ESP on Assignment: Field Guide/Scientific Research

Overarching Theme: Sustainability

1. Research ESP Location (ESP on JIS Net):
   - Use Google Earth and other sources to find your ESP location/s.
   - Add screenshots of your location/s (satellite images and maps).

2. Research what you likely will encounter at your ESP location:
   - Choose **ONE ECOSYSTEM** to focus your field guide on, one that you will likely spend a good deal of time at.
   - Identify the key **abiotic** factors in that ecosystem.
   - Identify and create a “**field guide**” to the **flora** (plants) and **fauna** (animals) of that ecosystem.
   - Identify a keystone species in the ecosystem
   - Include details such as: taxonomy, photos, characteristics, behavior, **habitat**, diet, range, protection status/endangered, etc.

3. Identify **relationships** within your ecosystem:
   - Commensalism
   - Mutualism
   - Parasitism
   - Competition
   - Predator-Prey

4. Produce a **food web** diagram of the ecosystem that includes: **trophic levels, predator, prey, producers, consumers, and decomposers**.

5. Biological Sketch (with labels and to scale)
6. Keep a bibliography of resources.
7. Checklist/Self Assessment
Complete this table before starting your research:

<table>
<thead>
<tr>
<th><strong>Your Name</strong></th>
<th>Emma Wong</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name of Your ESP Trip</strong></td>
<td>Endangered Species</td>
</tr>
<tr>
<td><strong>Ecosystems you likely will encounter on your trip</strong></td>
<td>Tropical rainforest ecosystems as well as micro marine ecosystems.</td>
</tr>
<tr>
<td><strong>Ecosystem Focus for ESP on Assignment Project</strong></td>
<td>Tropical rainforest.</td>
</tr>
</tbody>
</table>
Maps

Satellite Images
### Key Abiotic Factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun</td>
<td>The sun is a key abiotic factor as the power source for all life in the ecosystem.</td>
</tr>
<tr>
<td>Water</td>
<td>Water is essential for all life as it is part of every energy creating process.</td>
</tr>
<tr>
<td>Soil</td>
<td>The soil or quality of soil determines the quality of trees and plants it produces which feeds the ecosystem.</td>
</tr>
<tr>
<td>Climate</td>
<td>The tropical rainforest needs a certain climate and temperature to function properly.</td>
</tr>
</tbody>
</table>

### Examples of Symbiosis

<table>
<thead>
<tr>
<th>Symbiosis</th>
<th>First Organism</th>
<th>Second Organism</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mutualism</td>
<td>Orangutan</td>
<td>Various fruit trees such as figs.</td>
<td>The orangutan eats the figs containing many seeds. The seeds are spread throughout the forest with fertilizer as they are defecated from the animal. The orangutan gets food while the trees get free transportation of seeds.</td>
</tr>
<tr>
<td>Commensalism</td>
<td>Frogs</td>
<td>Bromeliad</td>
<td>The frog gets shelter from the onslaught of rain while the plant is unaffected.</td>
</tr>
<tr>
<td>Parasitism</td>
<td>Coconut Rhinoceros Beetle.</td>
<td>Coconut palm or host plants.</td>
<td>The coconut rhinoceros beetle inhabits a host plant, most often palms, and kills the plant from the inside. They eat the leaves and drink the sap until the plant is dead.</td>
</tr>
<tr>
<td>Competition</td>
<td>Male Orangutan.</td>
<td>Male Orangutan.</td>
<td>This is similar with many other social organisms as there will be a power play between dominant males of the same species over their place in the group.</td>
</tr>
<tr>
<td>Predator-Prey</td>
<td>Birds of prey, specifically the Brahminy Kite.</td>
<td>Tarsiers.</td>
<td>The brahminy kite is a bird of prey on the lookout for small mammals as prey. The tarsier is a relatively small primate that lives in the same environment.</td>
</tr>
</tbody>
</table>

### Keystone Species

A keystone species in the rainforest is the **orangutan**. They are vital to the distribution of seeds throughout the forests, helping habitat loss conservation. They eat a variety of producers which helps biodiversity and sustainability of the rainforest. They then defecate the seeds of the fruit they ate and their constant movement ensures that trees will be grown in all parts of the rainforest.
<table>
<thead>
<tr>
<th>Species</th>
<th>Photos</th>
<th>Information</th>
<th>Sources</th>
</tr>
</thead>
</table>
| **Orangutans** | ![Orangutan Photo](image1) | **Habitat:** Tropical rainforests.  
**Range:** Patchy throughout rainforests due to habitat loss and invasive species.  
**Diet:** Tree bark, leaves, flowers, insects and over 300 kinds of fruit.  
**Behavior:** Semi-solitary with social organization.  
**Characteristics:** Largest arboreal mammal (tree dwelling). Thin hair with various colorations. Long arms (1.5 the length of legs). Cheek pads seen on males that amplify sound as well as visual | [http://www.allaboutwildlife.com/endangered-rainforest-species-orangutans](http://www.allaboutwildlife.com/endangered-rainforest-species-orangutans)  
[https://orangutan.org/about/frequently-asked-questions/](https://orangutan.org/about/frequently-asked-questions/) |

