

Diagnosis and treatment of crop inflammation of Rough-legged Buzzard (*Buteo lagopus*) in Daqing Wildlife Nature Reserve, Heilongjiang Province, China

Zheng Wang^{1†} Ruxin Ding^{1†} Yansong Ge¹ Enshuang Xu¹ Jiasan Zheng^{1*}

Abstract

This article describes a Rough-legged Buzzard (*Buteo lagopus*) from the Wildlife Nature Reserve in Daqing, China. According to the staff of Daqing Wildlife Nature Reserve, the Rough-legged Buzzard was found to have impaired flight ability, depression, and loss of aggression, but its feathers were full and there were no obvious external injuries, so it was sent to the Wildlife Rehabilitation Center of the Teaching Animal Hospital of Heilongjiang Bayi Agricultural University for treatment. After the vet conducted X-ray and blood tests, he diagnosed the bird with a foreign body in the crop and crop inflammation. He finally treated the bird using endoscopic techniques, and the bird recovered well and was successfully released.

Keywords: *Buteo lagopus*, endoscopic treatment, plastic, raptor, avian

¹College of Animal Science and Veterinary Medicine, Heilongjiang Bayi Agricultural University, High-tech Industrial Development Zone, No. 5 Xinfeng Road, Daqing, 163319, People's Republic of China

[†]Equal Contribution Authors

*Correspondence: Jiasan Zheng, zjs3399@aliyun.com (J. Zheng)

Received: August 25, 2024

Accepted: October 4, 2024

Case description

In June 2023, a Rough-legged Buzzard (*Buteo lagopus*) was sent to the Wildlife Rehabilitation Centre of the Teaching Animal Hospital of Heilongjiang Bayi Agricultural and Reclamation University for rescue and treatment. The Rough-legged Buzzard had the following measurements: body weight of 550g, body length of 481 mm, beak crest of 17 mm, wingspan of 390 mm, tail length of 210 mm, and tarsal metatarsus length of 60 mm. The initial symptoms exhibited by the Rough-legged Buzzard included complete loss of flight ability, depression, severe dehydration, corrosive secretions from the corners of the mouth, decreased body temperature, disheveled feathers, visible feather ticks on the body surface, and drooping wings on both sides. According to Gregory's body condition scoring system (Gregory *et al.*, 1998), the score was 0-1 out of 0-4. The attending veterinary surgeon provided

supportive treatment by establishing venous access in the tibial vein. Blood is collected for hematological and biochemical analysis. The supportive treatment included fluid replacement (Lactated Ringer's solution, 20ml, CRI), multivitamins (Vitamin B complex), anti-secondary infection medication (Enrofloxacin, 15 mg/kg, PO q24h 7d) and sedative disposition (Butorphanol, 0.5mg/kg, NA). Subsequent imaging revealed a large amount of food in the Rough-legged Buzzard's crop with an uneven density, indicating a possible foreign body. The lungs appeared clear with no apparent changes, and the limb bones were normal and free of abnormalities (Fig. 1).

Meanwhile, the lead veterinarian conducted an examination for infectious diseases, using IDEXX diagnostic test kits to test for avian encephalitis, avian influenza, and avian pneumovirus. The results were negative, ruling out the possibility of infectious diseases causing the bird's impaired flight ability.



Figure 1 Dorsal abdominal radiograph, the blue arrow indicates the presence of a large amount of food in the crop and uneven density.

Laboratory examination of the collected blood revealed several abnormalities. The complete blood count (CBC) conducted using the IDEXX ProCyt Dx analyzer (IDEXX, IDEXX Laboratories (Shanghai) Co., Ltd, Hongqiao Business Building, No. 2272 Hongqiao Road, Changning District, Shanghai, China) showed

elevated levels of erythrocytes, erythrocyte pressure product, leukocytes, and neutrophils, as well as decreased lymphocytes (Dujowich *et al.*, 2005) (Table 1). Additionally, Diff-Quik staining of the blood smears confirmed the aforementioned findings and also revealed the presence of abnormal eosinophils.

