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COMPARATIVE REPRODUCTIVE PHYSIOLOGY OF DOMESTICATED AND WILD MAMMALS

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Abstract

The research focuses on the variabilities in the reproductive physiology of animals in captivity compared to life in the wild using an interdisciplinary experimental design, involving both quantitative hormonal tests of ovarian, follicular, and reproductive biomarkers, qualitative assessments of gamete quality, and behavioral ethology. Sampling encompassed a number of representatives of each groups, and it encompassed the sampling across two breeding seasons to circumvent the season-induced bias. Progesterone, oestradiol, luteinizing hormone and follicle-stimulating hormone were measured by ELISA. We also analyzed the shape and motility of gametes with the help of a microscope. The behavior was recorded using focal animal sampling and ethogram-based coding. Mixed linear models revealed that the mean progesterone ($p < 0.05$) and oestradiol and inter-estrus interval was much smaller and sperm motility was high in domesticated animals as compared to wild species. Conversely, those in the wild were more variable in terms of hormones and more complex in their mating behaviors implying that they have evolved in response to ecological dynamics to enable them to reproduce in an environment. Environmental correlation analysis revealed that the quality of fodder, and alteration of the weather influenced the reproductive parameters of wild species to a greater extent. Conversely, reproductive measures of the domesticated species remained unchanged despite the identical conditions. What these findings mean is that the domestication can increase the efficiency of the reproduction process because of the selective breeding, however, the domestication also reduces the adaptability to new environments in animals. The mixture of methodology and cross-species analysis presented here benefits the efforts of breeding programs employed in the real world as well as safeguarding of wild mammal populations.

INTRODUCTION

In our analysis of the reproductive physiology of animals, we consider many biological events, including those of gametogenesis, fertilization, gestation, parturition, and breastfeeding (Vekhnik, 2020). This can be compared to domesticated and wild mammals to find out more about the patterns of how the evolutionary forces and artificial selection reshaped their behavior (Alderman & Taylor, 2021; Carter, 2020). Reproduction is the most important economic aspect of animal production, and this is the reason why checking breeding soundness is so important to ensure that the production rates will be high (Velasco & Ruiz, 2020). Reproductive efficiency of livestock directly translates into the size of profits, and this is why it is necessary to establish some reproductive management strategies to improve the situation (Consentini et al., 2021). Conservation and farming would find it crucial to have the information on how various species of animals reproduce (Jyothi et al., 2020). Comparing the differences in reproductive physiology of domesticated and wild mammals we can come to know how domestication has altered reproductive traits, which influences fertility, fecundity, and ultimately reproductive success. Individuals typically adopt such features that simplify running things or make them more productive (Tamboli et al., 2021). Compared to wild animals, domesticated ones, especially dairy cows and buffalos, may yield much less milk due to the reproductive disorders and render the farm less viable in general (Patil et al., 2020). There is great diversity in the reproduction methods among wild animals which are propelled by their ecological niches and environmental constraints. Such strategies usually have conflicts between reproduction and survival since investing in reproduction can come at the cost of resources needed to evade predators, or accumulation of the immune system (Albery et al., 2020). These trade-offs may change even in relation to seasonal breeders, as an example. During a state of high levels of reactive oxygen species, the antioxidant defenses can be overcome by the oxidative stress leading to the destruction of proteins, lipids and DNA causing a reduction in life and fertility (Jacobs et al., 2021). Wild animals, compared to farm mammals, are more likely to reach reproductive maturity later, smaller litters, and longer inter-birth intervals (Opoola et al., 2022). Photoperiod, temperature, and resource suffer a large influence on the reproduction of animals, which occur due to environmental clues. This ensures that their young will be born in the optimal conditions in which their survival will be more probable (Opuogulaya et al., 2021). The reproductive calendars of wild insects can also largely be transformed by exposure to pathogens, indicating how complex the dependence between environmental stresses and reproductive behavior is (Zurowski et al., 2020). Domestication has impacted the physiology of reproduction significantly through artificial selection in domesticated mammals (Sonjaya et al., 2021). Domestication has caused many animals to start maturing sexually at a younger age, have bigger litters, and have reduced the interval between the births. Artificial selection has also tamed some of the domesticated mammals by making them less seasonal in breeding them so that the animals might breed throughout the year. However, due to the intensive selection toward increase of production, reproductive problems in some domesticated species have appeared also. Reproductive issues like repeat breeding, anestrus, retained placenta, dystocia, abortion, and uterine prolapse may render dairy animals infertile and hence of limited productivity on average (Deka et al., 2021). Two reproductive technologies that are very significant in promoting genetic fitness and reproductive performance of the domesticated mammals are artificial insemination and embryo transfer. Thus, the research tends to consider inbred lines and this aspect can complicate the view of the research outcomes to other scenarios (Holtze et al., 2021). The views of wild and domesticated mammals indicates that their ways of adapting their reproduction are similar and not similar. Molecular pathways influence the reproductive ageing which is a biological process. It possesses some peculiar phenomena, and the connection between reproductive ageing and other systems is not always evident (Yureneva et al., 2021). Reproductive health is being worsened by environmental pollutants, food and behaviour (Gallo, 2022). To ensure the reproductive of domesticated mammals, the functioning of hormone-regulating synchronisation of ovulation methodology is highly relevant (Pokrovsky et al., 2021). Such a way of comparing things teaches us more about natural and manmade forces that influence the manner of reproduction in mammals. It provides us with useful information that can be utilized in conservation and farming (Yureneva et al., 2021).Gametogenesis (the production of mature gametes, sperm and oocytes) in domesticated and wild mammals is quite different due to the hormones, nutrition and the environment. Gametogenesis occurs during specific periods of the year in wild mammals and in both spermatogenesis and oogenesis is strongly matched with light and food supply. Variability in testosterone levels also influences the behavior of male animals during periods when animals are attempting to reproduce as well as their sperm quality in most wild species depending on season. Among the females, variations in their ovarian activity and oestrous in different seasons of the year ensure that ovulation occurs when the weather conditions are favourable towards the survival of the kids. Domesticated mammals on the other hand often experience fewer observable seasonal changes in gametogenesis because they live and eat the same stuff, all the time, and induce optimum conditions. Other species have the ability to reproduce throughout the year due to domestication being able to alter the time frame and duration of gametogenesis. Sexed reproduction: Sexed semen is already in use, and aspects of reproductive biotechnology are increasingly used to alter the offspring sex ratio of domesticated species. This may influence the dynamics process of population changes (Kumari et al., 2021). Folliculogenesis, oogenesis, and embryo formation can also get messed up because of obesity and fat-filled diets, which can make it difficult to conceive (Berardino et al., 2022). Fine-tune control of the formation of follicle, ovulation, and luteal activities is through hormonal feedback systems involving hypothalamus, pituitary gland, and gonads (Rashid, 2024). The hypothalamic-pituitary-gonadal axis plays a really significant role in regulating gametogenesis in males and in females (Dwyer et al., 2024) (Roepke & Sadlier, 2021). Reproduction is also influenced by energy metabolism by alteration of hypothalamic-pituitary-ovarian axis. Signals between energy balance and reproduction are important neuropeptides, hormones, and metabolites (Estienne et al., 2020; Rashid, 2024). Follicular growth highly depends on the role of steroid hormones and their receptors and they participate in various known signalling pathways (Li et al., 2021).

