

Protected Areas in the World: Current State and Prospects

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Conservation is a state of harmony between men and land.

Aldo Leopold: Conservation (1938)

When one says “nature conservation”, many people recall various boards with a notice “protected area”. It is no surprise. Not only in the Czech Republic territorial protection or area-base conservation is among the oldest and at the same time most common approaches in protection, conservation and management of natural and landscape heritage. Moreover, there have been recently appearing various opinions whether protected areas really fulfil their mandate

and whether area-based conservation deserves at least a significant renovation (BHOLA *et al.* 2020, FENG *et al.* 2021, WALSH 2021, JONES *et al.* 2022, RAYMOND *et al.* 2022, ROBSON *et al.* 2022, WAUCHOPE *et al.* 2022, WILLIAMS *et al.* 2022, ZENG *et al.* 2022). This prompts the question about the current state of the art in global protected area network and in particularly what we have known on its real effectiveness.



Cloud forest which has been well-preserved in the Chirripó National Park in Costa Rica is the primary habitat there. © František Pelc



Before the COVID-19 syndemics according to respected estimations the global protected area property received 8 billion visits per year. The Redwood National Park in northern California became famous due to highest trees in the world – the Coast redwood (*Sequoia sempervirens*): the woody plant species is unique also to its huge girth. © František Pelc

What protected areas have experienced yet

At present the most frequently used concept proposed by the IUCN (International Union for Conservation of Nature) defined a protected area as a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values (DUDLEY 2008).

The very first protected area based on the current concept in the world is German islet of Vilm close to the island of Rügen where human interventions were limited for preserving nature as early as in 1812. Moreover, 12,000 years before people did not intentionally use some sites or areas of various size. Nevertheless, the aim was not to maintain their natural and landscape values but because of religious or cult reasons or of the strict protection of natural resources by owners against using them by other people. Of course, general strategic target in protection, conservation and management of natural and landscape heritage has been simply and at the same time expressive itself since its establishment in the first half of the 19th century: more protected areas for nature conservation. A real boom in territorial protection, particularly declaring national parks according to the U.S. concept, occurred in the 1950s where estab-

lishing a representative network of protected habitats/ecosystems/land cover types became a main nature conservation paradigm (PLESNIK 2012, 2022). Since that time both number of officially declared protected areas and their total coverage have been exponentially increasing on a global scale.

The current approach considers protected areas as a key strategy for maintaining life-supporting processes in nature, benefits of which we have most often used to call ecosystem services. The role of protected areas in mitigating global change impacts, particularly climate change, and adapting both human civilization and nature to them is also highlighted. Putting it simply, protected areas should be beneficial not only for nature (after all, that is why they are established), but also for citizens, mainly for local people.

Let us take a look at the most recent statistical data. As of July 15, 2022 there were in total 271,140 sites/areas meeting the above most respected concept of a protected area, at the same being included in the World Database on Protected Areas (WDPA) run together by the United Nations Environment Programme (UNEP) and IUCN. Of them, 253,359 protected the selected parts of land area and inland waters. Their total size is impressive 21,295,950 km², i.e. 15.78% of the Earth's terrestrial land, thus being comparable to whole North America. Marine ecosystems are harboured in 17,781 areas

covering in total 29,452,489 km² (8.13% of the global ocean). In national waters (Exclusive Economic Zones, EEZ) the proportion is sizeable 18.6%, while in Areas Beyond National Jurisdiction (ABNJ)/deep seas the state of the art is significantly less favourable (1.44 %, IUCN & UNEP 2022, cf. PLESNIK & HANEL 2021). It is hard to believe that still in the early 1960s the global protected area estate was only the size of the United Kingdom, i.e. approx. 250,000 km² (DUDLEY *l.c.*). Particularly as consequence of establishing huge marine reserves, since 2010 the total size of protected areas on Earth has increased by more than 21 million km², which is 41 % of the world's protected area system current size and twice as Europe (IUCN & UNEP 2022).

