OVERLINE

Protected area targets post-**2020**

Outcome-based targets are needed to achieve biodiversity goals.

By **Piero Visconti [1,2,3*†], Stuart H. M. Butchart [4,5], Thomas M. Brooks [6], Penny F. Langhammer [7,8,9], Daniel Marnewick [10], Sheila Vergara [11], Alberto Yanosky[12], James E.M. Watson [13,14]**

In 2010, Parties to the Convention on Biological Diversity (CBD) adopted the Strategic Plan for Biodiversity 2011–2020, and its 20 Aichi Biodiversity Targets, to catalyze national and international conservation efforts and reverse negative biodiversity trends. With the plan nearing an end, and attention turning toward a post-2020 biodiversity framework, it is timely to assess the strengths, weaknesses, and effectiveness of the Aichi Targets. Target 11, concerned with establishing effective and representative networks of protected areas (PAs) by 2020, has attracted considerable interest, due to widespread recognition of the pivotal role that appropriately situated and well-managed PAs have in conserving biodiversity (*1*). Substantial advances have been made toward the areal components of Aichi Target 11, with the PA estate increasing by 2.3% on land and 5.4% in the oceans since 2010, and now covering 15% of land and inland freshwater globally and 7% of the oceans (*2*). However, species population abundance within and outside PAs continues to decline (*1*), the placement and resourcing of the majority of PAs has been poor (*1*, *3*, *4*) and over half of PAs established prior to 1992 have suffered increasing human pressure (5). We discuss four problems with Aichi Target 11 that have contributed to its limited achievement and propose a formulation for a target for site-based conservation beyond 2020 aimed at overcoming them.

[1]Institute of Zoology, Zoological Society of London, London, NW1 4RY, UK. [2]Centre for Biodiversity and Environment Research, University College London, London, C1E6BT, UK. [3] International Institute for Applied Systems Analysis (IIASA), Schlossplatz 1, A-2361 Laxenburg, Austria. [4]BirdLife International, Cambridge CB2 3QZ, UK. [5]Department of Zoology, University of Cambridge, Downing Street, Cambridge, CB2 3EJ, UK. [6]International Union for Conservation of Nature, 1196 Gland, Switzerland. [7]Global Wildlife Conservation, Austin, TX 78767, USA. [8]Amphibian Survival Alliance, London, UK, SW7 2HQ. [9]School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501. [10]BirdLife South Africa, Dunkeld West, South Africa, 2196. [11]ASEAN Center for Biodiversity, Laguna, Philippines. [12]Guyra Paraguay, CC 1132, Asunción, Paraguay. [13]School of Earth and Environmental Sciences, The University of Queensland, St. Lucia Queensland 4072, Australia. [14]Wildlife Conservation Society, Global Conservation Program, Bronx NY 10460-1068, USA. Email: visconti@iiasa.ac.at, jwatson@wcs.org, stuart.butchart@birdlife.org

PERVERSE PERCENTAGES

Aichi Target 11 calls for effective conservation of 17% of land and inland waters and 10% of coastal and marine areas, and many countries have used these numbers as the sole basis for describing their progress, instead of reporting the biodiversity impacts of conservation areas. While some have argued that percentage targets have motivated countries to designate more PAs, there is no evidence for this. In fact, the rate of designation and total extent of additional PAs between 2010 and 2014, after establishment of the Aichi Targets, was half that in the previous five years (*3*). Focus on the percentage coverage of PAs generates perverse outcomes (*6*), with many new PAs being established in locations that are disproportionately unimportant for biodiversity (*3*) This pattern of protection of remote areas, often very large but not immediately threatened and with little conservation value, extends to the oceans (*7*). Continuing to protect areas of low opportunity costs for human uses, especially agriculture, in order to cover 17% of land, will have negligible biodiversity benefits (*1*, *3*, *8*). By contrast, if PAs were strategically sited to protect underrepresented threatened species, 30 times more species could be adequately represented with the same extent of PAs (8).

Moreover, thousands of PAs, many of which are important for conservation (*1*), have been downsized or degazetted (no longer protected by law or formal agreement)(9). Targets that are set around total percentage area legitimize such downsizing and degazettment if an equal amount of less important area for conservation is protected elsewhere. Finally, percentage area targets disregard the quality of what is being represented, with degraded ecosystems given the same value as those that are still functionally intact (and therefore more valuable from a conservation perspective).

