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**ANALYSIS OF MALLARD'S (*ANAS PLATYRHYNCHOS*)
BEHAVIOUR DEPENDING ON PHENOLOGY PERIOD AND THE SIZE
OF THE FLOCK ON WATER BASINS IN SZCZECIN**

Abstract

The subject of the study is the behaviour of Mallard's *Anas platyrhynchos* and was carried out in the city of Szczecin (Poland) in 2009–2010. We compared frequency of fights, rapes, courtships, copulations and whistles on a water basins within both big and small flocks, and in different phenology periods. The study shows significant relationship between season, number of ducks on a pond and frequency of fights, as well as between whistles and fights, whistles and season and courtships and season. The results show that the most active period for ducks are the autumn and winter months (pairing period), while more aggressive behaviours can be observed when the population density is high.

Keywords: sperm competition, forced copulations, Mallard, courtships

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Introduction

A commonly observed phenomenon in the animal world is the sperm competition. It occurs when a female copulates with more than one male – it is a competition between males which continues after mating, if the sperm of two or more males overlap near the site of fertilization in female (Parker 1970). The mechanisms which determine which of the males will be the father of female's offspring are conditioned by various factors: the number and the timing of inseminations, the timing of inseminations related to when the female ovulates, the number of sperm inseminated by each male and the fertilizing ability of sperm from each male (Birkhead 1998). One of the mechanisms of sperm competition is a forced copulation (rape). In the studied species, forced extra-pair copulations are common and it was confirmed that this phenomenon can result in sperm competition and the fertilization of eggs (McKinnley 1980).

The aim of the present study is to test a hypothesis that birds try to avoid sperm competition. We want to check it out by comparing a behaviour of Mallards in different phenology periods and on water basins with flocks of differing size. Therefore, it was assumed, that if ducks avoid sperm competition, more aggressive behaviours and less courtships and copulations, should be expected in places of high population density. Active defense of a female by her partner is probably one of the mechanisms to prevent sperm competition – it was observed in an example Mallard (Jeffrey 1980) as well as Common murre *Uria aalge* (Birkhead 1985) – in conclusion, big flocks of birds should encourage fights between males. Consequently, there should be more reproductive behaviour on ponds with a small number of resident birds – as a study on Common murre *Uria aalge*, showed the number of copulations depends on the population density (Birkhead 1985).

In addition, according to research carried on Mallards by Jeffrey (1980), the frequency of reproductive behaviours should be highest in a female's fertile period. Therefore we expect that in our study, the number of copulations and courtships as well as the number of the rapes, should be the highest during fertile period of females and the smallest outside the breeding season.

As literature shows, the frequency of aggressive behaviours depends on the season – fights between males begin in October, reach their peak in March/April and end in May. These behaviours do not occur in summer (Glutz von Blotzheim 1982) – we want to check it out in our study.

Material and methods

The study was conducted in the city of Szczecin and was carried out on two water basins with small flocks (2–25 resident birds) – at the eastern part of Rusałka Pond and the water basin by Wąska street. Also two ponds with big flocks were studied (26–100 individuals) – at the western part of Rusałka Pond and Przy Torach Pond. All of the water basins are located near the city centre and surrounded by buildings and streets. There is a high human population in this area.

The study began in March 2009 and was carried out until November 2010. The study consisted of using observation to compare the behaviour of ducks on ponds with a big or small flock as well as in individual seasons. We conducted 140 observations (80 on ponds with small flocks of birds and 60 on ponds with big flocks). The number of behaviour patterns is related to an unit of time (0,5 hour – it is duration of a single observation). Every fight, rape, courtship, copulation and whistle was recorded at each time of observation. For statistical analysis we used Kruskal-Wallis test and Mann-Whitney U test.

Table 1. The total number of observations carried out at different seasons on water basins with a big (26–100 individuals) and small (2–25 individuals) flock size

Flock size	Season 1 (March–May)	Season 2 (June–July)	Season 3 (October–February)
big	31	0	29
small	66	10	4

No observations on large flocks in summer is due to the fact that the ducks in the summer generally do not form large flocks, whereas in winter birds form a large flocks and it is difficult to find the small one.

Results

We observed more fights on ponds with big flocks of ducks than on the ones with small flocks – this difference is statistically significant ($p = 0.0006$).

Table 2. The total number of behaviours observed during our study on water basins with a big (26–100 individuals) and small (2–25 individuals) flock size

Flock size	Fights	Courtships	Copulations	Rapes
big	809	73	8	1
small	365	37	3	1

Table 3. The average number of observed behaviours of Mallards within a big (26–100 individuals) and small (2–25 individuals) flock size

Flock size	Fights/male	Courtships/couple	Copulations/couple	Rapes/male
big	2.33	0.08	0.01	0.001
small	1.11	0.14	0.01	0.006
P	0.0006	0.33	0.4	0.95
Z	3.43	0.97	0.82	0.05

It was found that number of fights, courtships and whistles depending on the season is significant.

