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TOPOGRAPHY AND MORPHOLOGY OF THE ESOPHAGUS AND STOMACH IN FOWL, DUCK, PIGEON, DOVE, QUAIL, HERON AND JACKDAW

(With 1 Table & 19 Figs.)

By

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دراسات طبوغرافيه ومورفولوجيه للمرئ والمعده في الفراخ والبط والحمام واليمام والسمان وأبوالقردان والغراب

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لقد تم في هذا البحث دراسة الخصائص الطبوغرافيه والمورفولوجيه لكل من المرئ والمعده بطريقة مقارنة في كل من الفراخ والبط واليمام وأبوالقردان والغراب – لقد اتضح من هذه الدراسه أن المرئ في هذه الطيور يختلف في طوله وموضعه وكذلك الى جانب تكوين ووضع الحوصله حيث يبلغ طول المرئ ٥ر٢٢سم في أبوالقردان و١٨سم في الفراخ و٥ر١٥سم في البط و١٤سم في الغراب و١٠سم في الحمام و٩سم في اليمام و٨سم في السمان ويتكون المرئ من جزئين أساسيين هما الجزء العنقي والجزء الصدري . كما أن الحوصله تكون مغزلية الشكل وبطول الجزء العنقي في البط والغراب كما أنها تكون على هيئة كيس منتفخ في الفراخ والسمان وتكون على هيئة كيس منتفخ يتكون من جزئين في الحمام واليمام . كما لوحظ أن الحوصله في أبوالقردان تكون عبارة عن انتفاخ مغزلي الشكل في الجزء الصدري للمرئ . ولقد اتضح من هذه الدراسه أيضاً أن المعده تتكون من جزئين واضحين يسهل التمييز بينهما لوجود الجزء الضيق الفاصل بينهما (البرزخ) في الفراخ والبط والحمام واليمام والسمان أما في أبوالقردان فلا يوجد بين المعده حد فاصل بينهما وبالتالي يصعب التمييز بينهما . ويمثل طول المعده في الفراخ ١ر٦١٪ من الطول الكلي لتجويف الجسم ، ٢ر٦٠٪ في البط ، ٤٠٪ في الحمام ، ٥ر٤٤٪ في اليمام ، ٥٠٪ في السمان ، ٤٠٪ في أبوالقردان والغراب هذا ويمثل وزن المعده حوالي ٧ر١٪ – ١ر٢٪ من الوزن الكلي للجسم في الفراخ ، ٦ر١٪ – ٢ر٢٪ في البط ، ٥ر٢٪ – ٣٪ في الحمام واليمام والسمان ، ٥ر٣٪ – ٥ر٤٪ في أبوالقردان والغراب .

...before morphological study.

The nomenclature used is that adopted by the NOMINA ANATOMICA AVIUM (1979) as if it was possible.

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ولقد اتضح أن حجم المعده العضليه كبير نسبياً وهي تشبه عدسة محدبه الوجهين يكون قطرها الأمامي الخلفي أطول من قطرها الظهري البطني ويكون الجسم الجزء الرئيسي من المعده العضليه والذي يفصل بين الكيسين الاعميين الصغيرين الأمامي والخلفي البطني واللذان يبرزان من نهايتي المعده في الفراخ والبط والحمام واليمام والسمان أما في أبوالقردان والغراب فيكون حجم المعده الغديه كبير نسبياً وهي كمترية الشكل تتجه نهايتها المتسعه الى الخلف والضيقه الى الأمام أما المعده العضليه فهي صغيرة

RESULTS

Esophagus:

The esophagus of birds is thin walled and distensible with relatively greater diameter than that of mammals. It connects the pharyngeal cavity to the glandular stomach (proventriculus). It is divided into the longer Pars cervicalis and the shorter Pars thoracica.

Pars cervicalis:

In situ, when the neck is unextended, the cervical part of the esophagus is shorter than the s-shaped cervical region of the vertebral column. Mostly the cranial third of it lies ventral to the column in all examined birds, while the caudal two-thirds lying to the right of the column in fowl, duck, pigeon dove and quail (Fig. 1-5/1) and dorsal to it in heron and jackdaw (Fig. 6, 7/1). The cervical part of the esophagus reaches about 17 cm length in heron, 15cm in fowl, 12cm in duck, 10cm in jackdaw, 8cm in pigeon and 7cm in dove and quail. It lies in the midline at first dorsal to the larynx and trachea til the level of the fifth cervical vertebra in fowl, third cervical vertebra in duck, pigeon, dove, quail and jackdaw and seventh cervical vertebra in heron. Where the esophagus, courses to the right side of the neck it covered only by the skin and accompanied by the right jugular vein and vagus nerve. In duck and jackdaw (Fig. 2, 7/2) the cervical part of the esophagus is expanded 3cm after its origin to form the elongated spindle shaped crop while in fowl, pigeon, dove and quail, the cervical part of the esophagus widens immediately cranial to the thoracic inlet between the branches of the furcula (Fig. 1, 3, 4, 5/2). In heron, the expansion of the esophagus was observed just it enters the body cavity through the thoracic inlet (Fig. 6/2).

Crop (incuvies):

The crop is function as a highly distensible storage chamber for food which is closely adherent to the covering skin. In duck and jackdaw the crop is in the form of elongated spindle shaped dilatation of the cranial, middle and caudal regions of the cervical part of the esophagus (Fig. 2, 7/2; 8/B). Moreover, in duck the crop extends about 2cm within the body cavity. In fowl and quail, the crop is in the form of saccular ventral diverticulum from the caudal part of the cervical esophagus (Fig. 1,5/2; 8/A). It lies on the right side of the neck and when full rests on the furcula. In pigeon the crop is well developed and consists of very large right and left lateral diverticul

which are connected in the midline by a small median diverticulum (Fig. 3/2, 8/C). In dove, the crop consists of a very large right diverticulum and a smaller left one (Fig. 4/2, 8/D).

In heron, the crop is represented by a spindle shaped dilatation in the cranial part of the thoracic esophagus (Fig. 6/2, B/B).

Generally, the inner surface of the crop is characterized by the presence of low parallel folds.