WHAT COUNTS AS PROTECTED?

Many PAs are inadequately managed or resourced (*1*), do not abate any of the threats to their biodiversity (*5*), and as such are simply 'paper parks' that do not meet the PA definition "managed for the long-term conservation of nature". Such areas are currently given equal value to those PAs that are well-sited and well-managed, which inflates the progress nations are apparently making towards Aichi Target 11.

To improve outcomes and avoid designation of "paper-parks", Aichi Target 11 requires PAs to be "effectively and equitably managed". A large database of information relating to Protected Area Management Effectiveness (PAME) now exists, and PAME scores appear to be increasing over time (*10*). However, they are marginally correlated with biodiversity outcomes, measured as animal population trends (*11*). This is not surprising: PAME metrics are not measures of biodiversity outcomes (status/trends) but rather inputs (staff, equipment) and outputs (law enforcement, type of management) (*12*). This suggests that current management effectiveness metrics are not a good surrogate for biodiversity outcomes, and that the desired biodiversity outcome should be an integral part of a site-based conservation target, with associated indicators.

REPRESENTATIVE OF WHAT?

Target 11 requires the PA network at all scales from national to global to be ecologically representative, with recommendations that ecoregions, which contain characteristic, geographically distinct assemblages of natural communities and species, are the appropriate level of representativeness. While ecoregion representation within PAs increased from 1954 to 2013 (*13*), species representation increased much less (3). Increasing ecoregional representation does not equate to increasing species representation because ecoregions are too broad to capture variability in species composition and endemism (4), as well as other core elements of biodiversity as defined by the CBD, such as genetic variation and ecological and evolutionary processes. To be truly representative, site-based conservation targets should encompass all elements of biodiversity.

DO NATIONAL TARGETS ADD UP?

The Strategic Plan was designed to be a flexible framework allowing nations to determine their own implementation actions and ambition based on the local needs and opportunities. However, a common challenge for all international agreements is interpreting targets at the national or sub-national level and allocating responsibilities to meet global targets. This was especially difficult for elements of Target 11 related to representation, coverage of important biodiversity areas, and connectivity, for which a universal percentage across nations would have been inappropriate in light of the unequal distribution of biodiversity and of area-based conservation needed to protect it.

A comparison of national interpretations of Target 11 with the amount of additional PAs needed in order to meet particular components of the target found that 35 of 79 national PA commitments were insufficient to meet a subset of target components (4). This, we argue, is due to the difficulty in partitioning the global ambition of Aichi Target 11 at the national level. Targets and indicators need to be scalable across biogeographic and administrative levels, and should be explicitly quantified at the national scale so that national ambitions and contributions can be summed to assess the total global ambition and achievement.

A NEW PROTECTED AREA TARGET

These four shortcomings of Aichi Target 11 may have contributed to global biodiversity loss, by shifting attention away from effective protection of sites of global significance for conservation, which continue to be threatened. To overcome these shortcomings, we propose an alternative approach for a post-2020 PA target based on outcomes: "The value of all sites of global significance for biodiversity, including key biodiversity areas, is documented, retained and restored through protected areas and other effective area-based conservation measures". By biodiversity value we mean all biodiversity elements (populations, ecosystems, ecological processes), for which a site has been identified as being of global biodiversity significance, which we argue should be kept in favorable conservation status (FCS).

Sites are individual units of land or sea that can be managed individually by particular authorities or entities, for example, individual PAs, or community-managed reserves. Manageability depends on the specific socio-economic context of the area, such that in some regions even relatively large areas may be manageable (e.g. sites important for their ecological integrity but currently not immediately threatened by human activities).

This target focuses explicitly on the specific locations (areas delineated as actual or potentially manageable units) that have been identified as important for the persistence of biodiversity. A global standard for defining such key biodiversity areas (KBAs) was recently published (*14*). The standard specifies how sites can qualify as KBAs under quantitative criteria relating to threatened species and ecosystems, geographically restricted species and ecosystems, ecological integrity, biological processes (e.g. aggregations), and irreplaceability. It can be applied through national processes to all macroscopic taxonomic groups and ecosystems.

