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Orientation of the Egg at Laying - Is the Pointed or the Blunt End First?

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Abstract: While the avian egg is formed in the oviduct, it acquires its shell membranes and shape in the isthmus and the calcified shell in the shell gland/uterus. However, in domestic species not all eggs are laid pointed end first, which led to the suggestion that egg rotation can occur in the oviduct prior to laying producing the blunt end first. However, not all studies were in agreement as to which end the pointed or the blunt-comes out first. Here, opportunistic observation of laying behaviour in domestic geese and ducks was carried out. 89.47% of the single yolked (SY) goose eggs were laid pointed end first. Goose age and dimensions did not influence the orientation of the egg, though the 12 blunt end first eggs were heavier and wider. 85.52% of the SY duck eggs were laid pointed end first. However, in double yolked (DY) duck eggs evidence was presented showing that the yolks closer to the airspace (blunt end) tend to be heavier (Salamon and Kent, 2013a) and had higher levels of fertilization (Salamon and Kent, in press) consistent with the yolk at the blunt end of the egg being ovulated first and suggests that the blunt end of these large eggs was caudal in the oviduct during egg formation. Questions remain to be answered.

Key words: Domestic goose, domestic duck, double yolked egg, egg laying, egg orientation

INTRODUCTION

Evidence was presented showing that the egg in the domestic fowl and some other domestic birds, using dissecting techniques at different times in the egg production cycle, is formed and passes down the oviduct from the isthmus with the pointed end first (pigeon, *Columba livia domestica*: Bartelmez, 1918; domestic fowl, *Gallus gallus domesticus*: Olsen and Byerly, 1932; Romanoff and Romanoff, 1949; California quail, *Lophortyx californicus brunnescens*: Lewin, 1963). Thus one would expect eggs to be laid pointed end first.

However at laying, studies reported that in 80-100% of eggs the blunt end comes out first (pigeon, Bartelmez, 1918; domestic fowl, Bradfield, 1951), while others found that 47-85% of eggs were laid pointed end first in domestic fowl (Olsen and Byerly, 1932; in caged environment, Wood-Gush and Gilbert, 1969). Bradfield (1951) argued that the finding of 65-85% of eggs laid pointed end first in the study of Olsen and Byerly (1932) was due to 'premature oviposition' caused by placing the hands near the hen. It was believed that before entering the vagina the eggs deform the uterus wall to enter a blind sac and then rotate 180°, which results in blunt end first laying in domestic fowl (Curtis, 1916; Olsen and Byerly, 1932; Romanoff and Romanoff, 1949). Bradfield (1951) using X-rays found that hen eggs do rotate 180° within the uterus in a horizontal plane about an hour before oviposition and in 9 of the 10 hens he studied were laid eggs blunt end first in a lab environment. It should be pointed out that in the Bradfield (1951) study careful selection of hens was undertaken with the 7th egg in a laying sequence being chosen to achieve laying at approximately midday to facilitate X-ray recording of shell deposition till 9 pm the day before and from 8 am on the day of laying. Thus, behaviours occurring between 9 pm to 8 am were not recorded, nor were other eggs in the laying sequence studied.

However in a later study, Wood-Gush and Gilbert (1969) observed with two groups of commercial hybrid hens in a battery caged environment that 47.4% (46/97) and 68.8% (53/77) of the eggs were laid pointed end first and argued that the hens were probably disturbed by the noise and movement in the battery house with stress leading to 'premature oviposition'. Thus, Wood-Gush and Gilbert (1969) could not confirm which egg orientation pattern is normal at laying nor could they confirm if rotation occurred as in the study of Bradfield (1951).

More recently with double yolked (DY) duck eggs Salamon and Kent (2013a) have shown that the yolk closer to the airspace, ie. blunt end, tends to be larger (62.5% of cases) and thus presumably ovulated first suggesting that the blunt end of the DY egg is caudal during shell formation. Further, yolks closer to the airspace had a higher level of fertilization (68.82% vs. 34.98%; Salamon and Kent, in press) supporting the hypothesis that the yolk closer to the airspace, was ovulated first and then fertilized. Presumably as the first yolk passed down the oviduct it was joined by the

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second yolk - with its lower fertilization levels - before shell formation.

Here, the orientation of the egg at laying (i.e., blunt or pointed end first) in domestic geese was recorded. Weight, length and width were also measured and goose age and the position of airspace were recorded. Opportunistic observation of laying in domestic ducks was also carried out.

MATERIALS AND METHODS

Domestic geese from nine flocks, aged one to seven years, were maintained at Ballyrichard, 72 km south of Dublin, Ireland (52.83°N, 6.13°W). All birds within a flock were of the same age. Individual geese were observed during a laying season (February and June, 2010) using non-invasive opportunistic observation between 9:30 h and dusk, when geese were on their nests in their house or in adjacent grass field. When the goose was sighted observation began from a distance of 4-5 m so as to avoid stress and the egg was usually laid within 20 min. After laying the egg was collected, the goose was captured and a numbered leg ring fitted. The egg was stored and one day later, it was weighed with a digital scale to the nearest 0.1 g, its length and width measured with a digital calliper to the nearest 0.01 mm. A flock of Aylesbury ducks was also maintained on the same facility at Ballyrichard. Individual ducks were observed during laying using non-invasive opportunistic observation in the morning between 7:30 am and 8:30 am over a period of one week in 2012. However, in ducks only the orientation of the egg at laying was recorded and individual ducks did not have numbered leg rings.