As of July 1, 2022, the global target to protect at least 30% of the planet's land and ocean by 2030 was supported by more than 100 countries including seven most economically developed ones and in accordance with the EU Biodiversity Strategy for 2030 also by the European Union (HAC 2022). In addition, particularly some academicians and NGOs as well as the Head of the Roman Catholic Church urge and promote opinion raised by the recently deceased American scientist Edward Wilson to cover by protected areas a half of the Earth's surface (WILSON 2016) by 2050 at the latest. The targets convinced supporters who stress, *inter alia*, that they can at the same time enhance climate change mitigation and adaptation (TALLIS *et al.* 2018, DINERSTEIN *et al.* 2019, 2020, WALDRON *et al.* 2020, YANG *et al.* 2020, UNEP 2022, ZENG *et al. l.c.*). On the other hand, opponents emphasize that the targets can, *inter alia*, possibly impact on global food production, human health and rights of indigenous people. Indigenous people at present manage at least a quarter of the Earth's terrestrial surface including a third of protected areas (BÜSCHER *et al.* 2017, MEHRABI *et al.* 2018, SCHLEICHER *et al.* 2019, VISCONTI *et al.* 2019, COUNSELL 2022, HENRY *et al.* 2022). The long-awaited decision shall be taken at the 15th meeting of the Conference of the Parties to the Convention on Biological Diversity in Montreal, Canada in December 2022.

Protected area is effective if.....

The above data can easily give impression of that global area-based conservation is O.K. and better than on the right track. Unfortunately, it is not the case. Effectiveness has been for quite some time Achilles heel of protected areas (PLESNIK 2008).



The Ichkeul National Park in northern Tunisia was declared in 1980 as a UNESCO World Heritage Site. In addition to a lake important for migratory birds it harbours the forested mountain landscape © Jan Plesnik



The Mount St Helens National Volcanic Monument covering 450 km² within the Cascade Mountains (Washington State, U.S.A) was established after the volcano eruption in 1980. The whole area destroyed by the eruption was left to spontaneous development having resulted in a successful forest ecosystem restoration by nature there. © František Pelc

The increasing number of protected areas in the world as well as their total coverage may not indicate their effectiveness. Although the data on the size of protected areas in relation to the total country's or continent's territory (the percentage protected of the country's or continent's territory, *i.e.* the total area of a country's or continent's protected areas is divided by the total area of the country or continent) is relatively well available, easy to apply and is understandable for the general public, decision-makers and politicians, it is not necessarily an indicator for either effective or efficient conservation because does account for biodiversity, ecosystem services and social equity within and

around protected areas, nor for the connectivity between them. Therefore, management and governance effectiveness need to be considered in the context of conservation target at all times.

Protected area effectiveness *sensu lato* shows the degree to which conservation targets are met by the respective national park, nature reserve or protected area management while management efficiency reflects the ratio between the management result and management effort to reach the result (HOCKINGS *et al.* 2006). Due to plethora of protected area designations, variability in protected area manage-

ment and various nature conservation targets, approx. 70 methods to assess protected area effectiveness have been developed (HOCKINGS 2003, LEVERINGTON *et al.* 2010a, 2010b, RODRIGUES & CAZALIS 2020, IUCN & UNEP *l.c.*).

While some studies concluded that protected areas safeguard the future of biological diversity and reduce impacts of drivers threatening it (JOPPA & PFAFF 2011, BARNES *et al.* 2016, GILL *et al.* 2017, VIMAL *et al.* 2021, FENG *et al. l.c.*, MACKINNON *et al.* 2020, PACIFICI *et al.* 2020, CHEN *et al.* 2022), other authors assert the exact opposite (GASTON *et al.* 2008, CRAIGIE *et al.*



Protected areas cover almost 40 % of the Croatia's territory. In consequence of war in former Yugoslavia the Plitvice Lakes National Park often visited by tourists from the Czech Republic was put on the UNESCO List of World Heritage in Danger in 1993 - 1997. © Jan Plesnik



The Kaziranga National Park in the Indian state of Assam is remarkable for rich flora and fauna in the flooded floodplain of the Brahmaputra River. The most recent data show that the park is inhabited by 2,600 Indian rhinos (*Rhinoceros unicornis*), *i.e.* by two thirds of the global population. © František Pelc



As it proved during the COVID-19 syndemics importance of green areas on the urban outskirts for human health has been underestimated (Daleje nad St Prokop Valleys Nature Park on the south-western margin of Prague). © Jan Plesník

2010, VENTER *et al.* 2014, PIMM *et al.* 2018, WILLIAMS *et al. l.c.*). Many protected areas can effectively protect habitats but not wild animal populations within them (GELDMANN *et al.* 2013). As it can be supposed investments and appropriate management enhance territorial protection effectiveness (GELDMANN *et al.* 2015, WAUCHOPE *et al. l.c.*). Countries with lower agricultural activity, higher economic growth and better governance are most strongly associated with greater country-level protected area effectiveness (SHAH *et al.* 2021).