Pars thoracica:

The thoracic part of the esophagus (Fig. 1–7/3) is shorter than the cervical part but its diameter is wider than it. It extends caudally dorsal to the syrinx, trachea and between the extrapulmonary primary bronchi. It is pushed between the syrinx and the ventral surface of the lung to reach the base of the heart and the dorsal surface of the liver. At the level of the second intercostal space or third rib in fowl and dove, third intercostal space or fourth rib in duck, pigeon, quail and jackdaw and seventh intercostal space or eighth rib in heron the esophagus turns to the left and ends in the glandular stomach without any line of demarcation. During its course, the thoracic part of the esophagus is related to the right and left cartotid arteries and jugular veins. It is closely related to the cervical, clavicular and cranial thoracic air sacs. This part of the esophagus is relatively long in heron where it reaches about 5.5cm and dove 3.5cm while it is relatively short in fowl (5cm). It reaches about 3.5cm in duck 4cm in Jackdaw and 2.5cm in pigeon and quail. The internal surface of the esophagus has low longitudinal parallel folds (Fig. 18, 19/1).

Stomach:

The relative weight of the stomach depends upon the species of the birds under investigation. As recorded in table (1) the weight of the stomach represents nearly about 1.7% – 2.1% of the total body weight in fowl, 1.6% – 2.2% in duck, 2.5% – 3.5% in pigeon, dove and quail and 3.5% – 4.5% in heron and Jackdaw. Relative length and situation of the stomach depends also on the species. Table (1) and Fig. (8) indicate also that, the relative length of the stomach to the total length of the body cavity is about 61.1% in fowl, 60.2% in duck, 40% in pigeon, 44.5% in dove, 50% in quail and 45% in heron and jackdaw. This result explains that the stomach oocupies more than the half of the total length of the body cavity in fowl and duck, nearly the half in quail and less the half in pigeon, dove, heron and Jackdaw.

The avian stomach consists of two chambers which are externally distinguishable from each other by a constriction (isthmus) in fowl, duck,

pigeon, dove and quail (Fig. 11–15/1) and not externally distingutshable in heron and Jackdaw. The cranial smaller chamber is the glandular stomach (proventriculus) which secrets gastric juice and is continuous cranially with the esophagus. The caudal larger chamber is the muscular stomach (Gizzard) which functions as the organ of mechanical digestion.

Glandular stomach:

The glandular stomach (proventriculus), is well developed in heron and jackdaw. In these two birds, it is elongated pear shaped structure which is not distinguishable externally from the small muscular stomach from which it has a greater capacity (Fig. 6, 7/4, 16, 17/b). Its cranial pole is connected with the esophagus without any line of demarcation from the exterier, while its caudal pole is rounded in shape and represents the base of the pear shape. In heron, the glandular stomach is about 4cm in length and 1.5cm width while in Jackdaw it is about 4cm in length and 1.2cm width. The extension of the glandular stomach differs in heron than Jackdaw. In heron, the glandular stomach (Fig. 6/4) begins at the level of the eights rib and extends caudally to the lower quadrant of the caudal part of the body cavity with its ventral contour reaches the floor of this cavity. However, in Jackdaw the glandular stomach (Fig. 7/4) begins at the level of the fourth rib and extends caudally to a level with the caudal border of the caudal rib. It does not reach the caudal end of the body cavity, but it lies in the middle third of this cavity. In heron the cranial half of the glandular stomach is concealed by the liver while in jackdaw it is completely concealed by the liver and is not related to the body wall.

In fowl (Fig. 1/4, 11/b) the glandular stomach measures about 4cm in length and begins directly without any distinct demaroated boundary from the esophagus. On the other hand, there is a distinct constriction (isthmus) between it and the muscular stomach. It lies in the lower left quadrant of the middle third of the body cavity with its long axis is directed craniodorsally from the level of the third rib and medially to caudoventrally and laterally to the level of the caudal border of the last rib. Most of the glandular stomach is concealed by the liver, on the left lobe of which it makes an impression. Medially it is relates to the spleen while dorsally it is covered by the cranial thoracic and abdominal air sacs which separate it from the lung.

The glandular stomach in duck (Fig. 2/4, 12/b) is more wider but shorter than that of fowl. It is pinkish in colour and reaches about 3cm in length. It lies in the lower quadrant of the middle third of the body cavity

and extends caudoventrally from the level of the third rib to the level of the sixth rib. It is completely concealed by the liver and is not related to the body wall. In pigeon (Fig. 3/4, 13/b) the glandular stomach is about 2.5cm in length. It lies in the lower quadrant of the body cavity and partially covered by the liver and is related to the body wall. It extends obliquely from the level of the third rib to the level of the sixth or seventh rib. In dove (Fig. 4/4, 14/b) the glandular stomach is about 3cm length and lies in the lower quadrant of the middle third of the body cavity and is completely concealed by the liver. It extends from the level of the second rib to the level of the fourth or fifth one. It has no relation with the body wall. In quail (Fig. 5/4, 15/b) the glandular stomach is about 2cm in length and typically fusiform in shape. It is situated in the middle quadrant of the middle third of the body cavity with its long axis is situated obliquely and extends from the level of the third rib to the caudal border of the fifth one.

The relative weight of the glandular stomach to the total body weight depends upon the species of the studied birds. As recorded in table (1) the weight of the glandular stomach represents nearly about 0.5% – 0.6% of the total body weight in fowl, 0.4% – 0.6% in duck and pigeon, 0.5% – 0.6% in duck and pigeon, 0.5% – 0.7% in dove, 0.3% – 0.5% in quail and 2.5% – 3% in heron and Jackdaw. Table (1) and Fig. (9) indicate also that, the relative length of the glandular stomach to the total length of the body cavity is about 33% in fowl, 20% in duck, 25% in pigeon, 22.5% in dove, 31% in quail and 35% in heron and Jackdaw.

In all the studied birds, a number of low, wide papillae is projected into the lumen of the glandular stomach. At the apex of each papilla opens the excretory duct of one of the glands of the lamina propria (Fig. 18, 19/2).

