Applied Biological Research 18 (1): 91-92; (2016) **SHORT NOTE**
DOI: 10.5958/0974-4517.2016.00015.X

AIR SACS OF KUTTANAD DUCKS *(Anas platyrhynchos domesticus):* CONTRAST RADIOGRAPHIC AND CORROSION CASTING STUDY

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(Received 2 November, 2015; accepted 27 February, 2016)

The ability of birds to sustain flight and fly in thin air of high altitude is striking evolutionary accomplishments. The extensive anatomical plan of the lung air-sac system of birds is responsible to achieve these accomplishments to which air sacs do play a vital role. A significant difference exists among the birds in these air sacs as seven air sacs in goose (Onuk *et al.*, 2010), nine in rock partridge (Kurtul *et al.*, 2004). Present work was aimed to castigate the occurrence of air sacs in Kuttanad duck and find any variation exists with rest of birds.

Six 12 week old adult ducks were randomly selected from a single hatch at University Poultry & Duck Farm, Mannuthy, Kerala (India). The birds were radiographed at ventro-dorsal, dorso-ventral and lateral positions taken with radiation exposure parameters set at 48-50 kV, 80 mA and 30 mA. Some radiographs were also taken by using computerized digital radiography equipment available in the Department of Veterinary Surgery & Radiology, Mannuthy. Barium chloride was used as a positive contrast medium and poured down through trachea into the respiratory tract with the help of 50 mL syringe till its overflow. After contrast radiography, silicon sealant was injected into trachea under constant pressure. Before injection, the silicon sealant was diluted with equal volumes of chloroform. The specimens were macerated with 3% KOH at 40°C for 48 h. Finally, they were rinsed in tap water, dried and stained in different colours by the method of Tasbas *et al.* (1994).

In Kuttanad ducks four paired and an unpaired clavicular air sacs were present in contradiction to Gerrit and Clark (1972) reported that in common crackle inter clavicular and anterior thoracic sacs were fused into a single unpaired sac (Fig. 1). The cervical air sac was cranial to lungs and ventral to last three and first two thoracic vertebrae. This sac aerated all the cervical vertebrae, except the atlas and axis in consonance with the findings of Civil *et al.* (2006) in mallard ducks. The unpaired clavicular air sac was at the base of neck between the level of shoulder and thoracic inlet. Paired cranial thoracic air sacs were dorsolateral in position within the thoracic cage and attached to the five sternal ribs and fourth and fifth vertebral ribs as reported earlier by Tasbas *et al.* (1994) in domestic birds.

The paired caudal thoracic air sacs were bigger than cranial thoracic air sacs. This sac did not aerate any bone and was aerated by the lungs through

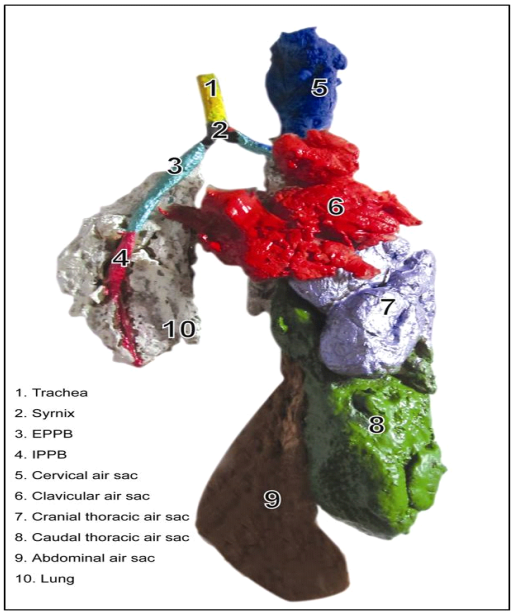

Fig. 1: Silicon cast of air sacs in Kuttanad duck

third lateroventral secondary bronchi as reported by Cevik *et al.* (2006) and Onuk *et al.* (2010) in goose. In present study, the largest air sacs were the paired abdominal which extended from lungs to cloaca. The abdominal air sac aerated pelvic girdle and synsacrum. Right abdominal sac was larger than the left one (Fig. 2). Ellenberger *et al.* (1974) also found that the volume of abdominal sac was larger on right side in domestic fowl but Murray and Fisher (1967) observed that the left had greater volume than the right side in Laysan albatross. Onuk *et al.* (2010) reported in goose that left and right abdominal sacs were of equal in size and located symmetrically.

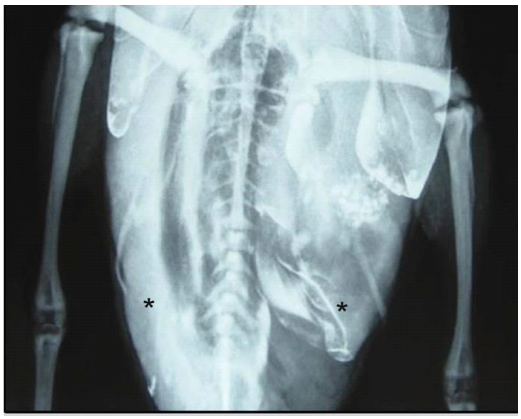

Fig. 2: Radiograph showing abdominal air sacs (*) in Kuttanad duck

The role of air sac is mostly the pulmonary ventilation during both inspiration and expiration. The nine air sacs of Kuttanad duck help this waterfowl to efficiently survive in deeper water or swim over water. Larger air sacs as compared to other birds make the Kuttanad duck hold its breath when under water.

Adamson, I.Y.R. 1997. Development of the lung. pp. 993-1001. **In:** *The Lung* (eds. R.D. Crystal, J.B. West, E.R. Weibel and P.J. Barnes). Scientific Foundations, Lippincott-Raven, Philadelphia, USA.

Cevik, D.A., Hazaroglu, R.M. and Kurtul, I. 2006. Air sacs (Sacci pneumatici) in mallard ducks (*Anas platyrhynchos*). *Veteriner Fakultesi Dergisi,* **53**: 75-78.

Ellenberger, W. and Baum, H. 1974. *Anatomy of the Pets.* pp. 256-264. Springer-Verlag, Berlin, Germany.

Gerrit, P.K. and Clark, L.C. 1972. The lung and air-sac system of the common crackle. *Ornithological Advances,* **89**: 817-825.

Kurtul, I., Aslann K., Aksoy, G. and Ozcan, S. 2004. Morphology of the air sacs (Sacci pneumatici) in the rock patridge (*Alectoris graeca*). *Veterinary Research and Communication,* **28**: 553-559.

Murray, P.H. and Fisher, H.I. 1967. Air sacs of respiratory origin in some Procellarii form birds. *The Condor,* **69**: 586-595.

Onuk, B., Hazıroğlu, R.M. and Kabak, M. 2010. The gross anatomy of larynx, trachae and syrinx in goose (*Anser anser domesticus*). *Veteriner Fakultesi Dergisi,* **16**: 443-450.

Taşbaş, M., Ahmet Çakır, R., Merih, H. and Mehpare, O. 1994. Morphological investigations of the respiratory system of the Denizli cock. II. Larynx, trachea, syrinx. *Veteriner Fakultesi Dergisi,* **41**: 135-153.