-logging-legality-license-svlk/> Accessed 24/04/2020.
- ⁹ <https://www.doc.govt.nz/news/issues/covid-19> Accessed 24/04/2020.
- ¹⁰ <https://theconversation.com/why-shutting-down-chinese-wet-markets-could-be-a-terrible-mistake-130625> Accessed 24/04/2020.

References

- Aronson, M.F.J., Lepczyk, C.A., Evans, K.L., Goddard, M.A., Lerman, S.B., MacIvor, J.S., Nilon, C.H. & Vargo, T. (2017). Biodiversity in the city: key challenges for urban green space management. *Front. Ecol. Environ.* **15**, 189–196.

- Crouzeilles, R., Ferreira, M.A., Chazdon, R.L., Lindenmayer, D.B., Sansevero, J.B.B., Monteiro, L., Iribarrem, A., Latawiec, A.E. & Strassburg, B.B.N. (2017). Ecological restoration success is higher for natural regeneration than for active restoration in tropical forests. *Sci. Adv.* **3**, e1701345.
- Cunningham, A.A., Daszak, P. & Wood, J.L.N. (2017). One Health, emerging infectious diseases and wildlife: two decades of progress? *Philos. Trans. R. Soc. Lond. B.: Biol. Sci.* **372**, 20160167. <https://doi.org/10.1098/rstb.2016.0167>.
- Faust, C.L., McCallum, H.I., Bloomfield, L.S.P., Gottdenker, N.L., Gillespie, T.R., Torney, C.J., Dobson, A.P. & Plowright, R.K. (2018). Pathogen spillover during land conversion. *Ecol. Lett.* **21**, 471–483.
- van Heuverswyn, F. & Peeters, M. (2007). The origins of HIV and implications for the global epidemic. *Curr. Infect. Dis. Rep.* **9**, 338–346.
- Hoffmann, M., Hilton-Taylor, C., Angulo, A., Böhm, M., Brooks, T.M., Butchart, S.H., Carpenter, K.E., Chanson, J., Collen, B., Cox, N.A. & Darwall, W.R. (2010). The impact of conservation on the status of the world's vertebrates. *Science* **330**, 1503–1509.
- Kingston, T. (2016). Cute, creepy, or crispy—how values, attitudes and norms shape human behaviour toward bats. In *Bats in the Anthropocene: Conservation of Bats in a Changing World*: 571–588. Voigt, C.C. & Kingston, T. (Eds). Cham: Springer International AG.
- Lamontagne, J.R., Reed, P.M., Marangoni, G., Keller, K. & Garner, G.G. (2019). Robust abatement pathways to tolerable climate futures require immediate global action. *Nat. Clim. Chang.* **9**, 290–294.
- MacDonald, A.J. & Mordecai, E.A. (2019). Amazon deforestation drives malaria transmission, and malaria burden reduces forest clearing. *Proc. Natl. Acad. Sci. USA* **116**, 22212–22218.
- McCarthy, D.P., Donald, P.F., Scharlemann, J.P., Buchanan, G.M., Balmford, A., Green, J.M., Bennun, L.A., Burgess, N.D., Fishpool, L.D., Garnett, S.T. & Leonard, D.L. (2012). Financial costs of meeting global biodiversity conservation targets: current spending and unmet needs. *Science* **338**, 946–949.
- Monroe, M.J., Butchart, S.H.M., Mooers, A.O. & Bokma, F. (2019). The dynamics underlying avian extinction trajectories forecast a wave of extinctions. *Biol. Lett.* **15**, 20190633.
- Strassburg, B.B., Beyer, H.L., Crouzeilles, R., Iribarrem, A., Barros, F., de Siqueira, M.F., Sánchez-Tapia, A., Balmford, A., Sansevero, J.B., Brancalion, P.H. & Broadbent, E.N. (2019). Strategic approaches to restoring ecosystems can triple conservation gains and halve costs. *Nat. Ecol. Evol.* **3**, 62–70.
- Sutherland, W.J., Dias, M.P., Dicks, L.V., Doran, H., Entwistle, A.C., Fleishman, E., Gibbons, D.W., Hails, R., Hughes, A.C., Hughes, J., Kelman, R., Le Roux, X., LeAnstey, B., Lickorish, F.A., Maggs, L., Pearce-Higgins, J.W., Peck, L.S., Pettorelli, N., Pretty, J., Spalding, M.D., Tonneijck, F.H., Wentworth, J. & Thornton, A. (2020). A horizon scan of emerging global biological conservation issues for 2020. *Trends Ecol. Evol.* **35**, 81–90.
- Woo, P.C., Lau, S.K. & Yuen, K.Y. (2006). Infectious diseases emerging from Chinese wet-markets: zoonotic origins of severe respiratory viral infections. *Curr. Opin. Infect. Dis.* **19**, 401–407.
- Zhang, T., Wu, Q. & Zhang, Z. (2020). Probable pangolin origin of SARS-CoV-2 associated with the COVID-19 outbreak. *Curr. Biol.* **30**, 1346–1351.e2.