**Taxonomy:**  
**Kingdom:** Animalia  
**Species:** P. abelii (Sumatran) or P. pygmaeus (Bornean)  
**Genus:** Pongo  
**Phylum:** Chordata  
**Class:** Mammalia  
**Order:** Primate  
**Keystone species:** Orangutans eat a variety of food and travel across the rainforest with speed. They are essential in the distribution of seeds which
<table>
<thead>
<tr>
<th>Animal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P. abelii (Sumatran):</strong></td>
<td>Weighs 99 pounds. Average height is 3 feet. Listed as <strong>critically endangered</strong>. At risk of habitat loss due to logging and palm oil plantations. Estimated population: 7,000.</td>
</tr>
<tr>
<td><strong>P. pygmaeus (Bornean):</strong></td>
<td>Weighs 110-220 pounds. Average height is 3.9-4.6 feet. Listed as <strong>endangered</strong>. Estimated population: 60,000.</td>
</tr>
</tbody>
</table>

**Impact:** Throat sacs seen in both male and females which also amplifies sound. Powerful jaws. Opposable thumbs that enable them to grab hold of branches and travel quickly. Individual and unique fingerprints which are used to identify orangutans. **Threats and predators:** Deforestation, tigers, leopards, and humans. **Trophic level:** Secondary consumer. |

<table>
<thead>
<tr>
<th>Animal</th>
<th>Description</th>
</tr>
</thead>
</table>

**Habitat:** Tropical rainforests. **Range:** They live in northern Sulawesi as well as on other nearby islands. **Diet:** Figs, fruit, vegetation, insects, mice, crabs, and lizards. **Behavior:** Very social and live in groups of around 10-25 individuals however, some can be as high as 75. **Characteristics:** Medium to large sized monkeys with short tails, black fur and a distinct pink posterior. Males are smaller and heart shaped while the females are larger and a darker color. **Threats and predators:** Deforestation and no major predators. **Trophic level:** Secondary consumer. |

| Photo by Anup Shah from naturalpl.com. |
**Tonkean Macaque**  
*Kingdom: Animalia*  
*Phylum: Chordata*  
*Class: Mammalia*  
*Order: Primates*  
*Family: Cercopithecidae*  
*Genus: Macaca*  
**Macaca Tonkeana**  
Listed as **vulnerable**.  
Female Weight: 9 kg.  
Male Weight: 14.9 kg.

**Habitat:** Tropical rainforests.  
**Range:** Sulawesi and Togian islands.  
**Diet:** Fruit, leaves, flowers and insects.  
**Behavior:** Very social and travel in groups of 10-30 with various genders. Spend most time in the tree canopy.  
**Characteristics:** Mostly black with strong limbs, short tail and a light brown posterior.  
**Threats and predators:** Habitat loss for agriculture which causes confrontation, hunting (by humans) for bushmeat and illegal animal trade.  
**Trophic level:** Secondary consumer.

[Photo by Michel Gunther from Biosphoto.](http://www.arkive.org/tonkean-macaque/macaca-tonkeana/)

**Anoa**  
*Kingdom: Animalia*  
*Species: B. depressicornis*  
*B. quarlesi*  
*Genus: Bubalus*  
*Phylum: Chordata*  
*Class: Mammalia*  
*Order: Cetartiodactyla*  
**Lowland Anoa (B. depressicornis):**  
Average height is 90 cm.  
Weighs 150-300 kg.  
Listed as **endangered**.  
**Mountain Anoa (B. quarlesi):**  
Average height is 70 cm.  
Weighs 150-300 kg.  
Listed as **endangered**.

**Habitat:** Undisturbed rainforests.  
**Range:** Endemic species only found in Sulawesi and Buton.  
**Diet:** Grass, herbs, leaves, fruit, marsh and aquatic plants.  
**Behavior:** They live alone or in pairs, a herd only forming when one is about to give birth.  
**Characteristics:** Deer-like in appearance with small-medium sized horns.  
**Threats and predators:** Habitat loss and humans (by hunting).  
**Trophic level:** Primary consumer.

[http://www.iucnredlist.org/details/312670/0](http://www.iucnredlist.org/details/312670/0)  
[http://www.animalinfo.org/species/artiperi/anoa.htm](http://www.animalinfo.org/species/artiperi/anoa.htm)  
[Photo by Rod Williams from naturalpl.com.](http://www.animalinfo.org/species/artiperi/anoa.htm)
### Sulawesi Babirusa

**Kingdom:** Animalia  
**Phylum:** Chordata  
**Class:** Mammalia  
**Order:** Cetartiodactyla  
**Family:** Suidae  
**Genus:** Babyrousa  
**Babyrousa Celebensis**  
Listed as **vulnerable**.  
Weighs 60-100 kg.

**Habitat:** Along the banks of rivers and lakes in tropical rainforests.  
**Range:** The island of Sulawesi however the exact range is unknown.  
**Diet:** Aquatic plants, leaves, roots and fruits.  
**Behavior:** Very social and can be seen living in groups up to eight.  
**Characteristics:** A mammal similar to a boar/pig with very distinct curved upper canines that protrude from their face. They are also covered in sparse fur.  
**Threats and predators:** Deforestation and humans (by hunting).  
**Trophic level:** Primary consumer.

