Migratory Flyways

ICAO APAC Workshop

05 – 06 May 2025

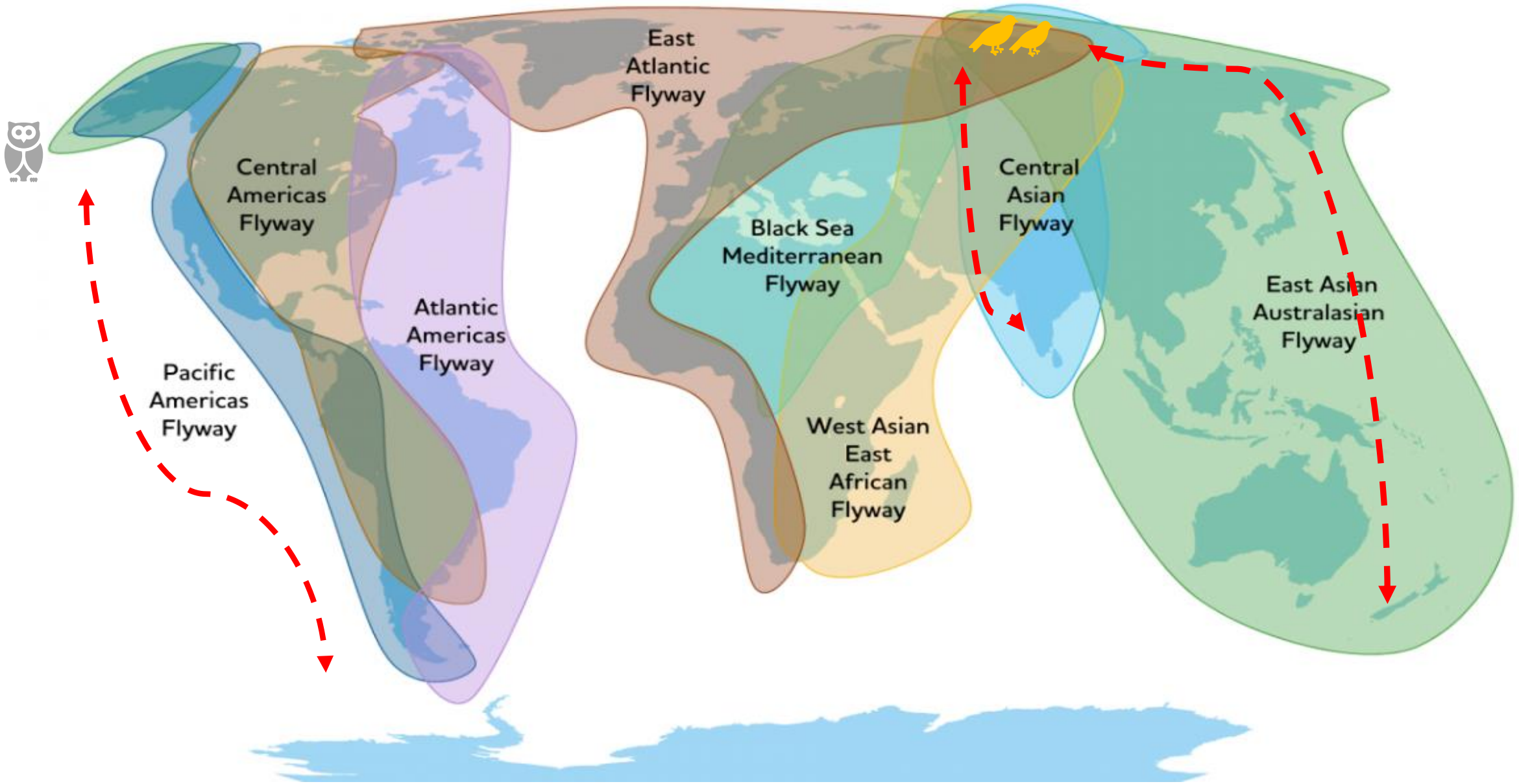
Migratory Flyways

What are Avian Migratory Flyways ? Why are they important to us?

A flyway is defined as the geographical area covered by a migratory bird over the course of its annual cycle, while travelling from its breeding grounds to the non-breeding areas and back.

There are **eight major flyways** worldwide:

1. **Pacific Flyway** (North and South America)
2. **Central Flyway** (North and South America)
3. **Mississippi Flyway** (North and South America)
4. **Atlantic Flyway** (North and South America)
5. **East Atlantic Flyway** (Europe, Africa)
6. **Black Sea-Mediterranean Flyway** (Europe, Middle East, Africa)
7. **West Asia-East Africa Flyway** (Asia, Africa)
8. **Central Asian Flyway** (Asia)
9. **East Asia-Australasia Flyway** (Asia, Australia, Pacific)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East Asian
Australasian
Flyway

Why Do Birds Migrate Every Year?

