

Study on the macrometry of gastrointestinal tract of wild west African Senegal parrot (*Poicephalus senegalus versteri*)

N. Wanmi, M.H. Sulaiman, I. Gosomji, S.M Maidawa, N. Plang

Correspondence to Wanmi Nathaniel, Department of Veterinary Anatomy, College of Veterinary Medicine, Makurdi, Benue state, Nigeria. nathanielwanmi2014@gmail.com. +2348034696906

ABSTRACT

Parrots are ornamental birds that are found in the wild and those in domestication end up in animal units of schools and houses of the wealthy individuals. The wild African Senegal parrot population is at risk of extinction due to its high popularity with urban dweller. Despite their high popularity, there is scanty documentation of the anatomical features of its gastrointestinal tract (GIT). The Wild West African Senegal Parrots were caught around forested area of a farm settlement in Shika, Zaria, Kaduna state, in the Northern part of Nigeria. The mean body weight of the wild Senegal parrot was observed to be 120.50 ± 5.42 g. The mean weights of the GIT with content and without content were 18.01 ± 4.80 g and 13.54 ± 5.51 g respectively which accounted for 12.95 % and 10.24 % of the total body mass. The mean weights (small and large intestines) were 2.10 ± 1.09 g and 0.70 ± 0.27 g. The caecum was not noticed and gall bladder had the least mean weight 0.17 ± 0.007 g. while the gizzard the highest of all mean weight 4.28 ± 2.25 g. The mean lengths (GIT, small and large intestines) were; 82.61 ± 2.36 cm, 41.75 ± 2.97 cm and 18.06 ± 2.01 cm. The glandular area of the proventriculus was longer than the non glandular portion and the left liver was longer compared to the right 3.03 ± 1.53 cm. The ileum is the longest segment of the small intestine which constituted 22.90 ± 2.92 cm.

Keywords: Macrometry, Gastrointestinal Tract, Senegal Parrots

INTRODUCTION

Birds are unique creatures with peculiar internal and external features. Parrots are among birds with unique features which belong to largest class of birds of the Psittacidae family. Parrots are kept in some school zoological garden, houses, zoos and recreation centers, for purpose of teaching and as site attractions for commercial gain. In Nigeria little is known on the commercial farming of this species of bird despite their increased usage as teaching tool and as pet's. Parrots are also use as source of meat especially in village settlements, means of income generation when sold and their feathers are used for making head ornaments (Luft, 1994). Senegal parrots have large range from Guinea to Cameroon and to Senegal. They have a gray head, bright green upper parts, bright

yellow orange abdomen and breast and green lower neck with a V- shaped green patch extending down the chest. Parrot population in Africa is declining and the need for conservation actions to address threats is increasingly recognized. The situation is worst in Nigeria and if care is not taken, this species of bird will soon go into extinction. Effective conservation requires a robust knowledge base on which decisions over appropriate actions can be made, presently there is no current and readily accessible synthesis of the status of populations, the threats they face and knowledge gaps IUCN (2000).

Knowledge on their feeding habits in wild is scarce in this part of the country despite efforts are being made toward domesticating and

Submitted 7th March 2017, revised on 7th September 2017. Published online 12th Nov 2017. To cite N. Wanmi, M.H. Sulaiman, I. Gosomji, S.M Maidawa, N. Plang. Study on the macrometry of gastrointestinal tract of wild west African Senegal parrot (*Poicephalus senegalus versteri*). Anatomy Journal of Africa. 2017. Vol 6 (3):1065 – 1070.

conservation of this species of bird. Report in the literature have shown that they feed on grains, flesh of oil-palm nuts, flowers, berries and fruit (Juniper and Parr, 1998). There exists a heap of literature of the GIT of other birds such as; on the GIT of blue and yellow macaws (Aizawa *et al.*, 2012), GIT of wild ferret pigeon in Taraba

state (Wanmi *et al.* 2015). There is dearth of information on the gastrointestinal tract (GIT) of this species of bird in Nigeria, despite their utility as laboratory and pet birds. The purpose of this study is to generate a baseline data on the GIT of this species of bird.

MATERIALS AND METHODS

Seven wild west African Senegalus parrot were caught around Shika village a small farmstead in Northern part of Kaduna State, Nigeria. This species of bird is rare in this part of the country; as such it was very difficult to trap them. Birds were transported in a standard laboratory cage to the animal units of the department of Veterinary Anatomy, faculty of veterinary medicine, Ahmadu Bello University, Zaria. Grains, fried cake and water were given *ad libitum* for two and half weeks.

