

PREFACE

The main content of this *Atlas of the World's Conifers* is the distribution maps. There are 728 maps in the Atlas. There are separate maps for all families, for all genera with more than one species, for nearly all species (only a few are combined), while subspecies and varieties, when shown, are on the map of the relevant species with different symbols. In addition to these 656 taxonomic maps, there are 72 additional maps, ranging from a global map of all conifer species to continental maps with the same, maps of families or genera or all species in parts of their range, e.g. China, Japan, Mexico, USA, maps that analyse taxonomic diversity distribution at genus and species + infraspecific levels, maps that calculate occurrence of rarity and other thematic maps. The main part of the Atlas is formed by the chapters that deal with the taxonomic distribution of conifers, beginning with *Global and trans-continental distributions* and proceeding through first the Northern Hemisphere with *North America; Mexico, Central America and the West Indies; Europe and the Mediterranean; Mainland Asia and Japan*; then through the Tropics and the Southern Hemisphere with *Malesia; Australasia; South America and Africa*. Genera and species have been given a map in the chapter where they appear to fit best; e.g. the species that occur in Algeria and Morocco N of the Sahara are not treated in the chapter *Africa* but in the chapter *Europe and the Mediterranean*. Truly African conifers occur almost all S of the Sahara and most of the species N of the Sahara either occur also in Europe or are very closely related to species that do. Similarly, species that cross over into the area of another chapter have been given a map where most of the distribution is situated. This is usually explained in the text at a point where the reader might expect a map to be given but is not. The indices at the end of the Atlas give the map numbers and pages where each map can be found. Maps are numbered by chapter and the chapters are indicated by an acronym.

The distribution of a taxon or taxa is represented on a map in map points; each point indicates the approximate locality where one or more herbarium collections of that taxon or those taxa have been made. For a discussion of the methods of data gathering and mapping and the nature and quality of the data we refer the reader to the chapter *Creating the Atlas of the World's Conifers*. Here we need to point out what the maps do and do not show, or in other words, how to read them. The maps show localities of herbarium collections made in the past. With each species map there are figures given in brackets that give the following data: 'n' is the number of herbarium collections (records) in the Conifer Database; 'm' is the number of 'mappable' records, i.e. those for which locality coordinates in degrees and minutes could be given; 'h' is the number of institutional herbaria in which the specimens (unicates and duplicates of collections) are kept; this is followed by the period in which these collections were made. These statistics are indicators of how complete or incomplete the data used for the maps are. The map points are together a subset of the presence of a species, limited to those trees from which a sample was taken for a herbarium. No other data sources were used. The maps should be read with these limitations in mind.

The text accompanies the maps and gives factual information on distribution, habitat, abundance or rarity, the conservation status if a species falls within a threatened IUCN Red List category and sometimes other topics. There may also be explanatory text on for example completeness of records, comparisons with other taxa and interpretation of the distribution patterns. The taxonomy refers to *A Handbook of the World's Conifers* by the first author, published by Brill in 2010, and remains unaltered in this Atlas. In addition to the text with the maps, each chapter has one or more introductory sections that outline the general geography of a continent, or smaller area,

if it is of particular note to conifer distribution (e.g. China, Japan, New Zealand). This information is kept as brief as possible and should not be read as an essay on the geography of that continent or country. These introductions serve merely to put in geographical perspective that which follows, which is an outline of conifer distribution and diversity in that area. Maps are here again supreme, and the text accompanies these and describes and interprets the distribution patterns. The first map in the chapter or section gives the total distribution of all species in the area. These and other maps like them are based on all records of species and their subspecies and varieties that occur there. They show not only where conifer species occur, but also where they are concentrated. The latter aspect is further analysed in diversity maps, usually at genus and species + infraspecific levels in two separate maps, calculated for 1 degree or smaller cells, with a scale from 1–5 from low to high diversity. The actual values given in the legends are dependent on the total number of taxa in the area. A third map in this section depicts 'rarity' that is it distinguishes cells with species that occur only there or in few other cells from those that are more widespread and gives the cells a rating on a scale of five values. Effectively these rarity maps depict the distribution of narrow endemics.

Photographs of conifers in the wild are included in many places, selectively and when available. These are captioned with species name and location, and may be accompanied by further comment given in a text box. The emphasis is on habitat shots to give an illustration of the environment a species occurs in; in many cases this can be linked to the map, which is a Natural Earth relief map, and to comments on habitat in the text. An attempt has been made to give examples of the wide variety of habitats in which conifers grow and to spread these evenly in the chapters. Limited availability of good photographs from some regions is the reason why this has not always been achieved.

The Conifer Database, with 36,755 records, is the source of this Atlas. We have made use of these data in a limited context, namely to produce maps that show the geographical distribution of the conifers. We believe we have exploited the data for this limited purpose to the full in this Atlas. However, these data can be used in different ways, in a taxonomic context, but also for wider biogeographical research. In the chapter *Examples of further research* we present in several short paragraphs some examples, a few of which have been contributed by other researchers who have used the Conifer Database. None of these examples are in any way research papers; they are only pointing at possibilities for further analysis of the data.

Some further statistics are presented at the end of the Atlas in *Tables and Indices*. These sections could also easily have been expanded to derive more information from the basic data. As with the examples in the final chapter, what we present here should be seen as possibilities arising from the Conifer Database, which is made available online (see chapter *Examples of further research; The Conifer Database online*). We present statistical data in Table 10 by country on the total number of taxa, endemism and conservation status in the IUCN Red List. In the Species Index we give the number of degree squares in which a species was collected and the conservation status of each species in the IUCN Red List of Threatened Species™ as of July 2013.

This Atlas is the first publication to present maps of all extant families, genera and species of conifers. Numerous publications exist with distribution maps of some kind, usually range maps that shade an area, sometimes with dot maps indicating localities, but all are confined to a taxon, a country or region, a taxonomic rank such as genus (e.g. Eckenwalder, 2009) or another subset of all conifers (e.g. Debreczy & Rácz, 2011). Published maps of species in the temperate zones of the Northern Hemisphere far outnumber those representing species in the Southern Hemisphere and in the Tropics. For several species this Atlas presents the first published distribution map.