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COMPARISON OF CONFORMATION AND LAYING PERFORMANCE OF VARIOUS PHEASANT SPECIES

Lidia Felska-Błaszczyk, Kamil Pohorecki

West Pomeranian University of Technology Szczecin, Poland

Abstract. The aim of this study was to compare body weight and measurements of selected Physianidae species, egg production, egg weight and shape. The study included the common pheasant (*Phasianus colchicus*), golden pheasant (*Chrysolophus pictus*), yellow golden pheasant (*Chrysolophus pictus luteus*), Lady Amherst's pheasant (*Chrysolophus amherstiae*) and Reeves's pheasant (*Syrmaticus reevesi*). We examined 50 individuals, 10 of each species, and the offspring of yellow golden and Lady Amherst's pheasants, which were weighed at 1, 4, 8, and 20 weeks of age. Measurements of adult pheasants included body weight, body length, and wing and head length. During the breeding season, eggs of the genus *Chrysolophus* they were collected, weighed and egg shape index was calculated. Distinct sexual dimorphism in the body weight of young males and females was observed, confirmed statistically for yellow golden pheasants. A number of statistical differences were found in body weight and conformation traits between the species of pheasants and between the sexes within species among adults. The highest body weights were attained by male Reeves's pheasants. The smallest pheasants were yellow golden pheasants, which also produced the highest number of eggs in 2014. Lady Amherst's pheasants laid the largest eggs.

Key words: common pheasants, ornamental pheasants, laying performance, conformation

INTRODUCTION

The charming appearance of pheasants is absolutely stunning and the birds inevitably attract those who are sensitive to the beauty of nature. Their popularity

Corresponding author: Lidia Felska-Błaszczyk, Department of Animal Anatomy, West Pomeranian Univeristy of Technology, Szczecin, Doktora Judyma 14, 71-466 Szczecin, Poland, e-mail: lidia.felska-blaszczyk@zut.edu.pl

have been growing recently, both in Poland and other European countries. The birds are becoming increasingly popular as feathered game in Poland, but also as a backyard poultry species in country homes, agritourism or organic farms, as well as in parks and exhibition aviaries. Hobby breeders keep pheasants just for pleasure. Emerging breeding associations contribute to the fact that the interest in these birds continues to grow. Breeders present their best specimens of pheasants at numerous national and international exhibitions, which are very popular. Pheasant colors are dazzling, the birds really beautify the environment in which we live; their presence is relaxing and we can also enjoy the details of their behavior, especially their spectacular calling. Pheasants have always delighted people, not only because of the colors of their plumage, but also due to the splendid taste of meat and eggs; pheasant feathers were even used to adorn noble outfit [Popescu-Micloşanu et al. 2011].

At the moment, the population of pheasants remains at a constant level. The birds that are reared and introduced into the wild still outnumber the individuals hunted. Thanks to numerous hunting associations and other organizations, the bird is present nearly everywhere across Poland. Besides its role as a game, the common pheasant is also farmed for meat for human consumption [Kirikçi et al. 2004], and although the consumption of pheasant meat in Poland is still marginal, this branch of poultry production is constantly growing. The carcasses produced in Poland are mainly exported to Germany, Spain, and France.

The family of pheasants (Phasianidae) embraces forty-nine species belonging to the sixteen genera. There are well-known species, such as the common (also called ring-necked) pheasant, *Phasianus colchicus*, or the Indian peafowl, *Pavo cristatus*, and rarer species, like the western trapogan, *Tragopan melanocephalus*, or Chinese monals, *Lophophorus lhuysii* [Jehnsgard 1999]. Asia is where all pheasants come from and most species of pheasants can be found in China. It is believed that all species originate from China [Kruszewicz and Manelski 2002].

The presence of pheasants in Poland was first mentioned in 1567 in Silesia [Glutz von Blotzheim 1973]. Aviary breeding of this species in Poland was started in the 19th century. During the interwar years both aviary and open farms of pheasants were very popular, yet the wild population, according to Pielowski [1984], did not increase significantly, despite intensive efforts. In 1955, pheasant population was estimated to 25400 birds [Kamieniarz 1990]. The reconstruction of the population of pheasant began in the 1950s through creating aviary breeding centers. The reared birds were next brought to the areas from where it had been previously depleted, but also introduced into places where pheasant had never lived before.