Muscular stomach:

The muscular stomach (Gizzard) is a large organ. Its craniocaudal diameter is greater than its dorsoventral one. In fowl, duck, pigeon, dove and quail the muscular stomach (Fig. 11–15/c) is shaped like a biconvex lens which is firm and red in colour with an oval circumference in dove and a rhomboidal one in the fowl, duck and pigeon. In heron and jackdaw, the muscular stomcah is in the form of a relatively round or oval sac–like structure (Fig. 16, 17/c). The muscular stomach almost fills the left lower quadrant of the caudal part of the body cavity and even extends beyond the midline to the right in fowl, duck, pigeon and heron (Fig. 1, 2, 3, 6/5) where its ventral contour reaches the floor of the abdominal cavity. In dove, quail and jackdaw (Fig. 4, 5, 7/5) the muscular stomach lies in the middle part of

the body cavity. Its ventral contour does not reach the ventral abdominal wall. In fowl, the muscular stomach extends caudally about 4cm caudal to the last rib (Fig. 1/5). In duck it extends from the level of the fifth rib to the caudal border of the last one (Fig. 2/5). In pigeon, it extends from the level of the fourth rib to a level caudal to the last rib by about 1.5cm (Fig. 3/5). In dove it extends from the level of the third rib to the sixth one (Fig. 4/5) and in quail from the level of the fourth rib to about 0.5cm caudal to the last one (Fig. 5/5). In heron it extends 2cm caudal to the caudal to the last rib (Fig. 6/5) while in Jackdaw it extends from the level of the 5th rib to the caudal border of the last one (Fig. 7/5).

The relative weight of the muscular stomach depends upon the species of the birds under investigation. As recorded in table (1) the weight of the muscular stomach represents nearly about 1.2% – 1.5% of the total body weight in fowl, 1.3% – 1.5% in duck, 2% – 2.5% in pigeon, 2% – 2.25% in dove, 2.2% – 3% in quail and 1% – 1.5% in heron and jackdaw. Table (1) and Fig. (9) indicate also that, the relative length of the muscular stomach to the total length of the body cavity is about 28% in fowl, 40% in duck, 15% in pigeon, 20.5% in dove, 19% in quail and 10% in heron and jackdaw.

The muscular stomach in fowl, duck, pigeon, dove and quail consists of a body (Fig. 11–15/2) and a small cranial blind sac Fig. 11–15/3) which protrudes from the cranial extremity and a small caudal blind sac (Fig. 11–15/4) protruding from the caudal extremity.

The extensive right and left tendinous surfaces of the body (Fig. 11–15/7) usually united dorsally and ventrally by much narrower annular surfaces. The intermediate zone opens into the cranial sac, the junction between the glandular and muscular stomach usually being marked externally by an isthmus (Fig. 11–15/1). The muscle tunic is massively developed and can be separated into four semi–autonomous masses radiating out from powerfull fan–shaped tendinous center. These tendinous centers in duck and quail appear to be unequally developed (Fig. 12, 15/7). The muscular masses are asymmetrically arranged relative to the longitudinal axis and include cranioventral and caudodorsal thick muscles (Fig. 11–15/5', 6') and craniodorsal and caudoventral thin ones (Fig. 11–15/3', 4'). The dark coloured thick muscles are composed of outer and inner portions and extend transversely between the tendinous centers and across the dorsal and ventral parts of the muscular stomach. These thick muscles form the basis of both pairs of tendinous and annular masses.

In duck, dove and quail the oranioventral thick muscle is better developed than the caudodorsal one. The much lighter – coloured more pliable, thin muscles are unlayered structures corresponding to the inner portions of the thick muscles and extend between the tendinous centers and across the sacs.

The cauodorsal thick muscle is continuous with the craniodorsal thin muscle where as the cranioventral thick muscle is continuous with the caudoventral thin muscle. This is marked on the external surface of the muscular stomach by a transverse caudal and cranial grooves (Fig. 11–15/8, 9). The asymmetrical arrangment of the muscle in this form of muscular stomach explains its rotatory as well as crushing movements when the organ contracts.

In heron and jackdaw, the muscular stomach is in the form of a relatively round or oval sac–like structure (Fig. 16, 17/c). The two relatively flat surfaces, the tendinous surfaces (Fig. 16, 17/7) each contains a round tendinous center, the light coloured muscle tunic is extremely poorly developed and of uniform thickness. Its fibers radiating out in all directions from the tendinous centers.

In fowl, duck pigeon, dove and quail the inner surface of the muscular stomach is lined by the cuticle. It is subdivided into three portions including a cranial sac, a caudal sac and a body (Fig. 18/4, 5, 6). The cranial sac opens into the dorsal part of the body, whereas the caudal sac opens into the ventral part. The slit–like ventriculopyloric opening lies between the cranial sac and the cranioventral thick muscle. The cuticle varies extensively in thickness between different regions of the organ and is of extremely hard consistency. It is best developed in the dorsal and ventral parts of the body and thinnest in the cranial and caudal sacs and over the tendinous centres. In heron (Fig. 19) and jackdaw the muscular stomach is internally undivided. The cuticle is more jell–like membrane.

DISCUSSION

More or less similar results concerning the position of the esophagus of the fowl are given by CALHOUN (1954), KOLDA and KOMAREK (1958), McLELLAND (1975), NICKEL, SCHUMMER and SEIFERLE (1977) as well as KING and McLELLAND (1979). According to DAS and BISWAL (1967) and as described in this investigation, the position of the esophagus in duck and geese as well as the different studied birds is similar to that of the fowl. From the account of MALEWITZ and CALHOUN (1958) few differences exist

between the esophagus of the turkey and that of the fowl. In this study the length of the esophagus is about 22.5cm in heron, 18cm in fowl, 15.5cm in duck, 14cm in Jackdaw, 10.5cm in pigeon and dove and 9.5cm in quail. According to LATIMER and ROSENBAUM (1926) the length of the esophagus in turkey is 22.5–33.5cm. Measurements by MARSDEN (1940) in young turkeys demonstrated that the cervical esophagus excluding the width of the crop is approximately twice the length of the thoracic esophagus.

The great diversity in the appearance of the crop has been described by GADAW (1891), NIETHAMMER (1933) and ZISWILER (1967 a,b). According to the above mentioned authors, the simplest form of the crop is basically a pindle shaped enlargment of the cranial, middle and caudal regions of the cervical esophagus. This type was observed in this work in duck and Jackaw, but in the duck the crop extends about 2cm caudally through the thoracic inlet within the body cavity. This type of crop was observed also in heron but in the thoracic part of the esophagus. They added also that, the well developed forms of the crop are highly differentiated sac–like structure which arises as ventral or lateral diverticula of the caudal part of the cervical esophagus. This type was observed here in fowl, pigeon, dove and quail. As mentioned by EVANS (1969) and FEDER (1969) in psittaciform species the crop is oriented transversely across both sides of the caudal part of the neck.

