

Case Report

First report of *Sarconema eurycerca* (Filarioidea) in mute swan (*Cygnus olor*) in Poland – the case report

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Summary

Mute swans (*Cygnus olor*) of the Anatidae family are common in wetlands of Europe. They winter in Africa, Asia and some parts of Europe. The species is exposed to many pathogens in its places of residence, including parasites possibly introduced from tropical countries by other species of birds that take long wanderings and occupy a similar ecological niche. One such case is the infection of the *Sarconema eurycerca*, nematode belonging to the Filarioidea family. It invades the bird's myocardium and, according to some authors, this nematode may be one of the main causes of swans' deaths. The material for the present study was an approximately 2 year old female mute swan, which during the flight fell suddenly to the ground in Pomorskie Voivodeship (Poland, 53°50'18"N 18°12'54"E) in November. During the examination and medical observation, weakness, diarrhea and infestation with lice were found. The cause of its eventual death was attributed to a failure of the circulatory system. Post mortem, two abscesses with diameters of 2-3 cm were found in its liver parenchyma. Three nematodes were visible in the epicardium and many more in myocardium. Upon cutting open the heart, small yellowish foci, about 1 mm in diameter were scattered over valves. On the basis of morphological features, infection by *Sarconema eurycerca* was concluded. As far as we are aware, in Poland there were no earlier reports of this parasite infecting a swan.

Keywords: case report; Cygnini; hearth worms; myocardium; nematode; waterfowl

Introduction

Mute swans (*Cygnus olor*) are partially migratory water birds belonging to the Anatidae family. They are quite common around water bodies in Poland. In recent years, swans wintering in Poland have also been observed, both on non-freezing inland waters and on the Baltic coast, e.g. in the Gulf of Gdańsk (Bzoma & Meissner, 2005). Migratory flights occur in February – May and September – December. Swans are large birds: adults measuring 144 – 158 cm measuring from the beak to the end of the tail, with a wing span of 2 – 2.5 m. They over-winter in northern Africa, central and southern Asia and in some parts of Europe (Wieloch, 1991). The resident

breeding population of these birds is estimated at approximately 5,000 – 6,000 pairs. Their diet consists mainly of plant food with the addition of crustaceans and other invertebrates. They can consume up to 10 kg of aquatic plants per day (Minnesota Department of Natural Resources). Mute swans are precocial birds, hence the cygnets are looked after by both the male and the female. In Poland, as by The Birds Directive (Directive 2009/147 / EC of 30 November 2009) they are subject to strict species conservation and require active protection. Unfortunately though, the mute swan is susceptible to an array of pathogens, both those endemic to its breeding grounds and those acquired from tropical countries during their own migration or by other birds, e.g. by ducks (Gaidet

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et al., 2010; Takekawa et al., 2010). Among the most dangerous swan pathogens are parasites. From the group of endoparasites, the most frequently detected are: *Trichomonas* spp., *Eimeria* spp., Schistosomatidae, *Echinoparyphium recurvatum*, *Orchipedium tracheicola*, *Wardoides nyrocae*, *Amidostomum anserinus*, *Capillaria* spp., *Echinuria uncinata*, *Sarconema eurycerca*, *Filicollis anatis* and *Polymorphus minutis* (Pennycott, 1998; 1999; Ballweber, 2004). In turn, in the group of ectoparasites, mainly infections of lice (Mallophaga) are diagnosed, e.g. *Anaticola cygnopsis*, *Ciconiphilus pectiniventris*, *Trinoton querquedulae* and *Trinoton anserinum* (Lapage, 1961; Cohen et al., 1991; Ballweber, 2004). Most relevant to the present report is the *S. eurycerca* nematode of the Filarioidea family which occurs in many species of wild waterfowl including swans and geese (Cole, 1999; Bartlett, 2008). Adult worms settle in the myocardium, probably in the coronary veins, within the epicardium, myocardium and endocardium. The female nematode gives birth to microfilaria, which then circulate in the bird's peripheral blood, from where they can be taken up by ectoparasites. From blood-collecting arthropods, microfilaria enter the final host in which they migrate to the myocardium. There, they reach sexual maturity (Wehr, 1939). An important vector, as well as an intermediate host for the cardiac worm *S. eurycerca*, are the aforementioned lice *Trinoton querquedulae* and *T. anserinum* (Wehr, 1939), as confirmed in the studies by Seegar et al. (1976), and. According to some authors, *S. eurycerca* may be one of the main causes of swan deaths (Ballweber, 2004).