Birds were euthanized using pentobarbital sodium at 100mg/kg intravenous and placed on dorsal recumbency and an incision was made

from the level of the mandible, through the thorax to the anal region. The cervical, thoracic and abdominal portions of the esophagus were exposed. Weight of the bird was taken using Mettler balance of sensitivity of 0.01 g. ruler, scissor, digital vernier caliper and thread were utilized. Measurements were recorded in grams (weight) and centimeter (length).

The mean \pm Standard Error of Mean (Mean \pm SEM) using Statistical Package for Social Science (SPSS) Version 17 was used in finding values for weights and length.

RESULTS

The morphometric values of the digestive system of wild west African Senegal parrot were considered in (Table 1) and the mean body weight was observed to be 120.50 ± 5.42 g. The mean weights of the GIT with its content and without content were 18.01 ± 4.80 g and 13.54 ± 5.51 g accounting for 12.95 % and 10.24 % of the body weight, respectively. The mean weights of esophagus and crop, proventriculus and gizzard were 1.04 ± 0.42 g, 0.62 ± 0.24 g and 4.28 ± 2.25 g of the total body weight, respectively. The mean weights of the small intestine; duodenum, jejunum and ileum were observed to be 2.10 ± 1.09 g, 0.69 ± 0.23 g, 0.41 ± 0.19 g and 0.99 ± 0.28 g representing

1.41 %, 0.37 %, 0.33 % and 0.62 % of the total weight of the bird respectively. The mean weight of the large intestine and its segments: colon and cloaca/vent were 0.70 ± 0.27 g, 0.31 ± 0.15 g and 0.33 ± 0.12 g accounting for 0.58 %, 0.24 % and 0.24 % of the total body weight, respectively. The liver, gall bladder and the tongue were seen to have the mean weights of 4.18 ± 1.82 g, 0.17 ± 0.07 g and 2.76 ± 2.14 g with liver and tongue accounting for 3.38 % and 2.26 % respectively. The mean weight of gizzard of the wild west African Senegal parrot was higher than that of the liver and accounted for 3.55 % of the of the individual parts of the GIT.

Table 1. Weights of the digestive system of the wild west African Senegal parrot. n= 7

Parameters: Weight; (g)	Min. value	Max. value	Mean \pm SEM	% Body Weight
Body weight	110.89	129.65	120.50 \pm 5.42	
Weight of GIT + Content	11.60	27.41	18.01 \pm 4.80	14.98
Weight of GIT empty	5.51	24.08	13.54 \pm 5.51	11.34
Weight of esophagus and crop	0.36	1.81	1.04 \pm 0.42	0.87
Weight of proventriculus	0.29	1.09	0.62 \pm 0.24	0.53
Weight of gizzard	1.12	8.62	4.28 \pm 2.25	3.55
Weight of small intestine	1.07	3.43	2.10 \pm 1.09	1.75
Weight of duodenum	0.31	1.10	0.69 \pm 0.23	0.57
Weight of jejunum	0.16	0.79	0.41 \pm 0.19	0.34
Weight of ileum	0.59	1.52	0.99 \pm 0.28	0.82
Weight of large intestine	0.23	1.17	0.70 \pm 0.27	1.94
Weight of colon	0.11	0.64	0.31 \pm 0.15	1.29
Weight of cloaca/vent	0.10	0.51	0.33 \pm 0.12	0.61
Weight of liver	1.38	7.60	4.18 \pm 1.82	3.38
Weight of gall bladder	0.09	0.30	0.17 \pm 0.07	0.75
Weight of tongue	0.48	1.93	2.76 \pm 2.14	2.26

G; Gram, Mean \pm SEM; Standard Error of Mean

In this study, the mean length of the GIT was observed to be 82.61 ± 2.36 cm. The mean length of the esophagus and crop were 5.37 ± 2.27 cm and 3.86 ± 2.18 cm accounting for 6.30 % and 4.43 % of the total length of the gastrointestinal tract (GIT). The mean length of the proventriculus was 3.02 ± 0.79 cm representing 2.45 % of the total length of the gastrointestinal tract. The glandular area of the proventriculus has the highest mean length of 2.26 ± 0.79 cm accounting for 2.54 %, while the non glandular portion had the least mean length of 0.73 ± 0.23 cm representing 0.65 % of the total length of the bird's GIT. The gizzard was seen to have a mean length of 3.85 ± 2.06 cm accounting for 4.44 % of the total length of the

GIT. The small intestine had a mean length of 41.75 ± 2.97 cm which accounted for 45.15 % of the total length of the GIT. The ileum accounted for highest mean value of 22.90 ± 2.92 cm followed by jejunum (12.48 ± 2.75 cm) and duodenum (9.34 ± 2.84 cm) respectively. The small intestine was found to be longer than the large intestine which was observed to have a mean length of 18.06 ± 2.01 cm. The cloaca/vent was seen to shorter and the colon longer with their respective mean lengths of 7.81 ± 2.38 cm and 10.08 ± 1.86 cm accounting for 7.45 % and 10.20 %. The accessory organs, the liver: right and left accounted for 3.03 ± 1.53 cm and 4.33 ± 1.82 cm, while the lowest value was observed for gall bladder to be 0.60 ± 0.22

cm with tongue accounting for 2.04 ± 0.99 cm (Table 2).

