

## Short notes

# The parasites of the mallard duck (*Anas platyrhynchos*) as an indicator of health status and quality of the environment

Rajmund Sokół<sup>1</sup>, Małgorzata Raś-Noryńska<sup>1</sup>, Michał Gesek<sup>2</sup>, Daria Murawska<sup>3</sup>, Vladimir Hanzal<sup>4</sup>, Paweł Janiszewski<sup>5</sup>

<sup>1</sup>Department of Parasitology and Invasive Diseases, Faculty of Veterinary Medicine, University of Warmia and Mazury, ul. Oczapowskiego 13, 10-719 Olsztyn, Poland

<sup>2</sup>Department of Pathological Anatomy, University of Warmia and Mazury, ul. Oczapowskiego 13, 10-719 Olsztyn, Poland

<sup>3</sup>Department of Commodity Science and Animal Improvement, University of Warmia and Mazury, ul. Oczapowskiego 5, 10-719 Olsztyn, Poland

<sup>4</sup>Department of Landscape Management, Faculty of Agriculture, University of South Bohemia, Studentska 13, 370-05 Ceske Budejovice, Czech Republic

<sup>5</sup>Department of Fur-Bearing Animal Breeding and Game Management, University of Warmia and Mazury, ul. Oczapowskiego 5, 10-719 Olsztyn, Poland

Corresponding Author: Rajmund Sokół; e-mail: rajmund.sokol@uwm.edu.pl

**ABSTRACT.** The mallard duck (*Anas platyrhynchos*) is a host to internal and external parasites. A heavy parasite burden indicates poor immunological status and a pathogen-contaminated environment. The present study describes the macroscopic and microscopic examination of isolated intestines and gizzards of 130 mallard ducks from birds kept in the breeding farm. Scrapings of intestinal mucosa were examined by flotation and with the sedimentation method. The results of the flotation method indicate the presence of coccidia oocysts in the ileum scrapings from one of five male mallards aged six weeks, one out of five aged 10 weeks and three out of five aged 12 weeks. In female mallards, oocysts were found in two of five birds aged 12 weeks and in two of five aged 16 weeks. No macroscopic lesions were found in the intestinal mucosa. Adult forms of the nematode *Amidostomum anseris* were found in the gizzards of six mallards aged 20 weeks and in two aged 22 weeks. The relatively low prevalence of parasitic infections reflects the purity of the environment, good immunity status of the birds and good management of the farm.

**Key words:** mallard duck, parasites, environment, indicator

## Introduction

The mallard (*Anas platyrhynchos* Linnaeus, 1758), a species of waterfowl of the family Anatidae, is the world's most widespread duck, inhabiting mainly the northern hemisphere from subtropical to subarctic regions. They do not generally dive when searching for food, preferring to dabble only the front part of the body. Under natural conditions, they are often present in groups with other waterbirds.

It is common practice to supply the population of free-living mallard ducks with captive-reared individuals for conservation, game and hunting purposes. However, captivity is known to often

result in morphological maladaptation that could affect the functional efficacy of the digestive system [1–4] and therefore make the birds more susceptible to parasitic infection. Both free living and captive mallards act as hosts for many parasites, and as the clinical significance of the vast majority of parasite species remains not fully defined, especially in the case of mixed invasion, the impact of each diagnosed species must be assessed in the context of co-existing factors such as other parasites, general diseases, overcrowding or nutritional deficiencies and environmental factors [5].

Due to the pollution of their natural habitat, mallards often experience poisoning by heavy metals (cadmium and lead), which in ionic form are

Table 1. Number of birds infected with *Eimeria* spp. and *Amidostomum anseris* dependant on age and sex

Sex	Tissue	Age (in weeks) n=5												
		1	2	3	4	6	8	10	12	14	16	18	20	22
♀	gizzard	-	-	-	-	-	-	-	-	-	-	-	5 a	-
n=65	intestines	-	-	-	-	-	-	-	2 o	-	2 o	-	-	-
♂	gizzard	-	-	-	-	-	-	-	-	-	-	-	1 a	2 a
n=65	intestines	-	1 o	-	-	1 o	-	1 o	3 o	-	-	-	-	-

o – *Eimeria* spp. oocysts, a – *Amidostomum anseris*

easily absorbed into the bird's body [6,7]. Poisoning leads to immunosuppression, which makes the birds more susceptible to previously unseen parasite species [8]. Among the different species of parasites that cause the greatest losses among mallards are leeches of the genus *Theromyzon*, coccidia, nematodes of the genus *Amidostomum*, *Echinuria*, *Capillaria*, *Streptocara* and *Eucolus*, flukes and tapeworms [5,9,10]. It has been shown that mallards succumb also to viral diseases and can be a reservoir of viruses dangerous to humans, such as bird flu.

## Materials and Methods

The study examined the intestines (jejunum, caecum and rectum) and gizzards isolated from 130 mallard ducks (65 females and 65 males) kept in the breeding farm of the company „Lesy and rybníky mesta, Ceske Budejovice s.r.o. (Czech Republic). The birds were reared to be released into the wild and mix with the local population. Until the 28th day of life, the mallards were kept in a closed building in the conditions typical for ducklings. Throughout the rearing period, the birds were fed *ad libitum* commercial Mallard food and feed consumption was not recorded. After completing four weeks of life, some of the ducklings were released. Other birds, intended to replace the parent flock, were kept in an aviary with access to a water reservoir which was also used by free-living waterbirds.

