A man with brown hair, wearing a black shirt, is looking through black binoculars. He is in a forest with green trees and foliage in the background.

# Chris Packham's **Nature** **Handbook**

Explore the wonders of the natural world







# Chris Packham's Nature Handbook

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Explore the wonders of the natural world





LONDON, NEW YORK, MELBOURNE,  
MUNICH, AND DELHI

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**Chris Packham** developed a fascination with wildlife from an early age and studied zoology at Southampton University, England. He has written several books on wildlife and has hosted many nature-based TV shows for the BBC, including *Springwatch* and *Autumnwatch*. Chris is involved with many wildlife conservation organizations including The Wildlife Trusts, The Wildfowl and Wetlands Trust, The Bat Conservation Trust, and is a Vice-President of the RSPB.

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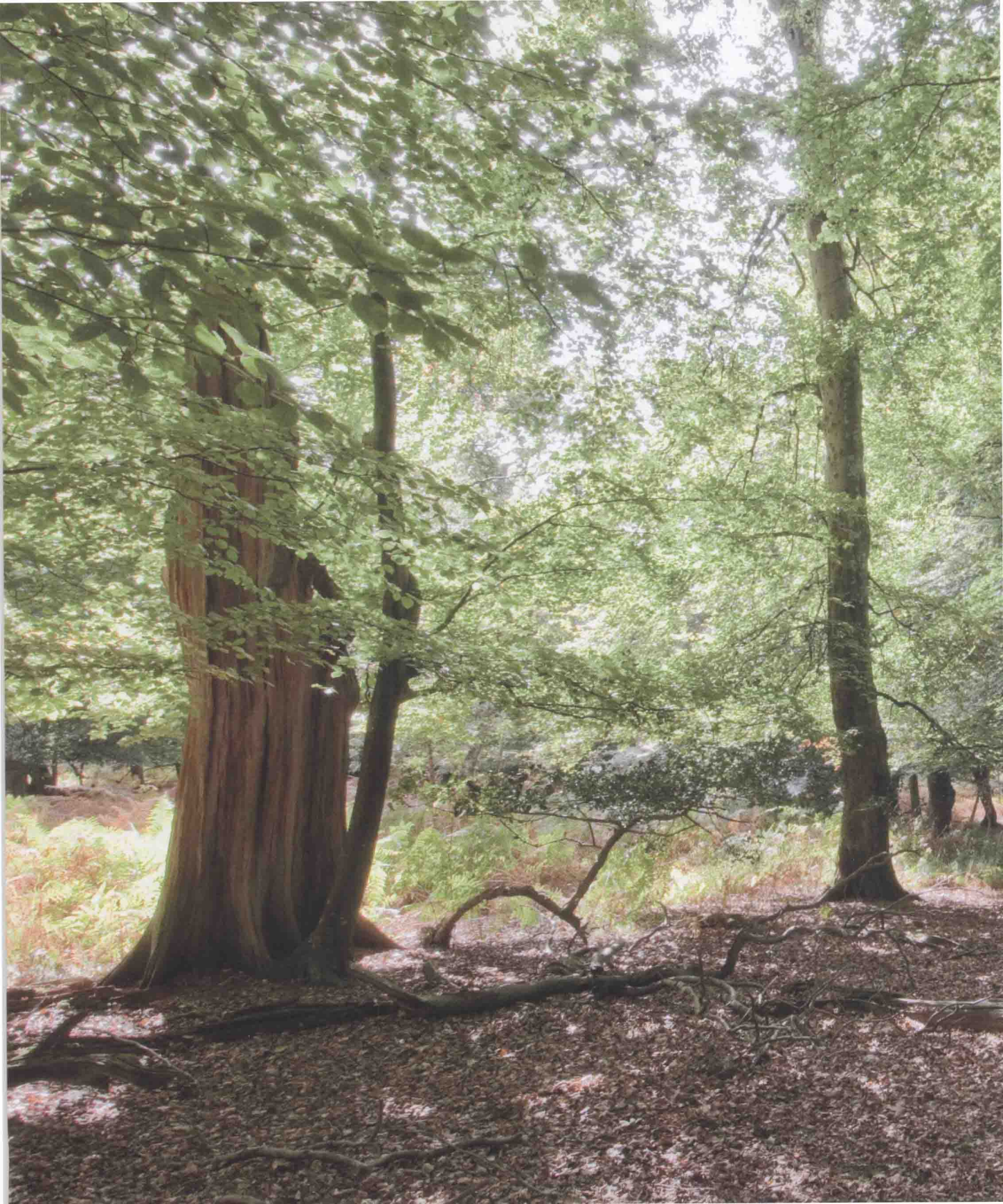
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## Foreword

