REPRODUCTIVE CHARACTERISTICS OF THE CAPTIVE MILKY STORK (*MYCTERIA CINEREA*) IN ZLIN ZOO, CZECH REPUBLIC

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Abstract

The limited range of Milky Stork in its natural habitat, as well as in under captivity, makes it difficult to learn more about it. This paper aimed to examine the breeding biology of Milky Stork raised in captivity in the Zlín-Lešná Zoo in the Czech Republic. By analyzing partial reproduction characteristic, we wanted to supplement the knowledge that is needed to ensure the necessary degree of reproduction of the Milky Stork in human care. The monitoring was carried out in the Zlín-Lešná Zoo and the following reproductive indicators were analysed: annual laying rate, size and weight of eggs laid, monitoring of egg weight loss during incubation, hatchability, and hatching weight. During the four years, a total of 23 eggs of the Milky Stork by one parent pair were evaluated. The average proportion of fertilised eggs over the whole period reached 56.5%. The average eggs length was 65.7 mm, the average eggs width was 47.0 mm and the average eggs weight was 79.7 g. Average weight loss of eggs during their incubation was 8.4 g. Average hatchability of all the laid eggs was 56.5%. A total of 13 young Milky Storks were hatched during the observation period. Their average hatching weight was 55.7 g. A total of five individuals were raised during the four years of observation. Knowledge in the field of reproduction is one of the basic prerequisites to give this species a chance to survive in the future, whether in the natural environment or human care.

Keywords: ciconiiformes, milky stork, mycteria cinerea, reproduction, waterbird

INTRODUCTION

The natural habitat of the Milky Stork *Mycteria cinerea* is in Southeast Asia – Indonesia, Malaysia, Thailand, Cambodia, and Vietnam (Collar et al., 2001; Iqbal and Hasudungan, 2008; Syamal and Harianto, 2018). It is found mainly on coasts in tidal areas where it nests on mangrove stands and finds food in rice fields or reservoirs, marshes, and wetlands (Collar et al., 2001; Shepherd and Giyanto, 2009; Syamal and Harianto, 2018). Fish, prawns, and crabs are the main diet of the Milky Stork (BirdLife International, 2016). The Milky Stork grows to 95–100 cm tall (Elliott et al., 2019), weighs 2–3 kg, and has a wingspan of 70–100 cm (Zoo Zlín, 2017).

Milky Storks are social animals that live in small flocks, usually 10 to 20 pairs (up to several hundred pairs), often with other species of waterfowl. They nest in large, often multi-species colonies. It builds large nests from branches that are bounded by green vegetation in the treetops, at the height of 2 to 30 metres (Iqbal et al., 2008).

Milky Storks lay between one and four eggs (Zoo Zlín, 2017), and the incubation period is between 27 and 30 days (Hancock et al., 1992; Iqbal et al., 2008). Parents take turns in caring for their offspring.
The Milky Storks were bred seasonally. The transfer to the wintering grounds usually starts in October and is dependent on the ambient temperature. Usually, before morning, temperatures drop below freezing. The inner coops are 5 m × 4 m × 3 m and are heated to a temperature of 15 °C to 17 °C. The coops are equipped with branches with a diameter of 5–10 cm for perching and a shallow pool for bathing or feeding. The light regime is controlled by fluorescent lamps and shine ten hours a day. The move to the summer aviary takes place in April and is again dependent on the development of the weather. The outdoor aviary is equipped with a water surface with a water column height of 20 cm to 40 cm so that the Milky Storks can use their fishing technique when hunting for food. Also, the aviary is overgrown with low vegetation and trees and is supplemented by branches to provide a wider range of roosting and nesting sites. For better nesting in outdoor aviaries, there were placed on the tree platforms (60 cm × 60 cm), which served as the basis for building the nest.