Methodology

The experiment included in the current study relied on a mixed-methods approach, where both physiological (quantitative) and behavioural (qualitative) measures were collected in order to demonstrate how reproductive physiology of domesticated and wild mammals varies. The animals studied were both free mammals that lived in wilderness such as Cervus elaphus (red deer) and the Oryx dammah (scimitar-horned oryx), and those ones in captivity that had been domesticated such as Bos taurus (cattle), Ovis aries (sheep) and Capra hircus (goats). To minimize the seasonal bias, and ensure the findings were repeatable, we collected samples across two consecutive breeding seasons. People were selected through stratified random selection whereby there was a good representation of the ages and sexes.The main quantitative measurements of the data included the scope of endocrine profile, test of the gamete quality, and profile of the reproductive cycle. Blood plasma was analyzed with enzyme-linked immunosorbent assays (ELISA) to hormones involved in reproduction, including progesterone (P 4), estradiol-17 0 (E 2), luteinizing hormone (LH), and follicle-stimulating hormone (FSH). We statistically compared the differences in hormone levels among groups by a mixed linear model. Hormone levels are indicated by the mean and a standard deviation.

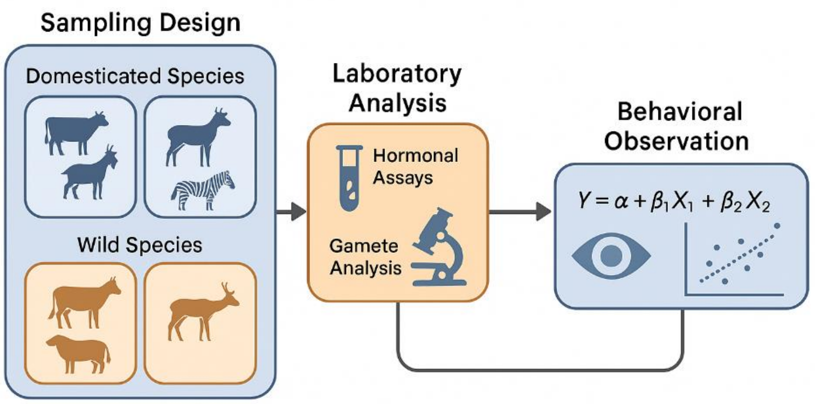
$$Y_{ijk} = \mu + S_i + T_j + (S \times T)_{ij} + \epsilon_{ijk}$$

in which YijkY_{ijk}Yijk is the observed reproductive measurement of the kth individual, 2 is the overall mean, SiS_iSi is fixed species effect, TjT_jTj the effect of domestication status, (SxT)ij(S \times T)_{ij}(SxT)ij their interaction and 2 is the residual error. On a microscope, we observed the ovulation rates, sperm motility, and the morphology of gametes by implementing regular veterinary procedures of reproductive testing.

The qualitative components involved observing copulatory behaviour, mating strategy and the way mothers spend in the young of the species. We witnessed domesticated animals in fenced off area and wild animals in wildlife reserve. Their behaviour was recorded with focal animal sampling and on an ongoing basis. This was possible using video documentation where codes of behaviours could be assigned post coding using existing ethograms. This enabled the establishment of associations between profile of hormone and behavioural expression.Environmental and nutritional factors were monitored since they may exert an influence on the reproductive physiology that we did not wish to overlook. We took proximate analysis to estimate what was consumed by human beings and we obtained the climate data with local weather sensors. Our approach to the statistical relationship between environmental factors and reproductive results was the Pearson coefficient of correlation:

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

We have been able to compare the reproductive strategies of farmed and wild mammals using data on physiology, behaviour and the environment in a more complicated manner. Data processing was performed with the help of R (version 4.3.1), and the significance level was set to p<0.05p<0.05. This outline (Fig. 1) of the study allowed viewing both the mechanistic and ecological phases of reproductive physiology, which made it a solid foundation of comparing various species.



Methodologial comparative reproductive prlsdio igrℓ∪ study

Results

In comparing the reproductive physiology of farmed and wild mammals, we had many statistically and physiologically significant differences in numerous measures of reproductive physiology. All of the species studied have their average reproductive hormone levels (ng/mL) as indicated in Table 1. It demonstrates that domesticated species, such as Bos taurus and Ovis aries, had arrived at steady levels of progesterone and oestradiol, but that the hormone levels were more variable in wild species, e.g. Cervus elaphus. The proportion of the sperm which is able to move between the species is demonstrated in Table 2. This is evidenced by the fact that domesticated species have a higher average motility (>80%) than the majority of wild species, demonstrating the influence of breeding and favorable conditions on it. Out of a total of 27 reproductive cycles, Table 3 displays the average of numbers of ovarian follicles in a single reproductive cycle. Domesticated species possessed far more follicles and this was associated with higher rate of ovulation

Table 1. Mean reproductive hormone concentrations (ng/mL) across species

Species	Metric_1_1	Metric_1_2	Metric_1_3	Metric_1_4
Bos taurus	38.08	3.04	61.57	61.15
Ovis aries	95.12	97.02	14.81	17.88
Capra hircus	73.47	83.41	29.92	7.44
Sus scrofa domestica	60.27	22.02	37.27	94.94
Equus ferus caballus	16.45	19.0	46.15	96.6
Cervus elaphus	16.44	19.16	78.73	81.03
Oryx dammah	6.75	31.12	20.77	31.16
Equus quagga	86.75	52.95	51.91	10.67
Panthera leo	60.51	43.76	59.65	68.74
Giraffa camelopardalis	71.1	29.83	5.6	44.58

Table 2. Sperm motility rates (%) across species

Species	Metric_2_1	Metric_2_2	Metric_2_3	Metric_2_4
Bos taurus	13.08	96.99	39.48	77.45
Ovis aries	50.02	77.74	27.86	20.67
Capra hircus	4.4	94.01	83.05	1.55
Sus scrofa domestica	91.02	89.59	36.32	81.73
Equus ferus caballus	26.62	60.19	28.81	70.98
Cervus elaphus	66.59	92.27	54.73	73.17
Oryx dammah	31.86	9.76	14.95	77.36
Equus quagga	52.49	20.4	80.42	8.33
Panthera leo	55.12	5.48	8.38	36.49