I wonder how many species are living on our world... right now? I wonder if any of them have become extinct in the time it has taken me to think this? I wonder exactly what it would be like to see through the eyes of a butterfly, and how it feels to be a swallow, swooping super-fast over a lake to snatch a sip of water on a summer's afternoon? I wonder how big the very largest giant squid is – or was – or what a tyrannosaur really sounded like? I also wonder what it would be like to be eaten by crocodiles, or whether in a one-on-one I could outwit a hungry tiger and survive. Oh, and I would also give anything to go for just one walk as a dog – to experience the world through smell, to enliven that forsaken sense with a sniff around the woods.



Let's be honest, I'll never know the precise answers to these questions, but there isn't one of them that I couldn't come up with an educated theory about. With a little research I could "guesstimate" some of them, learn what the most recent scientific ideas offer, or even read anecdotes of relevance for others. For instance, through personal observation I have learned that Nile crocodiles stalk their prey from beneath the water and lunge at the unsuspecting victims intent on dragging them backwards into the river to be killed by a combination of crushing, dismemberment, and drowning. I've read that their jaws can close with a force of 5,000lb of pressure per square inch (22kN), which means that opening them "a la Tarzan" is obviously impossible.

Thus, I can imagine that being attacked by a crocodile is a nightmarish scenario involving lots of muddy, wet pain! I'll avoid it whenever possible!

But I digress, this book isn't really about the power of predators' jaws, but it is about exciting and satisfying those with a fascination for the natural world, those who, like me, want to try to understand what makes it all tick, how that ticking takes place, and whether there's a proper name for it. You see, when I was the eager ten year old earnestly trying to understand everything about animals and the habitats they lived in as quickly as possible, pawing the pages of my animal encyclopaedias, ricocheting from tigers' stalking strategies, snakes shedding their skins, and the "miracle" of metamorphosis, what I really wanted was detail. I needed "sloughing" skins rather than "shedding" and I already knew that while the processes playing out in the chrysalis were hidden from me – and an explanation of them irritatingly absent from my book – there was certainly no miracle involved. And what annoyed me most of all was that I was sure that there was a white-coated scientist out there somewhere who knew all the answers. Perhaps it's because of this legacy that I've always refused to "dumb down" and that patronizing snobbery is out of my question. I never did "mini-beasts", I stuck with invertebrates and wondered why if children so easily and ably enjoy the names of dinosaurs then why do we shy from teaching them a proper naturalist's vocabulary? Young doesn't mean simple – it means hungry and absorbent – and if people develop a fascination for the natural world at a later age, then in these times of wider







awareness and access to all information they are well prepared to understand properly explained science and the workings of the natural world.

And that's what I wanted this book to be, a beautifully presented, full-colour, 21st-century look at the workings of the natural world for all the family. I wanted to learn a lot from it myself and to update things I'd read long ago, and I also wanted it to facilitate a wider ambition – one that for all my swotty obsession with everything that slithers, sneaks, slimes, and stings, wasn't realized until I was in my twenties. I wanted it to portray the bigger picture, to offer an opportunity to realize how and why all of the little things lives are linked, to illustrate aspects of an invisible web that necessarily joins all our planet's life. And through this to present the basis of a framework to support the readers own knowledge or observations, so that these could fuse recognitions of relationships between the infinite multitude of seemingly separate species, their physiologies, ecologies, and behaviours.