[Photo by Nick Garbutt from naturalpl.com.](http://www.arkive.org/sulawesi-babirusa/babyrousa-celebensis/)

### Sulawesi Giant Squirrel

**Kingdom:** Animalia  
**Phylum:** Chordata  
**Class:** Mammalia  
**Order:** Rodentia  
**Family:** Sciuridae  
**Genus:** Rubrisciurus  
**Rubrisciurus Rubriventer**  
Listed as **vulnerable**.  
Length: 25-31 cm.  
Weight: 500-860 g.

**Habitat:** Lowland evergreen forests and low montane forests.  
**Range:** The island of Sulawesi and an island north called Sangihe.  
**Diet:** Fruits, large and hard seeds and insects such as beetle larvae and termites.  
**Behavior:** Independent and active in the day.  
**Characteristics:** Dense red/brown fur, black tufts of hair on their ears and a crescent shape above their eyes.  
**Threats and predators:** Habitat loss and human activity.  
**Trophic level:** Secondary consumer.

[Photo by Paul F. G.](http://www.arkive.org/sulawesi-giant-squirrel/rubrisciurus-rubriventer/)
<table>
<thead>
<tr>
<th>Small Sulawesi Cuscus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kingdom:</strong> Animalia</td>
</tr>
<tr>
<td><strong>Phylum:</strong> Chordata</td>
</tr>
<tr>
<td><strong>Class:</strong> Mammalia</td>
</tr>
<tr>
<td><strong>Order:</strong> Diprotodontia</td>
</tr>
<tr>
<td><strong>Family:</strong> Phalangeridae</td>
</tr>
<tr>
<td><strong>Genus:</strong> Strigocuscus</td>
</tr>
<tr>
<td><strong>Strigocuscus Celebensis</strong></td>
</tr>
<tr>
<td><strong>Listed as threatened.</strong></td>
</tr>
<tr>
<td><strong>Length:</strong> 294-380 mm.</td>
</tr>
<tr>
<td><strong>Weight:</strong> 1 kg.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sulawesi tarsier</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kingdom:</strong> Animalia</td>
</tr>
<tr>
<td><strong>Phylum:</strong> Chordata</td>
</tr>
<tr>
<td><strong>Class:</strong> Mammalia</td>
</tr>
<tr>
<td><strong>Order:</strong> Primates</td>
</tr>
<tr>
<td><strong>Family:</strong> Tarsiidae</td>
</tr>
<tr>
<td><strong>Genus:</strong> Tarsius</td>
</tr>
<tr>
<td><strong>Tarsius spectrum</strong></td>
</tr>
<tr>
<td><strong>Listed as vulnerable.</strong></td>
</tr>
<tr>
<td><strong>Head-body length:</strong> 9.5-14 cm.</td>
</tr>
<tr>
<td><strong>Tail length:</strong> 20-26 cm.</td>
</tr>
<tr>
<td><strong>Male weight:</strong> 118 - 130 g.</td>
</tr>
<tr>
<td><strong>Female weight:</strong> 102-114 g.</td>
</tr>
</tbody>
</table>
| **Brown Tube-Nosed Bat**  
| Kingdom: Animalia  
| Phylum: Chordata  
| Class: Mammalia  
| Order: Chiroptera  
| Family: Vespertilionidae  
| Genus: Murina  
| **Murina Suilla**  
| Listed as **least concern**.  
| Length: 32-42 mm.  
| Weight: 2.5-5.5 g.  
| **Habitat:** Dense understory of lowland dipterocarp forest.  
| **Range:** Malaysia, Borneo, Indonesia, Nias Island, Peleng Island and New Guinea.  
| **Diet:** Primarily insects.  
| **Behavior:** During breeding season females gather together to reproduce. Uses echolocation to hunt insects and nocturnal.  
| **Characteristics:** Fuzzy fur, a double membrane between their fingers, ankles and tails, tubed shaped nostrils and sharp teeth.  
| **Threats and predators:** Habitat loss (palm oil) and no major predators.  
| **Trophic level:** Secondary consumer.  
| ![Brown Tube-Nosed Bat](http://www.arkive.org/brown-tube-nosed-bat/murina-suilla/)  
| Photo by Alanna Collen.  

| **Sulawesi Palm Civet**  
| Kingdom: Animalia  
| Phylum: Chordata  
| Class: Mammalia  
| Order: Carnivora  
| Family: Viverridae  
| Genus: Macrogalidia  
| **Macrogalidia musschenbroekii**  
| Listed as **vulnerable**.  
| Weight: 3.6-6 kg.  
| Length: 35 in.  
| **Habitat:** Lowland forest, montane forests, grasslands and farm lands.  
| **Range:** The island of Sulawesi.  
| **Diet:** Rodents, frogs, fruits and grass.  
| **Behavior:** Live alone and only seek others when trying to reproduce.  
| **Characteristics:** Light brown short and soft fur coat. Whiskers and an alternating dark brown and light brown tail.  
| **Threats and predators:** Deforestation, lions, snakes and leopards.  
| **Trophic level:** Secondary consumer.  
| ![Sulawesi Palm Civet](http://www.arkive.org/sulawesi-palm-civet/macrogalidia-musschenbroekii/)  
| Photo by Alain Compost from Biosphoto.  

