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***Muscovy Duck Behaviors', Breeding Habit
and Nesting Success under Captive Condition***

سلوكيات التوالد ونسبة نجاح الأعشاش في طائر البط تحت الأسر

Key words:

Breeding , Behavior , Nest , Success , Muscovy Duck

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الاستهلال



قال تعالى :

﴿ وَهُوَ الَّذِي مَدَّ الْأَرْضَ وَجَعَلَ فِيهَا رَوَاسِيَ وَأَنْهَارًا وَمِنْ كُلِّ الثَّمَرَاتِ جَعَلَ فِيهَا زَوْجَيْنِ اثْنَيْنِ يُغْشِي اللَّيْلَ النَّهَارَ إِنَّ فِي ذَلِكَ لَآيَاتٍ لِّقَوْمٍ يَتَفَكَّرُونَ ﴾

صدق الله العظيم

[سورة الرعد الآية: 3]

Dedication

To those who burn to light our way.

To those high mountains

To our mothers and fathers

Characters To all of our learned

To the companions of the scientific march

To the teacher *Nawal Nugud Margani*

Acknowledgement

Thanks to the God.

Thanks are extended to the Department of Fishers and Wildlife.

Thanks to all friends for helping

We do not forget to thank Dr/ Nawal Nogod

To have something for us who deserves it

You are the first to make it

Abstract

This study was conducted in order to identify the behavior of resting, eating, drinking, nesting success(eggs laying and incubation) of the ducks at the Kuku Zoo at Sudan University of Science and Technology College of Animal production Science and Technology.

The study period from 30 December 2017 to 5 February 2018.

The observation was conducted in three periods from 7:00am to 10:00am, from 11.00 am to 2:00 pm and from 3:00pm to 6:00pm. The result showed that the most activity was eating with frequency was 1575 times.

The eggs were incubated by the female while the incubation period was 35 days. Nesting success was 15%.

المستخلص

اجريت هذه الدراسة بغرض التعرف على سلوكيات التزاوج والراحة والاكل والشرب ووضع البيض والحضانة في البط , بحديقة حيوان كوكو بجامعة السودان للعلوم والتكنولوجيا كلية علوم وتكنولوجيا الانتاج الحيواني بولاية الخرطوم في الفترة من 30 ديسمبر 2017 الى 5 فبراير 2018.

وكانت المراقبة على ثلاثة فترات :

A. من 7 صباحا الى 10 صباحا

B. من 11 صباحا الى 2 ظهرا

C. من 3 مساء الى 6 مساء

اظهرت الدراسة ان اكثر سلوك متكرر هو الاكل وتكرر 1575 مرة.

تقوم الانثى بالحضانة حتى يتم فقس البيض وكانت مدة الحضانة 35 يوما.

ونسبة نجاح الاعشاش كانت 15 %.

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Chapter one

Chapter one

Introduction and Literature review

1.1 Behavioral living in group

For the purposes of this study a group consists of two or more Animals together either temporarily or permanently. Obviously, living in groups is only one of the many and possibly conflicting ways of reducing predation.

The social behavior has survival value in a number of ways , for instance in providing protection from predation , facilitating feeding , mating and reproduction That is an individual life is a sum of balance between the exerted costs and the gained benefit (Caro, 1994).

Disadvantages of group living arise partly from competition for food mate and parasitism. The advantage and disadvantages of group living may seem to cancel each other out. The disadvantages of increased parasitism seem to be cancelled out by the role of the colony as foraging information center.

Flocking in birds has many functions possible explanation is that individual birds increase their chance of locating rich sources of food or enhance their food intake by feeding in flock (Murton, 1971).

Flocking functions in increasing the difficulty of the predators search and detection problem, swimming predators, providing earlier warning of predatory attack and reducing the risk of capture once an encounter between predator and prey has been initiated by bunching , mobbing or combining these functions of flocking (Lazarus,1972)

Foraging flock and roosts sometime contain several hundred birds. In some urban areas of Texas, house sparrow may greatly outnumber all other species of birds (Bryant, 2002).