Wow! A tall order indeed! But if some readers wander their part of the world with their curiosities excited and generate questions that they reply to with theories, test with experience and research, and they, as I, suddenly understand that the reason for *all this is all that*, and the simple beauty of a tiny aspect of nature can be carried through to an appreciation of a real beauty in its complex whole – well, it's a job done then. But of course you won't achieve this solely by reading about it or looking at the pictures – you have to get out there where the action is, and this book aims to inspire you to do just that. That action doesn't have to be "big" or "glamorous" – and it certainly doesn't have to be exotic. There are incredible dramas playing out beneath logs in your garden, life and death battles being fought in your local park, and epics

unfolding on wastelands or nature reserves around your corner. And discovering them for yourself is always better, always more rewarding. Wildlife on television is a great way of instigating an interest, but not of satisfying it, and I'd rather spend ten minutes with a woodlouse or ladybird in the palm of my hand than ten minutes watching a tiger on TV. Real wildlife, however small and insignificant it may seem, is really exciting and understanding how and where it lives, where to look for it, and how it works in the grand scheme of things is something that will really enrich your life.

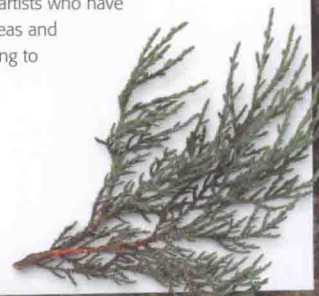
And I hope that with any such deeper understanding comes a deepened desire to protect and conserve those truly perfect things in our world and again a realization that all such efforts will be wasted unless we immediately employ our armoury of technologies to combat and adapt to our planet's changing climate. From twinkling stars and new clouds, to tadpoles and their metamorphosis, there is so much pure wonder portrayed on these pages – do we really want to destroy it? No. So let's empower ourselves to make a difference where and whenever possible.



Chris Packham

This book is dedicated to my Mum, who allowed my foxes to poo on her carpets without too much complaint.

I would also like to extend a gargantuan thank you to all the authors who have so diligently researched and skilfully written their sections to eloquently explain everything from the minutiae to the massive; to the team of editors at DK who have carefully melded these gems together to produce an effective synergy; and to the designers, photographers, and artists who have given such stunning visual life to all the ideas and explanations. I so wish I was ten and starting to explore the natural world again!







# The web of life

*The simple beauty of life can be relished on many levels.*

*A single bright-red ladybird on a fingertip is perfect. The fresh scent of a rose is sublime. The tiny rainbows seen flashing from the wings of aphids on the rose's stem are also unexpected gems, and the marvel of a myriad of ants flying up into the summer sky makes an urban spectacle. Each is individually remarkable, but then so are the relationships that essentially and intrinsically link them all. There is an undeniable and satisfying beauty to be found in an understanding of these webs that knit life together.*



# The nature of the planet

**Much of the time, we are aware only of life immediately around us, yet this is only a small part of a much larger network. Life on Earth exists in many places – some very different to others, but all are connected.**

## The thin green line

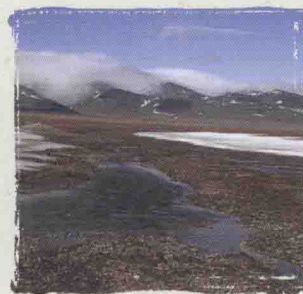
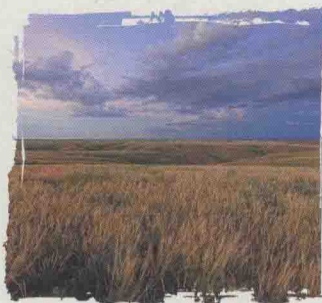
Life in all its forms is found exclusively on the Earth's outermost layers, including the land, oceans, and the atmosphere surrounding the planet. This narrow strip is known as the biosphere – a word that literally means "life ball". Within it are millions of species, of which humans are one, with each dependent on others for their survival. The biosphere isn't uniform, however – it is a collection of different, yet interconnecting habitats, which have many ill-defined boundaries between them.

