Biodiversity Explorer Kit

Guides for Observing and Documenting Life Around You
This 'Biodiversity Explorer Kit' is for simply anybody to fall in love with biodiversity in your backyard and engage with the fascinating flora, fauna, and fungi we live with. It comprises a series of guides for invertebrates, birds, mammals, reptiles, amphibians, and plants as well as one on how to Photograph Nature for Citizen Science.

WWF-India is committed to creating and demonstrating practical solutions that help conserve India's ecosystems and rich biodiversity. With a conservation journey spanning over 50 years, WWF-India works towards finding science-based and sustainable solutions. We work in different geographical regions pan-India through state and field offices. The uniqueness lies in the interconnectedness of our work and its impact across thematic areas, including conservation of key wildlife species, management of their habitats; rivers and wetlands; climate change adaptation; driving sustainable solutions for business and agriculture; empowering local communities as conservation stewards; combating illegal wildlife trade, as well as environmental education to students through outreach and awareness campaigns.

This resource has been developed by Nature Connect, an initiative of WWF-India’s extensive Environment Education programme working pan-India. We focus on biodiversity education through immersive nature-based learning experiences geared towards taking localised actions and community building. Connect with us at +91-7011390259 or edu@wwfindia.net.

Concept
Shonali Chenzira

Content
Aparajita, Nikhil John & Shonali Chenzira

Artwork
Vanshika Mody

172-B Lodi Estate,
New Delhi 110003,
India
GET STARTED WITH PLANTS

Plants are species which have chlorophyll and produce their own food. They play essential ecological roles like provision of food and shelter, regulation of water resources, and binding the soil with their roots.

MAKING OBSERVATIONS

- **Habit**: note the overall shape - is it a herb? shrub? tree? climber?
- **Bark**: note the bark and trunk, is it rough? smooth? any colour?
- **Leaves**: what type? simple or compound? what colour? arrangement? are they needle-like or broad? any unusual features like ‘hairy-structures’, elongated ends? what kind of edges, margins?
- **Phenology**: observe seasonal changes, ask – is it flowering? fruiting? are the leaves sprouting or shedding?
- **Senses**: observe any scents, sounds or tactile clues like spikes on the bark
- **Interactions**: observe interactions with other species like birds and insects - are they feeding, nesting, resting?

FLOWER
- Large red
- Attracts many animals

‘SEMAL’ OR RED SILK COTTON TREE
**Field Tips**

- **In your garden** - take note of the species growing on their own, not just the ones that were planted!

- **Neighbourhood** parks & waterbodies, along the roads

- **Places frequently visited** like campus, workplace, shopping centres

- **Forested areas**, botanical gardens, sacred groves

- **‘Unexpected’ spots** like on your terrace, walls, and even on other plants!

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**A Closer Look at Leaves**

- Pinnately compound
- Simple leaf
- Palmately compound
- Oak-like
- Needle-like
- Succulent

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**Explore Safely**

- **Maintain some distance**: coming in contact with certain plant species can cause skin irritation; beware of thorns.

- **Allergies**: some people are allergic to pollen, wearing a mask can be helpful.
GET STARTED WITH BIRDS

Birds are vertebrates with **feathers, hollow bones, and egg-laying** reproduction, that exhibit unique traits for **flight** and survival.

Their **diverse adaptations** make them a captivating group in the animal kingdom.

**MAKING OBSERVATIONS**

A good bird detective looks for clues about...

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**BAYA WEAVER**

- Material used: grass
- Intricately woven, hanging nest
- Medium size
- Males weave nests to attract females

**OSPREY**

- Sharp beak
- Large in size
- Specialised talons to catch fish
**FIELD TIPS**

Birds have adapted to all habitats and can be found –
- in cities
- in forests
- in grasslands
- in agricultural and farmland
- around water bodies
- at high altitudes
- migrating across oceans

**In a forest, you can look –**
- on the ground
- along tree trunks, branches
- above treetops
- in bushes / undergrowth
- on rocks
- around water
- up in the sky

**HIMALAYAN MONAL**
- High altitude mountains
- Ground-dwelling

**SPOTTED OWLET**
- In forest
- In tree hollows

**RED-WATTLED LAPWING**
- In farmlands
- Lays eggs in a ' scrape' on the ground

**BARN SWALLOW**
- Usually seen in flight

**COMMON KINGFISHER**
- Perches at a vantage point

**HOUSE CROW**
- Adapted to urban areas
- Omnivore

**AMUR FALCON**
- Trans-oceanic migration
GET STARTED WITH MAMMALS

Mammals are warm-blooded vertebrates (animals with a backbone). They are distinguished by the fur or hair that covers their body. Mammals birth live young and feed them milk.