1-2 Muscovy duck

The Muscovy duck (*Cairina moschata*) belongs to the family Anatidae. It is a species of waterfowl native to South America, Central America, Mexico, and a small portion of southern Texas in the United States (Stahl 2003). The species is commonly domesticated and raised for meat across the globe (Gille and Salomon

1998, Zhu *et al.*, 2012, Awde *et al.*, 2013, Yakubu, 2013). Muscovy ducks have a high reproductive potential (Nikolova and Gerzilov, 2004), and escaped or intentionally introduced populations have become established in many areas. Naturalized Muscovy ducks can be found in North America (Hanson and Willis 1976, Belant *et al.*, 1999), Europe (Niklus 1990, Mason and Macdonald 2000, Nankinov 2009), Africa (Yakubu 2011), and Asia (Shieh *et al.* 2006). Muscovy ducks have been little studied. Most research was on free-ranging, it has been conducted within their native geographical range where they are in some cases threatened. For example, a number of studies have reported counts of Muscovy ducks as a part of larger studies of bird abundance in Mexico and South America (Alves and Gomes 2006, Alava *et al.*, 2007, Ayala-Perez *et al.*, 2013).

The Muscovy duck is a tropical bird and lives in marshy forests, its robustness and hardiness have enabled it to adapt to different climates and habitats. Muscovy ducks are sexually dimorphic; males are significantly larger than females. The sexes are similar in plumage.

Muscovy duck is a large and heavily-built, black duck of tropical rivers, ponds and marshes. It is commonly kept in captivity. It versatile generalist feeders that use both open marshes and grain fields (Baldassarre, 2014), the diet includes a variety of grains, aquatic vegetation, fruits, nuts, small fish, insects, reptiles and crabs. Also includes and invertebrates such as spiders and crustaceans. It has a special predilection for termites (Dye and Stai, 2004). They usually feed at night, in the evening or very early in the morning.

Muscovy ducks may help to control harmful insect populations through their foraging. They are also domesticated and are used for food and in other products. Domesticated Muscovy ducks are used in farms as a way of controlling pest populations of flies, snails, locusts, grasshoppers, and slugs. Muscovy ducks put into cow pens reduce fly populations by 80 to 90 percent. They are also kept by poultry enthusiasts. (Grzimek, B. 2003).

1-3 Physical characteristics

Muscovy ducks are brownish-black in coloration with iridescent green and purple dorsal plumage and white wing patches. The legs and feet are grayish-black and the iris is yellowish-brown. The males have a patch of bare black skin surrounded by pinkish-red caruncles (fleshy outgrowths) which extends from the back of the eye to the bill.

1-4 Ecology

The original home of the wild Muscovy duck is in the tropical America, from Mexico to Peru and Argentina. It has been introduced to the warmer climates of the world where it has adapted and thrives (Burton and Burton, 2002), such places are Trinidad and Tobago, and Central America (Wildfowl Trust, 2008). Found in forested areas and prefer shady, wooded habitats, surrounded or close to wetlands (Wildfowl Trust, 2008). They make use of the trees in the hollows or crowns of Moriche palms (Wildfowl Trust, 2008), for roosting and nesting. They breed close to these wetland streams areas and prefer freshwater (Bouglouan, 2011).

1-5 Social Organization

The wild Muscovy is a gregarious bird, meaning they move around in flocks (Wildfowl Trust, 2008). Sometimes muscovies can be seen by themselves but they can form groups and also flocks which are seldom seen (Dye and Stai, 2004). As mentioned before they feed during the early morning and evening hours but they also loaf a large number of their time under trees or on them, for shade. During the breeding season wild muscovies can form groups consisting of 5 or more ducks (Dye and Stai, 2004). However when not breeding, they can form huge flocks of 20 or more individuals (Dye and Stai, 2004).

1-6 Active and Resting Behaviour Patterns

Wild Muscovy ducks display a variety of behavior including hissing at each other during mating, tail wagging, bill clapping, crest raising during mating. The wild and domesticated muscovies have a need for permanent access to water for carrying out its every day routines, during the day and night. A number of feeding, bathing and sleeping are repeated each day (Burton and Burton, 2002). Their resting posture is by sitting and placing their head into their shoulders or turned back so their bill rests in the shoulder blade feathers (Burton and Burton, 2002). This posture can be kept for long periods of time

1-7 Juvenile Behaviour

Before the ducklings are hatched a process whereby the mother and duckling exchange low frequency call is carried out, which imprints on the ducklings (Dye and Stai, 2004). After hatching their color is duller, with little or no white on the wing (Bouglouan, 2011), most of the ducklings would follow their mother, the newly hatched ducks are covered with a dense, insulating cover which traps air, making them able to float. The ducklings are able to forage by themselves but still require protection by the mother from predators (Dye and Stai, 2004). It is uses the “contact” call which was imprinted on them. The male muscovies leave the mother before the eggs are hatch, so the female raise the ducklings by herself. In wild Muscovy ducks, the mother will watch over her young for several months (Dye and Sati, 2004).