Table 4. Frequency of fights, courtships, copulations, rapes and whistles depending on the season

season	Fights/male	Courtships/couple	Copulations/couple	Rapes/male	Whistles/male
1. (March–May)	1.56	0.14	0.012	0.006	2.7
2. (June–July)	0.35	0	0	0	0.4
3. (October–February)	2.3	0.07	0.01	0	18.4
p	0.005	0.009	0.25	0.67	0.002
Chi square	10.67	9.48	2.8	0.81	12.39

We found out that there is a correlation between observed number of fights and the whistles.

Table 5. Whistles and fights correlation. $R^2 = 0.156$; $F_{1,135} = 26.18$; $p < 0.0001$

	B	T (135)	p
intercept	0.204	0.115	0.91
fights	0.658	5.117	0.000001

Discussion

In line with our expectations, on water basins with many Mallards present, more conflicts were observed between birds than on the ponds with a low population density (Tab. 3). This state of affairs can be the result of male competition over females. Fights between solitary males, or between solitary males and 'married' males defending their wives were often noticed. Male Mallards responded to rapes of their mate by intervening aggressively against the rapist, also aggressive intervention is more likely against a solitary male than against a group of rapists (Barash 1997). These observations may confirm our hypothesis regarding the avoidance of sperm competition.

Following the studies of Birkhead (1992), we also observed courtships and copulations most frequently during breeding period (March–May), less in winter and autumn (Tab. 4). However, we did not notice this kind of behaviour in summer (June–July). Courtships, consisting of the lifting and lowering of the head when floating side by side, in the autumn are often initiated by female, while in spring – by the male (Glutz von Blotzheim 1982). Copulations in autumn take place from time to time, in winter – every day (Glutz von Blotzheim 1982). The fact that during the winter a male cannot inseminate a female (males are unable to produce sperm in the winter months (Johnson 1966)), shows that copulations in winter could be related with keeping the relation between partners (Birkhead 1986). Furthermore, copulation outside the breeding season may be to check the mutual compatibility (Brock 1914) or physiological stimulation (Hailman 1978). The relationship between the season and copulations in our study unfortunately is not statistically significant (small data), while the relationship between season and courtships already is.

In the case of rapes, the small amount of data (Tab. 2) did not allow for the analysis of the issue. However, our data shows that rapes were only observed in breeding period – March–May (Tab. 4). These behaviours do not occur outside the breeding season, which undoubtedly indicates rape is correlated to the breeding success of rapists, which has been experimentally confirmed (McKinnley 1980). Forced copulations are characterised by escape behaviour and the absence of pre-copulatory displays which are characteristics for normal, non-forced pair bond copulations (Barash 1997). A rapist's pursuit of a female can take up to 15 minutes and it takes place at a distance of 800–1000m (Glutz von Blotzheim

1982). Female Mallards use a variety of tactics to avoid rape, like hiding, fighting and diving under water (Weidmann 1956).

The whistle of the male is produced on only two occasions. One situation in which this occurs is during social courtship, while males try to impress females. Males form groups and do a mating dance consisting of disturbing the water, fluttering and whistling (Sokołowski 1973; Abraham 1974). The second situation is the post-copulatory whistle (Abraham 1974). We are interested in the first kind of whistle.

Our study shows that there is a relationship between whistles and the phenology period (Tab. 4). We can observe whistles generally in the autumn and winter season (October–February), whereas in the summer (June–July) they were noticed just occasionally. On the basis of these facts, it is possible to conclude that Mallards are most sexually active and excited during autumn and winter season (pairing period). Also the relationship between fights and the season (fights are most often in autumn and winter season) may confirm this hypothesis.

It was found that there is a significant correlation between fights and whistles (Tab. 5). We frequently observed fights after whistles. It could be due to excitement of males which have no female yet. However, since the largest number of whistles occurs during pairing period, high frequency of accompanying fights may also be related to couple forming.

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ANALIZA ZACHOWAŃ KRZYŻÓWKI (*ANAS PLATYRHYNCHOS*) W ZALEŻNOŚCI OD OKRESU FENOLOGICZNEGO I WIELKOŚCI STADA

Streszczenie

Przedmiotem badań były zachowania kaczki krzyżówki *Anas platyrhynchos*. Badania zostały przeprowadzone w Szczecinie w latach 2009–2010. Porównano częstość występowania walk, kopulacji wymuszonych (gwałtów), zalotów, standardowych kopulacji oraz wydawanych przez samce gwizdów w dużych i małych stadach ptaków oraz podczas różnych pór roku. Badania wykazują znaczącą zależność między sezonem i liczbą kaczek na zbiorniku wodnym a częstotliwością walk, a także między gwizdami i walkami, gwizdami i sezonem oraz zalotami i sezonem fenologicznym. Wykazano, że okres największej aktywności ptaków przypada na jesień i zimę (czas tworzenia się par). Najwięcej zachowań agresywnych można zaobserwować natomiast przy wysokim zagęszczeniu populacji.

Słowa kluczowe: konkurencja nasienia, kopulacje wymuszone, krzyżówka, zaloty

Cite this article as: Wojcieszak H., Wysocki D., Kaliciuk J. 2013. Analysis of mallard's (*Anas platyrhynchos*) behavior depending on phenology period and the size of the flock on water basins in Szczecin *Acta Biologica*, 20: 81–88.