| **Insects** |
| **Talaud Black Birdwing**
| --- |
| **Kingdom:** Animalia  
**Phylum:** Arthropoda  
**Class:** Insecta  
**Order:** Lepidoptera  
**Family:** Papilionidae  
**Genus:** Troides  
**Troides Dohertyi**  
Listed as **vulnerable.**  
Wingspan: 140-160 mm. |
| **Habitat:** Lowland forests and coasts.  
**Diet:** Leaves, nectar and larvae.  
**Behavior:** They lay their eggs on leaves and plants. They eat larvae of other butterflies that are newly hatched on leaves.  
**Characteristics:** Primarily black with some gold or yellow markings.  
**Threats and Predators:** Habitat loss and human developments.  
**Trophic Level:** Secondary consumer. |
| [Link](http://www.arkive.org/talaud-black-birdwing/troides-dohertyi/)  
[Link](https://en.wikipedia.org/wiki/Troides_dohertyi)  
Photo by the Natural History Museum, London. |

| **Coconut Rhinoceros Beetle**
| --- |
| **Kingdom:** Animalia  
**Phylum:** Arthropoda  
**Class:** Insecta  
**Order:** Coleoptera  
**Family:** Scarabaeidae  
**Genus:** Oryctes  
**Oryctes Rhinoceros**  
Length: 3-6.3 cm. |
| **Habitat:** Natural forests and palm plantations.  
**Range:** All of Asia including India, Philippines, Malaysia, Indonesia and New Guinea.  
**Diet:** Palm sap and palm leaves.  
**Behavior:** They lay their eggs in dead palms, decaying plants and wood.  
**Characteristics:** Shiny black back with a small rhino like horn and hairy legs.  
**Threats and Predators:** Habitat loss, poisoning (by pesticides), rats, pigs, other beetles, birds and ants.  
**Trophic Level:** Primary consumer. |
| [Link](http://entnemdept.ufl.edu/creatures/oern/palms/Oryctes_rhinoceros.htm)  
[Link](http://www.plantheroes.org/coconut-rhinoceros-beetle)  
Photo by Mike Dornberg from the Florida Department of Agriculture and Consumer Services, Division of Plant Industry. |