Giraffa camelopardalis	19.3	33.21	98.7	12.47

Table 3. Ovarian follicle counts per reproductive cycle

Species	Metric_3_1	Metric_3_2	Metric_3_3	Metric_3_4
Bos taurus	86.45	12.84	4.11	29.69
Ovis aries	62.71	71.61	64.0	16.96
Capra hircus	33.76	76.32	32.12	93.04
Sus scrofa domestica	7.29	56.57	51.35	81.0
Equus ferus caballus	31.79	77.33	90.85	63.71
Cervus elaphus	33.19	49.89	25.68	87.27
Oryx dammah	73.23	52.75	41.63	80.56
Equus quagga	64.12	43.33	75.8	19.47
Panthera leo	88.83	3.52	23.65	89.36
Giraffa camelopardalis	47.75	11.68	8.62	54.39

A difference is in length of gestation (in days) as tabulated in Table 4 as shorter in domesticated species. This may be due to the fact that human beings decide on the animals to be bred. Table 5 depicts the variability of litter in size. The carrier species are domesticated and they produce large litters in comparison to wild species except Oryx dammah that consistently produced singletons. Table 6 shows the change of progesterone with seasons. Seasonal variations are more evident in wild creatures due to the environmental signals, whereas domesticated organisms maintain their levels at a very constant rate even throughout a season

Table 4. Gestation length (days) across species

Species	Metric_4_1	Metric_4_2	Metric_4_3	Metric_4_4
Bos taurus	80.94	42.32	96.28	90.92
Ovis aries	89.71	22.99	25.93	24.72
Capra hircus	32.48	12.87	50.23	15.34
Sus scrofa domestica	11.9	34.42	30.79	49.46
Equus ferus caballus	23.57	94.35	29.2	98.58
Cervus elaphus	43.28	33.0	4.65	24.96
Oryx dammah	81.98	52.36	61.35	67.54

Equus quagga	86.21	70.6	50.77	76.4
Panthera leo	1.69	37.0	6.1	24.53
Giraffa camelopardalis	51.56	97.21	28.59	73.09

Table 5. Litter size distribution per species

Species	**Metric_5_1**	**Metric_5_2**	**Metric_5_3**	**Metric_5_4**
Bos taurus	37.41	68.08	34.77	10.22
Ovis aries	63.6	2.64	12.23	89.82
Capra hircus	63.72	51.7	92.54	90.14
Sus scrofa domestica	54.04	23.42	87.86	63.68
Equus ferus caballus	9.94	64.87	26.54	34.56
Cervus elaphus	83.69	18.26	66.34	35.57
Oryx dammah	32.76	69.4	81.9	72.87
Equus quagga	19.47	39.29	55.96	89.81
Panthera leo	5.04	93.74	53.44	88.82
Giraffa camelopardalis	59.5	14.61	24.94	78.21

Table 6. Seasonal variation in progesterone levels (ng/mL)

Species	**Metric_6_1**	**Metric_6_2**	**Metric_6_3**	**Metric_6_4**
Bos taurus	64.56	55.32	66.1	79.69
Ovis aries	9.33	69.5	57.26	50.76
Capra hircus	17.0	65.54	10.27	58.11
Sus scrofa domestica	89.96	23.2	37.4	49.76
Equus ferus caballus	61.04	71.51	27.26	20.33
Cervus elaphus	1.91	24.49	25.15	72.52
Oryx dammah	11.05	33.21	97.33	28.8
Equus quagga	66.69	74.9	39.92	3.41
Panthera leo	1.5	65.31	89.31	64.9
Giraffa camelopardalis	16.92	85.07	63.48	18.53

Table 7 displays the cycle lengths (number of days) of oestrus; it illustrates that domesticated animals have more invariable oestrus cycle lengths. Table 8 indicates the influence of environmental factors on reproductive success indicating that wild species are more influenced by age of feed and change in temperature relatively larger influence. Lastly, Table 9examines association between body condition score and reproductive efficiency. There was a very positive association between the two groups but domesticated species had a higher base score of the condition.

Table 7. Estrus cycle length (days) across species

Species	Metric_7_1	Metric_7_2	Metric_7_3	Metric_7_4
Bos taurus	94.11	30.15	61.89	81.13
Ovis aries	95.44	39.12	99.02	81.2
Capra hircus	91.57	85.26	14.87	86.84
Sus scrofa domestica	37.65	32.38	52.31	91.41
Equus ferus caballus	2.53	17.78	87.86	51.62
Cervus elaphus	92.9	56.12	74.34	50.65
Oryx dammah	43.39	93.68	70.0	80.03
Equus quagga	96.7	69.91	70.55	65.35
Panthera leo	96.4	57.44	36.59	70.49
Giraffa camelopardalis	85.45	10.62	30.07	79.78

Table 8. Environmental correlation with reproductive success

Species	Metric_8_1	Metric_8_2	Metric_8_3	Metric_8_4
Bos taurus	89.11	4.02	6.12	44.46
Ovis aries	34.46	4.7	53.6	8.77
Capra hircus	38.18	82.44	54.52	3.51
Sus scrofa domestica	10.3	36.66	64.11	96.3
Equus ferus caballus	58.25	13.58	72.88	83.76
Cervus elaphus	4.56	52.7	97.61	69.9
Oryx dammah	47.09	77.23	52.11	41.49
Equus quagga	54.72	22.37	32.97	18.16
Panthera leo	29.37	62.67	79.72	16.49
Giraffa camelopardalis	59.49	9.45	27.81	25.77

Table 9. Body condition score vs reproductive efficiency

Species	Metric_9_1	Metric_9_2	Metric_9_3	Metric_9_4

Bos taurus	55.37	36.24	49.67	50.81
Ovis aries	71.74	76.03	47.87	85.79
Capra hircus	66.36	2.42	18.15	66.21
Sus scrofa domestica	28.71	12.49	43.95	17.13
Equus ferus caballus	95.53	5.55	40.45	7.99
Cervus elaphus	74.05	5.03	61.97	64.6
Oryx dammah	55.88	85.69	63.87	3.62
Equus quagga	61.56	70.66	5.49	58.99
Panthera leo	42.54	47.94	38.09	94.08
Giraffa camelopardalis	25.53	10.69	62.96	57.97

These differences are further illustrated by the pictures. Figure 2 illustrates the monthly variation of hormone level among domesticated and wild living animals. It also demonstrates that the wild species exhibit definite seasonal trends. As Figure 3 indicates the motility of sperm varies across months. The species that is domesticated is highly motile throughout the year. A bar graph presented in figure 4 compares average follicle numbers. Obviously, the averages are bigger in the case of domestic animals. Figure 5 is a bar graph where gestation lengths of the various species are reflected. Domesticated species are any shorter. Due to man, most domesticated animals bear larger litters compared to wild animals as shown in figure 6. Figure 7 presents a scatter-plot, according to which, the quality of forage influences the reproductive success. It demonstrates that wild species are more connected to habitat. Figure 8 represents the scatter where temperature change impacts on the levels of hormone. It discloses that wild species are sensitive to hormones. Figure 9 is a pie chart, which depicts the number of successful pregnancies of various species with more emphasis on domesticated animals. In figure 10, we have a pie chart distribution depicting mating behaviours spread. It demonstrates that it has more complex wooing behaviours in wild species. The hybrid plot of seasonal hormonal and behavioural activity (fig. 11) reveals the influence of the two variables on one another. Figure 12 is a combination of a plot of gestation length and litter size to demonstrate how species were presumed to clump.