At the end of the 1970s, a sharp drop in the numbers of pheasants was observed [Tomiałojć and Stawarczyk 2003]. About 60% of the population disappe-

ared despite a constant, intensive reintroduction with reared pheasants. Only in a few areas did the efforts bring positive outcomes in the form of stable local pheasant flocks. The poorest regions of Poland were in the north-west and south-west port of the country. According to Czyżowski [2003], the main perpetrators of the destruction of pheasants broods were corvids (36%), foxes (36%) and humans (28%). Besides the predation pressure, the collapse of pheasant numbers was likely due to reducing the mosaic of habitats, reduction the quality of introduced specimens, percentage afforestation, soil fertility, mechanization and use of chemicals in agriculture, lack of breeding treatments and severe winters [Pielowski 1984, Kamieniarz 1990]. The population of pheasants in relation to field trees density was studied by Bresiński and Chlewski [1980]. The authors found that pheasants make a use of field tree groups during autumn, winter and spring.

The common pheasant is a species with a very clear sexual dimorphism. The plumage of a male is bright and painted in shimmering metallic colors. The female has a protective-color plumage. Juveniles are similar to females. The full change of the plumage takes place once a year in late summer, earlier in roosters, which then become infertile. Young males differs from females in tail length and the iris color. Male feet bear spurs, the length of which allow age evaluation [Dudziński 1988].

Pheasants are omnivorous. In their natural habitats, the birds feed on seeds, green vegetation, and various small animals, such as spiders, larvae, worms, insects. They might occasionally feed on flies, beetles, and small mice. These satisfy the needs of their life processes [Peitz 2009].

The common pheasant was brought as a game bird, so nobody paid attention to the purity of the subspecies. Therefore, finding any of the subspecies of the common pheasant in Poland is virtually impossible. Those found here are usually hybrids of Caucasian, Mongolian and ring-necked pheasants, which are commonly refered to as common, game, field, ring-necked etc. Godlewski [1989] estimates that there are about 40 varieties derived from the three main subspecies.

The pheasant is the most widely introduced and the most popular petty game species [Szczepocki 2011]. In Polish pheasantries, more and more common are ornamental species, such as the golden pheasant (*Chrysolophus pictus*), yellow golden pheasant (*Chrysolophus pictus luteus*), Lady Amherst's pheasant (*Chrysolophus amherstiae*) and Reeves's pheasant (*Syrmaticus reevesi*).

In recent years pheasant breeding in Poland has become an object of growing interest of amateur breeders, zoos, and – like in other countries – of professional farms, which require a range of permits and licenses to operate. The literature lacks detailed studies on most of pheasant species, and their life history is not fully understood. Scarce data provide information related to pheasant management, housing, feeding or reproduction, which is the most problematic for bre-

eders importing new species of these beautiful birds. Therefore we undertook this study.

The aim of the study was to compare body weight and measurements of selected Phasianidae species, study egg production, egg weights and shapes, and a growth analysis of juvenile Lady Amherst's pheasant (*Chrysolophus amherstiae*) and yellow golden pheasant (*Chrysolophus pictus luteus*). Another aim of this article is to encourage breeders to care for pure-bred pheasants as well as to disclose the negative effects of inbreeding.

MATERIAL AND METHODS

Housing conditions

The observations were carried out on a farm located in West Pomeranian Voivodeship of Poland. The pheasants were kept in 12 identical aviaries, adjacent to each other. The aviaries were constructions based on wooden beams, 6 × 4 cm in cross section, covered with mesh size 2 cm × 2 cm hexagonal woven mesh. Roof cover was in 1/3 bitumen sheeting and 2/3 polyethylene mesh. To prevent digging-in by predators and rodents, the mesh was placed about 40 cm below the ground surface. Shrubs have been planted in the aviaries in order to provide the birds with most natural possible living conditions. The vegetation is a source of food, provide shelter, shadow, or cover for hens hiding from aggressive roosters. Each aviary was equipped with a 3.5-litter drinker and an automatic feed dispenser.

