Species lists and statistics

Indicator name	**Species lists and statistics**
Indicator unit	Counting of number of threatened species at site and country levels.
Area of interest	Species lists are generated for each protected area not smaller than 25 km² and statistics on threatened and endemic species are reported at the country level.

Related targets

Sustainable Development Goal 14 on life below water

Sustainable Development Goal 15 on life on land

Aichi Biodiversity Target 11 on protected areas

Aichi Biodiversity Target 12 on species

Policy question Where are the areas in the world hosting most species? How many species in a country have their ranges covered at least partially by protected areas? How many threatened species are endemic and how many of these have their ranges protected? Where are the main gaps in terms of species observations? These are key questions for assessing whether conservation measures have been taken to prevent extinctions on to measuring progress on Aichi Targets 11 and 12 of the Convention on Biological Diversity (CBD).

Use and interpretation Species assessed by the International Union for the Conservation of Nature (IUCN) and documented in the IUCN Red List of Threatened Species ™ (RLTS) have been used to provide end-users of DOPA Explorer with theoretical lists of species in protected areas ≥ 25 km² (IUCN, 2017) as well as country summary statistics on the number of endemic and threatened species (IUCN, 2018).

Species included in the Red List are classified into the following categories based on Red List criteria such as rate of decline, population size, area of geographic distribution, and degree of population and distribution fragmentation:

Threatened species fall into one of the following three categories:

1) Critically Endangered (CR) – Extremely high risk of extinction in the wild.

2) Endangered (EN) – High risk of extinction in the wild.

3) Vulnerable (VU) – High risk of endangerment in the wild.

All other species fall in these last categories:

4) Near Threatened (NT) – Likely to become endangered in the near future.

5) Least Concern (LC) – Lowest risk. Does not qualify for a more at risk category. Widespread and abundant taxa are included in this category.

6) Data Deficient (DD) – Not enough data to make an assessment of its risk of extinction.

7) Not Evaluated (NE) – Has not yet been evaluated against the criteria.

The IUCN further provides information about endemic species, i.e. species occurring naturally within one country only.

Country statistics:

Information regarding the RLTS has been used in two ways at the country level:

1) Country summary statistics on threatened and endemic species are expert based and proposed in DOPA Explorer 3 (Figure 1) as reported by the IUCN in their summary tables: https://www.iucnredlist.org/resources/summary-statistics

Figure 1. Summary statistics regarding species assessed by the IUCN at country level. These tables should be consulted for example, to obtain a summary of the number of threatened mammals and/or endemic species in any particular country.

2) Country lists of Threatened (Critically Endangered, Endangered, Vulnerable) and Near Threatened species (Figure 2) are derived from the overlay of the country boundaries with the species ranges provided by the IUCN for Mammals, Birds, Amphibians, Sharks & Rays, and Corals. Note that species will not necessarily be present in the country. Species ranges provided by the IUCN are mapped as generalized polygons which often include areas of unsuitable habitat, and therefore species may not occur in all of the areas where they are mapped. In general, for range-restricted taxa, ranges are mapped with a higher degree of accuracy, sometimes down to the level of individual subpopulations, compared with more widely distributed species. See http://www.iucnredlist.org/ for more details. Expert-based country lists of species can thus significantly differ from the indicative lists provided here.

Figure 2. Theoretical list of species assessed by the IUCN found within a country level.