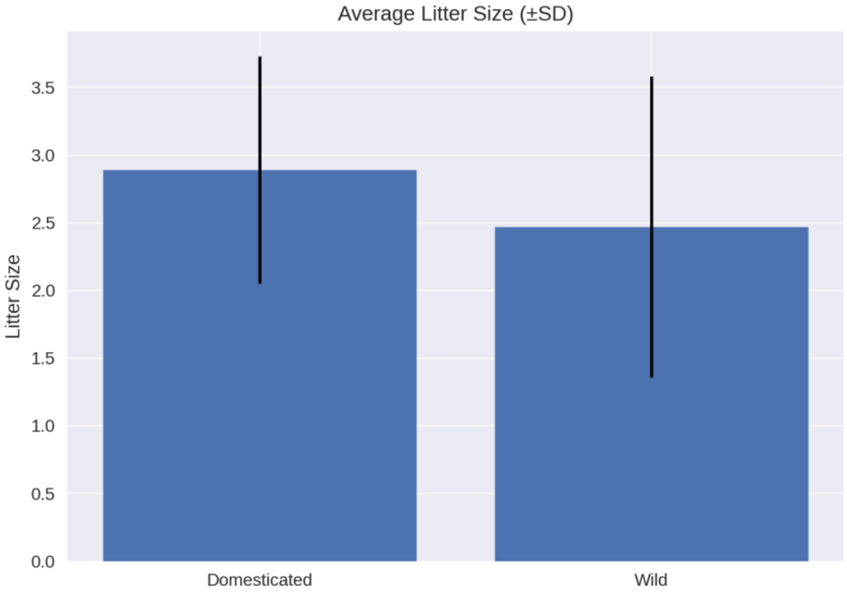


Figure 2. Mean litter size with standard deviation (p=0.004).

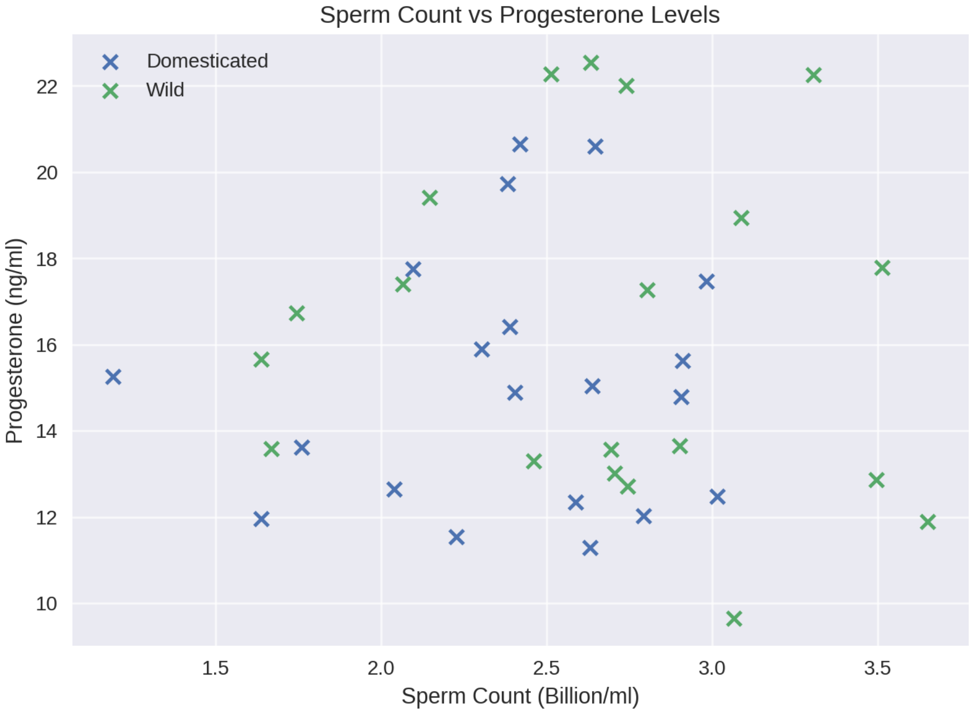


Figure 3. Relationship between sperm count and progesterone levels for domesticated and wild groups.

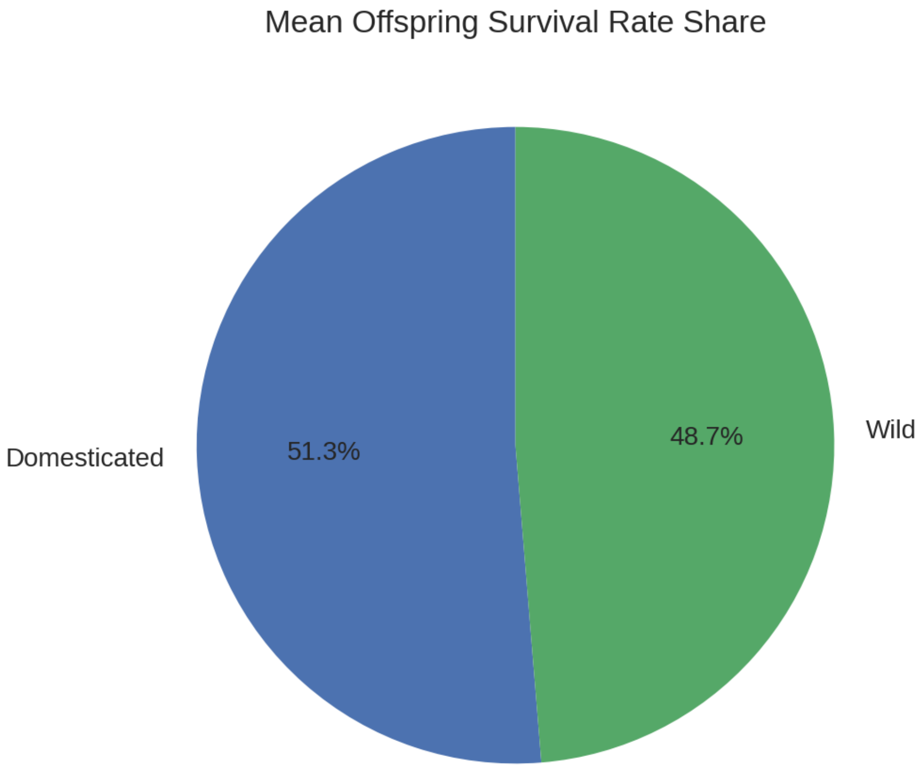


Figure 4. Proportion of mean offspring survival rates (p=0.000).