Mammals have adapted to life on land, in water, underground, amidst tree canopies and almost every habitat the planet offers!

You might recognise diverse groups of mammals like – carnivores, bats, rodents, primates, toothless insect eaters like pangolins, marine mammals, and more!

MAKING OBSERVATIONS

- Categorise into a sub-group - does it look like a monkey? deer? cat? rodent?

- Observe size (from snout to tail tip, approximately in cms) which helps differentiate similar species

- Focus on patterns (stripes of a tiger) and markings (rosettes of a leopard), note overall colours of the ventral (top side) and dorsal (underside) body

- Listen for calls as well as responses, they hold a lot of information.

- Note group dynamics - in pairs? solitary? large or small group?

- Attune to observing behaviour - feeding, playing, attracting a mate, defending territory or caring for young
**FIELD TIPS**

**What to look out for...**

- **Poop** – scat, pellets, dung
- Presence of burrows / nests or other types of homes
- **Pug / hoof-marks**
- **Scratches** on bark
- **Shed body parts** like quills and antlers
- **Evidence of feeding** – gnawed bark, remains of prey
- **Calls** are good indicators of their presence

**Where to look...**

- **Gardens, farmlands, forests, grasslands** and waterbodies
- **Larger mammals** usually stay away from densely populated urban areas
- **Look up** in the trees, archways
- **Nooks and crannies** in natural / man-made structures
GET STARTED WITH REPTILES

Reptiles are **vertebrates** (animals with a backbone) with skin covered in scales and/or bony plates. Reptiles include **snakes**, **crocodiles**, **alligators**, **gharials**, **lizards**, **turtles**, **tortoises**, and **terrapins**. Most reptiles lay eggs, but some (pythons, boas) birth live young.

They are **masters of survival** with adaptations like chameleons change colour to camouflage, and some snakes inject venom to hunt prey. Reptiles are **cold-blooded** (regulate core body temperature through external sources).

Most reptiles live on land, but can also be good swimmers, tree climbers, and even glide in the air!

MAKING OBSERVATIONS

- **Colours and patterns** are important to distinguish species
- **Size and length** from snout to tail tip
- **Arrangement of scales** and their characteristics, e.g. ridged, smooth, keeled
- **Ornamentation** like spikes or a dewlap
- **Behaviours** like basking, hunting, courtship, male combat

**Indian Star Tortoise**

- Patterned carapace
- Found in dry areas

**Water Monitor Lizard**

**King Cobra**

- Longest venomous snake
- Only snake in the world to build a nest

**IN WATER**
FIELD TIPS

- Look out for **shed skin**, or ‘moult’
- Easy to spot **near abundant prey** (frogs, rats, hen coops)
- In **crevices and dark places** where they like to hide
- **Sunny and cool spots** which aid in thermo-regulation
- On **tree branches and hollows**
- Around termite mounds, burrows, and **underground hiding spots**
- **Leaf litter**, under rocks, and even fallen logs
- In **water**, look on the banks, islands, exposed rocks
- Certain reptiles like crocodiles can be spotted at night, by their **eye shine**

EXPLORE SAFELY

- **Stay alert**: reptiles want to be left alone, and avoid humans generally
- **Respect their space**: never approach or try to catch them
- **Maintain a distance**: of 8 - 10 feet while photographing
- **On a night walk**: always carry a light, wear closed shoes and long pants
GET STARTED WITH AMPHIBIANS

Amphibians are **vertebrates** (animals with a backbone) who need water or **moist environments** to survive. They are cold-blooded and have **life cycles** that use both land and water. The types of amphibians are – **frogs, toads, salamanders, caecilians, and newts**.

They have **special skin** through which they breathe, as well as absorb water. They thrive in a variety of habitats and exhibit **fantastic adaptations** (e.g. bush frogs, tree frogs, gliding frogs, poison dart frogs and many more!)

MAKING OBSERVATIONS

- Many are nocturnal, they **communicate constantly through sounds** by which they can be identified
- Pay attention to **appearance** – colours? unique markings? patterns? stripes? spots?
- Observe their **limbs** and the **shape of their digits** (fingers and toes)
- Look for **behaviours** – stretching, croaking, mating or feeding
- Note their **skin** – is it smooth? rough? warty?
- **Distinctions** between ventral (topside) and dorsal (underside) body
- Shape and colour of the **eye**, iris, presence or absence of an eye ring
Amphibians can **glide, hop, swim, and leap** - which means you can find them in many niches.