While over 15,000 KBAs have been documented to date, sites have not been comprehensively identified for all taxa and ecosystems. Filling these gaps is a high priority for the coming decade. Given this, and the recognition that further application of the standard may reveal that modifications are necessary to identify sites of global significance to biodiversity comprehensively, our proposal is not restricted to KBAs and encourages effective conservation of all sites of documented global significance for biodiversity. These could include sites systematically identified for their global biodiversity importance under national and international legislation and conventions, for instance, Ecologically or Biologically Significant Marine Areas (ESBAs) that have been identified at the site scale, Natura 2000 sites in the EU, natural and mixed World Heritage Sites listed under the World Heritage Convention, and Wetlands of International Importance identified under the Ramsar Convention, or sites of high ecological integrity and high biodiversity importance with a quantitative rationale for their biodiversity significance.

The biodiversity value to be retained or restored (if lost since the time of designation) is, by definition, known and specific to the area as it is defined by the criteria invoked to identify the area as important for biodiversity. This facilitates the assessment of progress towards the proposed area-based conservation target. For instance, in all Natura 2000 sites, habitats and species of European Community Importance should be monitored and maintained in FCS as defined by the EU Habitats Directive. Guidelines to define habitats and species in FCS provide a consistent monitoring and reporting framework that could be replicated globally.

MONITORING AND REPORTING

The proposed target calls for systematic monitoring across all important sites to determine if the current management regime is effective in retaining or restoring a site's biodiversity value. To some degree this can be achieved through remote sensing (e.g. using trends in tree cover to assess deforestation and evaluate impacts on forest-dependent species), while large networks of camera traps, acoustic sensors, and other remote sensing tools can monitor occupancy, abundance, vegetation extent, structural composition and intactness, and threats to species and ecosystems. Such methods can be complemented by systematic in situ monitoring approaches applicable across large networks of sites. Reference values, systematic monitoring, and regularly updated status reports exist for several networks of areas of biodiversity importance (e.g. for Natura 2000 sites in the EU), and there are historical data to establish baseline and trends.

A potential challenge lies in identifying appropriate indicators of progress towards this target, noting that a given site could hold multiple biodiversity elements defining its global importance that are trending in opposite directions. We propose two metrics to track progress towards achieving biodiversity outcomes: the mean distance from the reference value for each element (measured, e.g., using population abundance or habitat extent and condition) and the proportion of elements below reference value. These indicators can be reported at multiple geographic scales, and aggregated taxonomically or by other ecological units, e.g. ecoregions, functional groups, etc. The target is achieved for a given site, country, ecoregion or globally, where all biodiversity elements are at least at their reference value in the network of conservation areas.

In addition, we propose a third metric to track progress toward the identification of sites of global significance: Percentage of taxonomic classes and ecosystem types for which KBAs and other sites of global biodiversity significance have been identified comprehensively.

The target and indicators laid out here are only concerned with outcomes, not impacts (commonly defined as the difference in outcomes with and without a PA). This is an important distinction that simplifies monitoring and reporting, as measuring the counterfactual world without protection requires experimental or quasi-experimental design that may discourage or delay adoption of impact-related targets and indicators without providing added benefits to biodiversity compared to an outcome-related target. However, conservation actions taken within or outside the network of sites of global significance should be, as much as possible, designed to maximize impacts.

ONE SINGLE CURRENCY

Unlike the current Aichi Target 11, achievement of this target is unlikely to have perverse outcomes (problem 1, above). For example, the target could not be met if countries fail to resource or secure PAs adequately, as it will expose 'paper parks' that are protected in name only and do not retain the biodiversity values for which they are important. It will also ensure that detrimental downsizing or degazettement of sites of significance for biodiversity influence the potential to achieve the target. Importantly, the target formulation is simple and less susceptible to misinterpretation. Our proposed indicators also address the issue of partial vs. complete coverage of important sites. The value of such sites is unlikely to be retained through protected or conserved areas that incompletely cover each site, incentivizing expansion of such areas to ensure the full value is retained.

The proposed target and indicator set is designed to motivate impact, while not being prescriptive about the specific policies and actions required (problem 2). Any form of governance or management that provides clearly defined, desired biodiversity outcomes and ongoing monitoring of biodiversity values may be appropriate.

