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Behaviour traits of alpacas based on pasture and stable observations

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Alpacas are gregarious herbivorous animals whose breeding has been successfully developed in Poland. Alpaca (*Vicugna pacos*) is a representative of camelid family *(Camelidae*) and originates from South America, where it was domesticated approximately 6,000 years ago (Wheeler, 1995; Czub et al., 2010). Animals of this species have been bred in our country since 2004 (Czub et al., 2010). Alpacas are bred predominantly due to high quality of their fleece (Komosińska and Podsiadło, 2002; Czub et al., 2010). However, over time, people began to notice more and more benefits resulting from breeding animals of this species. Currently, they are used for the production of fleece, meat, skin and furs, in tourism and recreation, protection of sheep herds (they show natural aggression towards small predators such as dogs or foxes) as well as in alpaca therapy (Cavalcanti and Knowlton, 1998; Australian Alpaca Association, 2002; Morales Villavicencio and Niżnikowski, 2006; Morales Villavicencio, 2010). Alpaca origin used to be a contentious issue, because some scientists considered vicugna (*Vicugna vicugna*) as alpaca ancestor, whereas the others thought that it was guanaco (*Lama guanicoë*). However, genetic studies confirmed alpaca origin from vicugna, which is reflected by its morphology and features of social behaviour (Kadwell et al., 2001). This contributed to a change in Latin name of alpaca from *Lama pacos* to *Vicugna pacos* in 2001. Alpaca represents camelid family that is characterised by four common behavioural features: (1) they move in lateral ambling gait (when walking, they simultaneously lift both limbs on one side of the body, transferring body's weight from one side to the other, which gives the animals a rocking gait), (2) they mate in a squatting position (sitting), (3) they have a similar fight pattern (between males) and (4) are herd animals (they live in family groups) (Komosińska and Podsiadło, 2002). Moreover, the behavioural features of alpacas, similar to other species of South American camelids (i.e. guanaco, llama, vicugna), include polygyny (mating of a male with many females) and territoriality (Tomka, 1992; Wheeler, 1995). The aim of the present studies was to develop an ethogram of the observed group of alpacas as well as their behavioural time budget considering the time of the day and the age of the studied animals.

Material and methods

Nine Huacaya breed alpacas were observed, including 4 males (one at the age of 8 years, three aged 3 to 12 months) and 5 females (three at the age of 3 to 4.5 years, two aged 1-2 years). The animals were kept at the Zootherapy Centre of the University of Information Technology and Management in Rzeszów. During the observation period, alpacas stayed in the pasture during the daytime, and they spent early morning and night hours in the alpaca stable (a building for keeping alpacas divided into group stalls). Behavioural observations of alpacas were conducted for 7 days at the end of July and the beginning of August 2016, between 7:00 and 20:00. A method described by Martin and Bateson (1993), consisting in observation of animal behaviour during determined periods of time with a 10-minute interval, was applied in the present study. Time dedicated for the individual categories of behaviour was measured with the use of a stopwatch. The behaviour was classified as active or passive. Active behaviour included standing, moving, grazing, ruminating, grooming and social contacts,

whereas passive behaviour – resting. The time for the given type of behaviour was summed up, and then its percentage share in the whole observation was calculated. Based on the data on duration of particular types of behaviour on the following days of observation, the average values of the percentage of particular categories of behaviour were calculated. They served for the development of a general time budget of behaviour of the observed group of alpacas as well as time budget depending on the time of the day (in the morning at 07:00–12:00, in the afternoon at 12:00–16:00, in the evening at 16:00–20:00) and age of the animals (for 5 young individuals and 4 adult ones). Types of behaviour analysed in the time budget (fig. 1-4) did not include reproductive and excretory behaviour as well as water drinking characterised in the ethogram (table 1). This resulted from the fact that reproductive behaviour was observed occasionally, whereas water drinking and excretion lasted for too short a time to be distinguished as separate categories in the behavioural time budget.