The generl appearance of the stomach varies considerably between different groups of birds and seems to be determined mainly by diet (SWENANDER, 1902). Much of the total weight of the stomach is due to the gizzard except in the carnivorous, piscivores in which the weights of the proventriculus and gizzard are relatively similar (KING and McLELLAND, 1979). Two basic types of stomach can usually be identified depending mainly on the extent to which the gizzard is adapted for the physical preparation of food. The first type is relatively undifferentiated and is characteristic of carnivorous and pisciverous species in which the primary requirement is for an expansible type of organ for holding food, the relatively soft nature of the diet necessitating little mechanical treatment. In these birds, both chambers are specialized for storage the stomach being a relatively large, sac like structure in which the junction between the two chambers is often difficult to identify externally. Usually one of the chambers is better developed than the other, as for example in the great cormorant in which the proventriculus is the larger and in the little owl in which the gizzard is the better developed. The gizzard in this undifferentiated type of stomach is always thin–walled and relatively poored muscled.

The second type of stomach is highly differentiated and is characteristic of omnivorous, insectivorous, herbivorous and granivorous species in which the diet consists predominantly of tough food requiring mechanical treatment berfore being acted on by the gastric juice. The stomach in this type consists of a small spindle-shaped proventriculus and a massively developed gazzard. The junction between the proventriculus and gizzard being marked by a distinct constriction or isthmus.

In this investigation, the stomach of fowl, duck, pigeon, dove and quail are of the 2th type in which the muscular stomach is well developed than the glandular one. In heron and Jackdaw the stomach is of the 1st type in which the glandular stomach is well developed than the muscular one.

More or less similar results concerning the stomach is in accordance with that mentioned by SWENANDER (1902), McLELLAND (1975), NICKEL, et al. (1977) and KING and McLELLAND (1979) where the general appearance of the stomach varies considerably between different groups of birds and seems to determined mainly by diet. In fowl, duck and pigeon the muscular stomach is a much more prominent organ than the glandular stomach because of its larger size and because most of its ventral and left surfaces lie directly on the body.

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LEGENDS

Fig. 1–7: Esophagus and stomach of fowl, duck, pigeon, dove quail, heron and Jackdaw, deep dissection, right view.

1– Cervical part of esophagus. 2– Crop 3– Thoracic part of esophagus. 4– Glandular stomach (proventriculus) 5– Muscular stomach (Gizzard). 6– Duodenum.

a) Trachea. b) Scapula. c) first rib. d) last rib.

Fig. 8: Diagramatic illustrations showing the crop in the different studied birds. A) Fowl and quail. B) Duck, Jackdaw and heron. C) Pigeon. D) Dove.

Fig. 9: Showing the position of the stomach within the body cavity as well as the relation between its length and the total length of the body cavity.

Fig. 10: Showing the relation between the length of the glandular and muscular stomach and the total length of the body cavity in the different studied birds.

Fig. 11–17: Stomachs of fowl, duck, pigeon, dove, quail, heron and Jackdaw, A right aspect, B left aspect

a) Esophagus b) Glandular stomach c) Muscular stomach. d) Pylorus with the origin of the duodenum.

1– Isthmus 2– Body 3– Cranial and 4– Caudal blind sacs with the craniodorsal 3' and caudoventral 4' thin muscles. 5– Ventral and 6– Dorsal parts of the muscular stomach with the cranioventral 5" and caudodorsal 6' thick muscles. 7– Tendinous aponeurosis. 8– Caudal transverse groove. 9– Cranial transverse groove.

Fig. 18, 19: Right half of stomach of fowl and heron in section Respectively.

a) Pylorus with the origin of the duodenum.

1– Mucous membrane of esophagus. 2– mucous membrane of proventriculus with orifices of the glands. 3– Isthmus. 4 & 5– mucosa of the cranial and caudal blind sacs (cuticle). 6– Mucosa of the body of the gizza