### Key

-  Grassland
-  Desert
-  Tropical forest
-  Temperate forest
-  Coniferous forest
-  Mountains
-  Polar regions and tundra
-  Rivers and wetlands
-  Coral reef
-  The oceans

### WORLD BIOMES DISTRIBUTION

The scientific word for a habitat is a biome. This map shows the variety of these biomes and their distribution, which is determined by climate and geology. Human impact on the environment isn't indicated – areas shown as temperate forest, for example, may now be farmland.

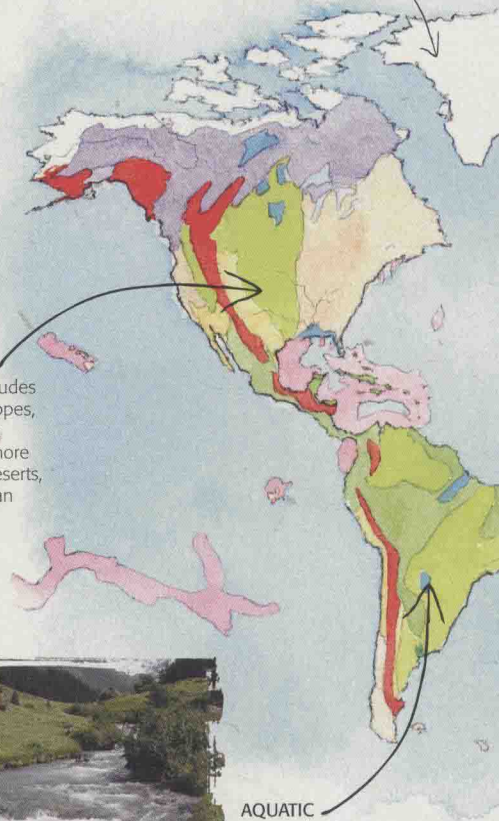


### TUNDRA

Exposed, cold, and treeless, with many lichens and mosses, tundra is a habitat of the far north.

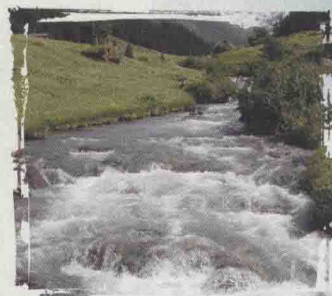
### GRASSLAND

Grassland includes savannas, steppes, and prairies. It experiences more rainfall than deserts, but is drier than forests.



### AQUATIC

Aquatic habitats include lakes and streams to rivers and oceans. They may be saltwater or freshwater.



### HABITAT-MAKER

Left to their own devices, some habitats are transient, changing from time to time. Reed beds are a good example. Often, dead vegetation builds up at the base of the reeds. This dries out the reed bed, allowing other species to gain a foothold. Scrub may take over, and ultimately woodland, which is a much more stable habitat.



### REED BEDS IN NORFOLK, UK

Many of these important habitats would be lost today if they were not periodically managed.



## More than one home

Some animals have a very strong connection with a single habitat – Europe's bearded tits, for example, are small birds found mainly in reed beds. Other species make themselves at home in many habitats – the adaptable carrion crow can be seen in woods, uplands, and foraging on estuaries, among other places. Dragonflies make a big habitat change when they become adults.



### TRANSFORMER

The first part of a dragonfly's life is spent underwater as a larva, yet once it matures, it becomes an aerial predator.

### FOREST

Forests are highly varied and species-rich habitats. Types of forest include northern boreal, tropical, and temperate forests.



*Find your own biome on the map. Perhaps it was once temperate forest.*



### DESERT

Deserts seem barren, experiencing almost no rain and possessing little or no vegetation. However, many species have adapted to desert life.



## LIFE ON EARTH

All life on Earth exists as part of an intricate web of interconnections. These images help to put some of these into context. They start with an individual of one species, and, step by step, move on to the biosphere. Individuals of any species don't generally live in isolation – others of their kind normally reside in the same area. Together, these make up a population. Add populations of other species in the same area and this builds into a community. The community lives in a specific habitat, with a certain climate, geology, and soil – together these living and non-living components make up an ecosystem. Put all the ecosystems together and you have the biosphere. In this way life on earth is interconnected, and we should take care to not tip the balance.