On a global scale, there has not been from various reasons an analysis of protected area network effectiveness: over 55,000 evaluations of protected area, *i.e.* 18 % of their total coverage, have already been completed through the Global Database on Protected Area Management Effectiveness (RODRUGUES & CAZALIS *l.c.*). Till now the most comprehensive analysis based on data from 12,315 protected areas across 152 countries concluded that many protected areas are able to reduce human pressure and to buffer the wild populations and habitats they contain from human impacts on the environment. Over the past 15 years the sample of protected areas has been on average in this respect not more effective than matched unprotected areas (GELDMANN *et al.* 2019). At the

local extent, biodiversity, precisely speaking species richness (number of species) and numbers of the monitored species can be after all higher inside protected areas than in their surroundings (GRAY *et al.* 2016).

What makes protected area effectiveness harder on a global scale

There are various reasons why protected areas do not carry out their mission and their detailed debate goes beyond the scope of this article. Approximately one-third of the global protected area estate is already under intense human pressure (JONES *et al.* 2018). Protected areas were mostly established without systematic conservation planning, but *ad hoc* and from aesthetic motives. We should also add that protected areas have been often declared not in areas where it is (urgently) needed but where their establishment do not conflict with other competing land uses, simply said where they never mind that (BALDI *et al.* 2017, VENTER *et al.* 2017). At the same time, many protected areas, particularly those in densely populated economically developed world's regions, maintain and preserve valuable parts of nature, but on small, from a point of view of effective conservation and management often unsatisfactory territory.

In Europe 67% of terrestrial protected areas cover less than one square kilometre (BISE 2022).

It is no secret that protected areas worldwide suffer from lack of finances. Data from 2,167 protected areas (with an area representing 23% of the global terrestrial protected area estate) confirm that less than a quarter of these protected areas have adequate resources in terms of staffing and budget – and this reflects even the state of the art before the COVID-19 syndemics (COAD *et al.* 2019). Let us repeat that the overall benefit:cost ratio of an effective global protected area network is at least 100:1 (BALMFORD *et al.* 2002). At the same time, governments worldwide spend per year in support that is potentially harmful to biodiversity five to six times more than their total spending for biodiversity protection and conservation (OECD 2020).

Unfortunately it does not appear that the state of the art shall in the near future change. Anthropogenic land use is expected to continue in expanding into protected areas due to increasing human demand for resources including land for agriculture and forestry, and to accelerate (GELDMANN *et al.* 2019). Despite huge efforts from some countries for connectivity between protected areas and for functionally integrating them into the surrounding landscape more than 90% of the global protected area estate have been continuing to be islands of the natural or close to nature environment isolated in the landscape heavily transformed by man (WARD *et al.* 2020). Territorial protection has had to deal with invasive alien species impacts literally all over the world (LIU *et al.* 2020). On the other hand well-managed protected areas can remain effective in preserving the target species despite climate change (LEHIKONEN *et al.* 2019).

Some thoughts instead of clever-clever conclusions

Let us be clear. We neither assert that territorial protection has fulfil its mission in global biodiversity conservation, nor enthuse about to stop establishment of new protected areas. Just on the contrary for preserving biological diversity in the often unexpectedly changing world deliberately selected, well managed and over a long period viable protected areas have been and shall be absolutely necessary. Moreover, we are profoundly convinced that newly declared protected areas should provide, except the cases when being under time pressure, from the very beginning the relevant protection, conser-



The Hinchinbrook Island National Park in tropical Queensland secures the survival of one of the most threatened ecosystems worldwide – mangroves. Also the area situated on north-eastern Australia was inscribed on the UNESCO World Heritage List.
© František Pelc

vation and management. Instead to often chase after the highest number of protected areas and their maximal proportion to the whole country's territory, continent, land or sea area, more attention should be paid to high-quality nature and the landscape protection, conservation and management in areas having been formally declared to maintain and preserve natural and landscape heritage (*cf.* MACKINNONN *et al.* 2021). Thus, there is concern that focusing solely on the percent area coverage of the global biodiversity conservation targets could be at the detriment of achieving the quality elements of the target. In other words, we should preferen-

tially try to consistently and wherever possible enhance and improve protection, conservation and management of the existing protected areas, particularly from a point of view of their representativeness, effectiveness and connectivity, as it is explicitly said by the above targets within the Global Biodiversity Framework having been just negotiated within the Convention on Biological Diversity (UNEP 2021, 2022, *cf.* MAXWELL *et al.* 2020, ADAMS *et al.* 2021, GELDMANN *et al.* 2021). We intentionally recall the statement many times repeated that less is sometime more and that it is about time quantity gets quality.