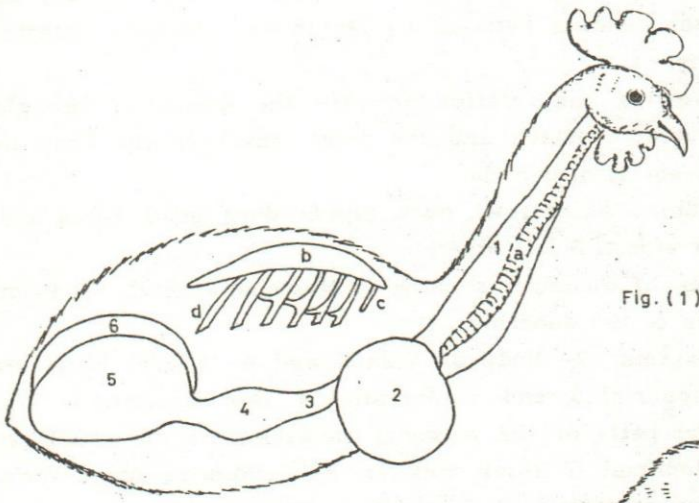


Fig. (1) Fowl

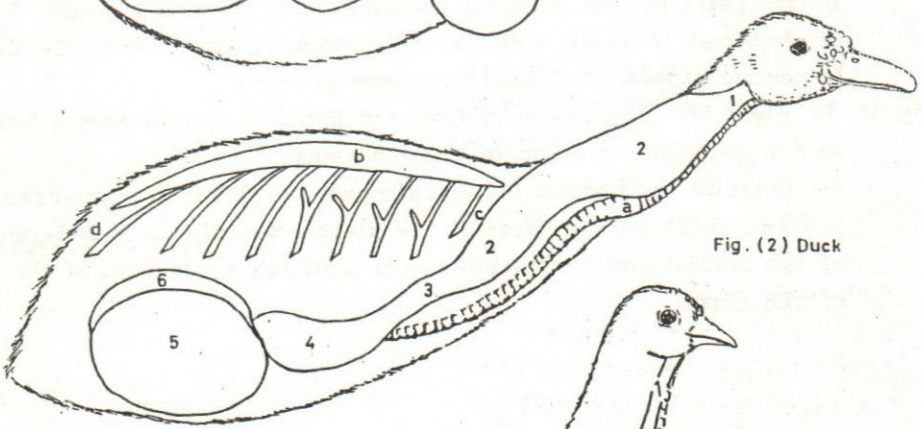


Fig. (2) Duck

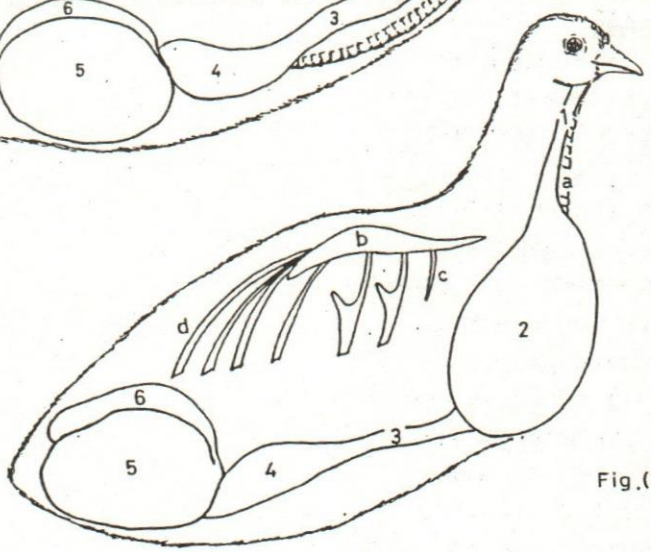


Fig.(3) Pigeon

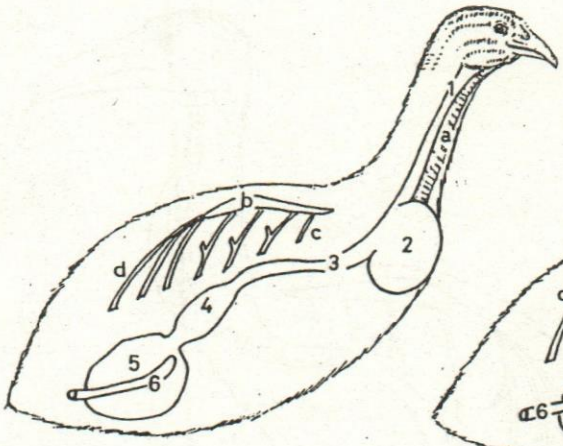


Fig.(5) Quail

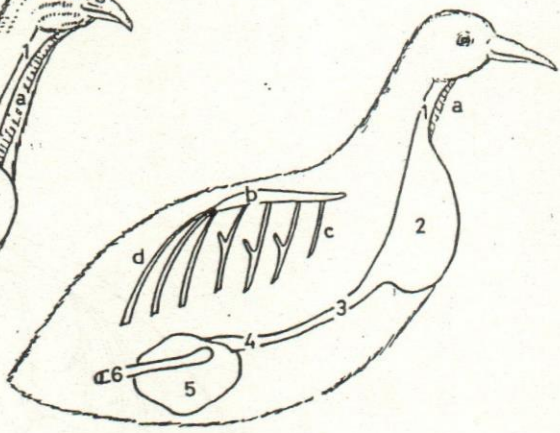


Fig.(4) Dove

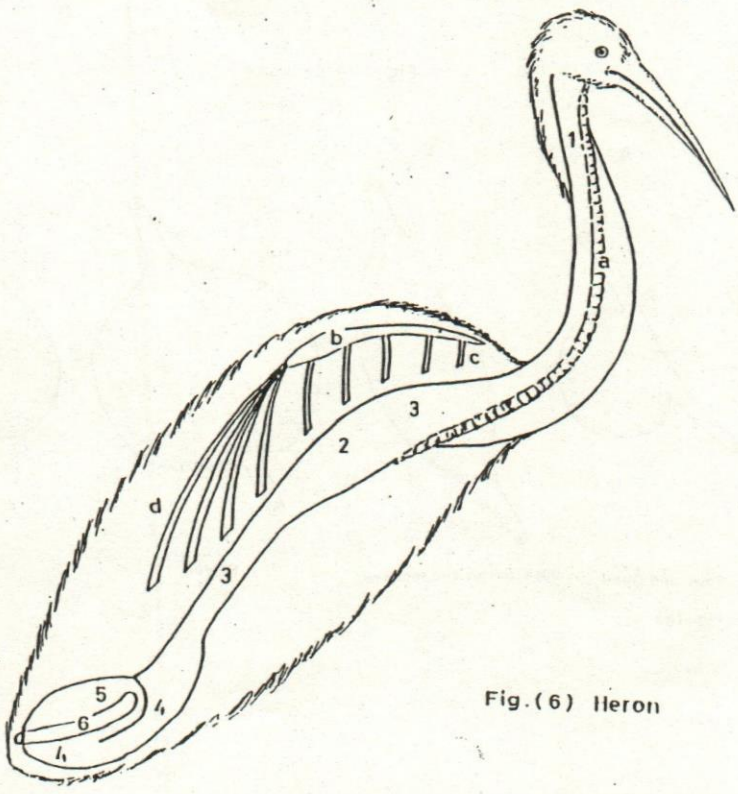


Fig.(6) Heron

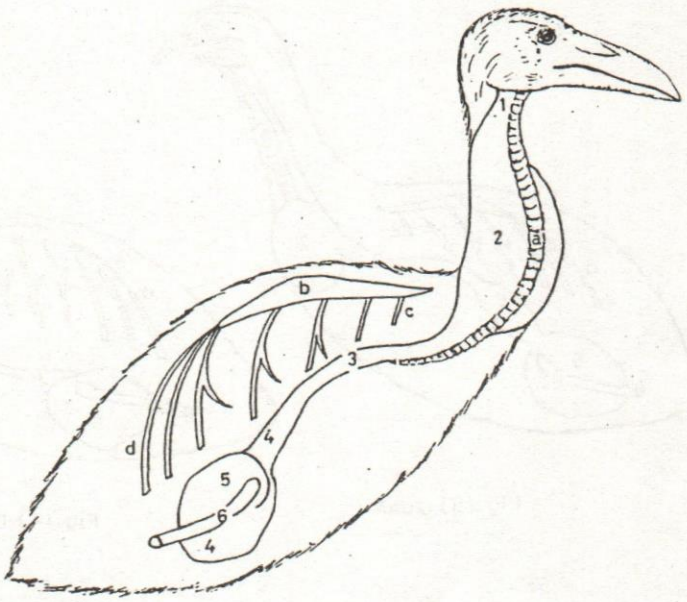
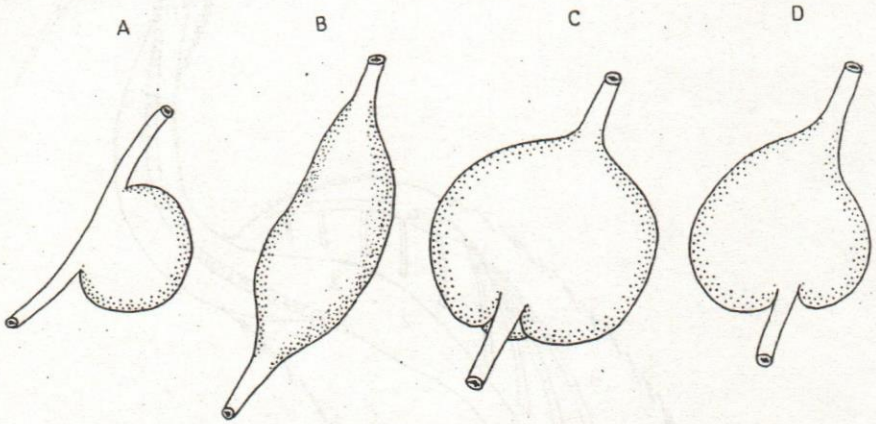


Fig.(7) Jackdaw