The reproduction cycle in pheasants started in late March – early April and brooding lasted until late September – early October. Eggs were collected daily, in the evening, and stored at about 14°C and 60% relative humidity.

Day-old chicks were after hatching transferred into a warm room and placed in previously prepared fiberboard nurseries. A stocking ensity was 10–15 chicks · m^{-2} floor area. The bottom of each nursery was bedded with clean and free from epizootic hazards litter from wheat straw or sawdust, and also equipped with feeders and drinkers. Heat lamps were naturally mounted, too, in order to keep the brood warm; it should be kept mind that in the first week of rearing, the temperature under the lamp should be constant, not lower than 36–37°C. After 7–8 days of the chicks time spent in the nursery, temperature is lowered by one degree a day, by raising the lamp or successively replacing bulbs of lower wattage, e.g. 100 W, 60 W, and, finally, 40 W.

As soon as a few days after hatching, the young birds will try their flying abilities, therefore – in order to provide them with good development and adaptation conditions – 4-week-old birds were placed in outer aviaries with a warm and safe

shelter. The flooring was bedded with fresh gravel, riverine sand, or straw chaff. It is commonly accepted that the stocking in a nursery should not exceed 3–4 birds · m^{-2}. In good weather, young pheasants may spend several hours per day in the poultry run. From 9 weeks of age on, the pheasants remained in the aviaries until the end of the production cycle, i.e. until 24–26 weeks of age.

Feeding

Throughout the study, all birds were fed the same feed ad libitum and had constant and unlimited access to fresh and clean water, vitamin-mineral mix and gravel. Feeding was divided into three phases. From the first day until 4 weeks of age, the birds were fed complete pelleted mix BAF-101 containing 2900 kcal energy and 24.5% total protein. The feed is well digestible, easy to swallow pellet, which prevents or alleviates digestive tract disorders. The next phase, at 5 to 8 weeks of age, was to apply this feed in 2/3 of the daily ration, the rest being replaced with wheat and maise middlings. The thirds period of feeding began with the transfer of the young birds to the aviaries, from 9 to 24 weeks or age. The complete mix was gradually replaced with own-made middlings mix of lower protein content, 18%, which was next replaced by whole grain feeding. Besides the concentrates, the birds also received green legumes forage, fruit, vegetables, boiled potatoes, and vitamin-supplemented water.

Adult pheasant feeding during the breeding was also based on the complete feed BAF-101, which was fed in appropriate proportions along with corn mixes from late February until late June. Outside the reproduction season, pheasant nutritional needs were low and it was enough to feed wheat and maize enriched with green forage, vegetables and fruit, and Polfamix A+Z administered to drinking water.

Measurements

The study involved the common pheasant (*Phasianus colchicus*), golden pheasant (*Chrysolophus pictus*), yellow golden pheasant (*Chrysolophus pictus luteus*), Lady Amherst's pheasant (*Chrysolophus amherstiae*), as well as Reeves's pheasant (*Syrmaticus reevesi*). All birds in the trial were mature and at a similar age of about 4 years. Golden, yellow golden, Lady Amherst's and Reeves's pheasants are ornamental pheasants kept in zoos, amateur aviaries, and agritourism farms, whereas the common pheasant are bred mainly as game birds or for meat; their mutations, however, are also desired by hobby breeders.

The analyzed group of pheasants were breeding birds of each species managed in polygamous flocks, 1 rooster and 3–4 hens plus their brood, both males and

females. In all, the study involved 50 birds, 10 from each species, as well as the brood of yellow golden and Lady Amherst's pheasants.

The breeding flock birds were measured and weighed during laying, after completion of egg brooding, and during the resting period and after complete molt. The number of laid eggs, their weight, and shape index (length-width ratio) were noted.