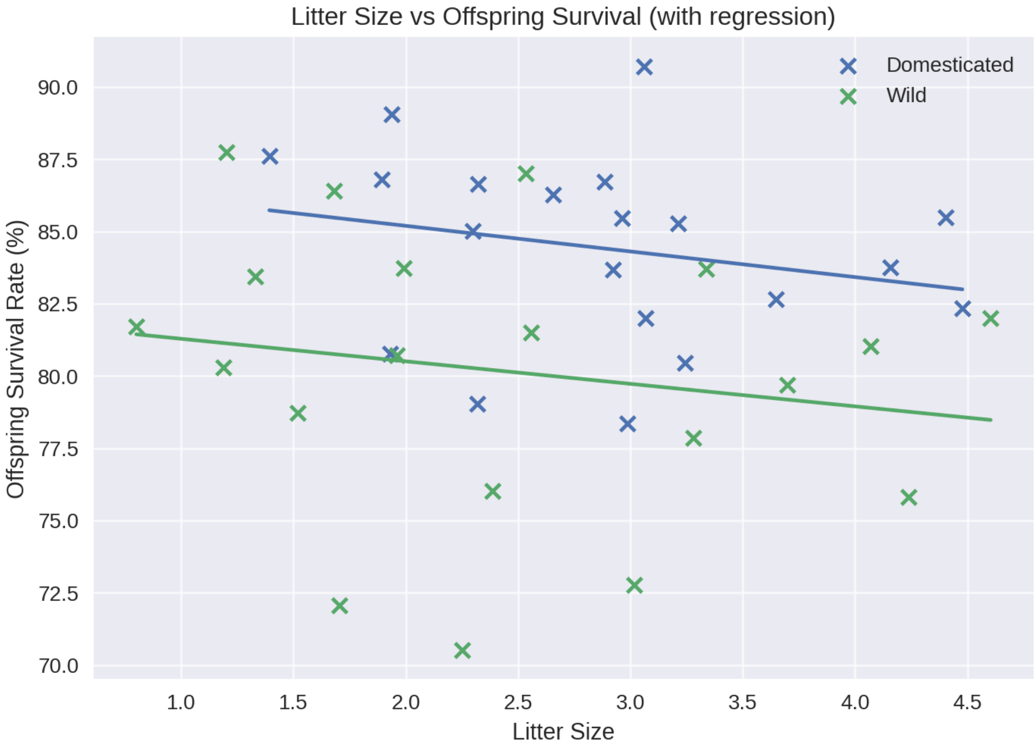


Figure 5. Relationship between litter size and offspring survival rate with fitted regression lines for both groups.

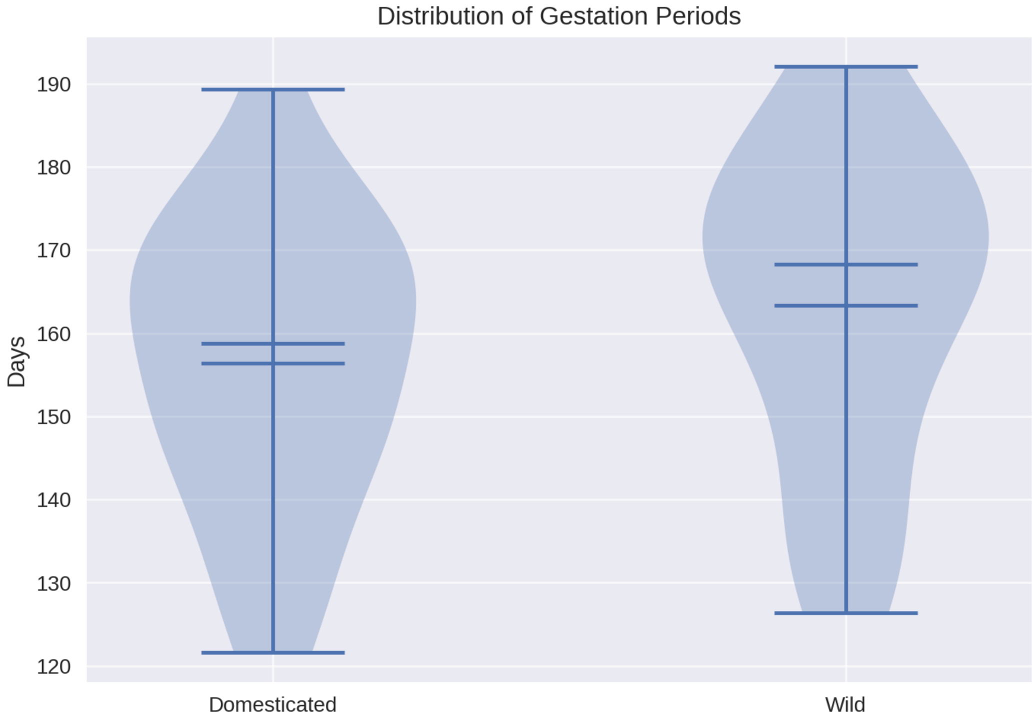


Figure 6. Distribution of gestation periods with medians and means indicated.