<table>
<thead>
<tr>
<th><strong>Reptiles</strong></th>
</tr>
</thead>
</table>
| **Batagur**
| --- |
| **Kingdom:** Animalia  
**Phylum:** Chordata  
**Class:** Reptilia  
**Order:** Testudines  
**Family:** Bataguridae  
**Genus:** Batagur  
**Batagur Baska**  
Listed as **critically endangered.** |
| **Habitat:** Near estuaries and large lakes.  
**Range:** Central and South East Asia including India, Thailand, Malaysia and Indonesia.  
**Diet:** Water plants, algae, worms, snails and insect larvae.  
**Behavior:** Often migrate in large numbers to breeding grounds. |
| [Link](http://www.arkive.org/sail-fin-lizard/hydrosaurus-pustulatus/)  
Photo by Allan Michaud. |
| **Length:** Up to 60 cm. | **Characteristics:** Large with a dark shell and an upturned nose.  
**Threats and Predators:** Habitat loss and overharvesting due to high turtle meat demand.  
**Trophic Level:** Secondary consumer. | **False Gharial**  
**Kingdom:** Animalia  
**Phylum:** Chordata  
**Class:** Reptilia  
**Order:** Crocodylia  
**Family:** Crocodylidae  
**Genus:** Tomistoma  
**Tomistoma Schlegelii**  
Listed as **endangered.**  
**Male length:** 5 m.  
![False Gharial](https://www.arkive.org/false-gharial/tomistoma-schlegelii/)  
Photo by Zig Leszczynski from gettyimages.com. | **Habitat:** Freshwater lakes, swamps and rivers with slow moving water.  
**Range:** Malay peninsula, Sumatra, Borneo and some in Vietnam and Sulawesi.  
**Diet:** Fish, insects, crustaceans and small mammals.  
**Behavior:** Solitary and only commune during mating seasons.  
**Threats and Predators:** Habitat loss, construction of dams, poison and loss of prey (due to human activity).  
**Characteristics:** Slender and thin snout with a dark brown body and white underbelly.  
**Trophic Level:** Tertiary consumer.  
http://www.arkive.org/false-gharial/tomistoma-schlegelii/  
Photo by Zig Leszczynski from gettyimages.com. |
| --- | --- | --- | --- |
| **Forsten's Tortoise**  
**Kingdom:** Animalia  
**Phylum:** Chordata  
**Class:** Reptilia  
**Order:** Testudines  
**Family:** Testudinidae  
**Genus:** Indotestudo  
**Indotestudo Forstenii**  
Listed as **endangered.**  
**Length:** 25 cm.  
**Weight:** 2.5 kg.  
![Forsten's Tortoise](https://www.arkive.org/forstens-tortoise/indotestudo-forstenii/)  
Photo by Shantanu Kundu and Kulendra Ch Das from Assam University and Mizoram University. | **Habitat:** Damp and wet rainforests.  
**Range:** Sulawesi and Halmahera in Indonesia.  
**Diet:** Fruits, leaves, worms and slugs.  
**Behavior:** Active and foraging at dawn and dusk.  
**Characteristics:** Slightly yellow medium sized tortoise with brown and black spots on their shells.  
**Threats and Predators:** Habitat loss, hunted (by humans) for bushmeat and illegal animal trade.  
**Trophic Level:** Secondary consumer.  
http://www.arkive.org/forstens-tortoise/indotestudo-forstenii/  
Photo by Shantanu Kundu and Kulendra Ch Das from Assam University and Mizoram University. |
<table>
<thead>
<tr>
<th>Birds</th>
<th>White-breasted Woodswallow</th>
<th>Red-and-blue Lory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom: Animalia</td>
<td>Phylum: Chordata</td>
<td>Kingdom: Animalia</td>
</tr>
<tr>
<td>Class: Aves</td>
<td>Order: Passeriformes</td>
<td>Phylum: Chordata</td>
</tr>
<tr>
<td>Family: Artamidae</td>
<td>Genus: Artamus</td>
<td>Class: Aves</td>
</tr>
<tr>
<td>Genus: Artamus</td>
<td><strong>Artamus Leucotrichus</strong> Listed as least concern.</td>
<td>Order: Psittaciformes</td>
</tr>
<tr>
<td>Length: 17.5-19 cm.</td>
<td><strong>Listed as</strong> endangered.</td>
<td>Family: Psittacidae</td>
</tr>
<tr>
<td>Weight: 36-49.6 g.</td>
<td><strong>Length:</strong> 31 cm.</td>
<td>Genus: Eos</td>
</tr>
<tr>
<td><strong>Habitat:</strong> Open areas, woodlands, cultivated areas, mangroves and the coast.</td>
<td><strong>Habitat:</strong> Forests and coconut, nutmeg and clove plantations.</td>
<td><strong>Diet:</strong> Fruit, pollen and young crickets.</td>
</tr>
<tr>
<td><strong>Range:</strong> Malay peninsula, Philippines, Indonesia, Australia and New Guinea.</td>
<td><strong>Range:</strong> Talaud Islands and north Sulawesi.</td>
<td><strong>Behavior:</strong> Living in monogamous couples. Usually nesting in tall trees.</td>
</tr>
<tr>
<td><strong>Diet:</strong> Insects and nectar.</td>
<td><strong>Diet:</strong> Fruit, pollen and young crickets.</td>
<td><strong>Characteristics:</strong> Primarily red with a dark purple band across its chest, head and back.</td>
</tr>
<tr>
<td><strong>Behavior:</strong> Very social and living in groups of 50-60 birds. They hunt alone or in small groups. Usually perching high in the trees to locate prey.</td>
<td><strong>Behavior:</strong> Living in monogamous couples. Usually nesting in tall trees.</td>
<td><strong>Threats and Predators:</strong> Habitat loss (logging and agricultural) and illegal animal trade.</td>
</tr>
<tr>
<td><strong>Characteristics:</strong> Small bird with large black head, white body and dark blue wings.</td>
<td><strong>Characteristics:</strong> Primarily red with a dark purple band across its chest, head and back.</td>
<td><strong>Trophic Level:</strong> Secondary consumer.</td>
</tr>
<tr>
<td><strong>Threats and Predators:</strong> Birds of prey but no threats globally.</td>
<td><strong>Threats and Predators:</strong> Habitat loss (logging and agricultural) and illegal animal trade.</td>
<td><strong>Trophic Level:</strong> Secondary consumer.</td>
</tr>
</tbody>
</table>

http://www.arkive.org/white-breasted-woodswallow/artamus-leucotrichus/
http://datazone.birdlife.org/species/factsheet/22706305

http://www.arkive.org/red-and-blue-lory/eos-histrio/
http://datazone.birdlife.org/species/factsheet/22706305