From each brood, 10 yellow golden and Lady Amherst's pheasant chicks were taken at random and weighed at age 1, 4, 8, and 20 weeks. Adult pheasants were measured for body weight, body length, wing length, and head length. Body weight was measured with precision to 1 g using an electronic suspended balance, whereas linear measurements of wings and heads were performed to 1 mm, using a folding rule or calipers, respectively. Body length was measured with a measure tape, to 1 mm. Body length was measured from the tip of beak to the end of tail, head length from the tip of beak to the occiput, the wing at its maximal chord.

During the laying period, eggs of the genus *Chrysolophus* hens were weighed and measured for the shape index.

The resulting data were processed using the STATISTICA 10.0 PL package. We applied one-way ANOVA, and means and standard deviations (SD) were calculated.

RESULTS AND DISCUSSION

Growth and development of young pheasants

Table 1 shows the measurement of body weight in yellow golden and Lady Amherst's pheasants in relation to sex. Body weights yellow golden pheasants were similar to Lady Amherst's pheasants, only at 8 weeks of age, Lady Amherst's males were heavier by about 10 g compared to yellow golden roosters. Pheasant display distinct sexual dimorphism, although it is invisible in the plumage until the second year of age. Sex of young pheasants is thus determined based on the secondary sexual characteristics. One way to determine the gender may be body weight [Kokoszyński et al. 2011], since males are heavier than females as soon as in the first weeks. In the present study, the occurrence of sexual dimorphism in body weight of young pheasants was observed from the first week of life; in yellow golden pheasants the differences were confirmed statistically at $P \leq 0.05$, and from the age of 20 weeks at $P \leq 0.01$. Górecki et al. [2012] found, however, that differences in body weight between the sexes occurred in game pheasants from 3 weeks of age. Also a statistical analysis of body weight in young birds between species was performed, no statistical difference were found, though.

Table 1. Body weight of growing pheasants

Tabela 1. Masa ciała rosnących bażantów

Sex – Płeć	Age, weeks Wiek, tyg.	Lady Amherst's pheasant Bażant diamentowy		Yellow golden pheasant Bażant bananowy	
		Mean, g – Średnia, g	SD	Mean, g – Średnia, g	SD
Male – Samiec	1	23.10	±3.96	26.34*	±0.48
Female – Samica	1	22.49	±3.24	23.12*	±1.85
Total – Razem	1	22.87	±3.48	24.88	±2.07
Male – Samiec	4	126.45	±11.36	127.11*	±5.19
Female – Samica	4	120.54	±0.43	118.73*	±4.37
Total – Razem	4	124.24	±9.12	123.30	±6.34
Male – Samiec	8	276.36	±20.79	266.96*	±10.14
Female – Samica	8	247.06	±5.39	248.70*	±8.42
Total – Razem	8	265.37	±22.03	258.66	±13.07
Male – Samiec	20	578.56	±16.35	577.14**	±5.01
Female – Samica	20	560.39	±9.90	562.54**	±8.19
Total – Razem	20	571.75	±16.41	570.50	±9.87

** Differences statistically significant at $P \leq 0.01$ between females and males – Różnice statystycznie istotne na poziomie $P \leq 0{,}01$ pomiędzy samicami i samcami.
* Differences statistically significant at $P \leq 0.01$ between females and males – Różnice statystycznie istotne na poziomie $P \leq 0{,}05$ pomiędzy samicami i samcami.

Body measurements of young growing pheasants are relevant for assessing the development of birds. In this study, they were made every 4 weeks. Pheasants reach a mature body weight at the age of 20–24 weeks. The most intensive growth is observed between 1 and 4 weeks of age, whereas from 8 weeks, the growth decreases significantly [Mróz 2003]. According to Straková et al. [2005], the fastest growth occurs later, between 5 and 10 weeks of age. Also Ipek and Dikmen [2007] observed that pheasants attained the highest weight gain between 4 and 8 weeks of age. Hens between 20 and 24 weeks of age accumulate fat under the skin and inside the body and the weight gain may be greater than between 16 and 20 weeks of age [Mróz 2003]. Weight gain and growth rate in pheasants are influenced by many factors. Environmental factors include the breeding season, housing conditions, nutrition, temperature, and weather. Also important are genetic factors, health status and sex of birds. Pheasants are characterized by very rapid growth and development. A day-old chick's weight is doubled at the age of 2 weeks.