Birds migrate primarily for **survival—**to access better food resources, breeding grounds, and favourable climates. Key reasons include:

1. **Food Availability –** Many birds leave colder regions where food becomes scarce (e.g., insects, seeds) and migrate to warmer areas with abundant resources.
2. **Breeding Opportunities and Success –** Birds migrate to regions with optimal nesting conditions, lower predation risks, and suitable temperatures for raising chicks.
3. **Climate Adaptation –** Seasonal changes in temperature force birds to move to areas where they can survive harsh winters or extreme summer heat.
4. **Daylight Hours –** Longer daylight in summer provides more foraging time, supporting better chick growth and survival.
5. **Genetic Programming:** Migration behaviour is inherited; birds have innate cues (daylength, temperature) that trigger departures and guide navigation along established flyways.

Migration is an **energy-intensive journey**, and birds rely on stopover sites along flyways to rest and refuel.

How do Birds Navigate ?

- Birds use a combination of remarkable senses, innate abilities, and environmental cues to navigate.
  - Magnetoreception
  - Celestial Cues
  - Landmarks
  - Olfaction (Sense of Smell)
  - Polarized Light
- Examples:
  - **Arctic Terns** migrate over vast distances (pole-to-pole) using a mix of magnetic fields, celestial navigation, and visual cues.
  - **Homing Pigeons** are famous for their ability to return to their lofts from distant locations using magnetic fields and olfactory cues.

Murmuration

What is Murmuration?

- **Murmuration** is a mesmerizing aerial display where thousands of birds, usually starlings, fly together in a highly coordinated, fluid-like formation.
- These dynamic patterns in the sky appear almost like a **living cloud**, shifting and changing shape in perfect synchronization.
- There is no fixed leader, position or direction.
- The space between any two birds is fixed and their motions sunchronised.
- Position of the bird in the flock changes continuously.

Why Do Birds Form Murmuration's?

Birds engage in murmuration's for several reasons:

1. **Protection from Predators** – The swirling motion and rapid shape changes confuse predators like hawks and falcons, making it harder for them to target a single bird. The rapid, shifting movement creates an illusion of a large, unpredictable mass, discouraging attacks.
2. **Social Bonding** – Murmuration's help birds communicate and maintain strong flock cohesion, especially during roosting.
3. **Navigation and Roosting** – Starlings often use murmuration's to guide each other toward communal sleeping sites.
4. **Environmental Awareness** – Scientists believe that murmuration's help birds share information about food sources and changing weather conditions.