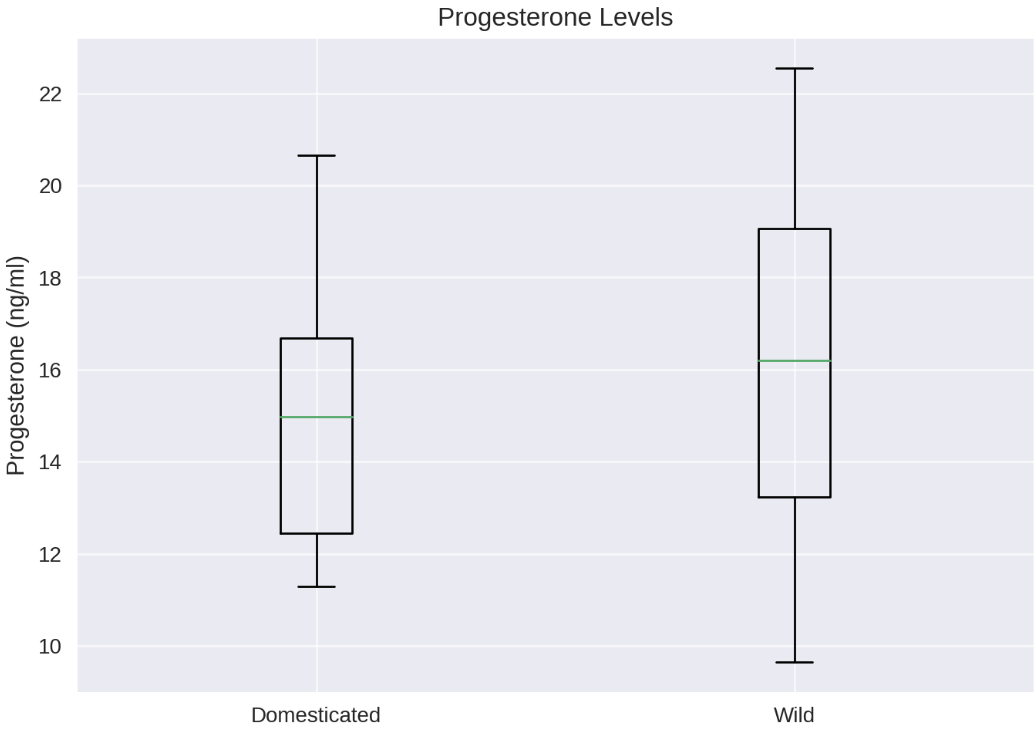


Figure 7. Progesterone levels across groups (p=0.008).

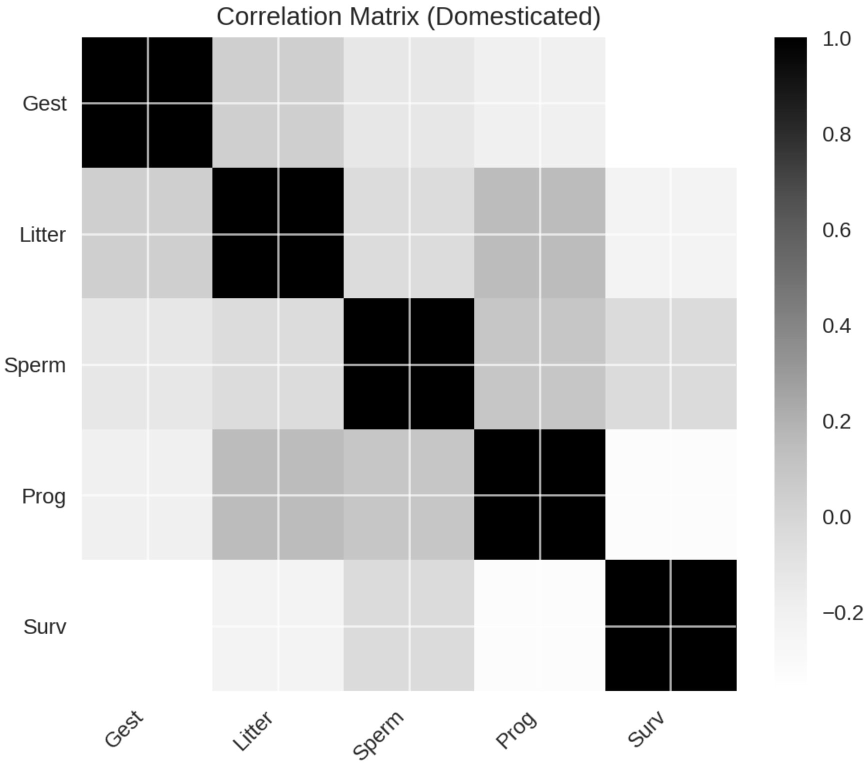


Figure 8. Correlations among reproductive parameters in domesticated species.

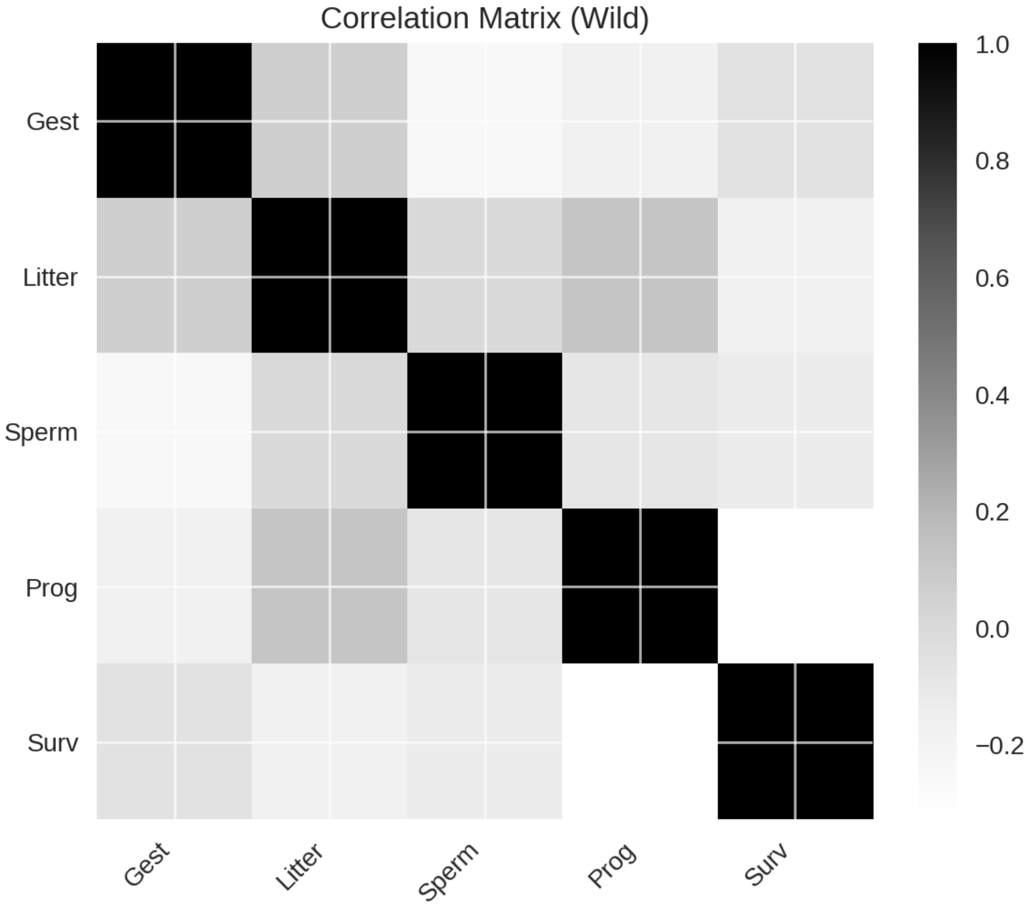


Figure 9. Correlations among reproductive parameters in wild species.