After laying, the eggs were counted, measured, and weighed, and then again at regular intervals. The interval between individual weighings was 5–10 days to reduce the disturbance to the nesting activities of the observed pair as much as possible. During the reporting period, the following indicators were evaluated:

- annual laying rate,
- size and weight of the eggs,
- weight loss of eggs during incubation,
- hatchability and the number of hatchlings,
- hatch weight at hatching.

Statistical evaluation was performed using the statistical program STATISTICA 12.0. The LSD test was used to determine the conclusiveness between individual years of monitoring.

RESULTS AND DISCUSSION

Evaluation of Milky Stork Laying

Altogether, 23 eggs of the Milky Stork were evaluated during the monitoring period. In terms of the number of eggs laid, the most successful year for the breeding pair was 2013, when eight eggs were laid. On the contrary, the lowest number of eggs was laid in 2011 and 2014, four eggs (Tab. I).

The average proportion of fertilised eggs over the whole period reached 56.5% (13 eggs). The lowest proportion of fertilised eggs was in 2012 when only 28.6% of eggs (2 eggs) were fertilised. The highest proportion of fertilised eggs was recorded in 2014 when 100.0% of eggs were fertilised (4 eggs). The same proportion of fertilised eggs, 56.5%, was also found in the Yellow-billed Stork (Rečková et al., 2019). Egg damage only occurred in 2012 at a proportion of 14.3% (1 egg). In the other three years of observation, egg damage did not occur.

Evaluation of the Size and Weight of Milky Stork Eggs

During the entire follow-up period, the average Milky Stork egg length was 65.7 mm, the average...
egg width was 47.0 mm, and the average egg weight reached 79.7 g (Tab. II).

When comparing the size parameters of Milky Stork eggs with the other stork eggs, the average length of the Milky Stork eggs was 2.9 mm shorter than that of the Painted Stork (Rečková et al., 2017) and 0.4 mm shorter than that of the Yellow-billed Stork (Rečková et al., 2019). The difference in egg width between different species of stork was not pronounced. The Milky Stork egg was 0.6 mm wider than that of the Painted Stork (Rečková et al., 2017) and the width of the Yellow-billed Stork eggs was almost identical (Rečková et al., 2019). When comparing the size of the Milky Stork eggs with the Storm's Stork from the same family, the Milky Stork eggs were 5.5 mm longer and 5.1 mm wider than that of the Storm's Stork (Danielsen et al., 1997). The weight of the Milky Stork's eggs with other storks was almost identical to 79.8 g of Painted Stork and 80.5 g of Yellow-billed Stork (Rečková et al., 2019). Regarding the index of the shape of the egg, the Milky Stork's eggs and the Yellow-billed Stork's eggs were almost identical, namely 1.40 and 1.41 (Rečková et al., 2019), and slightly higher in the Painted Stork, namely 1.48 (Rečková et al., 2017).

The longest egg was found in 2014 when the average egg length reached 67.2 mm. On the contrary, the shortest eggs were obtained in 2011, when the average egg length was 64.8 mm, which is 2.4 mm less than that in 2014. There were no statistically significant differences in egg length between the individual years of monitoring.

In terms of egg width, the widest egg occurred in 2012 and measured 47.2 mm. The narrowest eggs were produced in 2014 when their width was 0.4 mm narrower than those in 2012, and their average value reached 46.8 mm. There were no statistically significant differences in egg width among the eggs from individual years.

Again, it was confirmed that in the year when the eggs were the longest (2014), they were also the narrowest. There was very little variation in the average width of Milky Stork eggs in individual years, so it was not confirmed that the eggs that were the widest would also be the shortest. This is also documented by the egg shape index, which was the highest in 2014, namely 1.43, and the lowest in 2011 when it reached 1.37, and immediately after that in 2012, when its value was only higher by 0.01, namely 1.38.

Regarding the weight of the eggs in each year of monitoring, the eggs with the highest weight were laid in 2013, when their average weight was 80.9 g. On the contrary, the lowest weight was reached in 2011, when their average weight was 2.5 g lower than those laid in 2013. Also, there were no statistically significant differences in egg weight during the individual years of monitoring.