Fowl and Quail | Duck, Heron and Jackdaw | Pigeon | Dove

Fig. (8)

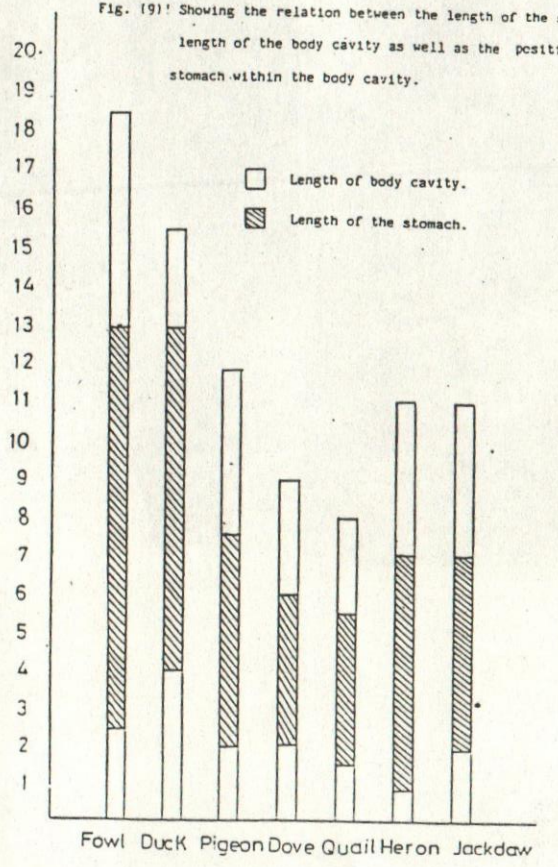


Fig. (9): Showing the relation between the length of the stomach and the length of the body cavity as well as the position of the stomach within the body cavity.

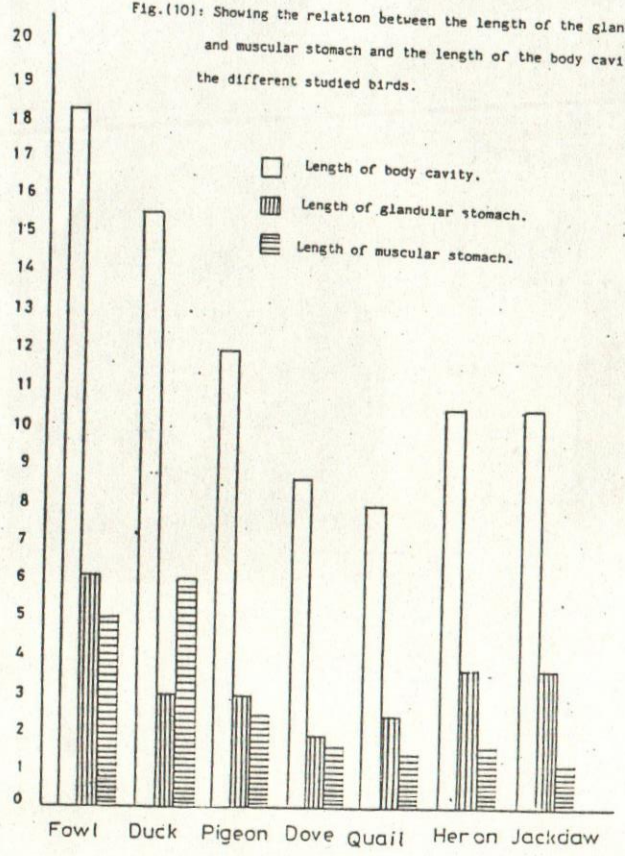


Fig. (10): Showing the relation between the length of the glandular and muscular stomach and the length of the body cavity in the different studied birds.