Body conformation and weight in adults

The literature brings scarce information on bird biometrics, especially in gallinaceous birds. This study is an attempt to analyze some parameters describing body size and weight of the extensively used adult common pheasant, and several

ornamental species, often threatened by extinction. Basic biometric measurements were performed in this study. Table 2 shows the weight of five species of pheasant. Table 3 presents data on the body length, total length of the head with beak and wing length. A number of statistical differences ($P \leq 0.05$ and $P \leq 0.01$) have been found in body weight of birds and linear measurements of the body of pheasants, both between species and between the sexes within species.

Table 2. Body weight of adult birds

Tabela 2. Masa ciała dorosłych ptaków

Species – Gatunek	Sex – Płeć	Body weight – Masa ciała	
		Mean, g – Średnia, g	SD
Golden pheasant – Bażant złoty	Male – Samiec	720.00^{AB}*	±10.00
	Female – Samica	605.55^{GH}*	±82.47
	Total – Razem	634.17	±87.43
Reeves's pheasant – Bażant królewski	Male – Samiec	1430.00^{ACD}**	±183.85
	Female – Samica	746.67^{GI}**	±61.64
	Total – Razem	870.91	±15.00
Lady Amherst's pheasant – Bażant diamentowy	Male – Samiec	763.33^{CE}	±25.17
	Female – Samica	685.56^{J}	±86.33
	Total – Razem	705.00	±82.30
Yellow golden pheasant – Bażant bananowy	Male – Samiec	686.67^{DF}	±20.82
	Female – Samica	662.50^{K}	±85.48
	Total – Razem	669.09	±73.00
Common pheasant – Bażant łowny	Male – Samiec	1283.33^{BEF}**	±123.42
	Female – Samica	940.00^{HIJK}**	±66.52
	Total – Razem	1025.83	±173.49
Total – Razem		781.38	±215.42

A, B, C ... Differences designated with the same letters are statistically significant at $P \leq 0.01$ between species – Różnice oznaczone tymi samymi literami są statystycznie istotne na poziomie $P \leq 0{,}01$ pomiędzy gatunkami.

** Differences statistically significant at $P \leq 0.01$ between females and males – Różnice statystycznie istotne na poziomie $P \leq 0{,}01$ pomiędzy samicami i samcami.

* Differences statistically significant at $P \leq 0.01$ between females and males – Różnice statystycznie istotne na poziomie $P \leq 0{,}05$ pomiędzy samicami i samcami.

Evaluation of conformation includes the color of plumage, the dimensions of some parts of the body, weight and the way of flying. Below are some of the characteristics of pheasants. Pheasants of particular species had significantly different plumage, weight, and size. Body weight and wing length of common pheasants is within the range specified by Mróz [2003], i.e. 1–1.4 kg for roosters and up to 1 kg for hens, wing length 25.5–26.6 cm, and the length of the trunk with tail was about 10 cm lower as reported by Mróz [2003], respectively 90 cm for males and 70–80 cm for females. On the other hand, Johnsgard [1999] reports that male common pheasants have wings 23.8–25.8 cm in length while females 21.0–22.0

cm, so much the same as obtained in the present study. Body weight of birds of both sexes was greater than that reported by Johnsgard [1999], who found that male body weight was 1150 g and females 850 g.

Body length of adult golden pheasants was lower than that presented by Łukasik and Siennicka [2010], 110 cm for a male and 65 cm for a female. In contrast, Cramp and Simmons [1980] found a slightly lower body weight of males (from 575 to 710 grams) compared to body weight of male golden pheasants found in our study (Table 2, 720 g). The length of the wing of either sex golden pheasants, on the other hand, was very similar to the data reported by Cramp and Simmons [1980].

In Lady Amherst's pheasants the tail is wide and may reach up to 115 cm in length, with the entire body length 130 cm [Jarosz 2002]. According to Cramp and Simmons [1980], these pheasants' wing length measured from 21.5 to 22.6 cm in males (which is slightly higher than that in our study), and from 19.4 to 20.3 cm in females (similar result to that observed in our study). It can therefore be noted that female and male Lady Amherst's pheasants are larger than golden pheasants and such information is available in the literature. Yellow golden pheasants are mutants of the golden pheasant and so their body conformation and weight should be similar. However, through the mutation and long-term mating of closely related individuals, slight variations in the dimensions and weight may occur.