Material and Methods

The object of the present study was a female mute swan weighing 8.20 kg at the age of about two years as indicated by grey tips of the alulas and by the absence of annulus. According to witnesses, the bird suddenly fell to the ground while flying over the village of Czubek, the municipality of Kaliska, Pomorskie Voivodeship (53°50'18"N 18°12'54"E). The swan was recovered alive and was transported to the Pomeranian Center for Rehabilitation of Wild Animals "Ostoja" in Pomieczyn. The swan stayed and was treated at the Pomeranian Center from November 9, 2017 to the day on which the bird was found dead on November 18, 2017. At the Center, the swan had no contact with other animals; it was lodged in solitary confinement in a covered aviary for water birds, with easily washable floors, a swimming pool with drain, rubber mats and artificial grass. During the stay at Pomeranian Rehabilitation Center for Wild Animals full clinical examination was performed. During the stay, the following treatment was used: Insectin (permethrin cis / trans 25:75, 10 mg / g, external: Biowet; Puławy; Poland), Betamox L.A. (amoxicillin 150mg / ml; ScanVet; Skierzeszewo; Poland, 300.0 mg *subcutaneous* every 24 hours), Orungal (itraconazole 100mg; Janssen-Cilag International NV; Beerse; Belgium, 50.0 mg *per os* every 24 hours). The bird did not feed on its own, therefore it was fed with esophageal feeding tube two times a day with a mix of rescue feeds Dr Ziętek for animals feed-

ing on seeds and plants (Manufacturer - Ambulance of small mammals Dr Ziętek, Lublin, Poland) along with supplementation with Oro-Digest and Probi-Zyme (Versele-Laga, Deinze, Belgium, acc. manufacturer's recommendations).

A full postmortem examination was performed in Pomeranian Rehabilitation Center for Wild Animals "Ostoja" according to standard guidelines (Van Riper & Van Riper, 1980). After the detection of parasites, the heart was transported to Department of Parasitology and Invasive Diseases, for further diagnosis. No other tissues were collected. During heart autopsy, nematodes were dissected from epicardium and fixed in 70 % ethanol for further testing. Parasites species were identified based on their morphological characteristics under a Leica M165C stereoscopic microscope (Leica Microsystems GmbH, Wetzlar, Germany) (×40 magnification). The scientific publications available in Pubmed were helpful in identifying the parasites (Wehr, 1939; Holden & Sladen, 1968; Bekir et al., 2015). Descriptive statistic of nematodes length (Mean – *M*; Median – *Me*; Standard Deviation – *SD*; Standard Error – *SE*; Coefficient Interval 95 % – *CI* 95 %; Variance – *V*) was calculated using the Statistica 13.1 program.

Ethical Approval and/or Informed Consent

The swan was handled according to good veterinary practice and Polish veterinary regulations. Pomeranian Center for Rehabilitation of Wild Animals "Ostoja" in Pomieczyn has permission from the Ministry of the Environment for treating and holding wild animals (DZPWG.6520.21.2015.mk).

Results and Discussion

At the examination, no bone fractures were detected. Numerous but minor abrasions around the right elbow and right foot, caused by falling, did not require skin care procedures, and analgesics were not used. In the feathers, lice infestation was present but species identification was not performed. There were some cornified plantar masses on the bird's feet. During continued observation, the following symptoms were recorded: weakness and diarrhea (only at the beginning of the stay, probably caused by stress related to the transport to the Center) and abnormal for the species reactions to environmental stimuli and to the presence of humans, in the form of excessive vocalization and aggression.

The cause of the swan's death 10 days after arrival at the Center was a failure of the circulatory system. Post mortem, two abscesses with diameters of 2 – 3 cm were found in its liver parenchyma. Three nematodes were visible in the epicardium (see Fig. 1), and numerous nematodes were present in the myocardium. Upon cutting open the heart, small yellowish foci about 1 mm in diameter were scattered over valves. Pancarditis and dilated cardiomyopathy within the ventricles were demonstrated during cardiac section examination. The official pathological diagnosis was avian parasitic pancarditis.