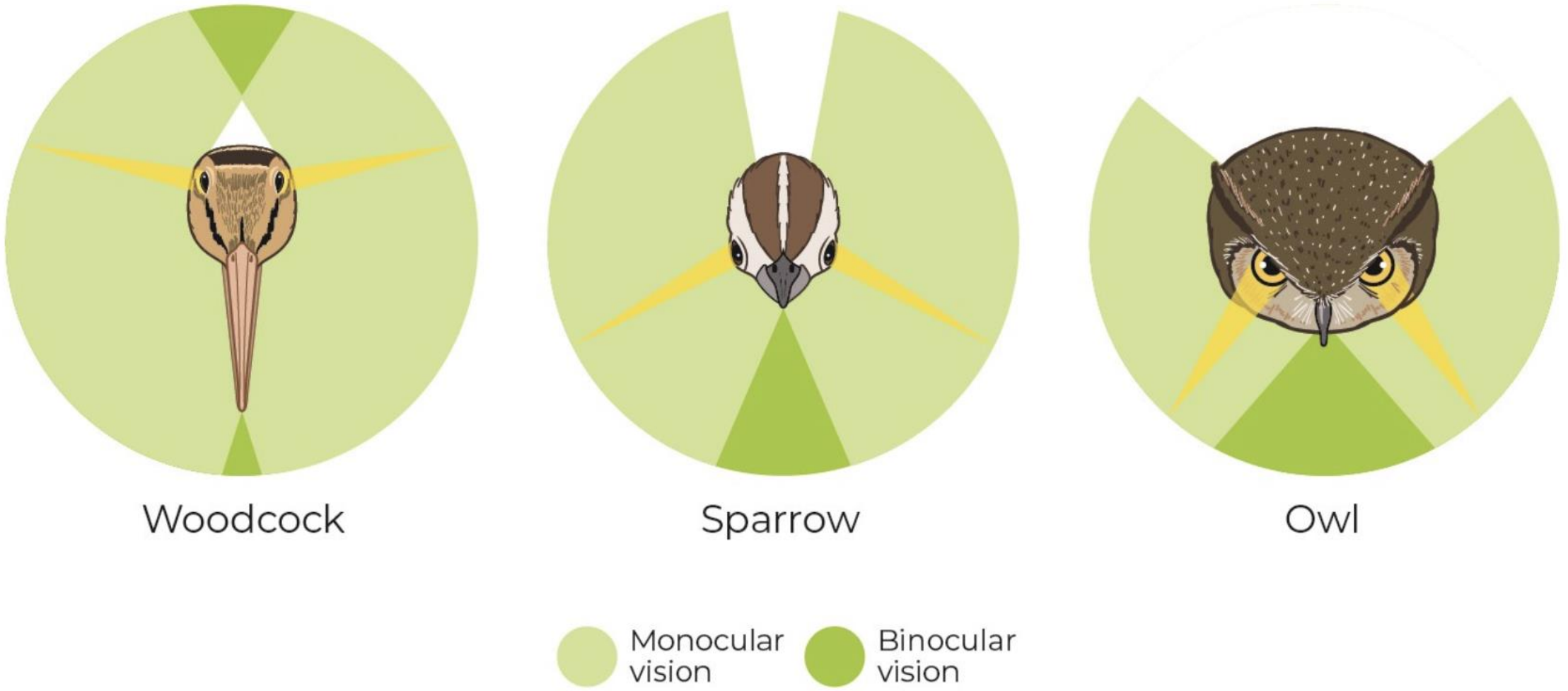
- **Where and When Can You See Murmuration's?**
  - **Best Time**: Late autumn and winter, just before sunset.
  - **Best Locations**: Open fields, wetlands, and near roosting sites such as reed beds or urban structures.
- Murmuration's are one of nature’s most fascinating spectacles, showcasing the beauty of collective movement in the animal kingdom.
- **How Do Birds Stay in Sync?**
  - Each bird in a murmuration follows a simple rule: it reacts to the movements of **its seven closest neighbours**, creating a chain reaction that ripples through the entire flock. This rapid response, combined with natural instincts, results in breathtaking, coordinated motion without a single leader.

Flocking Rules Adopted by Birds

- Basic models of flocking behaviour are controlled by three simple rules:
  - **Cohesion Rule:** This rule encourages birds to stay within a certain range of each other, promoting flock stability and allowing them to benefit from the collective advantages of being in a group.
  - **Separation Rule:** Birds actively steer away from neighbours that are too close, essentially creating a personal space bubble around themselves. This prevents them from bumping into each other or getting too close, which could lead to collisions or disruption of flight.
  - **Alignment Rule:** Birds also align their direction of flight with their neighbours, contributing to the overall coordinated movement of the flock.

Bird Biology - Eyesight

1. **Exceptional Visual Acuity**
   - Birds have the sharpest vision in the animal kingdom. Eagles, for instance, can see prey from over 3 kilometres away.
   - Raptors like hawks and falcons have 5–8 times better visual resolution than humans.
2. **Wide Field of View**
   - Many birds have eyes on the sides of their heads, providing a wide field of view (up to 360° in pigeons).
   - Predatory birds like owls have forward-facing eyes, giving them excellent depth perception.
3. **Colour Vision Beyond Human Capabilities**
   - Birds can see ultraviolet (UV) light, unlike humans. This helps them spot prey, mates, and even trails of urine left by small mammals.
   - Plumage that looks dull to humans may appear vibrant in UV light, aiding in mate selection.
4. **Double Fovea**
   - Many birds, (eg. swallows, have two foveae (the part of the retina responsible for sharp vision), allowing them to focus on multiple points simultaneously.
   - This helps them track moving prey while flying at high speeds.
5. **Rapid Processing Speed**
   - Birds perceive more frames per second than humans. Humans process about 24 frames per sec, pigeons can process up to 75 frames per sec.
   - This allows birds to react quickly to fast-moving objects, crucial for flying and hunting.
6. **Adaptations for Different Lifestyles**
   - Nocturnal birds like owls have large eyes and more rod cells , allowing enhanced vision in low light.
   - Diurnal birds have more cone cells, enhancing colour vision and sharpness.


Woodcock
Sparrow
Owl
Monocular vision
Binocular vision

Thank You