Table 2. Length of the digestive system of the wild west African Senegal parrot. n= 7

Parameters: Length (cm)	Min. value	Max. value	Mean \pm SEM	% Body Weight
Length of GIT	76.13	95.01	82.62 \pm 2.36	
Length of esophagus	1.36	9.21	5.37 \pm 2.27	6.80
Length of crop	0.93	8.11	3.86 \pm 2.18	4.43
Length of proventriculus	1.39	5.01	3.02 \pm 0.79	2.54
Length of glandular area	1.12	3.78	2.26 \pm 0.79	2.64
Length of non-glandular area	0.31	1.10	0.73 \pm 0.23	0.65
Length of gizzard	1.02	7.86	3.85 \pm 2.06	4.82
Length of small intestine	30.02	53.95	41.75 \pm 2.97	45.15
Length of duodenum	4.22	14.02	9.34 \pm 2.84	8.37
Length of jejunum	7.60	17.10	12.48 \pm 2.75	14.69
Length of ileum	18.01	22.58	22.90 \pm 2.92	22.72
Length of large intestine	10.97	26.07	18.06 \pm 2.01	21.65
Length of colon	6.98	13.41	10.08 \pm 1.86	12.20
Length of cloaca/vent	3.79	12.01	7.81 \pm 2.38	9.45
Length of left liver	1.93	7.91	4.33 \pm 1.82	4.75
Length of right liver	0.99	6.03	3.03 \pm 1.53	3.54
Length of gall bladder	0.21	0.96	0.60 \pm 0.22	0.86
Length of tongue	0.81	4.02	2.04 \pm 0.99	

cm; Centimeter, Mean \pm SEM; Standard Error of Mean

DISCUSSION

The mean body weight of the wild west African Senegal parrot in this study was higher than that of the quail, lower than that of the pigeon (Hena *et al.*, 2012). Ibe, *et al.*, 2008, reported a higher mean weight in life helmeted guinea. The gastrointestinal tract with its content put together was equivalent to the weights of empty gastrointestinal tract, liver and tongue. The GIT and its content accounted for 12 % of the total

body weight and this vary from one species to another. This might be as a result of variation in the types of diet of individual species of bird. The esophagus and crop constitute 0.03 % of the body weights. At day 14 and 28 post hatch of the broiler, the average weight of the esophagus was higher but lower at day one post hatch (Nasrin, 2012). The proventriculus and the gizzard were the two stomach forms in the

parrot. The avian stomach is a muscular organ for secretion (proventriculus) and grinding (gizzard) located between the esophagus and the intestine and it is consisting of two parts; the proventriculus and the ventriculus (McLelland 1979) and (Dyce, Sack *et al.* 2010). The small intestine is made up of the duodenum, jejunum and ileum with ileum having the highest mean value. This agrees with the statement that the weight of the small intestinal segments varies between the different species of birds (Hassouna, *et al.*, 2001). Most birds lack cecum which is a site for anaerobic activity and this is common in horses, rabbit and rodents (Kotze, 2006). Apart from the gizzard which had the highest mean weight, the liver is an accessory organ seen to have the highest mean weight followed by the tongue. Itopa *et al.* (2012), in the male African giant rat indicated liver to have the highest mean and this agreed with report of many researchers in most domestic animals and birds.

The mean length of the GIT and esophagus were 82.61 ± 2.36 cm and 5.37 ± 2.27 cm with crop accounting for 4.43 % of the total length of the GIT. In most animals including birds, the cervical part of the esophagus lied dorsal to the trachea and ventral to the ventral cervical muscles, extending from the pharynx to the thoracic inlet still maintained its position dorsal to the trachea and continues as the thoracic esophagus, until it reached the trachea bifurcation where it lay between the lung lobes (Timothy, 1990). The glandular portion and non glandular portion were the various portions found in the proventricular stomach and the glandular portion was seen to be longer than the non glandular, while the muscular stomach (gizzard) was the longest. The

Acknowledgment

Much appreciation to all technical staff, gross unit of the Department of Veterinary Anatomy, Ahmadu Bello University, Zaria for their technical support. We thank the Head of Department for approving the use of gross laboratory.