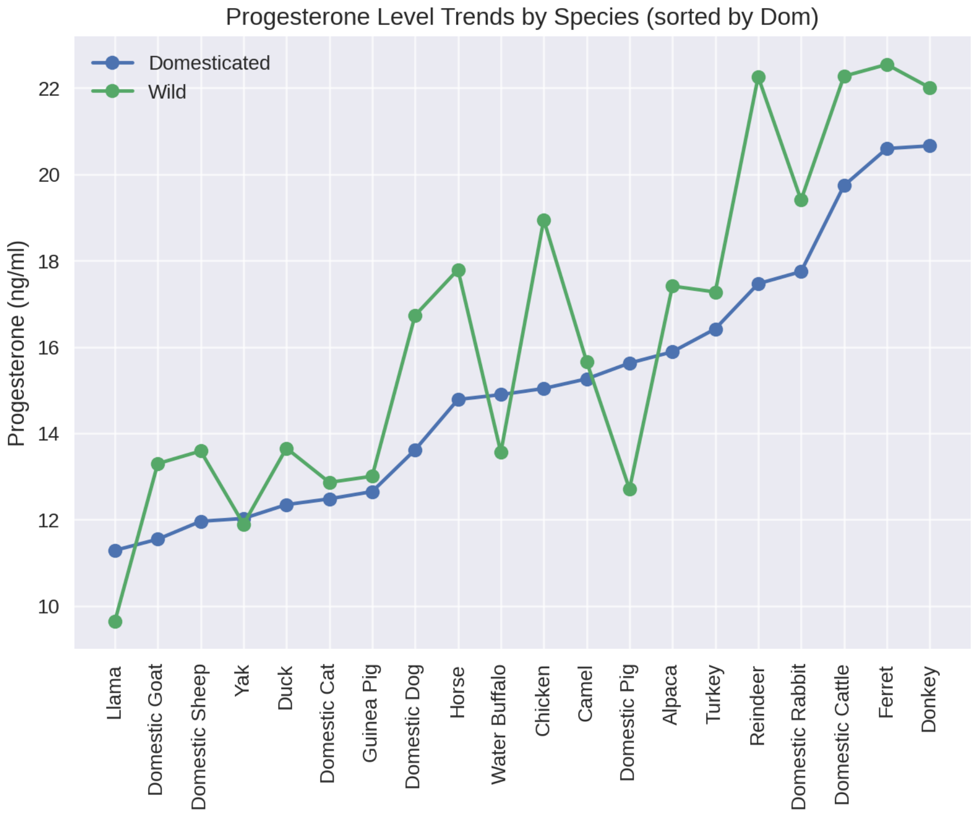


Figure 10. Progesterone trends across species pairs, sorted by domesticated levels.

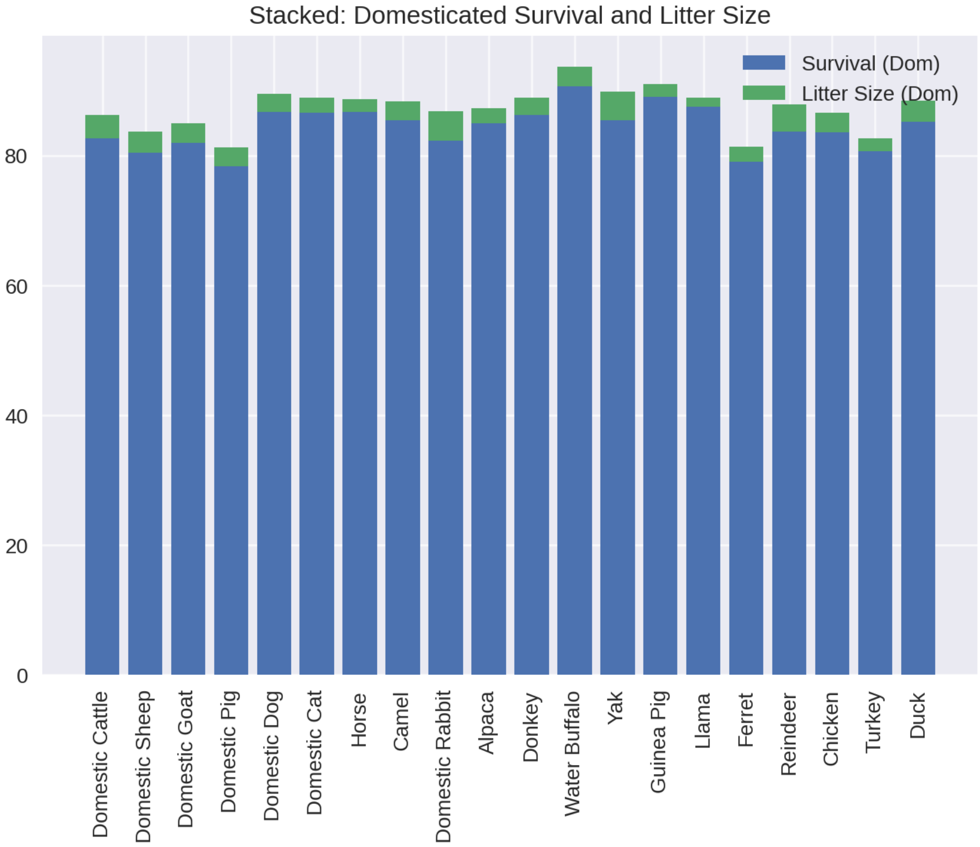


Figure 11. Stacked bars showing survival and litter size for domesticated species.