Male Reeves's pheasant is one of the largest species of pheasants and, as described in literature, should reach 160–200 cm in body length [Mróz 2003, Kruszewicz 2003]. Table 3 shows a considerably lower value of this parameter, 110.15 cm. Body weight of birds of either sex (Table 2) was also slightly lower than in the literature. Delacour [1977] reported that the body weight of the Reeves's pheasant averaged 1529 g in males and 949 g in females. Table 2 shows, however, that males weighed 1430 g and females 746.67 g. The length of the wings, on the contrary, was similar to those published by Delacour [1977].

Egg production and hatching egg traits

The highest average number of eggs were laid by yellow golden pheasants, 18.7, whereas the lowest by Reeves's pheasants, 10.5 (Fig. 1). In golden and Lady Amherst's pheasants, the mean number of eggs laid during the season was, respectively, 15.5 and 15.3. Observations carried out in England by Johnsgard [1999] mention maximum 12 eggs. In a Chinese zoo, on the other hand, golden pheasant hens laid about 7 eggs during the season, weighing 21.2 to a 44.5 g. Most eggs were laid by females in the second season, but in natural harvesting [Wang Wen-Lin et al. 2005]. This is confirmed Sepielak and Gomułka [2014], who noted the number of their eggs in successive seasons on the level of 16–25 and 16–20

Table 3. Biometric measurements in adult birds

Tabela 3. Pomiary biometryczne ptaków dorosłych

Species – Gatunek	Sex – Płeć	Biometric measurements – Pomiary biometryczne					
		Body length, cm Długość ciała, cm		Wing length, cm Długość skrzydła, cm		Head length, cm Długość głowy, cm	
		Mean, g Średnia, g	SD	Mean, g Średnia, g	SD	Mean, g Średnia, g	SD
Golden pheasant Bażant złoty	Male – Samiec	93.00^{ABCD**}	±2.15	18.5^{ABC}	±0.28	6.20^{A}	±0.15
	Female – Samica	56.33**	±2.08	17.83^{IJK}	±0.29	5.96^{Ba}	±0.20
	Total – Razem	65.50	±18.41	18.00	±0.40	6.02	±0.20
Reeves's pheasant Bażant królewski	Male – Samiec	110.15^{AEF**}	±12.56	28.05^{ADEF*}	±0.32	7.02*	±0.32
	Female – Samica	61.17**	±1.89	21.10^{ILL*}	±0.21	6.41^{Ca*}	±0.08
	Total – Razem	75.26	±6.52	25.42	±0.42	6.78	±0.45
Lady Amherst's pheasant Bażant diamentowy	Male – Samiec	105.00^{BGH**}	±6.51	20.50^{BDG}	±0.23	6.20^{D}	±0.25
	Female – Samica	54.67**	±1.53	19.50^{JL}	±0.50	6.10^{E}	±0.10
	Total – Razem	67.25	±25.20	19.75	±0.64	6.12	±0.10
Yellow golden pheasant Bażant bananowy	Male – Samiec	70.00^{CEGa*}	±5.24	19.00^{EH}	±0.25	6.50^{G*}	±0.34
	Female – Samica	61.00*	±4.24	18.33^{L}	±0.29	6.09^{F*}	±0.17
	Total – Razem	64.00	±6.00	18.5	±0.41	6.19	±0.25
Common pheasant Bażant łowny	Male – Samiec	77.00^{DFHa*}	±5.22	26.00^{CFGH*}	±0.42	7.90^{ADG**}	±0.56
	Female – Samica	58.33*	±3.51	21.67^{K*}	±0.29	6.97^{BCEF**}	±0.15
	Total – Razem	63.00	±9.76	22.75	±0.65	7.20	±0.48
Total – Razem		64.36	±14.07	19.95	±0.85	6.39	±0.51

A, B, C ... Differences designated with the same letters are statistically significant at P ≤ 0.01 between species – Różnice oznaczone tymi samymi literami są statystycznie istotne na poziomie P ≤ 0,01 pomiędzy gatunkami.

a ... Differences designated with the same letters are statistically significant at P ≤ 0.05 between species – Różnice oznaczone tymi samymi literami są statystycznie istotne na poziomie P ≤ 0,05 pomiędzy gatunkami.