Conflict of interest

No conflict of interest as this is an original article.

small intestine was longer than the large intestine where the ileum was the longest segment of the small intestine followed by jejunum and duodenum. This variation could be attributed to its feeding habit were most of the feed intake is digested in the jejunum rather than the duodenum. This report varies from those reported in some species of animals; Nzalak *et al.* (2012) on the African giant rat, reported jejunum to be the longest segment, Byanet *et al.* (2008) in African grasscutter reported jejunum to be the longest segment of the small intestine and Arlene (2004), reported the mean length of the small intestine of brushtail possum to be longer than that of the wild African Senegal parrot. The colon and rectum constitute segments of the large intestine in the Senegal parrot. The cecum is absent in this species of bird. Cecum are long cylindrical expansion where the large intestine started from and are blind pouches that extend along the line of the small intestine towards the liver having proximal and distal part, and were closely attached to the small intestine along their length by the mesentery (Hassouna, 2001). The tongue was longer than gall bladder and non glandular area of the proventriculus, almost equal to the length of the glandular area of the proventriculus and half the mean length of liver.

In conclusion, this study was aimed at providing a baseline data in the gastrointestinal tract of wild Senegal parrot which will aid in understanding its feeding habit. The ileum of the Senegal parrot is the longest and does not have cecum. This may suggest that the Senegal parrot is likely a fruit eating birds than seed eating.

REFERENCES

1. Arlene M, Bernie, Euan JM, Ian, G. T., 2004. A Morphometric Study of the Gastrointestinal Tract of the Common Brushtail Possum in Southern New Zealand. *Australian Mammalogy*, 27: 61-67
2. Byanet O, Nzalak JO, Salami SO, Nwaogu IC, Bosha JA, 2008. Macroscopic studies of the gastrointestinal tract of the African grasscutter (*Thyromys swinderianus*). *Midwell Journal of Veterinary Research*, 2(2): 17-21.
3. Dyce KM, Sac WO, Wensing CJG, 2010. Text book of Veterinary Anatomy.4th Edition *Saunders Elseveir*. Pp: 799-804.
4. Hassouna EMA, 2001. Some anatomical and morphometrical studies on the intestinal tract of chicken, duck, goose, turkey, pigeon, dove, quail, sparrow, heron, jackdaw, hoopoe, kestrel and owl. *Assiut Veterinary Medical Journal*. 44: 47-78
5. Hena SA, Sonfada ML, Belloa A, Danmaigoroa A, Tanimomo BT, 2012. Comparative Morphologic and Morphometric Studies on the Lower Respiratory Tract of Adult Japanese Quail (*Coturnix japonica*) and Pigeon (*Columbia livia*). *Scientific Journal of Biological Sciences*. 1(2) 37-42
6. Ibe CS, Onyeausi BI, Salami, SO, Umosen AD, Maidawa SM, 2008. Studies of the Major Respiratory Pathways of the West African Guinea Fowl (*Numida meleagris galeata*): The Morphometric and Macroscopic Aspects, *International Journal of Poultry Science*, 7 (10): 997-1000,
7. IUCN, 2000. Red list guiding conservation for 50 years.
8. Itopa EA, James CS, Wesley DN, 2012. Organ Body Weight Relationship of Some Organs in the Male African Grasscutter (*Thyromys swinderianus*). *Journal of Advanced Veterinary Research*, Vol. (2) 86-90.
9. Juniper T, Parr M, 1998. Parrots, a guide to parrots of the world. Pica press & Yale university press, United Kingdom & United States.
10. Kotze SH, Van Der Merwe EL, O'riain MJ, 2006. The Topography and Gross Anatomy of the Gastrointestinal Tract of the Cape Dune Mole-rat (*Bathyergus suillus*). *Anatomia Histologia Embryologia*, Vol. 35, 259-264.
11. Luft S, 1994. Der Graupapagei – Lebensweise, artgemässe Haltung und Zucht. Naturbuch Verlag, Augsburg.
12. Mcllland J, 1979. Digestive system. In: King, A. S., J. Mcllland. Form and Function in Birds. London: Academic Press, Pp. 69-181.
13. Nasrin M, Siddiqi MNH, Masum MA, Wares MA., 2012. Gross and Histological Studies of Digestive Tract of Broilers During Postnatal Growth and Development. *Journal Bangladesh Agriculture University*, 10(1): 69–77
14. Nzalak JO, Onyeausi BI, Salami SO, 2012. Macrometric Study of the Digestive System of the African Giant Rat (*Cricetomys gambianus* Waterhouse 1840). *European Journal Anatomy*, 113-118
15. Timothy PJ, 1990. Comparative gross anatomical studies of the rabbit digestive system. *DVM, ABU*, Student Project.