Table 1 IDEXX ProCytex Dx analyzer results

Inspection items	Result	Reference*
White Blood Cell (WBC)	29.45 × 10 ⁹ /L	46.8-244
Red Blood Cell (RBC)	2.80 × 10 ¹² /L	0.71-2.53
Haemoglobin (HGB)	230.62 g/L	46-194
Hematocrit (HCT)	122.33%	12.4-48.1
Mean Corpuscular Volume (MCV)	436.65 fL	175-190
Mean Corpuscular Hemoglobin (MCH)	82.32 Pg	102.86-172.93
Mean Corpuscular Hemoglobin Concentration (MCHC)	188.52 g/L	371-464
Red Cell Distribution Width-Standard Deviation (RDW-SD)	93.00 fL	82.71-130.27
Red Cell Distribution Width Coefficient of Variation (RDW-CV)	10.61%	7.48-13.53
Creatinine (CREA)	56.72 μmo/l L	30.25-45.07
Urea nitrogen (BUN)	18.96 mmo/l L	6.90-12.14
Globulin (GLB)	41.83 g/L	20.39-34.40

*Provide reference here

Furthermore, blood dilution biochemical tests carried out using the IDEXX Catalyst One (IDEXX, IDEXX Laboratories (Shanghai) Co., Ltd, Hongqiao Business Building, No. 2272 Hongqiao Road, Changning District, Shanghai, China) fully automated biochemical analyzer showed elevated levels of creatinine, urea nitrogen, and globulin (Table 1) (Dujowich *et al.*, 2005). On the other hand, coagulation tests demonstrated normal coagulation and effectively ruled out the possibility of the Rough-legged Buzzard consuming voles contaminated with anticoagulant drugs such as bromadiolone.

Based on the above findings, the attending veterinary surgeon diagnosed the Rough-legged Buzzard with a suspected foreign body in its crop.

Subsequently, the bird was sedated with Butorphanol (0.5mg/kg, NA, MSD, Merck Sharp & Dohme Animal Health (Shanghai) Co., 1582 Gumei Road, Xuhui District, Shanghai, China) nasal drops, administered intravenous propofol (2.0mg/kg, IV, Peifen, Jiabo Pharmaceutical, Bio-medical City, High-tech Industrial Development Zone, Qingyuan City, Guangdong Province, China, underwent tracheal intubation, and had anesthesia established. Using an endoscope (8mm multi-purpose electronic soft mirror, Xi'an Xichuan Medical Equipment Co., Ltd), the veterinary surgeon successfully removed putrefactive food, a large number of plastic bags, hairs, and other foreign objects from the crop (Fig 2). The endoscope examination also revealed the presence of a large ulcer in the crop.



Figure 2 The foreign object that was removed from the crop of the Rough-legged Buzzard (*Buteo lagopus*).

The Rough-legged Buzzard was diagnosed with a foreign body in the crop and crop inflammation, and during subsequent treatment the Rough-legged buzzard experienced reflux and loss of appetite. Application of histamine H2 receptor antagonists by attending veterinarians (Omeprazole, 0.5 mg/kg, PO q24h 7d; Oak, Changzhou Four Medicine Factory Co., No.168, Ligong Road, Chashan Street, Changzhou City, Jiangsu Province, China), antibiotic (Enrofloxacin, 15 mg/kg, PO q24h 7d; Baytril, Germany), probiotics (1g, PO q24h 5d; Beijing Bailin Kangyuan Biotechnology Co., 2F, Building 7, No.19 Courtyard, Tianrong Street, Daxing Biomedical

Industry Base, Zhongguancun Science and Technology Park, Daxing District, Beijing, China), for anti-infective and gastrointestinal flora regulation. Over the course of the following 7 days, the Rough-legged Buzzard showed gradual improvement, regained its ability to fly effectively, and was successfully released back into the wild.

Discussion

The Rough-legged Buzzard is a migratory medium-sized raptor that feeds on small rodents such as voles and small birds, and primarily nests in wetlands and taiga forests in the northernmost parts of

Eurasia during the breeding season. It is a highly adaptable raptor that can thrive in a variety of habitats. However, the shrinking range of its natural habitat, severe environmental pollution, and direct conflicts between wildlife and urban human life have led to an increasing mortality and morbidity rate for wildlife. Reduction of wildlife habitat due to urbanization (Murray *et al.*, 2018) and reduced availability of wetlands is one of the factors responsible for the sudden decline in wildlife population, and the causes of morbidity and mortality are: 1. Human-induced injuries such as car accidents, striking injuries, electrocution, and impeller strikes from wind power generation (Lucas *et al.*, 2008; Vigneault *et al.*, 2021); 2. Harvesting of foreign objects (such as plastics, rubber, etc.), and food poisoning (Clausen *et al.*, 1981); and 3. Non-human-induced injuries, such as West Nile disease (West Nile Virus, WNV) infection (Smith *et al.*, 2018).