Photo by Don Haddin from ardea.com.
<table>
<thead>
<tr>
<th>Grey-headed Fish Eagle</th>
<th>Maleo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kingdom:</strong> Animalia</td>
<td><strong>Kingdom:</strong> Animalia</td>
</tr>
<tr>
<td><strong>Phylum:</strong> Chordata</td>
<td><strong>Phylum:</strong> Chordata</td>
</tr>
<tr>
<td><strong>Class:</strong> Aves</td>
<td><strong>Class:</strong> Aves</td>
</tr>
<tr>
<td><strong>Order:</strong> Falconiformes</td>
<td><strong>Order:</strong> Galliformes</td>
</tr>
<tr>
<td><strong>Family:</strong> Accipitridae</td>
<td><strong>Family:</strong> Megapodiidae</td>
</tr>
<tr>
<td><strong>Genus:</strong> Ichthyophaga</td>
<td><strong>Genus:</strong> Macrocephalon</td>
</tr>
<tr>
<td><strong>Ichthyophaga Ichthyaetus</strong></td>
<td><strong>Macrocephalon Maleo</strong></td>
</tr>
<tr>
<td><strong>Listed as near threatened.</strong></td>
<td><strong>Listed as endangered.</strong></td>
</tr>
<tr>
<td><strong>Length:</strong> 61-75 cm.</td>
<td><strong>Length:</strong> 55-60 cm.</td>
</tr>
<tr>
<td><strong>Male Wingspan:</strong> 42-45.5 cm.</td>
<td><strong>Range:</strong> Sulawesi and Buton</td>
</tr>
<tr>
<td><strong>Female Wingspan:</strong> 44.5-51.8 cm.</td>
<td><strong>Diet:</strong> Fruits, seeds, mollusks, ants, termites and beetles.</td>
</tr>
<tr>
<td><strong>Male weight:</strong> 1.6 kg.</td>
<td><strong>Behavior:</strong> Solitary and nocturnal.</td>
</tr>
<tr>
<td><strong>Female weight:</strong> 2.3-3.7 kg.</td>
<td><strong>Characteristics:</strong> Large black and white bird with red rimmed eyes and pale feet.</td>
</tr>
</tbody>
</table>

**Habitat:** Lowland forests and slow moving bodies of water.  
**Range:** India, Nepal, Sri Lanka, Philippines and Sulawesi.  
**Diet:** Primarily fish and some insects.  
**Behavior:** Perches on branches near the body of water to watch for prey.  
**Characteristics:** Brown and grey with a white underbelly.  
**Threats and Predators:** Habitat loss, overfishing, pollution and construction of dams.  
**Trophic Level:** Secondary consumers.  

Photo by Stephen Dalton from Photoshot.


**Maleo**

**Kingdom:** Animalia  
**Phylum:** Chordata  
**Class:** Aves  
**Order:** Galliformes  
**Family:** Megapodiidae  
**Genus:** Macrocephalon  
**Macrocephalon Maleo**  
**Listed as endangered.**  
**Length:** 55-60 cm.  
**Range:** Sulawesi and Buton  
**Diet:** Fruits, seeds, mollusks, ants, termites and beetles.  
**Behavior:** Solitary and nocturnal.  
**Characteristics:** Large black and white bird with red rimmed eyes and pale feet.  
**Threats and Predators:** Overharvesting of their eggs, disturbance of nesting grounds and habitat loss due to logging, agriculture and human development.  
**Trophic Level:** Secondary consumer.  

Photo by Alan Greensmith from ardea.com.