Results and discussion of results

Based on the conducted observations, an ethogram (table 1) was developed that included the individual categories of behaviour observed in alpacas with a detailed description of their reactions. Alpacas are representatives of a herd species that is characterised by the presence of dominant and submissive relationships between individuals in a group. It has been observed that a dominant individual is a male, whereas females and the young submit to him. Inside a group of females, certain individuals occupy higher positions in the hierarchical structure of the herd than the others and it is often associated with their age. The young occupy the lowest position in the group. An individual with a lower position in the hierarchy manifests signals of submission towards an individual with higher position (table 1). Very similar features of social organization and hierarchical relations in representatives of camelids were also reported by Tomka (1992) and Komosińska and Podsiadło (2002). In authors' own observations it was noticed that in case of a conflict at the manger or in a situation when one of the individuals approaches the other one too close (e.g. when this one is lying), both of them demonstrate or only one of them demonstrates a warning posture (photo 1), sometimes accompanied by spitting at each other. Usually, an individual that is in a lower position in the hierarchy, retreats and walks away. Alpacas may form strong bonds between each other and if they are allowed to stay with their acquainted individuals, their welfare improves. It was also observed that the acquainted animals spend the majority of time together, resting near each other and grazing together, which facilitated strengthening mutual relationships. An interesting affiliation behaviour noticed in alpacas is quiet mooing that serves to maintain contact between the individuals. Strong social bonds between alpacas were also demonstrated by Pollard and Littlejohn (1995), who studied the influence of social isolation on behaviour and heart rate of alpacas and concluded that separating one animal from the rest of the herd is very stressful for it. Social interactions also play a very important role in dangerous situations. It was observed that in case of danger, alpacas herd together. The individual that notices a danger makes a high, shrilling sound and looks towards the potential danger with arched tail and pricked up ears. A similar description of reactions observed in a situation of danger was reported by Cavalcanti and Knowlton (1998). A phenomenon of social facilitation observed in many herd animal species, among others in sheep (Leme et al., 2013), occurs in alpacas as well. Observations of behaviour of these animals have shown that the phenomenon of social facilitation (when behaviour of one animal may have the effect on behaviour of the other animals) occurs in the following situations: (1) obtaining food (grazing, feed intake) and resting – when one individual starts grazing, the others follow it; if they rest, they also do it together; (2) defecation – it primarily concerns females and young who defecate at the same place and time (photo 2); (3) rolling in the sand or hay; (4) reproduction – when one male starts courtship, the other one does this as well.

Table 1. Ethogram of observed alpacas' group

Category of behaviour	Description of behaviour
Standing	Neutral posture: body position – straight up with head raised high, neck at the angle of about 120° in relation to the back; with pricked ears, tail lowered loosely, adheres to the body.
	A slight alarm: body position such as in the neutral posture, but ears lying flat, neck at the angle of 90° to the back.
	Interest: body position such as in the neutral posture, tail slightly away from the body, pricked ears, looks towards the object, neck at the angle of 90° to the back.
Social contacts	Signals of submission: the fore part of the body is lowered, ears lying flat, tail turned up to the back.
	Warning signals (threatening): individuals stand next to or opposite each other with outstretched necks, head is an extension of the neck or forms an angle of approx. 120° with the head. Both individuals have ears lying flat and tails lifted up. They produce sounds similar to snorting, rasping or sneezing (warning about spitting).
	Aggression: body position – erected neck, head raised high, open mouth, tail even with the line of the back, ears lying flat. The individual produces high sounds (similar to threatening signals that often warn about spitting). Spitting: body position as described above, spits with saliva often mixed with stomach contents. Chasing: it runs with lowered neck, tail raised up, ears lying flat.
	Group playing: frolicking, pretended fights.
Rest	Lying: lying on the abdomen with legs under the body, sometimes one fore leg is extended straight forward, head raised or lying straight on the ground; or lying on the side with head raised up or lying down.
	Lying down: squatting on the wrists, lying down the rump, lying down the fore part of the body.
	Standing up: raising the hind part of the body, then the fore part (the other way round than when lying down).
Moving	in lateral ambling gait: when walking, an animal simultaneously lifts up both limbs on one side of the body.
Grazing	Nibbling the grass with teeth aided by the lips.
Water drinking	Sucking water without using the tongue.
Ruminating	In lying or standing position, an animal moves its mouth alternately or in the same direction.
Excretion	Slight squat, tail is turned up to the back.
Grooming	Scratching with the hind leg (with nails) or nibbling with the use of teeth, rubbing against wooden elements, rolling in the sand or hay.
Reproductive behaviour	Flehmen response in males: head arched backwards, slightly opened mouth, pricked tears, lowered tail, sniffing. Courtship: a male chases a female and jumps up on her producing characteristic gurgling and rasping sounds; the female runs away for some time and then lies down and allows the male to cover her. Mating: in squatting position; when mating, a male produces a throaty sound, similarly as during courtship.