Plastic pollution has become a global environmental problem, as early as the early 20th century, plastic waste has been spreading in the environment (Bijker 1987), to the 1960s, plastic waste as well as become the most common and serious environmental pollution problems, the environment, human health has a huge impact (Blettler *et al.*, 2017), in recent years, the relevant reports on the wildlife foraging, entanglement (Provencher *et al.*, 2017; José 2002), or due to plastic waste death cases have been increasing year by year. Studies of foreign body ingestion by raptors have focused on vultures or birds that consume carrion food, which are considered opportunistic and have a higher probability of being associated with humans and plastic waste (Cunha *et al.*, 2022; Ballejo *et al.*, 2021).

In the present case, the foreign body mistakenly ingested by the Rough-legged Buzzard was only lodged in the crop, and foreign bodies such as plastic and hair have not yet been seen in the stomach and lower gastrointestinal tract. Foreign bodies in the gastrointestinal tract have been reported in other birds, such as parrots with gastric perforation due to foreign bodies in the stomach (Hoefler *et al.*, 2013), *Acridotherestrictis*, and *Falco rusticolus* (Lloyd, 2009). Gastrointestinal foreign bodies are usually not easily detected in the wild and are likely to be life-threatening. Causes include pica, foraging, and other non-specific symptoms such as loss of appetite, dehydration, lethargy, and decreased or absent GI motility. The source of pica mainly comes from the presence of household waste such as plastic in the habitat; pica in captive raptors may be caused by the dense interactions between the feeding range and the human living area, whereas pica in individual wildlife such as peregrine falcons, kestrels, and owls may originate from the excessive pressure given by the outside world (Applegate *et al.*, 2017). However, factors that led the Rough-legged Buzzard to forage for foreign objects in this case may not be confirmed. For raptors as a species, the probability of consuming large pieces of plastic or larger plastic pellets is low. However, studies have shown that the diet of the *Strix varia* has been influenced by urban civilization, with rats being the main food source for the species, and since rats sometimes forage for plastic, and the source

of the plastic may be due to secondary ingestion, the *Strix varia* ingests more anthropogenic garbage than would be expected (Caldwell *et al.*, 2020).

Here, the Rough-legged Buzzard, on clinical physical examination, we found a decreased body condition score, which may have existed in relation to a reduced dietary intake in the life prior to the misuse of the foreign body. Because of the altered rate of movement of the gastrointestinal system, in raptors, infectious diseases should be considered. Fortunately, infectious disease was not found in the present case. Complete history taking, physical examination, laboratory tests, and imaging are useful in the diagnosis of the disease and help in the detection of underlying disorders such as poisoning and electrolyte disorders. After the sick animal is stabilized, a noninvasive examination can be performed to screen for abnormal enlargement of the body cavity and is a critical tool in the evaluation of gastrointestinal foreign bodies or obstruction and is helpful in confirming the uneven density of imaging structures within this Rough-legged Buzzard.

Appropriate management, including early diagnosis and intervention, needs to be considered in order to improve the survival of raptors that ingest foreign bodies. However, for different types of wildlife, digestive foreign bodies should be disposed of slightly differently or treated with a combination of multiple techniques, such as endoscopy (Lloyd, 2009), surgery (Hoefler *et al.*, 2013), and gastric lavage (Grunkemeyer *et al.*, 2021). Gastric lavage is not effective in the treatment of intragastric foreign bodies in raptors because the stomach is too dense with the foreign body for effective removal or flushing of intragastric foreign bodies, which needs to be addressed by surgical treatment. In this case, the attending veterinarian found that the foreign body was only in the crop and treated it endoscopically, and the Rough-legged Buzzard fed on its own 3d after symptomatic treatment.

The frequency of plastic ingestion by vultures is the highest among all raptors and is related to the fact that this species lives in colonies on human domestic dumpsites and is predominantly a carrion feeder, and that human waste may pose a serious threat to wildlife foraging environments. In this case, the ingestion of plastic was the main factor contributing to the abnormality of this rough-legged Buzzard, and increased awareness of conservation management and less environmental plastic contamination are key measures to reduce foreign body ingestion by wild raptors. We recommend that management routinely screen raptor nests and feces for plastics, which will help us to more fully understand the exposure of plastics in wildlife to improve the assessment of plastic intake and the identification of associated potential risks.