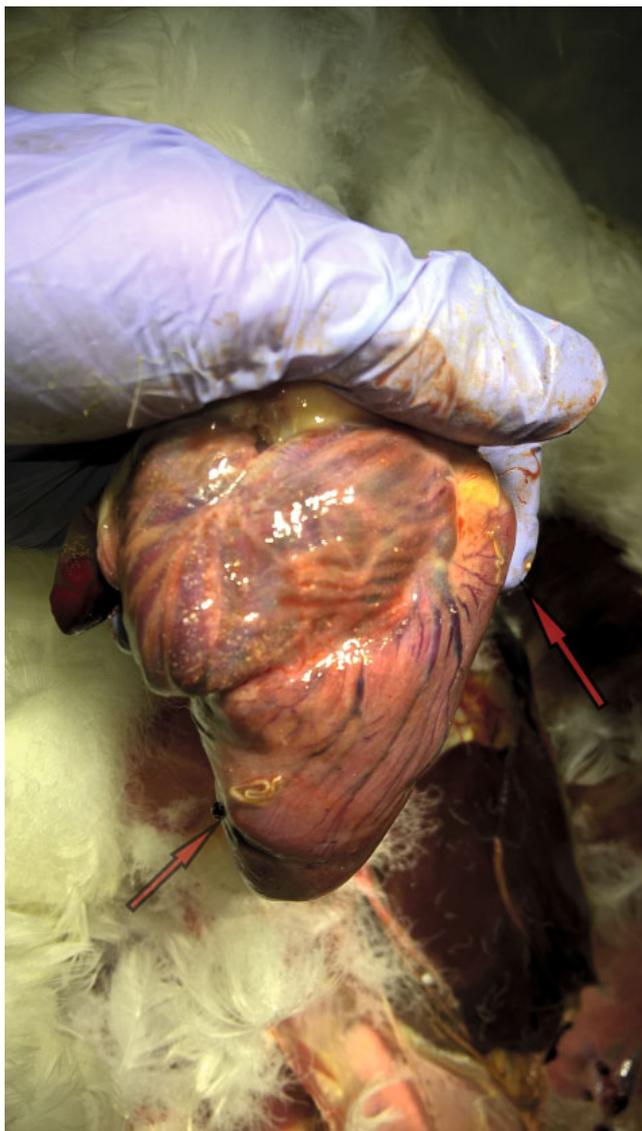


Fig.1 A photo from an anatomopathological study of a mute swan showing the heart with *Sarconema eurycerca*. The nematodes were marked with arrows.

The nematodes mean long was $M=6,87$ cm ($Me=6,9$; $SD=0,35$; $SE=0,20$; $CI\ 95\%=5,99-7,74$; $V=5,11$). On the basis of morphological features, it was established that the nematodes belong to the *Sarconema eurycerca* species. Most likely, this nematode infection of the heart led to the fall of the bird (as a result of cardiorespiratory distress) and, subsequently, to its death from heart failure. *Sarconema eurycerca* has been most often observed in North America and in Asia. It was first identified and described in the USA in the states of Washington, Wisconsin and Utah in whistling swan *Cygnus columbianus* (Wehr, 1939). In 1975, *Sarconema eurycerca* infections in Canada were recorded by MacNeil (1975) in whistling swan and independently by Irwin who found that the prevalence of this parasite in an Ontario swan population

amounted to over 50 % in the same species. Decades later, the nematode was reported in Japan (Yoshino *et al.*, 2009) and Korea (Woo *et al.*, 2010). Soon thereafter, Saparov *et al.* (2013) reported 15 cases of the infection of *S. eurycerca* in the wild Anseriformes in Uzbekistan, and one year later Bekir *et al.* (2014) described the first case in Turkey.

The available literature provides also evidence of the migration of this nematode towards Europe. The first case report of *S. eurycerca* diagnosed in Europe came from England (Boughton, 1965). Forty years later, the nematode was diagnosed in Austria (Khayal *et al.*, 2010) and in the Netherlands (de Bruijn, 2009). Currently, there are no reports of this parasite from Central or Northern Europe. In particular, it is our understanding that the parasite has never before been recognized in Poland (Kavetska, 2008).

The reports from Western Europe pointed to a similar course of infection and its consequences for swans as in our case. Kluge (1967) described *S. eurycerca* pancarditis with yellowish foci scattered over the epicardial and endocardial surfaces of the heart and throughout the 1 – 2 mm myocardium. Similar changes were observed in our case. According to available literature the most important changes in the histopathological picture of the heart during the *S. eurycerca* infection include: scattered foci with zigzag pattern of myocardial fibres, numerous basophilic granules in their sarcoplasm, interstitial fibrosis throughout the myocardium, focal areas of chronic inflammation characterized by fibrin deposition, local mineralization within the epicardium, as well as endocardium and myocardium necrosis (Kluge, 1967; Woo *et al.*, 2010). In studies on physiological effects of *S. eurycerca* on birds, a significant reduction in body weight was observed regardless of age and gender (Seegar, 1979). In our case, we also found an approximate 30 % reduction in the bird's body weight (8.2 kg), as the normal range for 2 year old mute swan females is 11 – 12 kg. Due to the location of the parasite, detection of the infection is difficult. So far, no diagnostic methods or treatment have been developed against *S. eurycerca*, which in future may pose a threat to native swan populations, and also creates the possibility of endemic sites for this parasite in Europe. The detection of the infection of *S. eurycerca* in northern Poland indicates the need for monitoring wild birds, especially swans, in the direction of infection with this nematode. It is also advisable to pay attention to the occurrence of similar cases in other areas of Northern and Central Europe.

Conflict of Interest

Authors state no conflict of interest

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