- Start exploring **in and around water** - shallow edges, puddles.
- Look near **grassy areas**.
- Near areas where prey (like insects) is abundant.
- Search on **trees** and near agricultural **fields**.
- Look for **eggs and tadpoles** especially in water.

**Types of Feet**
- **Terrestrial**
- **Aquatic**
- **Arboreal**

**Caecilian**
- Lives underground or in shallow streams.
GET STARTED WITH INVERTEBRATES

Invertebrates are animals which lack a backbone. They are cold-blooded and show a great diversity - in fact, invertebrates comprise more than 90% of the diversity of life on Earth. Here's a look at a few common invertebrates you might encounter:

**Insects**
- 1 pair of antennae
- 3 pairs of legs
- 3 body segments – head, thorax & abdomen
- Have an exoskeleton
- Butterflies, dragonflies, ladybugs, ants, bees, among others

**Arachnids**
- No antennae
- 4 pairs of legs
- 2 sets of mouthparts
- 2 body segments
- Have an exoskeleton
- Spiders, scorpions

**Molluscs**
- Soft-bodied animals
- May / may not have shells
- Snails, slugs

**Others**
- Earthworms, crabs, sponges, starfish, flatworms, centipedes, millipedes, round worms

**MAKING OBSERVATIONS**

- **Shape & size** of the body
- **Presence / absence & position of wings**
- Pay attention to **colours, markings & patterns**
- **Sounds** - can be useful in detecting invertebrates like cicadas & crickets; try to observe sounds of insects like bees & dragonflies
- **Behaviour** - feeding, mud-puddling, mating, egg-laying, nest-building, basking, flight pattern
- **Habitat and Season** - where in the habitat did you see it? Which time of the year?
FIELD TIPS

What to look out for...

The presence of invertebrates can be indicated by - eaten leaves, patches / squiggly lines on leaves, galls / bulges on leaves or branches, small holes on trees, nests / hives / mounds, birds / other animals feeding on them

Where to look...

Look for invertebrates on flowers, on & below leaves, in the leaf-litter, in & around organic material like animal poop, decaying matter, in waterbodies like puddles, water tanks, natural / artificial ponds, on the walls - near light sources / streetlights

EXPLORE SAFELY

Avoid wearing any artificial scents when exploring insects.

Maintain a safe distance to avoid allergies and/or getting stung!
Citizens play a key role in contributing biodiversity-data on digital platforms. While we don’t necessarily need to know scientific names to submit our observations, we do need to provide clear and accurate photographs to support identification and review.

1. **Framing:** Unobstructed images are important, especially in case of look-alike species.

2. **Background:** A plain, contrasting background makes the subject clearly visible. Also, backgrounds provide useful information about season and habitat.

3. **Identification:** Know the criteria or features of identification for the taxa you are photographing and ensure you capture these e.g. for birds – shape of beak, feet, crest, colour, markings, and such.

4. **When to Use Video:** If the subject is moving too quickly, try taking a video, instead of a photograph. Videos are also useful to capture behaviour, communication or interactions.
PHOTOGRAPHING PLANTS

Capture multiple features separately - (1) the whole plant (2) leaves (singly & in a bunch) (3) bark (4) flowers (5) fruits (6) spines & other unique features, if any.

PHOTOGRAPHING INVERTEBRATES

Capture different angles of the same individual, this ensures important information such as species and gender are recorded. Always include a standard object (like a coin or pen) in a photograph for comparison of scale.
PHOTOGRAPHING MAMMALS

Even if you cannot spot the animal, capture images of its **signs & tracks** like pugmarks, scat / pellets (poop) and scratch marks. This forms important **evidence of its presence**. Always include a **standard object** (like a coin or pen) in a photograph for **comparison of scale**.

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PHOTOGRAPHING BIRDS

Try to capture an **unobstructed, head-tail image**. For **soaring birds** like raptors, it is best to capture shots when they are **directly above** the photographer.

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PHOTOGRAPHING REPTILES

Maintain a **safe distance** of minimum 8 - 10 ft while photographing reptiles (you can zoom in from a distance). Try to capture the **patterns** clearly, a **head-tail image** is useful.

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PHOTOGRAPHING AMPHIBIANS

These are **agile creatures**, so capturing **videos** may be easier & effective.
Always clean your lens before taking pictures/videos.

A good camera is useful, but a combination of binoculars + smartphone can give you decent images too.

For smaller subjects, combine a macro lens with a smartphone.

Getting the camera to focus on a tiny specimen is tricky - try placing (without disturbing it) a notebook behind it, to obtain a clear image.