** Differences statistically significant at P ≤ 0.01 between females and males – Różnice statystycznie istotne na poziomie P ≤ 0,01 pomiędzy samicami i samcami.

* Differences statistically significant at P ≤ 0.01 between females and males – Różnice statystycznie istotne na poziomie P ≤ 0,05 pomiędzy samicami i samcami.

from Lady Amherst's and golden pheasants, respectively. Egg laying starts in late March and early April and ends in June or in early July, depending on the weather. Short, seasonal reproduction lasting 90–140 days underlies the fact that pheasants are birds of low egg productivity.

The analysis showed that an egg weight ranged from 26.31 g to 30.91 g (Table 4). Sepielak and Gomułka [2014] showed variations in weight of eggs from 24 to 26 grams for golden pheasants and from 28 to 31 grams for Lady Amherst's pheasants. Cultures conducted in England report similar weight of eggs. In the literature, there are no specific requirements on the weight and shape of the *Chrysolophus* species eggs, but that is of little importance in such a small number of eggs produced. As shown by Ipek and Dikmen [2007], egg weight has

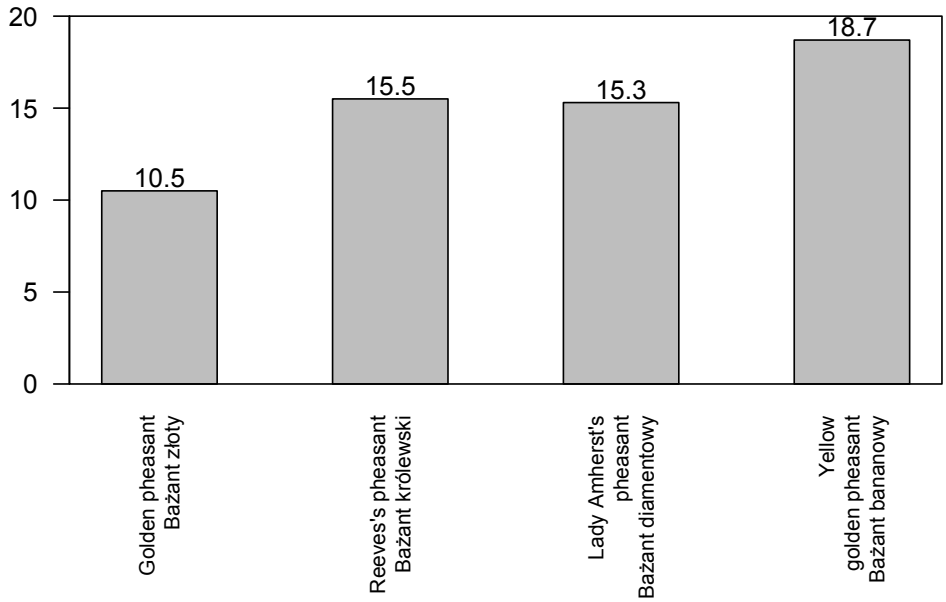

Fig. 1. The number of eggs laid per female during the breeding season in 2014

Rys. 1. Liczba jaj zniesionych przez samicę w sezonie rozrodczym w 2014 roku

a direct impact on the mass of the born chick – the larger the eggs for hatching, the chicks bigger are born.