1-8 Antipredator Behaviour

When there is an intruder in the flock, responses, such as freezing, alarm calling and crest raising are seen (Burton and Burton, 2002). Wild muscovies are strong and heavy, despite this they can fly pretty good and when disturbed or threatened they can fly until no longer seen (Dye and Stai, 2004). If caught they fight vigorously and use their wing, claws and beaks to chase intruders away (Burton and Burton, 2002).

1-9 Communication: Wild Muscovy are mostly silent , they do not use vocalization , apart from hissing at each other during mating, tail wagging , bill clapping, crest raising during mating or to show awareness (Wildfowl Trust, 2008). Soft quacks and chirrs or cackles can be heard by the females. The most important sense of a duck is its vision; since good eyesight is essential for safe flight (Dye and Stai, 2004). The vision in wild Muscovy ducks is well developed which gives keen insight superior to that of other vertebrates (Dye and Stai, 2004). The eyes are like reptile eyes but has better-position lens (Dye and Stai, 2004).

1-10 Sexual Behaviour

Wild muscovies first breed at the age of 1-2 years. The male muscovies are promiscuous, mating with any female that is ready to mate and keeping other males away by fighting fiercely using the bills (Burton and Burton, 2002). They fight to defend territory and mate. During the courtship period a series of displays are seen, such as the males nodding their heads back and forth and crests raised (Burton and Burton, 2002). A similar display is seen by the females. There is also over excessive preening and feeding behaviors. There are also specific calls and postures such as holding both tail and head up (Dye and Stai, 2004). Once paired they stand side by side, nodding their heads and hissing at each other. At first the male runs after the female and tries to grab her, the female first try to escape and they both may run around for some time until finally she ceases resistance (Burton and Burton, 2002). The nest is built by the female in a hole in a tree and she lays a clutch of about 15 eggs. A fierce watch is given to other male mates by the mating partner but the female may mate with others. The mating pair doesn't stay together for life; they find new partners each year (Dye and Stai, 2004).

1-11 Nesting Behavior and Hatchability

Hatchability of Muscovy duck eggs under artificial incubation was always found to be lower than under natural incubation (Serbul, 1986; Moraes, 1988; Bonino and Velez, 1992), which suggests that heat supplied by conduction results in a better embryo temperature and development than by convection. Reasons to study reproductive performance of Muscovy duck were that this duck: is one of the most common breeds found in tropical Asia (Farrell, 1995) and in rural areas of Africa (Clayton, 1984; Kuit *et al.*, 1986); 2) has a growing economic importance as a meat bird

1-12 The Objectives

1-The present study describes an investigation of some aspects of social behavior of *Cairina moschat* in captivity.

2-Document the habitat use, and nesting success of *Cairina moschat*, in the Zoo of College of Animal Production Science and Technology at Hillat Kuku.

Chapter Two

Chapter Two

Materials and Methods

2-1 Study Area

Observations were carried out on a group of six birds. They were housed in cage measuring 29.53x21x2.6m length, display, altitude. The cage was placed in Zoo of Collage of Animal Production Science and Technology at Hillat Kuku, Sudan University.

The cage was made from metal frame work and wire –mesh .The wire mesh was smoothed and fine to avoid unnecessary injury. Food and water were provided in bowls on the floor. The food consisted of grains of poultry whiteness feed which consists of the following:- carbohydrate ratio from 55% to 70%, proportion of plant proteins from 10% to 35%, Proportion of animal proteins from 5% to 10% with possibility of dispensing with animal protein and using 100% vegetable protein, fat ratio from 0% to 5%, the percentage of the mineral salts from 1% to 4% .And rejla(*portulaca oleracea*) .Numbers of individuals engaged in each of the following acts was recorded feeding, drinking , rest behavior

Duration of observation were made over 37days for the hatch and 14 days for the other ducks on 30th of December 2017 to 5 of February 2018, from 7.0 am to approximately 6.0 pm. The time spent in each behavioral category (i.e. social) was calculated and summarized by time of day, where morning was considered 7:00-10:00, afternoon as 11:00-14:00, and evening as 15:00-18:00.