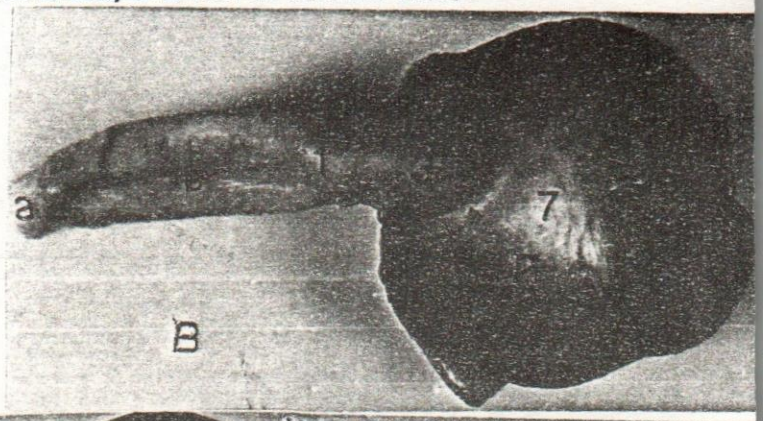


Fig.(11) Fowl

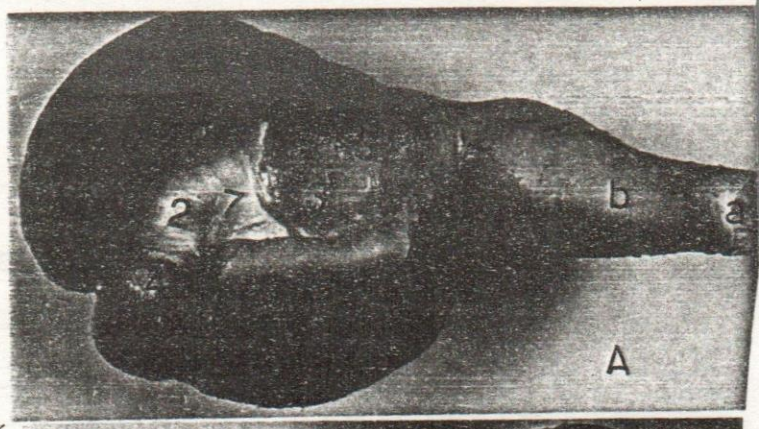


Fig.(12) Duck

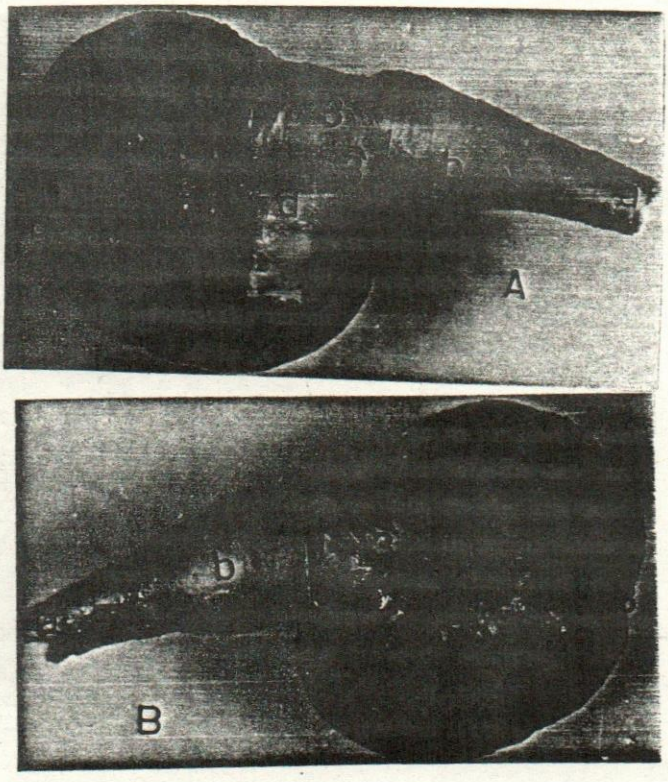


Fig.(13) Pigeon

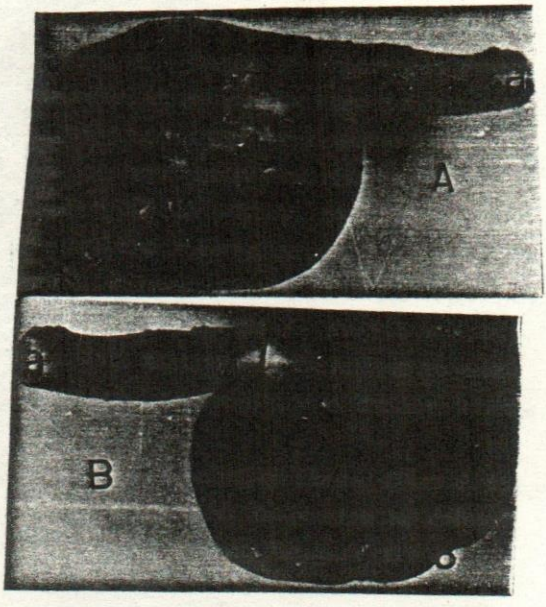


Fig.(14) Dove

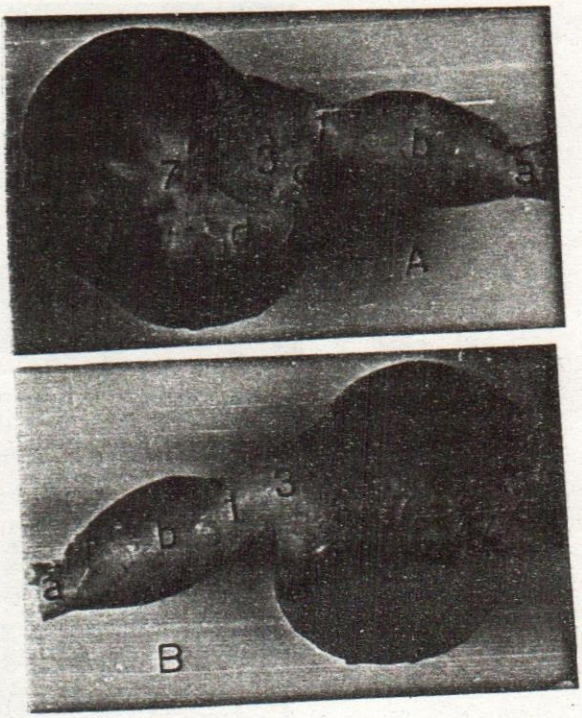


Fig.(15) Quail

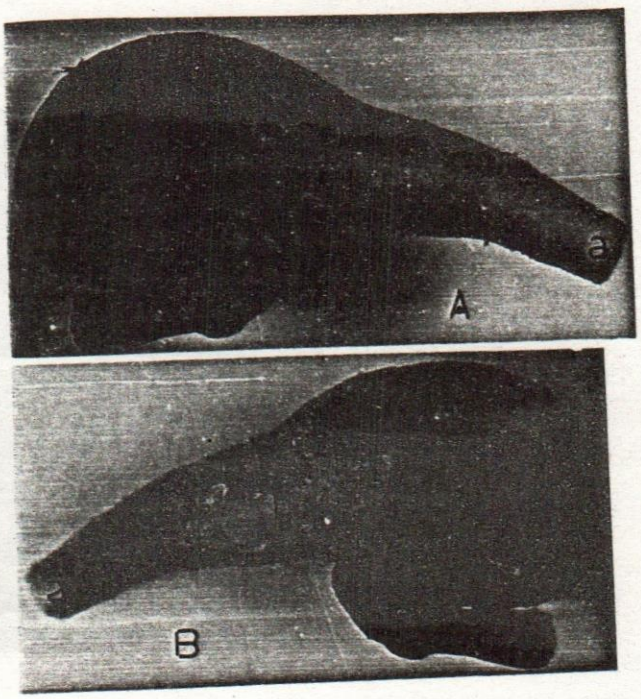


Fig.(16) Heron

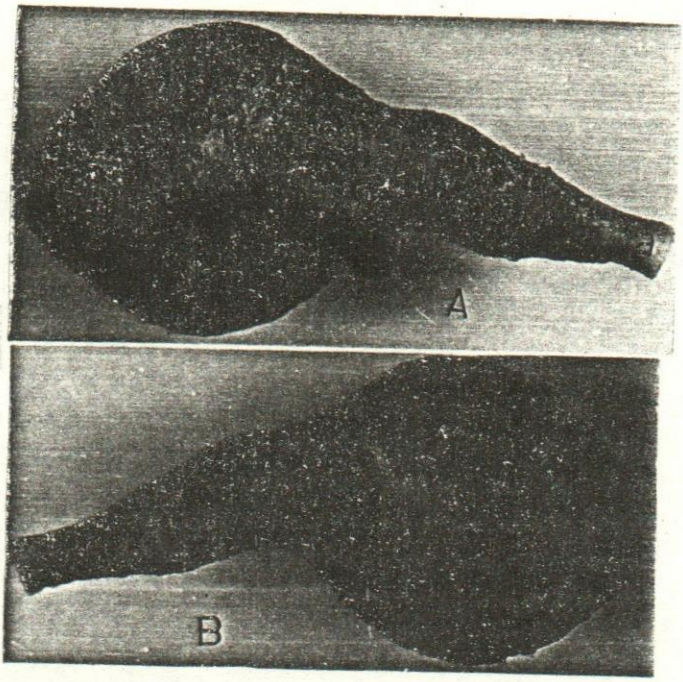


Fig.(17) Jackdaw

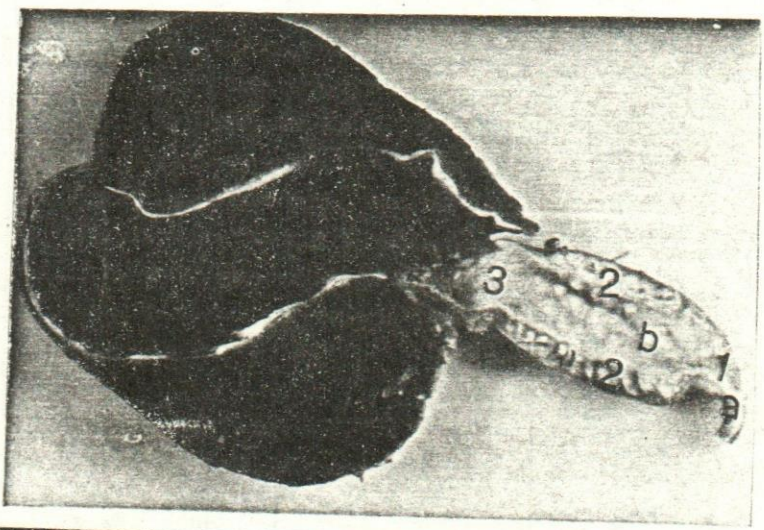


Fig.(18) Fowl

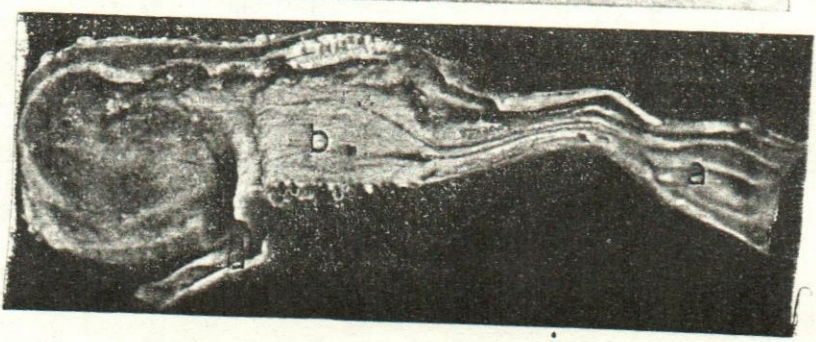


Fig.(19) Heron

Table (1): Showing the weight of the bird, length of its body cavity in addition to the weight and length of the glandular and muscular stomach as well as length of esophagus in fowl, duck, pigeon, dove, quail, heron and Jackdaw.