The majority of the Cheetah (*Acinonyx jubatus*) current range (77%) occurs outside protected areas where the species faces multiple threats. © Jan Plesník

PROTECTED AREAS AND CLIMATE CHANGE

If protected areas of various categories cover more than one-sixth of the Earth's terrestrial land and one-twelfth of the global ocean they cannot avoid current and projected climate change impacts. Climate change impacts may have already affected protected areas to a degree that makes it impossible to achieve their conservation targets (SCHEFFER *et al.* 2015). Many wildlife species, particularly cryophilic taxa, will not anymore find suitable habitats within them. In addition it is projected that increase in global mean temperatures by 2 °C above pre-industrial level will change the environment in 58% land area within protected areas by 2050 (DOBROWSKI *et al.* 2021). The predicted climate-induced redistribution of biodiversity suggests that many protected areas will not retain their current biodiversity: thus further shifts in the distribution range will affect more species enjoying territorial protection than today (HOLSINGER *et al.* 2019). Biodiversity loss within protected areas is rarely compensated for by incoming biota (FUENTES-CASTILLO *et al.* 2019).

Protected areas at both extremes of gradients are most exposed to climate change, namely small protected areas at low elevation, with low geodiversity, high human pressure and low irreplaceability for threatened species; and large protected areas at high elevation, with high geodiversity, low human pressure and high irreplaceability for threatened species (HOFFMANN & BEIERKUHNLEIN 2020, HOFFMANN 2022).

Various methods, tools and approaches how to reasonably mitigate climate change impacts on protected areas and/or how to adapt properly them to the serious processes have been proposed (HANNAH *et al.* 2007, HUNTLEY 2007, ARAÚJO 2009, PLESNÍK 2009a, 2009b, RANNOV *et al.* 2014, THOMAS & GILLINGHAM 2015, GROSS *et al.* 2016, MARQUET *et al.* 2019). Moreover, euphemistically said their implementation in practice has been significantly lagging behind although the fact might determine protected area effectiveness just in the near future (ELSEN *et al.* 2020, PARKS *et al.* 2022).

In addition neither well located, adequately financed and effectively, *i.e.* by involving all the stakeholders, managed protected areas are themselves enough. Relevant management of the broader unprotected landscape, particularly ensuring its suitable composition, structure and functioning ("health") should complement in this respect the irreplaceable role of protected areas. But this another, although in some aspects resembling story. ■



Martagon lily (*Lilium martagon*) in the Triglav National Park.
© Zdeněk Patzelt



BioLog

<http://biolog.nature.cz>

Species recording is a crucial source of data for nature conservation. The recording needs to be effective, precise and comfortable. Recent technologies are suitable environment to do so. The BioLog Android application by Czech Nature Conservation Agency, serves as an effective way to collect records in the field or just while hiking in nature. BioLog provides an off-line notepad for your observations of animals, plants or fungi in the nature of Central Europe.

The application enables automated localisation (via Google maps) and recording in structured form, which is possible to be imported into Species Occurrence Database of NCA (<https://portal.nature.cz/nd>) or to be exported.

BioLog could be used as a hint source for species search or species local distribution atlas, from the opposite side. Through filtering of Species Occurrence Database via the Around Me function you can get the records collected near to your position on the screen. Your new records through BioLog can then easily enrich this distribution atlas.

The app is connected to the Species Occurrence Database and therefore collected records could be used in wide spectrum of conservation practice based on species presence: as a ground of administrative issues, for management of the specific areas, for assessments on local and regional levels.

Species Occurrence Database

<https://portal.nature.cz/nd>



Species Occurrence Database is a valuable information resource for experts and all interested in species in Czechia. It is a central species data repository on the national level.

Database encompasses more than 32 million of localised and dated records of 24 thousand species. Three quarters of data are of plants, animals are making a fourth quarter, fungi and lichens do not reach one percent of the data volume. Most of the data are results of expert research and monitoring, but the involvement of public in the citizen science project shows a growing trend.

Former intention to build a database for expert and official use made the growing public interest and open data policy outdated. The data (except of sensitive records) are today available under the Creative Commons License for any registered user.

Public are grid maps of species distribution (available at <https://portal.nature.cz/karty-druhu>), which are generated on a day-to-day basis on the actual state of database, the published knowledge is very recent. The grid maps enable the comparison with published and digitized species distribution atlases. Data are available also in BioLog, the Android app in Around Me function.

Full records are accessible through Filter (at: <https://portal.nature.cz/nd>), the main gate to the database: just put the species name or other conditions. If you are interested what species you can find in your home municipality (if it is in Czechia), just try to search...