DOPA Explorer 3.0 also provides a ranking of the protected areas within each country in terms of total number of threatened and near-threatened species (Figure 3)
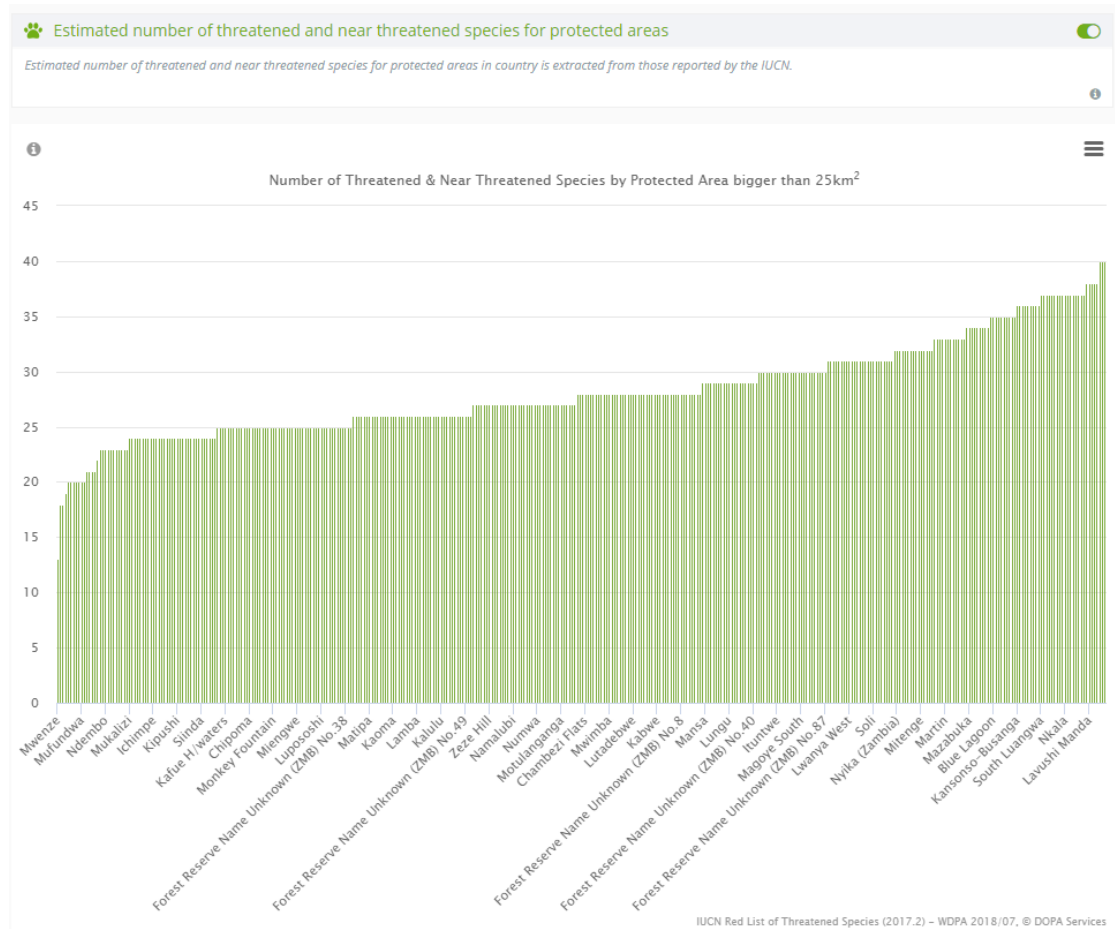

Figure 3. Ranking of PAs by Threatened and Near Threatened Species. The numbers are computed over the mammals, birds, amphibians, sharks and rays and corals.

DOPA Explorer 3.0 also provides spatial layers made available from the Global Biodiversity Information Facility (GBIF) showing species occurrences as reported from many sources, including everything from museum specimens collected in the 18th and 19th century to geotagged smartphone photos shared by amateur naturalists in recent days and weeks. This dataset may help you identifying information gaps and factors limiting the dissemination of biodiversity information that are recognized as priorities both at the political and scientific levels of the UN Convention on Biological Diversity (CBD) (Figure 4). See https://www.gbif.org for more details.
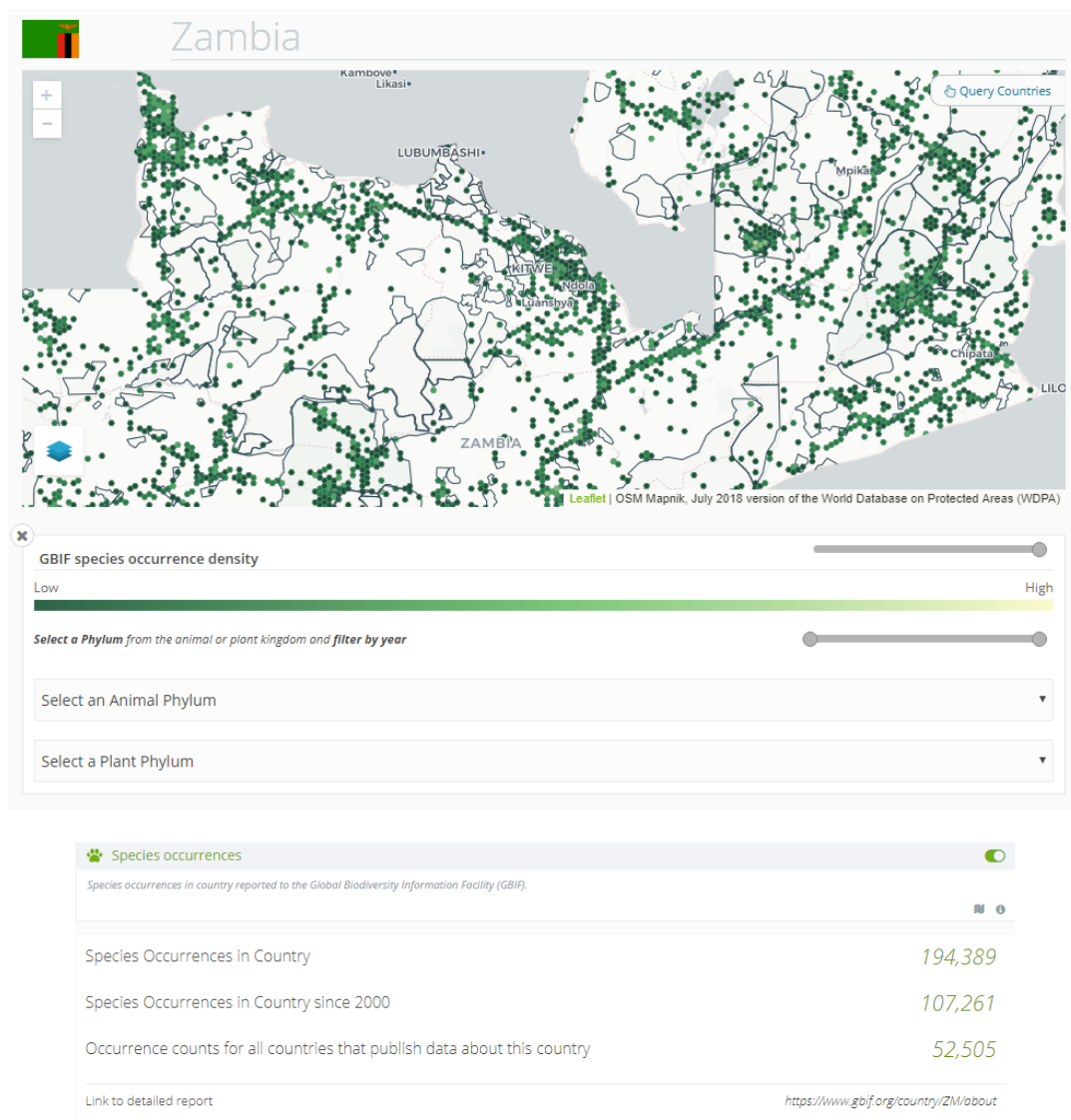
Figure 4. Species occurrences in a country as reported by the GBIC and country statistics. GBIF provides further web services allowing the data to be selected by phylum.