### INDIVIDUAL

As a naturalist, you might encounter just one individual of a species. However, it is part of a larger group.



### POPULATION

The individuals of a species in one area make up the population. Different species have different sized populations.



### COMMUNITY

All the populations together form a community, where population fluctuations for one species have an impact on species.



### ECOSYSTEM

Ecosystems may be large or small, and combine living components with an area's physical characteristics.



### BIOSPHERE

This is the "ball of life". It is made up of all individuals in every population in every community and all habitats on the planet. The true worldwide web.





# The diversity of life

**The diversity of life on Earth is extraordinary. As a naturalist, there is always something new to understand, experience, and enjoy.**

Scientists have identified about 1.8 million species, and it is estimated that as many as 6 to 12 million more are waiting to be discovered. Humans are just one animal species among many, but we have a unique role to play in understanding and conserving the rest.

## Evolution

Just as human families exhibit variations in, for example, eye colour, animals vary within a species. As differences are passed on to subsequent generations, species may slowly evolve into individuals with varied appearances and capabilities. For example, if one bird has a larger beak than its neighbour and is better at feeding its young, more of them survive. Some of its chicks will inherit larger beaks, and, with time, more offspring acquire larger beaks until they look quite different to their smaller-beaked relatives. If there comes a time when the birds with large beaks can no longer breed successfully with the birds with small beaks, a second species has been created.



### SLOW PROGRESSION

The elephants we recognize today are believed to have evolved from a prehistoric animal called *moeritherium* – an animal that more closely resembled modern tapirs.

## MAMMALS

Mammals make up around 5,500 species, including these raccoons, tiny bats, massive whales, camels, kangaroos, polar bears, cheetahs, giraffes – and humans.



## BIRDS

The nearly 10,000 known bird species are hugely diverse, ranging from ostriches to penguins, albatrosses to eagles, ducks to owls, hummingbirds, and sparrows.



## REPTILES

These are cold-blooded vertebrates and their bodies are usually covered in scales. There are close to 8,000 known species, including lizards, snakes, turtles, and crocodiles.



## AMPHIBIANS

These animals have adapted to life both in water and on land. There are about 5,000 species of amphibians including caecilians, salamanders and newts, and frogs and toads.





## EVOLUTION IN ACTION

The five digits in this skeletal paw, and what looks like a thumb, belong to the giant panda, a member of the bear family. The "thumb" is actually a wrist bone, but it is much larger than that of, say, a brown bear. It can also move, is padded, and works with the true digits to make it easier for the panda to handle bamboo, its preferred food. This appendage may have evolved over thousands of years as a trait that was beneficial to the panda's survival.



## Adaptations

Evolution is about change, and if an inherited characteristic increases the chance of survival by making an animal better at finding food or avoiding predation, for example, then those attributes are more likely to be passed on to the next generation. Within the animal kingdom, some species have – over many generations – evolved an array of adaptations to meet the challenges of life, including camouflage, super-sharp senses, mouthparts that function as specialist feeding tools, anti-freeze in the blood, or even feathers that hold water.

### MIMICRY

Predators may keep their distance from some non-venomous species of milk snake, which have evolved to resemble highly venomous coral snakes.



CORAL SNAKE



MILK SNAKE

red touches  
black bands,  
not yellow

### PERFECTLY ADAPTED

Sword-billed hummingbirds use their ultra-long beaks to reach nectar in flowers, pollinating them in the process.



## FISH

Earth's fresh, brackish, and salt waters are home to almost 31,000 known fish species, including salmon.

## INSECTS

Insects are the most abundant class of animals on Earth. Around 950,000 insect species share the planet with humans – over 350,000 of them are beetles.

## FLOWERING PLANTS

Around 260,000 flowering plant species have been recorded, on land and in water. These include grasses, trees, and more familiar blooms, such as these sunflowers.

## TREES

The definition of what is considered a tree is not absolute, but there are an estimated 100,000 tree species in the world.

## FUNGI

There are around 100,000 species of fungi. Toadstools and mushrooms belong to this group.

