Getting around -
animal movement

Summary

This factfile describes how and why animals move from place to place with emphasis on movement in water and through the air.

Why move?

Animals are capable of locomotion - the ability to move from place to place. This enables them to defend where they live (their territories or home ranges), find food, avoid enemies, meet mates, seek sun or shade, and be in the right place at the right time.

Some animals spend their entire life within a single burrow. Others, like migratory birds, travel thousands of kilometres. Some animals are restricted to one type of locomotion. Others use several types (eg duck waddles, swims and flies).

Manatee

Moving in water

Passive floating

Many small animals, like water fleas and plankton, are carried by water movement.

Water Flea

Swimming

Adaptations include fins, flippers, and paddles; rudder-like tails; webbed feet; oily feathers, and waterproof fur; streamlined shape, and swim bladders in fish to aid buoyancy.

Examples include:

Wriggling and undulating small pond minibeasts like Bloodworms, Mayfly nymphs; flatworms, leeches, hydra (when not looping the loop), eels etc.

Mayfly nymph

Hydrofoil swimming - water boatman paddles; seal flippers and wildfowl webbed feet give extra surface area to push against water with the backward stroke. Wildfowl webs close on the forward stroke to lessen water resistance. They also act as brakes and water skis when the birds land on water, and provide a large surface area when walking on muddy or boggy ground. Some newly hatched ducklings drop from considerable heights shortly after hatching (e.g. Mandarin ducklings from tree nest holes and Barnacle goslings from Greenland cliffs. Webbed feet also slow this descent by acting as parachutes.

Lesser Water Boatman

Jet propulsion - some dragonfly larvae take in water to the rectum during breathing. If the abdominal muscles are suddenly contracted, water is expelled, propelling the larva along.

Black Darter nymph

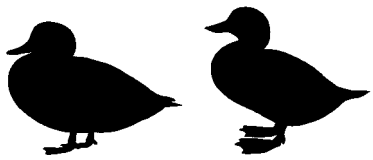
Gyrating - Whirligig Beetles gyrate on water surfaces.

Whirligig Beetles

Buoyancy - hollow bones, large air sacs, and air trapping insulatory feathers all help wildfowl remain buoyant in water. Air-filled swim bladders help many fish do the same.

Strutted bone

Streamlined shapes cut down the effect of drag. Diving ducks are rounder than dabblers with short, stiff feathers to steer underwater. The powerful legs and webbed feet are placed to the rear of the body and assist with propulsion and steering control. However, this does make walking on ground rather ungainly. Some species (like penguins) use their wings as paddles to 'fly' through water.



Silhouette of Diver and Dabler

Surface walking

Surface film on water is like skin on rice pudding. Animals like Pond Skaters have dense 'hairy' pads on their undersides and on some legs. These trap air and allow the insect to move over the water surface like a hovercraft.

Pond Skater

Fish out of water

Some fish spend time out of water and have to solve problems of breathing, temperature control, vision, drying out, and locomotion. Electric Eels use gills for aerial breathing and Mudskippers use their skin. Eels move by undulating over land (just as they swim) whereas Climbing Perch and Walking Catfish use their fins.

Mud Skipper

Hopping/leaping/springing

Frogs make short hops when hunting or migrating, and long hops to escape danger. Toads crawl although Natterjack Toads can run fast over warm sand.

Jumping frogs & Natterjack Toad

Springtails keep their tails in hook-like structures under the body. When released, the insects spring into the air.

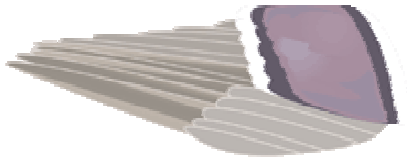
Spring Tail

Flight

Flight has evolved independently at least four times in the Animal Kingdom (birds, bats, insects, pterosaurs). As with moving through water, a streamlined body shape helps cut down the effects of drag.

Drag results from air pressure holding back forward motion, and can also occur if turbulence builds up behind a moving object.

Wings act as aerofoils to provide surfaces for flight and lift. In birds, wing and tail flight feathers provide surfaces for lift controlled by powerful flight muscles attached to the breastbone (keel). There are two sets of flight muscles - one to raise, one to lower the wings. Primary feathers provide forward motion (thrust) and secondaries form the aerofoil shape needed for lift. Once airborne, primary, secondary and tail feathers, together with the feet, help steering.



Compare the wings of:

Peregrine

Daubentons Bat

Emperor Dragonfly

Archaeopteryx

Flight may be achieved by:

- Flapping wings (very energy intensive)
- Soaring and gliding using air currents and thermals
- Hovering (eg Kestrel).

Look around your school grounds and WWT centres for different bird wing shapes that aid various flight patterns. Most wildfowl have relatively short and pointed wings which are very strong and supported by powerful muscles that give the broad-breasted appearance. Achieving and maintaining momentum in the air requires continuous fast wing beating for such heavy birds with high wing loading. Compare wildfowl wings with other birds like falcons (slim and pointed for speed) or pheasants (deeply slotted for speedy takeoff and manoeuvrability).

The UK's heaviest flying bird is the Mute Swan (males or cobs weigh 14 kg - migratory Whooper Swans are probably thinner after the strains of migration).

The fastest bird is the Peregrine who can attain 180 kph (112 mph) in dives. Eider Ducks are the fastest birds in level, steady flight (76 kph - 47 mph), and also the species with the highest wing loading (smallest wing area relative to body weight). Swifts fly at 23 kph (14 mph) when hunting for insects, and up to 40 kph (25 mph) during migration. Swifts have a low wing loading for soaring.

The highest flying UK bird is the Whooper Swan (8320 m recorded).

Dragonflies are among the most powerful insect fliers. They can move forwards, backwards and sideways in the air. Dragonflies (not damselflies) also hover and glide. Large hawkers fly at up to 36 kph (23 mph) and damselflies up to 10 kph (6 mph). Dragonflies have enormous flight muscles which flap wings at 30 beats per second. This pales into insignificance against the record breaking midge who flaps at 62760 beats per minute (1046 beats per second).

Bats belong to the mammalian order 'Chiroptera' - a name meaning 'hand wing'. Skin is stretched over elongated fingers to form wings. Like birds, various bat species have different shaped wings. In the UK, for example, larger Noctule Bats have long, thin wings and can fly over tree tops at 50 kph (30 mph), whereas Daubenton's Bat (often seen hunting for insects over wetlands) has broader wings and flies slower (16-25 kph, 10-15 mph).