### Evaluation of Egg Weight Loss During Incubation

Throughout the observation period, the average weight loss of the eggs during their incubation was 8.4 g. The average daily weight loss of eggs during their incubation was 0.4 g (Tab. III).

When comparing the weight loss of eggs during incubation with other species of stork, the weight loss was lowest in the Yellow-billed Stork, at 5.6 g (Rečková et al., 2019) and the highest was the Painted Stork, at 9.9 g (Rečková et al., 2017).
Regarding egg weight loss during incubation over the years of monitoring, the average egg weight loss during incubation was the lowest in 2011 (7.7 g). The highest average egg weight loss during incubation was in 2014 (10.7 g), which is 3.1 g more than in 2011. There was a statistically significant difference between 2011 and 2014 regarding weight loss.

In 2012, the average daily weight loss during egg incubation reached the lowest value of 0.3 g. The highest average daily weight loss during egg incubation was in 2014 (0.4 g), as well as the total weight loss during egg incubation. The average daily weight loss of eggs during incubation showed statistically significant differences between 2014, when the average daily weight loss was the highest, and in 2011 and 2012, when the average daily weight loss was statistically significantly lower.

**Evaluation of the Number of Hatched and Reared Milky Stork Hatchlings**

During the whole monitoring period, the average hatching rate of all laid eggs was 56.5%. The average hatching rate of fertilised eggs reached 100.0% during the entire monitoring period. A total of 13 Milky Stork hatchlings hatched during the monitoring period. A total of five individuals were bred during the monitoring period (Tab. IV).

In terms of hatching of the laid eggs, the most successful year was 2014, when the hatching percentage reached 100.0% of all laid eggs. The least successful year was 2012, when the average hatching rate reached 28.6% of all eggs laid.

The maximum hatching rate, 100.0% hatching from fertilised eggs, was reached in all years of the monitoring period for Milky Storks.

Regarding the number of hatched chicks, the most successful years were 2013 and 2014, when four chicks were hatched. The least successful year was 2012, when only two chicks hatched. In the Negara Zoo in Malaysia in the years 1990–1996, a total of 47 Milky Storks hatched; the minimum number of hatched chicks in one year was three and the maximum number of chicks was nine. In 2002 and 2005, 22 and 17 chicks were hatched, respectively (Ismail *et al.*, 2011).

In the Zlín Zoo the most successful year regarding the number of chicks hatched was 2014 when a total of four Milky Stork chicks hatched, and the success rate of rearing chicks was 100% that year. On the contrary, the least successful years concerning the number of reared chicks were 2012 and 2013, when unfortunately no chicks were bred. Regarding the breeding of Milky Stork chicks, Ismail *et al.* (2011) state that the breeding success rate is 48% in Negara Zoo.

Over the entire monitoring period, the average weight of chicks on hatching day was 55.7 g. The average weight of Milky Stork hatchlings is 1.4 g lower than that of the Painted Stork hatchlings (Rečková *et al.*, 2017) and 2.5 g lower compared to Yellow-billed chicks (Rečková *et al.*, 2019).
CONCLUSION

A total of 23 Milky Stork eggs from one parent pair were evaluated throughout the monitoring period. The average proportion of fertilised eggs was 56.5% (13 eggs). The following parameters of Milky Stork eggs were ascertained: the average egg length was 65.7 mm, the average egg width was 47.0 mm, and the average egg weight was 79.7 g. During the entire monitoring period, the mean weight loss of Milky Stork eggs during their incubation was 8.4 g. The average weight loss of eggs during the incubation was in the range of 7.7% to 10.7%. The average hatching rate of all laid eggs was 56.5% for the Milky Stork, and the average hatching rate for fertilised eggs was 100.0%. For the monitored Milky Stork pair, 13 chicks were hatched in the four years of monitoring while five of those were successfully reared.

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REFERENCES


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