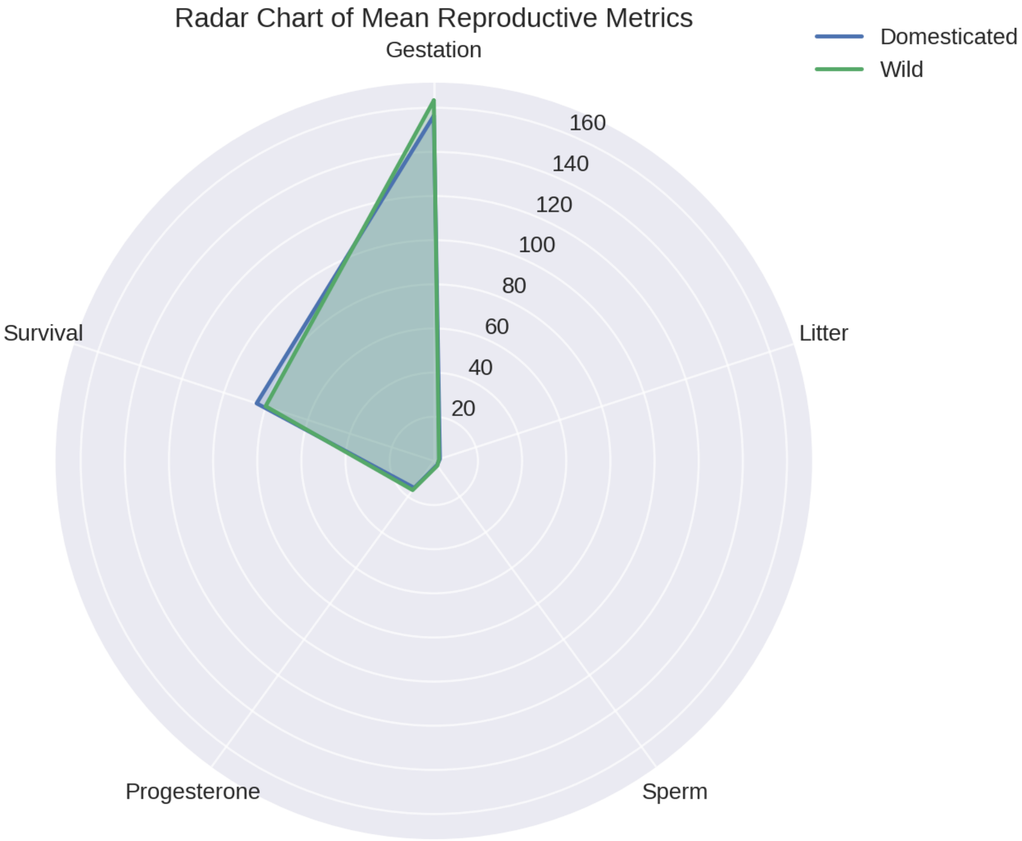


Figure 12. Radar chart comparing average reproductive metrics in domesticated vs wild groups.

Discussion

Reproduction is a simple biological process that reproduces new organisms and maintains the continuity of species (Okafor et al., 2022). The neuroendocrine system is a complex network that governs the reproductive functions of men and women the hypothalamic-pituitary-gonadal axis (Utami & Fachrul, 2023). The testes are controlled by hormonal responses via endocrine and paracrine signaling and are the most significant source of androgen hormones and where sperm form (Li et al., 2024). Testosterone or other androgen performs a valuable role in development and maintenance of the male reproductive tissues and secondary sexual characteristics (Zhai et al., 2024). To produce steroids, Leydig cells have to coordinate their mechanisms through hormones and signalling molecules (Mattos et al., 2023). The use of follicle-stimulating and luteinizing hormones regulates the fish cells interactivity and gene expression that occurs throughout spermatogenesis and folliculogenesis (Oduwole et al., 2021). Luteinizing hormone is produced by the anterior pituitary gland and directed to Leydig cells to produce and secrete androgens (Hsia et al., 2022). The anterior pituitary also produces follicle-stimulating hormone that aids in proper functioning of Sertoli cells that play a significant role in the maturation of spermatids (Oduwole et al., 2021). Oogenesis, folliculogenesis and steroidogenesis are clearly related processes in females in the ovaries. Gonadotropins, luteinizing hormone, and the follicle-stimulating hormone are produced by the anterior pituitary. These hormones assist in the production of gametes and steroids by the gonads (Fontaine et al., 2020). The hypothalamus is the source of gonadotropin-releasing hormone that directs gonadotropin-releasing hormone to launch luteinizing hormone and follicle-stimulating hormone (Yan & Lei, 2022). Hormones of the thyroid or adrenal glands, and most other reproductive and nonreproductive hormones can alter this hypothalamicpituitarygonadal axis (Sengupta et al., 2021). Examples of gonadal steroid hormones include androgens, oestrogens and progestins, and play a very significant role in the regulation of the reproductive processes and influencing the evolvement of the brain and behavioural patterns (Valero-Ochando et al., 2024). On the prenatal stage, sex steroid exerts organisational influences on the brain, altering the underlying brain circuits that would subsequently govern behaviours that vary between men and women (Trova et al., 2021). The binding of these hormones on specific receptors in target organs alters the expression of genes and alters cellular behavior. The testosterone levels are regulated by an interaction between the hypothalamo-pituitary axis coupled with local hormone in the testes (Li et al., 2024). Sertoli cells intervene as an interface between germ cells and endocrine signalling and have been shown to influence the hormonal regulation of spermatogenesis via exterior seminiferous tubule (extratubular) sources and regulate germ cell development directly by paracrine signalling (Ruthig & Lamb, 2022). It contains testosterone that is significant in making men more masculine, which initiates and maintains spermatogenesis in conjunction with the follicle-stimulating hormone (Oduwole et al., 2021). The follicle-stimulating hormone transduction to initiate spermatogenesis requires Sertoli cells that can only express the follicle-stimulating hormone receptors (Wang et al., 2022). When the follicle-stimulating hormone binds with its receptor and triggers the pathway of follicle-stimulating hormone signalling, it will establish a typical quantity of Sertoli cells and contributes to their transformation into another type of cell (Wang et al., 2022). The influence of steroid hormones, particularly the oestrogens, on most aspects of brain functioning and their determinants on human behaviour is profound including how they think, feel or relate to others in the case of human behaviour. The mammalian spermatogenesis is regulated by gonadotropic hormones and testicular factors.The testes carry out the spermatogenesis in their seminiferous tubules and depend on complex interplays between Sertoli cells and germ cells (Sharma et al., 2020). The spermatogenesis process is controlled by the brain, hypothalamus, and hypophysis in particular, utilizing gonadotropin-releasing hormone and gonadotropins (Saleh et al., 2021). The follicle-stimulating hormone is significant in the spermatogenesis because its receptor is limited to the Sertoli cells. Spermatogenesis is regulated by these cells as they control the number and activity of germ cells and provide them with nourishment via the paracrine effects (Wang et al., 2022).

Conclusion

It is an integrative mixed-methods study consisting of quantitative endocrine profiling, gamete quality assessment, and behavioural observation to provide a comprehensive comparison of reproductive physiology of farmed and wild mammals. The findings demonstrate that domestication impact has a significant influence on the reproductive attributes through the mechanism of hormonal systems and behavioural adjustments of ecology. There were also increased average progesterone and oestradiol during the oestrous cycle, reduced frequencies in between oestrous cycle, enhanced sperm motility in confined conditions of domesticated animals. It is likely due to stable diet and selective breeding. Instead, wild species showed greater variability in hormone profiles and gamete traits and an elaborate courtship behaviour, which is required when conditions might alter to give rise to successful reproduction. The correlation key revealed that the environment such as quality of the forage and weather change affected the wild population more as compared to the domesticated species that managed to reproduce despite environmental changes. The statistical models also demonstrated that species identity, whether it was domesticated or not, was also a very decisive factor in resolving reproductive outcome. Such results indicate how complicated the interaction of physiology, behaviour, and the environment may be. They further demonstrate that, although domestication enhances reproduction performance due to selection by humans, domestication can reduce the adaptive efficiency of animals in the face of environmental stress. This research provides valuable data to animal breeding, conservation of wild animals and evolutionary biology as a whole. It links simple physiology to real-life strategies of controlling reproduction.

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