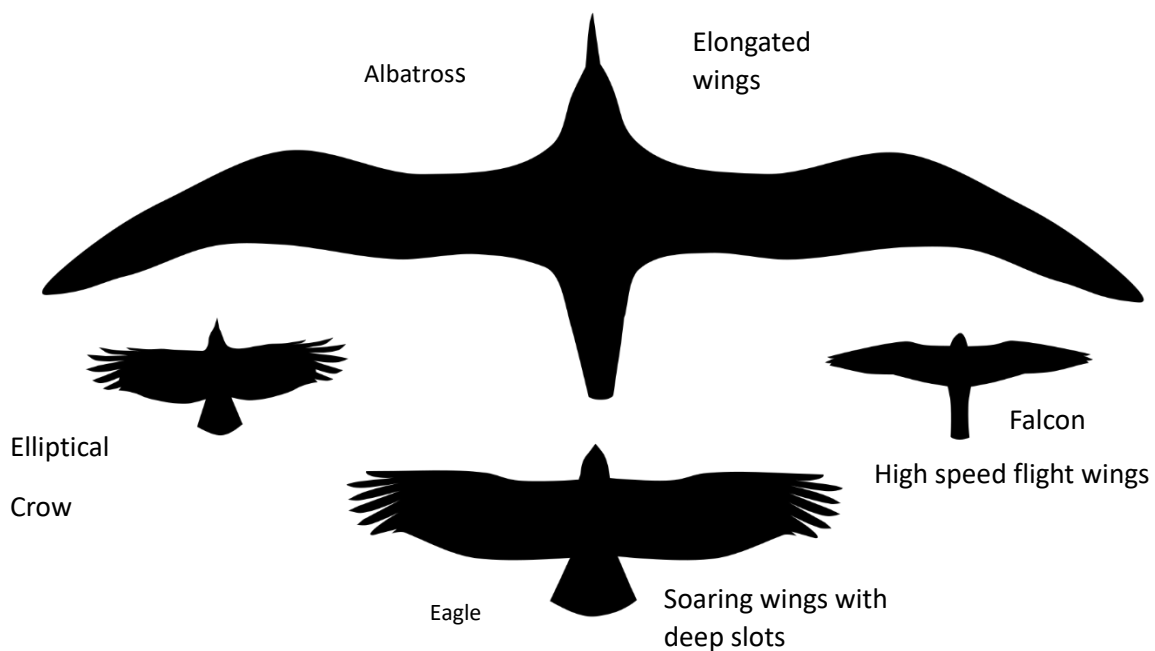


THE WINGS

The bird's paired forelimbs are the wings. They create lift, essential for flight. The wings of aquatic flightless birds act as flippers, flying in water, such as penguins (Spheniscidae).

The shape of the wing is important in determining the flight capabilities of a bird. Different shapes offer different advantages such as speed, low energy consumption and manoeuvrability.

Wing span (the square of the wingspan divided by the wing area) and wing loading (the ratio of weight to wing area.)



Source: https://en.wikipedia.org/wiki/Bird_wing#/media/File:FlightSilhouettes.svg

Wing types

Elliptical: rounded and short, allowing rapid manoeuvring in narrow spaces, e.g. in dense vegetation, e.g. hawks (Accipitrinae)

High-speed wings: short, pointed wings that, combined with a heavy wing loading and rapid wingbeats, use a lot of energy but provide high-speed flight. e.g. falcons (Falconidae)

High aspect ratio (elongated) wings are suitable for long-distance, slow flight with low wing loading. e.g. terns (Sternidae)



Arctic Tern (*Sterna paradisaea*)

Source: <https://pixabay.com/hu/photos/sarki-cs%C3%A9r-mad%C3%A1r-rep%C3%BCI%C5%91-cs%C3%A9r-%C3%A1llat-6285345/>

- **Soaring wings with slots:** slots at the wingtip between the primary feathers reduce drag and wingtip vortices due to lift. Typical of large birds: eagles, storks, vultures.

Feather groups

Flight feathers

Long, stiff, asymmetrically shaped but symmetrically paired feathers on the wing or tail of a bird. Those on the wings are called remiges and those on the tail are called rectrices. The **remiges** are used to generate thrust and lift. The remiges are called primary or hand feathers and secondary or arm feathers according to their position along the wing. There are usually 11 primary **remiges** attached to the hand, the longest and narrowest of the remiges.

The **secondary remiges** are attached to the ulna. These feathers stay close together in flight (they cannot be separated like the primary feathers) and help to shape the wing of the bird to help it lift. Secondaries are generally shorter and broader than primaries and have blunt ends.

Covert feathers are not true remiges, which originate from the shoulder girdle region. They serve as a protective covering for all or part of the primary and secondary feathers.

Winglet or alula (**bastard wing**)

Not considered true feathers; although asymmetrical, they lack the length and stiffness of most true flight feathers. However, alula feathers aid slow flight.

In most situations feathers on the alula lie flush against the wing. In slow flight or when landing, the bird moves its winglets slightly up and forward, creating a small gap at the anterior edge of the wing.

Rectrices

They help the bird to change direction and brake during flight.

Specialized flight feathers

The flight feathers of owls (Strigidae) have serrated edges that disrupt the air flow over the wings, allowing the bird to fly more quietly and hunt more successfully. The rectrices of woodpeckers (Picidae) are relatively short and stiff, so they can rest on them while feeding on the trunk.



Great spotted woodpecker (Dendrocopos major)

Source: <https://pixabay.com/ru/photos/mad%C3%A1r-hark%C3%A1ly-%C3%A1llat-erd%C5%91-4983859/>

Ear covering feathers

Small feathers that protect the ear opening.

Tail cover

These feathers are sometimes special, for example very elongated in peacocks.