Using Minitab 16, the effect of female age, egg weight and dimensions on the orientation at oviposition was examined using GLM. Egg weight and dimensions were used as covariates. Goose age, egg weight and dimensions of pointed end first and blunt end first eggs were compared by two sample t-tests.

RESULTS

Ninety one geese were observed laying a total of 114 single yolked (SY) eggs, with one goose laying up to five eggs (one egg: n = 76 geese, two eggs: n = 11, three eggs: n = 1, four eggs: n = 2, five eggs: n = 1). From the geese that laid more than one egg, six laid two consecutive eggs, at two day intervals (Romanov, 1999; Kent and Murphy, 2003; Salamon and Kent, 2013b) and all those eggs were laid pointed end first.

89.47% of these SY goose eggs were laid pointed end first similar to findings in laying hens (Olsen and Byerly, 1932). Further, in domestic ducks 124 of the 145 (85.52%) random layings were observed as pointed end first presentations. Both with the geese and ducks used here care was taken not to stress the birds at laying as suggested by Bradfield (1951) and Wood-Gush and Gilbert (1969).

Table 1: Number of eggs, goose age (years), weight (g) and dimensions (mm) and standard deviations (sd) of goose eggs laid either pointed end or blunt end first

	Pointed end first	Blunt end first
Number of eggs	102	12
Percentage	(89.47%)	(10.53%)
Mean goose age (years)	3.21[a]	3.58[a]
SD	1.48	1.83
Mean egg weight (g)	178.84[a]	191.95[b]
SD	21.88	19.37
Mean length (mm)	90.59[a]	92.00[a]
SD	5.53	4.51
Mean width (mm)	59.30[a]	61.18[b]
SD	2.47	2.10
Mean shape index	1.53[a]	1.50[a]
SD	0.07	0.05

Row means with differing superscript letters (weight and width) differed significantly ($p<0.05$)

Female age, egg weight, length and width did not have an effect on the egg orientation at laying ($p = 0.182$, $p = 0.351$, $p = 0.346$, $p = 0.139$ respectively; adj $R^2 = 6.08\%$), but blunt end first eggs tended to be heavier (191.95 g vs. 178.84 g; $p = 0.046$) and wider (61.18 mm vs. 59.3 mm; $p = 0.012$; Table 1).

DISCUSSION

It is generally accepted that in domestic fowl and pigeons eggs are formed pointed end first (Bartelmez, 1918; Olsen and Byerly, 1932; Romanoff and Romanoff, 1949), then rotate or not in the uterus (Bradfield, 1951) and depending on the rotation they are either laid round end or pointed end first (Bartelmez, 1918; Olsen and Byerly, 1932; Romanoff and Romanoff, 1949; Bradfield, 1951; Wood-Gush and Gilbert, 1969). However, the findings of Salamon and Kent (2013a; in press) with DY duck eggs show that the yolk closer to the airspace tends to be larger and have higher fertilization suggesting that those DY eggs are at least at some stage of development formed blunt end first. The space in the uterus is limited for egg rotation due to the pelvic bone (Bradfield, 1951), which suggests that larger SY or DY eggs might not be able to rotate, compatible with the finding here that SY goose eggs laid blunt end first were heavier and wider.

Based on the above in domestic ducks and geese some and especially the larger DY eggs pass down some of the oviduct from the isthmus in blunt end first form or are formed blunt end first in the isthmus and shell gland. Alternatively SY duck and goose eggs are formed pointed end first and generally do not rotate and are laid pointed end first. However, the evidence still suggests that the large DY eggs may be formed blunt end first, consistent with blunt end first laying in the large SY eggs found here.

REFERENCES

Bartelmez, G.W., 1918. The relation of the embryo to the principal axis of symmetry in the bird's egg. Biol. Bull., 35: 319-361.

Bradfield, J.R.G., 1951. Radiographic studies on the formation of the hen's egg shell. J. Exp. Biol., 28: 125-140.

Curtis, M.R., 1916. Studies on the physiology of reproduction in the domestic fowl, XVI. Double eggs. Biol. Bull., 31: 181-213.

Kent, J.P. and K.J. Murphy, 2003. Synchronized egg laying in flocks of domestic geese (*Anser anser*). Appl. Anim. Behav. Sci., 82: 219-228.

Lewin, V., 1963. Reproduction and development of young in a population of California quail. Condor, 65: 249-278.

Olsen, M.W. and T.C. Byerly, 1932. Orientation of the hen's egg in the uterus and during laying. Poult. Sci., 11: 266-271.

Romanoff, A.L. and A.J. Romanoff, 1949. The Avian Egg. John Wiley and Sons Inc., New York.

Romanov, M.N., 1999. Goose production efficiency as influenced by genotype, nutrition and production systems. World`s Poult. Sci. J., 55: 281-294.

Salamon, A. and J.P. Kent, 2013a. Double and single yolked duck eggs: their contents and dimensions compared and the mechanical stimulation hypothesis for albumen secretion is supported. Int. J. Poult. Sci., 12: 254-260.

Salamon, A. and J.P. Kent, 2013b. Egg weight declines to baseline levels over the laying season in domestic geese (*Anser anser domesticus*). Int. J. Poult. Sci., 12: 509-516.

Salamon, A. and J.P. Kent, 2014. Yolk size and ovulation order determine fertility within double yolked duck (*Anas platyrhynchos domesticus*) eggs. Reprod. Fert. Dev., (In press).

Wood-Gush, D.G.M. and A.B. Gilbert, 1969. Observations on the laying behaviour of hens in battery cages. Br. Poult. Sci., 10: 29-36.