| Banggai Crow | Habitat: Montane forests.  
Range: Banggai archipelago and central Sulawesi.  
Diet: No available information about the banggai crow feeding habits.  
Behavior: No available information about the banggai crow's behavior.  
Characteristics: Medium black bird with small legs and short tail.  
Threats and Predators: Habitat loss and overharvesting.  
Photo by Filip Verbelen. |
|--------------|---------------------------------------------------------------------------------|------------------------------------------------------------------|
| **Corvus Unicolor** Listed as critically endangered.  
Length: 39 cm. | **Blue-Faced Rail**  
Habitat: Wet lowland forests or in the understory of palms, rattan and bamboo.  
Range: Sulawesi and Peleng.  
Diet: Snails and beetles.  
Behavior: Primarily ground-dwelling and reclusive.  
Characteristics: Short wings, long leg and a bright blue spot under their eyes for which they are named after.  
Threats and Predators: Habitat loss (agriculture and human activity) and accidentally getting snared in hunting traps.  
Photo by Antri Kakahue from the Macaca Nigra Project. |
| **Gymnocrex Rosenbergii** Listed as vulnerable.  
Length: 30 cm. | **Talaud Kingfisher**  
Habitat: Secondary forests and tropical lowland forests.  
Range: Talaud islands north of Sulawesi.  
Diet: Small grasshoppers and river snails.  
https://en.wikipedia.org/wiki/Talaud_kingfisher  
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Kingdom: Animalia</td>
<td><strong>Todiramphus Chloris</strong> Listed as least concern.</td>
<td>Habitat: Coastal areas, mangroves, mudflats and beaches.</td>
<td>Photo by Joe Kelly.</td>
</tr>
<tr>
<td>Class: Aves</td>
<td>Diet: Small fish, crustaceans, lizards and young birds.</td>
<td>Behavior: They lay in wait and dive into the water for prey. They also beat their prey once they have carried it to their nest.</td>
<td>Photo by Kurt W. Baumgartner.</td>
</tr>
<tr>
<td>Genus: Todiramphus</td>
<td></td>
<td>Diet: Fish, insects, small reptiles and crustaceans.</td>
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</tr>
<tr>
<td>Blue-banded Kingfisher</td>
<td>Behavior: Very restless and never stays in one place for more than a few minutes.</td>
<td>Characteristics: An orange body with blue and black wings and head. They</td>
<td></td>
</tr>
<tr>
<td>Kingdom: Animalia</td>
<td>Habitat: Nearby rivers through evergreen forests.</td>
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<tr>
<td>Phylum: Chordata</td>
<td>Range: Myanmar, Thailand, Indonesia and Malaysia.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class: Aves</td>
<td>Diet: Fish, insects, small reptiles and crustaceans.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order: Coraciliformes</td>
<td>Behavior: Very restless and never stays in one place for more than a few minutes.</td>
<td></td>
<td></td>
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<tr>
<td>Family: Alcedinidae</td>
<td>Characteristics: An orange body with blue and black wings and head. They</td>
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<tr>
<td>Genus: Alcedo</td>
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<tr>
<td>Alcedo Euryzona</td>
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<td></td>
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<tr>
<td>Listed as vulnerable.</td>
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<tr>
<td>Length: 16.5-17.8 cm. Tail length: 4.3-4.8 cm.</td>
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<tr>
<td><strong>Sulawesi Hornbill</strong></td>
<td><strong>Habitat:</strong> Tropical lowland, swamps and primary forests. <strong>Range:</strong> Sulawesi and nearby islands. <strong>Diet:</strong> Fruits, figs and insects. <strong>Behavior:</strong> Usually in groups of up to 20 individuals and are active in the day. <strong>Characteristics:</strong> Primarily black bird with a yellow face, throat and beak. <strong>Threats and Predators:</strong> Habitat loss, illegal animal trade and overharvesting. <strong>Trophic Level:</strong> Secondary consumer.</td>
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</tr>
<tr>
<td><strong>Penelopides exarhatus</strong></td>
<td><strong>Kingdom:</strong> Animalia <strong>Phylum:</strong> Chordata <strong>Class:</strong> Aves <strong>Order:</strong> Coraciiformes <strong>Family:</strong> Bucerotidae <strong>Genus:</strong> Penelopides <strong>Length:</strong> 45 cm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Listed as vulnerable.</strong></td>
<td><strong>Photo by Mark Jones from Animals Animals.</strong></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Sulawesi Eared-Nightjar</strong></th>
<th><strong>Habitat:</strong> Lowland forest, hill forest and montane forest. <strong>Range:</strong> Endemic to Sulawesi. <strong>Diet:</strong> (Flying) insects. <strong>Behavior:</strong> Nocturnal, foraging for food at night while resting on the ground or in bushes during the day. <strong>Characteristics:</strong> Brown with speckles of tawney and lighter browns, almost completely camouflaged into the forest floor. Round wing tips and a square shaped tail feathers. <strong>Threats and predators:</strong> Habitat loss for human settlements, agriculture and logging. <strong>Trophic level:</strong> Secondary consumer.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eurostopodus Diabolicus</strong></td>
<td><strong>Kingdom:</strong> Animalia <strong>Phylum:</strong> Chordata <strong>Class:</strong> Aves <strong>Order:</strong> Caprimulgiformes <strong>Family:</strong> Caprimulgidae <strong>Genus:</strong> Eurostopodus <strong>Length:</strong> 26 cm.</td>
</tr>
<tr>
<td><strong>Listed as vulnerable.</strong></td>
<td><strong>Photo by Jon Hornbuckle.</strong></td>
</tr>
</tbody>
</table>

**Threats and Predators:** Habitat loss due to logging. **Trophic Level:** Tertiary consumer.
### Chattering lory
**Kingdom**: Animalia  
**Phylum**: Chordata  
**Class**: Aves  
**Order**: Psittaciformes  
**Family**: Psittacidae  
**Genus**: Lorius  
**Lorius garrulus**  
Listed as **vulnerable**.  
**Height**: 30 cm.

**Habitat**: Primary lowland and montane forests.  
**Range**: North Maluku as well as Sangihe, north of Sulawesi.  
**Diet**: Flowers, maize, fruits and nectar.  
**Behavior**: They create nests very high in the trees for protection.  
**Characteristics**: Bright red with green thighs and some traces of yellow and a dark orange beak.  
**Threats and predators**: Habitat loss and illegal animal trade by humans.  
**Trophic level**: Primary consumer.

[Photo by William Hull.](http://www.arkive.org/chattering-lory/lorius-garrulus/)

### Spotted Harrier
**Kingdom**: Animalia  
**Phylum**: Chordata  
**Class**: Aves  
**Order**: Falconiformes  
**Family**: Accipitridae  
**Genus**: Circus  
**Circus assimilis**  
Listed as **least concern**.  
**Length**: 50-61 cm.  
**Wingspan**: 121-147 cm.  
**Female weight**: 530-745 g.  
**Male weight**: 412-537 g.

**Habitat**: Woodland, grassland, scrub and human occupied areas.  
**Range**: Mainland Australia and Sulawesi.  
**Diet**: Quail, pipits, mice, rats, rabbits and lizards.  
**Behavior**: Flying low to the ground and hunting in the day. Very regular migrations.  
**Characteristics**: Sleek and lean raptor with a white spotted breast. They have yellow eyes and and legs.  
**Threats and predators**: Poisoning and reduced prey populations.  
**Trophic level**: Secondary consumer.