Site level statistics:

Information regarding the RLTS at the level of the protected area is organized similarly as for the country statistics although providing more detailed information. The data proposed are also all exclusively derived from the overlay of the boundaries of each protected area ≥ 25 km² with the species ranges provided by the IUCN. Hence, here again, species will not necessarily be present in the protected area. Species ranges provided by the IUCN are mapped as generalized polygons which often include areas of unsuitable habitat, and therefore species may not occur in all of the areas where they are mapped. In general, for range-restricted taxa, ranges are mapped with a higher degree of accuracy, sometimes down to the level of individual subpopulations, compared with more widely distributed species. See http://www.iucnredlist.org/ for more details. Here again, species occurrences reported to the GBIF can also be visualized at the site level.

We provide the following two tables regarding the RLTS

1) Species summary data are derived from the overlay of the park boundaries with the species ranges provided by the IUCN for the Mammals, Birds, Amphibians, Sharks & Rays and Corals (Figure 4). In contrast to the country summary table covering only Threatened and Near Threatened species, the information provided at the site level covers all categories of threats, from critically endangered species to species of least concern of data deficient.

Computed Species Summary Data

Red List Category summary totals for this Protected Area

Class	No. Species	No. Threatened	No. Critically Endangered	No. Endangered	No. Vulnerable	No. Near-threatened	No. Least concern	No. Data deficient
Sharks and Rays	1	1	0	1	0	0	0	0
Amphibia	47	0	0	0	0	0	45	2
Birds	422	1	0	1	0	5	414	2
Mammals	168	9	1	2	6	10	141	8
Total	638	11	1	4	6	15	600	12

RLTS jun 2017, WDPA 2017/10, © DOPA Services

Figure 4. Computed summary statistics computed at the site level using the species assessed globally by the IUCN.

2) Species lists data are derived from the overlay of the park boundaries with the species ranges provided by the IUCN for all Mammals, Birds, Amphibians, Sharks & Rays and Corals.

Overall, the species distribution maps used for the species statistics cover nearly 23,000 species. These maps invariably represent current, known limits of distribution for individual species within their native historical range.

Species from the RLTS used in DOPA	All species (used for site levels only) …	… from which Threatened & Near Threatened (used for country statistics)
Mammals	5 194	1 378
Birds	10 582	2 215
Amphibians	5 277	1 950
Sharks and Rays	1 001	295
Warm-water reef-building corals	843	408
Total	*22 897*	*6 246*

Key caveats	The species list produced for each protected area not smaller than 50 km^2 is derived from the processing of the data from the World Database on Protected Areas (WDPA) and the IUCN Red List of Threatened Species ^{TM} and is therefore depending on the quality of the spatial data.