Bird	Total body weight	length of body cavity	Pregastric length	Gastric length	Posgastric length	Absolute weight of stomach	Relative W. of stomach	Abs. W. of proventriculus	R. W. of pr.	Abs. W. of gizzard	R. W. of gizzard	Length of prov.	Length of gizzard	Length of esophagus	
														Cervical	Thoracic part
Fowl	1150-1850	18.3	5	11	2.3	20-30	1.7%-2.1%	5-7	0.5-0.6%	15-20	1.2% 1.5%	6	5	15	5
Duck	1450-2000	15.5	2.5	9	4	25-35	1.6%-2.1%	6.8	0.4%-0.6%	20-30	1.3% 1.5%	3	5	12	3.5
Pigeon	300 - 400	12	4.5	5.5	2	7-10	2.5%-3.5%	2.3	0.4%-0.6%	5-8	2 % 2.5%	3	2.5	8	2.5
Dove	150-200	9	3	3.8	2.2	5-7	2.5%-3.5%	1.5-2.5	0.5%-0.7%	3-5	2 % 2.25%	2	1.8	7	3.5
Quail	250-350	8	2.5	4	1.5	7-10	2.5%-3.5%	1.3-2.1	0.3%-0.5%	5-8	2.2% 3 %	2.5	1.5	7	2.5
Heron	250-300	11	5.5	5.5	1	7-10	3.5%-4.5%	5-7	2.5%-3 %	2-3	1 % 1.5%	4	1.5	17	5.5
Jackdaw	200-300	11	4	5.2	2	6-9	3.5%-4.5%	4-6	2.5%-3 %	2-3	1 % 1.5%	4	1	10	4