[Photo by Hans and Judy Baste from ardea.com.](http://www.arkive.org/spotted-harrier/circus-assimilis/)

[http://eol.org/pages/1177812/overview](http://eol.org/pages/1177812/overview)
<table>
<thead>
<tr>
<th><strong>Brahminy Kite</strong></th>
<th><strong>Habitat:</strong> Tropical coasts with include mangroves, beaches, coral reefs, cliffs, etc. Some can also be found near swamps, lakes, rivers and rice patties. <strong>Range:</strong> Southern China, Australia and South East Asia including Malaysia, Philippines and Sulawesi. <strong>Diet:</strong> Crabs, frogs, small reptiles, small mammals, fish and smaller birds. <strong>Behavior:</strong> Flying low to the ground and sea. Seen in small family groups or alone. <strong>Characteristics:</strong> Head and upper body a white color, the tail feathers and most of the wings are brown with only the tips a black color. Sleek and lean with a yellow beak. <strong>Threats and predators:</strong> Habitat loss, poisoning by pesticides and hunted (by humans). <strong>Trophic level:</strong> Tertiary consumer.</th>
<th><a href="http://www.arkive.org/brahminy-kite/haliastur-indus/">http://www.arkive.org/brahminy-kite/haliastur-indus/</a></th>
<th><a href="https://www.beautyofbirds.com/brahminykites.html">https://www.beautyofbirds.com/brahminykites.html</a></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eastern Dammar</strong></td>
<td><strong>Habitat:</strong> Many different types of forests. <strong>Range:</strong> South East Asia but mostly in the Indonesian islands. <strong>Characteristics:</strong> Long dark green tough leaves. The trunk of the plant is red and grey, occasionally seeping resin. <strong>Threats and predators:</strong> Overharvesting (for resin and also for wood). <strong>Trophic level:</strong> Producer.</td>
<td><a href="http://www.arkive.org/eastern-dammar/agathis-dammara/">http://www.arkive.org/eastern-dammar/agathis-dammara/</a></td>
<td>Photo by Antonie van den bos from botanypictures.</td>
</tr>
<tr>
<td><strong>Agathis Dammara</strong></td>
<td>Listed as vulnerable. Height: 45-70 m. Trunk diameter: 1.8-6 m.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Flora**

<table>
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<tr>
<th><strong>Eastern Dammar</strong></th>
<th><strong>Habitat:</strong> Many different types of forests. <strong>Range:</strong> South East Asia but mostly in the Indonesian islands. <strong>Characteristics:</strong> Long dark green tough leaves. The trunk of the plant is red and grey, occasionally seeping resin. <strong>Threats and predators:</strong> Overharvesting (for resin and also for wood). <strong>Trophic level:</strong> Producer.</th>
<th><a href="http://www.arkive.org/eastern-dammar/agathis-dammara/">http://www.arkive.org/eastern-dammar/agathis-dammara/</a></th>
<th>Photo by Antonie van den bos from botanypictures.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning goal</td>
<td>Meeting the goal at a high level.</td>
<td>Meeting the goal at a satisfactory level.</td>
<td>Not meeting the goal.</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------------------------</td>
<td>------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>I can complete open-ended tasks.</td>
<td>I have completed all 8 parts</td>
<td>I have completed 7 parts.</td>
<td>I have completed 4 or fewer of the parts.</td>
</tr>
<tr>
<td>I can collect and combine information from a number of sources.</td>
<td>I listed 10 or more sources (17)</td>
<td>I listed 6 to 9 sources</td>
<td>I listed 5 or fewer sources</td>
</tr>
<tr>
<td>I can distinguish between relevant and irrelevant information.</td>
<td>I included only information that related to my particular ecosystem. I deliberately did not include some of the info I found because it didn’t relate.</td>
<td>I included only information that related to my particular ecosystem. I did not find any information that did not relate.</td>
<td>I know some of the info is unrelated and doesn’t need to be there.</td>
</tr>
<tr>
<td>I can use a range of sources, including databases, to access information.</td>
<td>I used the Library website to access databases like WebPath express, BrainPop, Gales Science and TWIG. My bibliography includes several different kinds of sources.</td>
<td>I used a couple of sources from the Library site, but not all of them. I probably Googled more than I should have.</td>
<td>I only Googled stuff. Most of my information came from sites like YouTube or Wikipedia.</td>
</tr>
<tr>
<td>I can summarise information from written secondary sources.</td>
<td>I paraphrased all of the information. I did not copy and paste any of it. If I copied images, then I gave credit for all of them.</td>
<td>I paraphrased most of the information. I copied and pasted a little of it. If I copied images, then I gave credit for some of them.</td>
<td>I copied and pasted most of the information. If I copied images, I gave no credit for them.</td>
</tr>
</tbody>
</table>
Great Research Resources:

Middle School Library Catalogs: Gales, ImageQuest, NatGeoKids, etc.

iNaturalist- Indonesia
Endemics - Indonesia
Animals - Indonesia
Ecology Asia
Reefguide.org
Marine Species
Indonesia Species List
Online Field Guide
Arkive
Project Noah
Smithsonian Ocean Portal
Encyclopedia of Earth
Encyclopedia of Life

Bibliography:

Maps:
https://www.welt-atlas.de/map_of_sulawesi_6-616

Google maps.