Table 4. Egg weight and egg shape index in pheasants

Tabela 4. Masa jaj i indeks kształtu jaj bażantów

Species – Gatunek	Egg weight, g – Masa jaj, g		Egg shape index – Indeks kształtu jaj	
	Mean, g – Średnia, g	SD	Mean, g – Średnia, g	SD
Golden pheasant – Bażant złoty	26.31^{AB}	±2.03	74.89	±4.38
Reeves's pheasant – Bażant królewski	28.18^{ACD}	±0.74	–	–
Lady Amherst's pheasant – Bażant diamentowy	30.91^{CE}	±2.90	74.05	±2.29
Yellow golden pheasant – Bażant bananowy	26.48^{DE}	±1.69	75.75	±3.69
Total – Razem	27.67	±2.71	74.86	±3.30

A, B, C ... Differences designated with the same letters are statistically significant at $P \leq 0.01$ between species – Różnice oznaczone tymi samymi literami są statystycznie istotne na poziomie $P \leq 0{,}01$ pomiędzy gatunkami.

Eggs for hatching should be oval in shape, typical for pheasant; deformed, elongated, spherical, rough, with excrescences, or very small as well as extremely large eggs should be rejected from hatching. Observations indicate that the best

results are achieved when hatching eggs of a shape index between 76–78%, as recommended for common pheasant eggs in the standard developed in January 1998 by the Polish Committee for Standardization [PN-R-78565, 1998].

The mass of an egg in a year-old flock is 30–32 g, being greater in older flocks. At the beginning of laying eggs are the heaviest, and in the next phases are lighter [Mróz 2012]. Krystianiak and Kontecka [2001] found that the duration of laying period and the number of eggs from various laying hens in the flock ranges from 25 to 126 days and from 5 to 95 eggs, which proves their high genetic potential. The best results are obtained from year-old and older hens and two- and three-year-old roosters; mating frequency is also important [Chełmońska and Piotrowski 1984].

Hens and roosters can be managed for three reproductive seasons. This was confirmed by Majewska et al. [2000] in a trial on eggs hatchability of 3-year-old common pheasants.

CONCLUSIONS

As a result of this analysis, a distinct sexual dimorphism in body weight of young males and females was found, which was confirmed statistically in yellow golden pheasants. A number of statistically significant differences have been found in body weight and conformation measurements between the species of pheasants and between the sexes within species. The highest body weight was reached by Reeves's pheasant males. The smallest pheasants in terms of measurements were yellow golden pheasants, which were also characterized by the highest number their eggs laid in 2014. Lady Amherst's pheasants, on the other hand, laid the largest eggs.

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PORÓWNANIE POKROJU ORAZ WSKAŹNIKÓW NIEŚNYCH BAŻANTÓW RÓŻNYCH GATUNKÓW

Streszczenie. Celem niniejszej pracy było porównanie masy ciała i wymiarów ciała wybranych gatunków z rodziny Phasianidae, kontrola nieśności, masy i kształtu jaj. Badaniami objęto bażanty łowne (*Phasianus colchicus*), złociste (*Chrysolophus pictus*), bananowe (*Chrysolophus pictus luteus*), diamentowe (*Chrysolophus amherstiae*) oraz królewskie (*Syrmaticus reevesi*). Badaniami objęto 50 osobników po 10 z każdego gatunku oraz potomstwo bażantów bananowych i diamentowych, które ważono w wieku 1, 4, 8 i 20 tygodni życia. Pomiary bażantów dorosłych dotyczyły masy ciała, długości ciała, skrzydła i głowy. W czasie trwania sezonu rozrodczego od bażantów z rodzaju *Chrysolophus* zbierano jaja, ważono je i obliczano indeksu kształtu jaj. Stwierdzono występowanie wyraźnego dymorfizmu płciowego w masie ciała młodych samic i samców, co zostało potwierdzone statystycznie u bażantów bananowych. Zanotowano szereg różnic statystycznych w masie ciała oraz w wykonanych pomiarach pokroju między analizowanymi gatunkami bażantów oraz między płciami w obrębie gatunku u bażantów dorosłych. Najwyższą masę ciała osiągnęły samce bażanta królewskiego. Najmniejszymi bażantami pod względem wykonanych pomiarów były bażanty bananowe. Bażanty bananowe charakteryzowały się najwyższą liczbą zniesionych jaj w roku 2014, a bażanty diamentowe znosiły natomiast największe jaja.

Słowa kluczowe: bażanty łowne, bażanty ozdobne, nieśność, pokrój.

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