

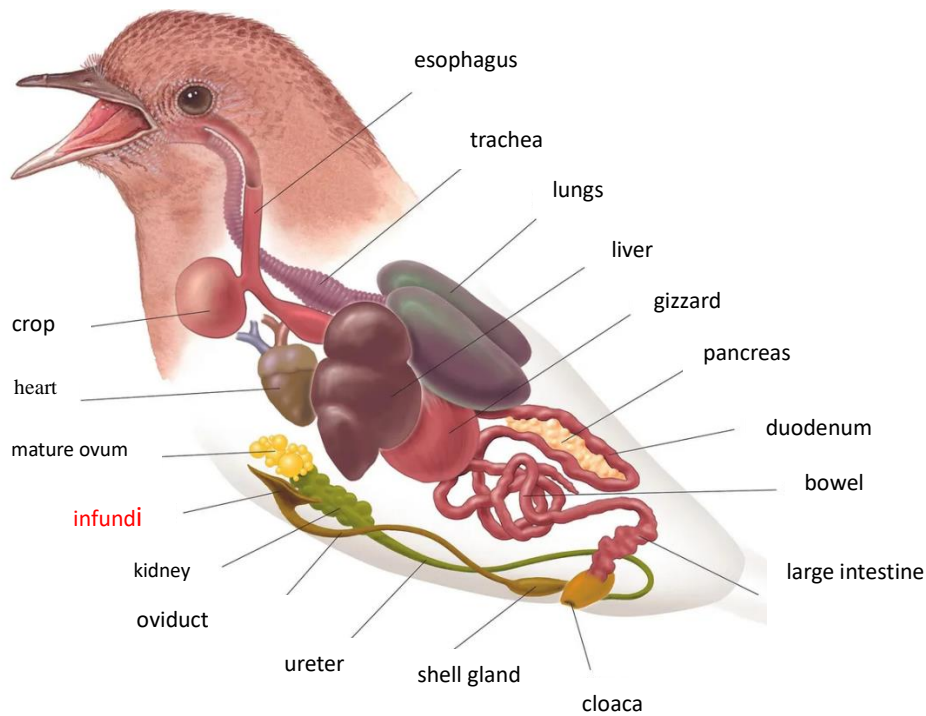
FEEDING

Birds need to search for food almost constantly to meet the high energy demands of flight. Therefore, their feeding habits and the structure and function of their digestive systems have evolved and developed to support flight.

Birds digest food more quickly than mammals. Their intestinal tract is generally shorter than that of mammals, they have no teeth and heavy jaws, which have been replaced by a light beak.

The length and structure of the digestive system may differ between species.

Unlike mammals, their oral and pharyngeal cavities are not separate, but form a single **oral-pharyngeal cavity**.



Digestive system of birds

Source: <https://birdfact.com/anatomy-and-physiology/digestive-system>

Esophagus

Most birds swallow food whole, so the esophagus must be dilatable. Food is moved by the peristalsis of the oesophageal muscles.

Crop

It is connected to the esophagus, is actually its expansion and is mainly used to store food. Here, the food softens as it mixes with the water and saliva that enter. The digestive enzyme in saliva helps break down the starch in the food. The resulting fatty acids and alcohol are then absorbed and contribute to the body's energy supply. The crop did not evolve in all species, e.g. owls..

Crop types:

- the paired lobed, **true** crop is typical, for example, of pigeons,
- a spindle-like, **vestigial** crop is a characteristic of cormorants,
- the odd sacular protuberance, the **false crop** occurs in diurnal birds of prey.

Stomach

Birds have a dual-function stomach, which is anatomically and functionally distinct:

Glandular stomach of the digestive tract, where the production of gastric juices and the chemical digestion of food take place - similar to mammals. It has a small capacity, so the intestinal contents only stay for a short time. Its main function is to mix gastric juices, highly acidic (pH 0.5-2.5) hydrochloric acid and pepsin, a protein-degrading enzyme, with the stomach contents.

The **muscular gizzard** is where the physical grinding of food takes place. It plays a prominent role because birds have no teeth. The powerful contractions of the stomach grind up the coarser food and mix the stomach contents with the gastric juices. The physical activity of this stomach is aided by the tiny pebbles that the bird takes. Stomach motions return some of the broken stomach contents to the glandular stomach so that they can mix with the gastric juices. This significantly enhances the proteolytic activity.

Small intestine

Nutrients from food are absorbed in the **intestines**, and waste products pass through the digestive tract. This is similar to the intestinal function of mammals. Birds that feed on easily digestible food such as fruit, meat and insects have short intestines, while birds that feed on seeds, plants and fish need longer intestines to allow sufficient time for nutrients to be absorbed.

Semi-digested food moves into the small intestine, where most digestion and absorption takes place. This part of the digestive system consists of three parts:

- the duodenum: most carbohydrates are absorbed here.
- the jejunum: the main site of enzymatic digestion and absorption of amino acids, calcium and phosphorus. It is the longest intestinal segment in birds.
- ileum: shorter than the jejunum, with a similar function but less absorption.

Accessory glands of the small intestine

The **liver** produces bile, which is involved in the breakdown and absorption of fats. Birds have relatively large livers compared to their body weight.

Pancreas: located between the parallel "U" shaped stalks of the duodenum, which releases carbohydrate, protein and fat-breaking enzymes into the small intestine.

Birds have paired **caecums**, which are located at the junction of the ileum and large intestine. The contents of the caecum are different from those of the small intestine and large intestine, being drier. The caecum is the site of limited absorption of amino acids and carbohydrates.

The **large intestine** is the last part of the alimentary canal, located between the ileum and the cloaca. Water, sodium and chloride are absorbed in the large intestine.

The **cloaca** is the external orifice where the waste products of the digestive tract and urine are discharged, and where the reproductive system ends. The waste products are emptied as quickly as possible to reduce weight, which affects the flying ability.