PAs and Other Effective Area-Based Conservation Measures, (which deliver positive and sustained biodiversity outcomes, but unlike PAs, are not specifically managed for biodiversity objectives), can contribute to achievement of this target (through complementary networks and hence building on the existing Target 11), but their effectiveness must be documented and monitored rather than assumed. Similarly, unlike Target 11, our proposed target does not require specifying particular desirable characteristics of PAs such as spatial connectivity and social equity; to be effective, area-based approaches must inherently address these issues, but rather than focusing on the mechanisms, which are context-dependent, the target focuses on the outcomes.

This target recognizes the importance of quality of habitat and the need for representation to occur across all levels of biodiversity, from genes, to populations, species and ecosystems and large-scale ecological processes (problem 3). The target has one single currency, which is the biodiversity value across the network of important sites, where the value is identified and monitored for each individual site. Progress towards the target can therefore be assessed at any geographic and administrative level (problem 4). Trends in progress towards the target are driven by the loss, retention or restoration of this biodiversity value.

To achieve the goal of halting biodiversity loss, our proposed target will need to be complemented by others, in particular, addressing the retention of ecosystem extent and condition (as an inheritor to Target 5), of ecosystem services (as an inheritor to Target 14), and of climate change mitigation (as an inheritor to Target 15), which we suggest should undergo similar revision processes.

This target naturally links area-based conservation measures with biodiversity status and trends that they are meant to maintain and improve. It allows nations to act locally but frame their actions within a global biodiversity agenda. Our proposed target and indicators also allow nations to set national and regional targets aimed at the retention of biodiversity of importance at sub-global levels. Indeed, a broader alternative formulation could be "The value of sites of significance for biodiversity, including all key biodiversity areas of international importance is documented, retained and restored […]". This would encourage buy-in by the widest possible set of countries and recognise that sites of international (but not necessarily global) importance play an important role in national conservation strategies and are already used by nations to assess progress in PA coverage under Sustainable Development Goal 15.

The evidence-base accumulated since the adoption of the 2010-2020 strategic plan suggests that specific, measurable, ambitious, realistic, unambiguous and scalable targets are more effective and associated with greater progress (*15*). We therefore expect that this target would galvanize greater and more effective and efficient efforts than previous area-based conservation targets or alternative proposals that are not based on conservation outcomes.

REFERENCES AND NOTES:

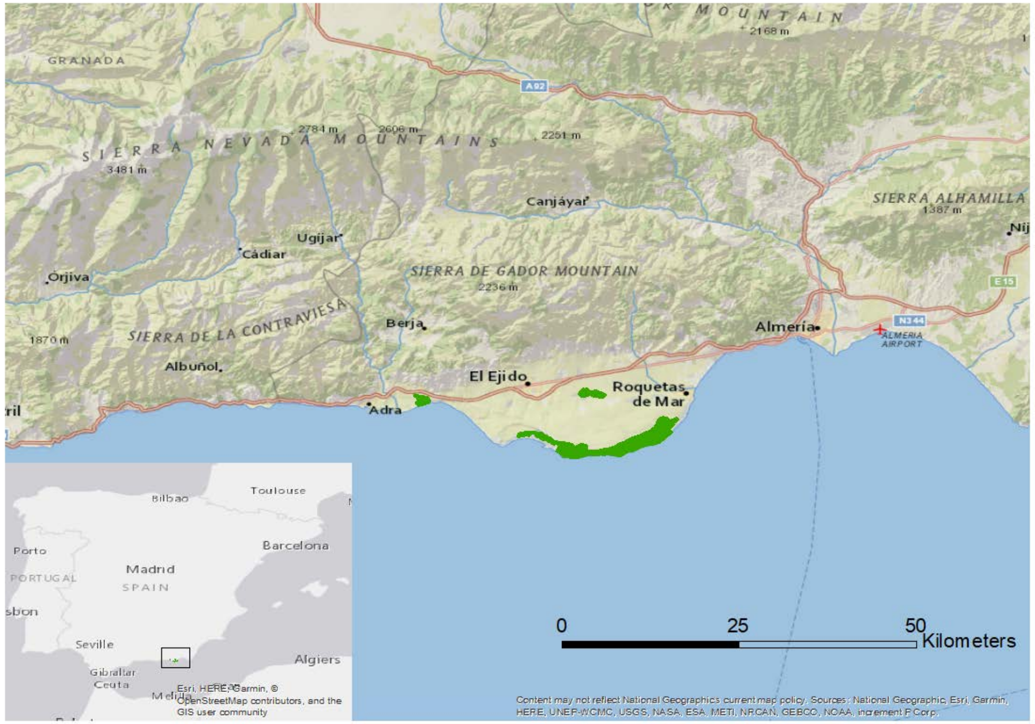
1. J. E. M. Watson, N. Dudley, D. B. Segan, M. Hockings, *Nature*. **515**, 67 (2014).
2. UNEP-WCMC and IUCN, "Protected Planet: The World Database on Protected Areas (WDPA), March 2018" (Cambridge (UK), 2018), (available at www.protectedplanet.net.).
3. O. Venter *et al.*, *Conserv. Biol.* **32**, 127 (2018).
4. S. H. M. Butchart *et al.*, *Conserv. Lett.* **8**, 329 (2015).
5. K. R. Jones *et al.*, *Science (80-.).* **360**, 788 (2018).
6. M. D. Barnes, L. Glew, C. Wyborn, I. D. Craigie, *Nat. Ecol. Evol. 2018*, 1 (2018).
7. R. Devillers *et al.*, *Aquat. Conserv. Mar. Freshw. Ecosyst.* **25**, 480 (2015).
8. O. Venter *et al.*, *PLoS Biol.* **12** (2014), doi:10.1371/journal.pbio.1001891.
9. W. S. Symes, M. Rao, M. B. Mascia, L. R. Carrasco, *Glob. Chang. Biol.* **22**, 656 (2016).
10. J. Geldmann *et al.*, *Biol. Conserv.* **191**, 692 (2015).
11. J. Geldmann *et al.*, *Conserv. Lett.*, 1 (2018).
12. R. L. Pressey, P. Visconti, P. J. Ferraro, *Philos. Trans. R. Soc. B Biol. Sci.* **370** (2015), doi:10.1098/rstb.2014.0280.
13. C. D. Kuempel, A. L. M. Chauvenet, H. P. Possingham, *Conservation Letters*. **9**, 422 (2016).
14. IUCN, *A Global Standard for the Identification of Key Biodiversity Areas. Version 1.0* (Gland, Switzerland, First., 2016).
15. Secretariat of the Convention on Biological Diversity, Royal Society for the Protection of Birds, BirdlLife International, "Literature-based assessment and lessons learnt analysis of progress towards the Aichi Targets - input to SBSTTA 22/COP14" (2018).

Acknowledgments: We thank Andrew Plumptre, Carolina Hazin, Paul Donald, Richard Greogry and anonymous reviewer for useful feedback on the manuscript.

FIGURE CAPTION.

Figure 1 An example of how the biodiversity value of a Key Biodiversity Area (the Wetlands of western Almería, Spain highlighted in green in the map), can be monitored over time. The site qualifies as a KBA because of its global significance for two bird species: Audouin's gull Larus audouini under KBA criterion D1a (≥1% of the global population size supported during one or more key stages of its life cycle, in this case the non-breeding season) and white-headed duck Oxyura leucocephala (globally Endangered according to the IUCN Red List) under KBA criteria A1c (≥0.1% of the global population and ≥5 reproductive units, i.e. pairs) and D1. Source http://datazone.birdlife.org/site/factsheet/wetlands-of-western-almer%C3%ADa-iba-spain/details. Photos: Ron Knight & Massimiliano Sticca, Flikr.

Formatted: German (Austria)



Reference Population: c.2000 individuals (1995)

Current Population: 1700 individuals (-15%)

Reference Population: 61 breeding pairs (1996)

Current Population: 52 breeding pairs (-16%)

Proportion of features at reference level: 0/2 =0 Mean distance from reference level = 15.5%.

Figure 1 An example of how the biodiversity value of a Key Biodiversity Area (the Wetlands of western Almería, Spain, highlighted in green in the map), can be monitored over time. The site qualifies as a KBA because of its global significance for two bird species: Audouin's gull *Larus audouini* under KBA criterion D1a (≥1% of the global population size supported during one or more key stages of its life cycle, in this case the non-breeding season) and white-headed duck *Oxyura leucocephala* (globally Endangered according to the IUCN Red List) under KBA criteria A1c (≥0.1% of the global population and ≥5 reproductive units, i.e. pairs) and D1. Source http://datazone.birdlife.org/site/factsheet/wetlands-of-western-almer%C3%ADa-iba-spain/details. Photos: Ron Knight & Massimiliano Sticca, Flikr.