This case describes the surgical management of a Rough-legged Buzzard due to crop foreign body and crop inflammation caused by accidental ingestion of plastic. The clinical presentation of this case was characterized by complete loss of flight ability, depression and putrid discharge from the corners of the mouth. Radiograph was taken to determine where the animal's body was abnormal, and it was finally

found that there was a large amount of food in the crop of the Rough-legged Buzzard, and the density was uneven, which was suspected to be a foreign body. Therefore, the veterinarian decided to anesthetize him and perform an endoscopy. The food in the crop was removed using an endoscope and was found to be putrefactive food, a large number of plastic bags, hair, etc., and a large, ulcerated crop was seen. Finally, the Rough-legged Buzzard was diagnosed with crop foreign body and crop inflammation and was gradually restored to health and successfully released after medical treatments.

Acknowledgements

We thank all authors and the Heilongjiang Bayi Agricultural University for their contributions to this report.

Conflict of interest: All authors had no conflicts of interest to declare.

References

- Applegate JR, Van Wettere A, Christiansen EF, Degernes LA 2017. Management and Case Outcome of Gastric Impaction in Four Raptors: A Case Series. *J Avian Med Surg.* 31:62-69.
- Ballejo F, Plaza P, Speziale KL, Lambertucci AP, Lambertucci SA. 2021. Plastic ingestion and dispersion by vultures may produce plastic islands in natural areas. *Sci Total Environ.* 755: 142421.
- Blettler MC, Ulla MA, Rabuffetti AP, Garello N 2017. Plastic pollution in freshwater ecosystems: macro-, meso-, and microplastic debris in a floodplain lake. *Environ Monit Assess.* 189:581.1-581.13.
- Bijker WE 1987. The social construction of bakelite: toward a theory of invention. MIT Press. 159-187
- Caldwell A, Seavey J, Craig E 2020. Foraging strategy impacts plastic ingestion risk in seabirds. *Limnol Oceanogr Lett.* 5.
- Clausen B, Gudmundsson F 1981. Causes of mortality among free ranging gyrfalcons in Iceland. *J Wildl Dis.* 17:105-109.
- Cunha WA, Freitas ÍN, Gomes LAS, de Oliveira Gonçalves S, Montalvão MF, Ahmed MAI, Malafaia G 2022. From carrion-eaters to plastic material plunderers: Toxicological impacts of plastic ingestion on black vultures, *Coragyps atratus* (Cathartiformes: Cathartidae). *J Hazard Mater.* 424.
- Dujowich M, Mazet JK, Zuba JR 2005. Hematologic and biochemical reference ranges for captive California condors (*Gymnogyps californianus*). *J Zoo Wildl Med.* 36:590-597.
- Gregory NG, Robins JK 1998. A body condition scoring system for layer hens. *N Z J Agric Res.* 41:555-559.
- Grunkemeyer V, Swisher S 2021. Backyard poultry and waterfowl. *Exot Anim Emerg Crit Care Med.* 664-693.
- Hoefler H, Levitan D 2013. Perforating Foreign Body in the Ventriculus of an Umbrella Cockatoo (*Cacatua alba*). *J Avian Med Surg.* 27:128-135.
- José GB Derraik 2002. The pollution of the marine environment by plastic debris: a review. *Mar Pollut Bull.* 44:842-852.
- Lloyd C 2009. Staged endoscopic ventricular foreign body removal in a gyr falcon (*Falco rusticolus*). *J Avian Med Surg.* 23:314-319.
- Lucas MD, Janss GFE, Ferrer WM 2018. Collision fatality of raptors in wind farms does not depend on raptor abundance. *J Appl Ecol.* 45:1695-1703.
- Murray MH, Kidd AD, Curry SE, Hepinstall-Cymerman J, Yabsley MJ, Adams HC, Hernandez SM 2018. From wetland specialist to hand-fed generalist: shifts in diet and condition with provisioning for a recently urbanized wading bird. *Philos Trans R Soc B Biol Sci.* 373:20170100.
- Provencher JF, Bond AL, Avery-Gomm S, Borrelle SB, Rebolledo ELB, Hammer S, Van Franeker JA 2017. Quantifying ingested debris in marine megafauna: a review and recommendations for standardization. *Anal. Methods.* 91454-1469.
- Smith KA, Campbell GD, Pearl DL, Jardine CM, Salgado-Bierman F, Nemeth NM 2018. A retrospective summary of raptor mortality in Ontario, Canada (1991-2014), including the effects of West Nile virus. *J Wildl Dis.* 54:261-271.
- Vigneault A, Fitzgerald G, Desmarchelier M 2021. A retrospective study of femoral fractures in wild birds of prey: 119 cases. *J Zoo Wildl Med.* 52:564-57.