Every seven days between the first and 28th day of life, 10 birds (five male and five female) were randomly chosen from the rearing house, and every 14 days between the 28th and 154th day of life, ten birds were chosen from the aviary. The birds were slaughtered by quick decapitation. Obtained organs (gizzard, jejunum, ileum rectum, cecum and cloaca)

were examined macroscopically and under the light microscope. Scrapings of intestinal mucosa were examined by the flotation method with Darling's solution (50% saturated saline solution and 50% glycerol) and with the sedimentation method according to Żarnowski and Josztowa [11]. Intestinal scrapings were rubbed through a sieve and mixed with Darling's solution to a volume of 10 ml and centrifuged for six minutes at 2500×g.

Following this, 10 µl of the mixture was transferred to the glass and viewed under the light microscope at 400× magnification. The gizzards were cut into strips of 3 mm and examined macroscopically after removal of the grinding pads and lining.

This research was conducted with the approval of the Local Ethical Committee at the University of South Bohemia in Ceske Budejovice.

## Results

The flotation method examination revealed coccidia oocysts in the ileum scrapings from four female and six male mallards of different age. Prevalence of the infection was estimated at 9.2% for male and 6.1% for female birds. The intensity of infection was very low: on average only a few oocysts in a 10µl sample. No macroscopic lesions were found in the intestinal mucosa. Several adult forms of the nematode *Amidostomum anseris* (Zeder, 1800) were found in the gizzard of one male and five female mallards aged 20 weeks and in two males aged 22 weeks. Detailed results are shown in Table 1.

## Discussion

Coccidial parasites are prevalent in many species of birds. As a subclinical mild infection is believed

to promote protective immunity to subsequent infections in free-ranging and captive mallards, it is recommended that the coccidia population in a flock should be monitored and controlled, rather than eradicated [5]. Our findings indicate that the infection is self-limiting and that acquired immunity increases with the age of the bird. Controlling coccidian infections in wild and released mallards has not been necessary.

Infection with *Amidostomum anseris*, a nematode with a direct life cycle, is very common in ducks [5]. The prepatent period is only 15 to 20 days post-infection. Hence, gizzard worms are of great concern in birds living in a closed area, especially aviaries. The lesions caused by this nematode are related to the number of parasites, and heavy infections may result in ulceration and necrotic granulomas within the gizzard mucosa and muscle. However, the experimental birds only presented minor lesions limited to inflammatory foci at the site of attachment of the nematodes.

The mallard duck is regarded as a very good indicator organism. Previous studies have found the mallards in western Poland to be in poor condition, and these findings hence testify to the poor quality of the local environment [6]. Our obtained results indicate that captively-reared mallards remain in good health with kept with limited contact with the wild population. The relatively low prevalence of parasitic infections testifies to the purity of the environment, good immunity status of the birds and good management of the farm.

## References

- [1] Champagnon J., Guillemain M., Elmberg J., Massez G., Cavallo F., Gauthier-Clerc M. 2012. Low survival after release into the wild: assessing “the burden of captivity” on Mallard physiology and behaviour. *European Journal of Wildlife Research* 58: 255-267.
- [2] Champagnon J., Guillemain M., Elmberg J., Folkesson K., Gauthier-Clerc M. 2010. Changes in Mallard (*Anas platyrhynchos*) bill morphology after thirty years of supplemental stocking. *Bird Study* 57: 344-351.
- [3] O'Regan H.J., Kitchener C.A. 2005. The effects of captivity on the morphology of captive, domesticated and feral mammals. *Mammal Review* 35: 215-230.
- [4] Liukkonen-Anttila T., Saartoala R., Hissa R. 2000. Impact of handrearing on morphology and physiology of the Capercaillie (*Tetrao urogallus*). *Comparative Biochemistry and Physiology - Part A: Molecular & Integrative Physiology* 125: 211-221.
- [5] Ballweber L.R. 2004. Waterfowl Parasites. *Seminars in Avian and Exotic Pet Medicine* 13: 197-205.
- [6] Kalicińska E., Salicki W., Mysłek P., Kavetska K.M., Jackowski A. 2004. Using the Mallard to biomonitor heavy metal contamination of wetlands in north-western Poland. *Science of the Total Environment* 320: 145-161.
- [7] Wałkuska G., Bojar H., Chałabis-Mazurek A., Kurska K. 2010. Mallard (*Anas platyrhynchos* L.) as bioindicator of pollution with selected heavy metals of some water reservoirs in the Lublin District. *Fresenius Environmental Bulletin* 19: 383-389.
- [8] Betlejewska K.M., Kalisińska E., Korniyushin V.V., Salamatin R. 2002. *Eucoleus contortus* (Creplin, 839) nematode in mallard (*Anas platyrhynchos* Linnaeus, 1758) from North-Western Poland. *Electronic Journal of Polish Agricultural Universities* 5 (1).
- [9] Kozhokov M.K., Aramisov A.M., Afaunova L.K. 2007. Formation of mixed invasion of waterfowl. *Russian Agricultural Sciences* 5: 339-340.
- [10] Lebedeva D.I., Yakovleva G.A., Ieshko E.P. 2015. Nematodes in the mallard (*Anas platyrhynchos* Linnaeus 1758) and the common goldeneye (*Bucephala clangula* Linnaeus, 1758) (Anatidae) from Northern Europe. *Parasitology Research* 114: 3935-3937.
- [11] Ziomko I., Cencek T. 1995. Outline of laboratory diagnostic of farm animal parasites. National Veterinary Research Institute, Pulawy, Poland.

Received 13 July 2016

Accepted 23 September 2016