The IUCN Red List of Threatened Species ^{TM} is the world's most comprehensive information source on the global conservation status of animal, fungi and plant species. It contains a rich compendium of supporting information of the distribution range, ecological requirements, habitats and threats to species and on conservation actions that can be taken to reduce or avoid extinctions. For further details, see www.iucnredlist.org. Global species maps from the red list represent current, known limits of distribution for individual species within their native historical range. Although these maps have many uses, they generally have a coarse resolution and consequent limitations. Species ranges are mapped as generalized polygons which often include areas of unsuitable habitat, and therefore species may not occur in all of the areas where they are mapped. In general, for range-restricted taxa, ranges are mapped with a higher degree of accuracy, sometimes down to the level of individual subpopulations, compared with more widely distributed species.

In a very few cases, a single protected area can be fragmented over multiple countries and over large distances and a species list for this protected area do not make any sense. This is the case for example for the Protected Area with ID 903141 that is fragmented over 12 European countries and which has been removed from the analyses.

Indicator status	Standard indicators of the Biodiversity Indicators Partnership (BIP) as an indicator to measure species conservation under Aichi Target 12.

Available data and resources

Data available	Species lists are available for each protected area ≥ 25 km^2 from the DOPA Explorer 3.0 website http://dopa-explorer.jrc.ec.europa.eu/
Data updates	Planned with each update of the Red List of Threatened Species.
Codes	Computed on PostgreSQL 9.6.6 with PostGIS 2.3.3 spatial extension. No codes publicly available yet. For details see our Technical Documentation at http://dopa.jrc.ec.europa.eu/en/technicaldocumentation
	Species occurrences are obtained directly from the GBIF API, see more details at https://www.gbif.org/developer/species

Methodology

Methodology	Range maps of all birds, amphibians, mammals, corals and rays and sharks assessed globally the IUCN (2017.2 version of the IUCN Red List of Threatened Species ^{TM} (RLTS)) have been used to generate country and site level statistics. These range maps have been intersected with the boundaries of all protected areas to produce indicative species lists for the protected areas (for more details

see Dubois *et al.*, 2016). In short, the species distribution maps were imported in DOPA as vectors polygons and, in case of invalid geometries, cleaned to allow further processing.

The species statistics were then obtained by computing the spatial intersection of:

- the distribution range data for species that are categorized with the following attributes:
    - o the presence is either extant or probably extant;
    - o the origin is either native or introduced
    - o the seasonality is breeding, non-breeding or resident
- and the entire set of protected areas from the World Database on Protected Areas (WDPA) for all designated protected areas (PAs) not smaller than 50 km^2), excluding UNESCO Biosphere Reserves.

The number of threatened species by country as reported by the IUCN are directly derived from the IUCN's summary statistics (IUCN, 2017b).

Input datasets   The indicator uses the following input datasets:

Protected Areas
- WDPA of July 2018 (UNEP-WCMC & IUCN, 2018).

    - o Latest version available from: www.protectedplanet.net

Species Ranges
- IUCN Red List of Threatened Species ^{TM} 2017 version 2 (IUCN, 2017a)

    - o Latest version available from: http://www.iucnredlist.org

Threatened species statistics by country as reported by the IUCN
- IUCN Red List of Threatened Species ^{TM} country summaries (IUCN, 2017b)

    - o Latest version available from: http://www.iucnredlist.org/about/summary-statistics

Species Occurrences
- The Global Biodiversity Information Facility (November 2018)

    - o Latest version available from: https://www.gbif.org/developer/summary

References   Dubois, G., *et al.* (2016). Integrating multiple spatial datasets to assess protected areas: Lessons learnt from the Digital Observatory for Protected Areas (DOPA). *ISPRS International Journal of Geo-Information,* 5: 242. http://dx.doi.org/10.3390/ijgi5120242

IUCN (2017). IUCN Red List of Threatened Species. Version 2017.2. <http://www.iucnredlist.org>. Received on 20 October 2017.

IUCN (2018). IUCN Red List version 2018-1. Tables 8a Summary of the number of threatened species by country. http://www.iucnredlist.org/about/summary-statistics (2018.2)

UNEP-WCMC and IUCN (2018). Protected Planet: The World Database on Protected Areas (WDPA) [On-line], [July/2018], Cambridge, UK: UNEP-WCMC and IUCN. www.protectedplanet.net

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Factsheet last   November 15, 2018
updated

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