Observations were conducted by naked eye or with the aid of low power binoculars.

Birds were observed from a distance of 5 meter to avoid disturbance.

2-2 Data Analysis

Average (means), standard deviation

Also calculated .one way ANOVA and factorial multivariate analysis of variance was used to examine differences in proportion of time spent in different activity, the daily activity presented as percentage.

Chapter Three

Chapter Three

Results

3.1 Nesting Activities of the Muscovy duck

When the field work was started in December 2017 at Kuku Zoo, there were six nests which were found on sand (Plate, 1 and Plate, 2) and on earthen pot (Plate, 3).



Plate(1): The nest with 5 eggs on sand, with no protection from high level of direct sunrise and temperature.



Plate, (2): The nest on sand in shaded area



Plate,(3):The nest on earthen pot

3.2. Egglying and Incubation

The first egg which was laid after selection nest site, the mean interval between two eggs was 24.9 hours. The clutch size which means the numbers of eggs laid in series without any interruption. Normally the upper limit of the clutch size were fifteen (n=2) ,but there were different numbers of eggs two nests with 4 eggs , and two nests one with 10 eggs and the others with 5 eggs. During egg laying period the female visited the nest sat on eggs(Plate,(4)&Plate,(5)) for 6-9hours in the first day,after25.9 days(n=6) the incubation will be continuously, the female left the nest to feed and drink(n=30). It was noticeable that during the last incubation period female fluffth feathers especially those of the breast and wings when it was sat on the eggs (Plate,6). The Female was rolling eggs from time to time(n=28)(Plate,7)



Plate(4): Female sat on eggs during incubation period



Plate(5): Female sat on eggs during incubation period



Plate(,6)during the last incubation period female fluffth feathers especially those of the Breast and wings when it sat on the eggs



Plate,(7):Female was rolling eggs by the beak from time to time



Plate (8):Female was collected feathers from the ground and put it on the eggs



Plate (9): the nestling in nest in different stages after hatching

The incubation period from egg laying to hatching(Plate,9) was found to be 35days based on six nests After hatching, the female take care about the nestling and protect them, the youngest at the age of day can walk, eat and drink and always follow his mother.

3.3. Breeding Success

Breeding success (Table,1) is defined as "when one or more young from a clutch of eggs survives until become adult ". During the study period a total of 6 nests of Muscovy duck (*Cairinamoschata*) were studied carefully. The percentage of breeding success of it was 15% , it was weak. The main cause of mortality were, failing of eggs to hatch , aggressive behavior of adult duck to the nestling, destruction of eggs .

Table(1):Nesting Success of the Muscovy duck (*Cairinamoschata*)

Measurements	Total
Number of nest	6
Number of eggs laid	53
Mean clutch size	9
Number of eggs hatched	15
Number of egg hatched per nest	2.6
Number of eggs predated	2
Number of young dead by aggressive behavior	7
Number of destroyed eggs	1
Number of eggs failing to hatch per nest	35
Mean number of eggs failing to hatch per nest	5.8
Number of young was life	8
Nesting success (young/egg laid)	15%

3-4 Some different daily activity of Muscovy duck (*Cairinamoschata*)in captivity

There were three activities which were studied carefully eating(Plate, 10) drinking (Plate, 11),and resting(Plate,12.Plate, 13.Plate, 14) .Readings were taken every 3hours and for morning , afternoon and the evening. The results showed that eating activity was more frequent behavior repeated 1575 times, which was more in the evening. The percentage of eating in morning was 36% and during afternoon was 14.2%, while in the evening it reached 49.8% (table, 2).

The behavior of eating is followed by the repetition of drinking behavior which is repeated 1034 times, most by in the evening.

The percentage of drinking was 33.3% in the morning, 12.9 in the afternoon and 53.8% in the evening. The rest activity was repeated 723 times, the most activity of resting in the evening was 39.9%, in the morning it was 31.3%, in the afternoon was 30.8% .As our observation that ducks in the afternoon spend most of the time with rest activity

Table (2): Percentages of frequency of behavior in Muscovy duck
(*Cairinamoschata*)

The periods The behaviors	The morning	The afternoon	The evening
Eating	36%	14.2%	49.8%
Drinking	33.3%	12.9%	53.8%
Resting	31.3%	30.8%	37.9%

Table (3):Variation between the three activities and the three different timein Muscovy duck (*Cairinamoschata*)

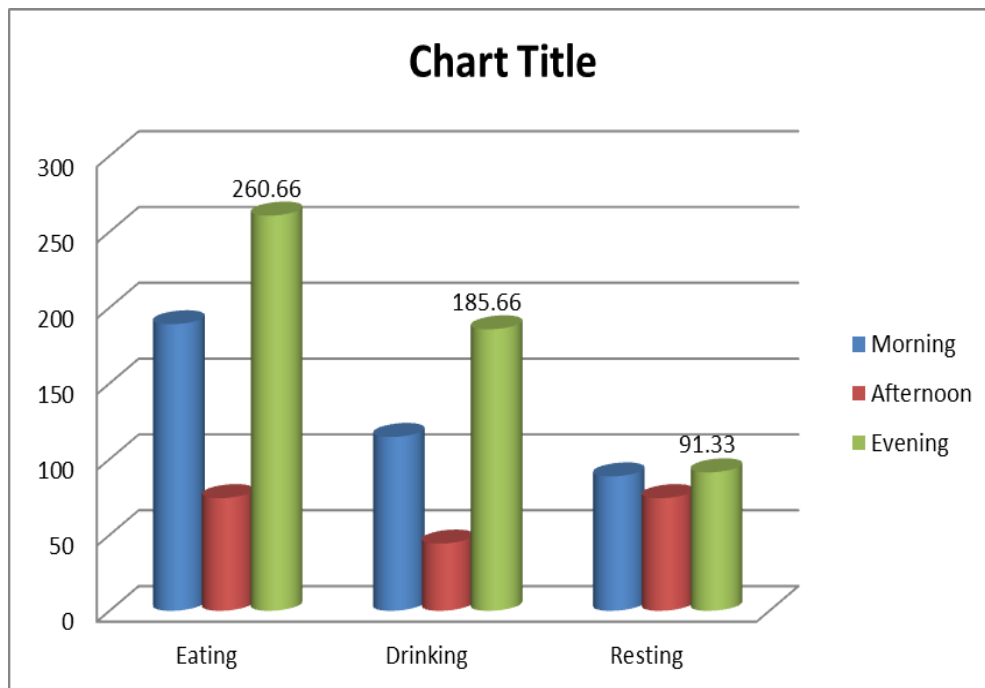
Parameters	Eating M±SD	Drinking M±SD	Resting M±SD
Times			
Morning	189.00±39.00 ^{ab}	114.66±27.31 ^b	88.66±36.01
Afternoon	74.33±25.71 ^b	44.33±29.66 ^a	74.33±38.99
Evening	260.66±109.15 ^a	185.66±45.09 ^b	91.33±51.98
Sig	*	**	NS

* Significant different at (p≤0.05)

** Significant different at (p≤0.01)

NS: No Significant different at (p≥0.05)

The differences in the means between eating activity in three times (morning, afternoon, and evening) found to be statistically significant at (p≤0.05). Also the different in means in drinking activity in three times(morning , afternoon, and evening) found to be significant at (p≤0.01), and the last activity rest the differences of means was found to be insignificant different.



(Plate, 10) The variation between three activity and three different time in Muscovy duck (*Cairinamoschata*)



(Plate, 11) The activity of eating



(Plate,12) The activity of drinking



(Plate, 13) The activity of resting



(Plate,14) Activity of resting

Chapter Four

Chapter Four

Discussion

There were some factors effecting in incubation and there for influencing in hatchability. The most reason in this cause is the effect of temperature on eggs incubation.

The female which nests on sand under intensive sunrise all eggs in nest failed to hatch .The subtle changes incubation conditions can influence hatchling success.

The second reason which was observed directly the aggressive behavior of the adult to the hatched which lead to their death of nestling.

The result showed that there is relationship between eating, drinking, and resting behavior.

The result showed that feeding is the most activity in captive.

The fighting behavior among members of the group is high during feeding bouts, but it is reduced during resting time. Fighting generally in this group is reduced because it is an established group.

The behavior of the flock was undoubtedly synchronized. This behavior was studied in other like *Amandra amandra*(Evans, 1970) and (Hamed, 1981)

Chapter Five

Chapter Five

Recommendations

- 1-- provide good shelter for the mothers so to incubate the remaining eggs and good care, abundant food and caring for the young .
- 2- nails should be removed from the fence
- 3-attention to the cleanliness of the cage or fence .
- 4-do not leave the basin empty long time.

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