As it was already mentioned above, all camelids have a specific fight pattern. Antagonistic behaviour concerning territory defence is triggered by the fact that a stranger male invades the area occupied by the herd. For example, an adult vicugna male defends the occupied territory whose borders are determined by characteristic piles of dung (Tomka, 1992; Komosińska and Podsiadło, 2002). The role of an adult male as the group leader consists in maintaining its stable social composition and is associated with expelling young individuals from the herd: males 4-9 months old and females 10-11 months old (Tomka, 1992).

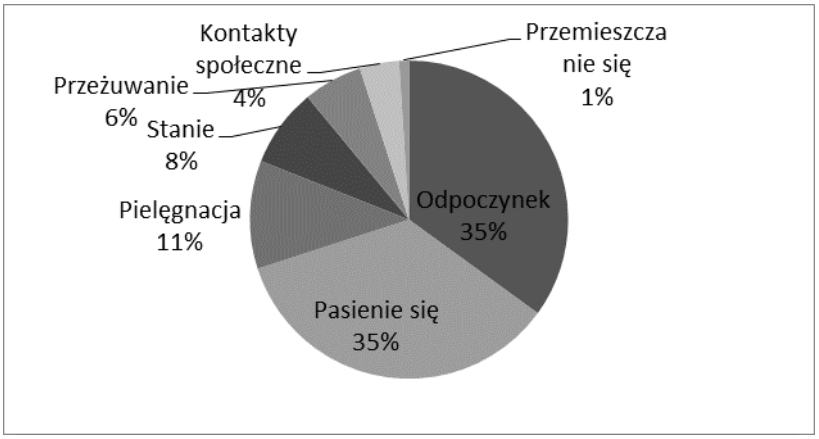

Fig. 1. Time budget of observed alpacas' group

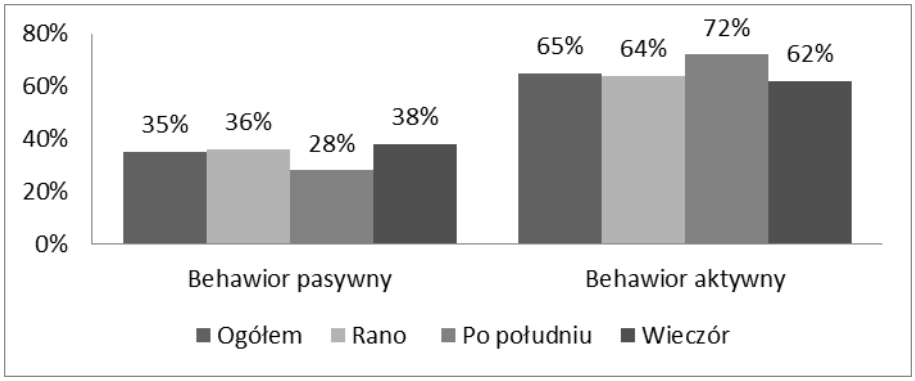

Fig. 2. Percentage contribution of active and passive behaviour in observed alpacas' group

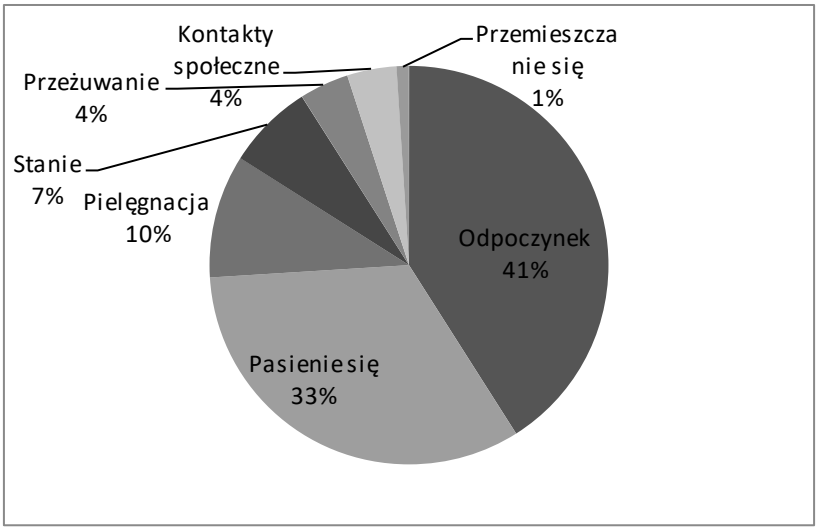

Fig. 3. Time budget of adult individuals

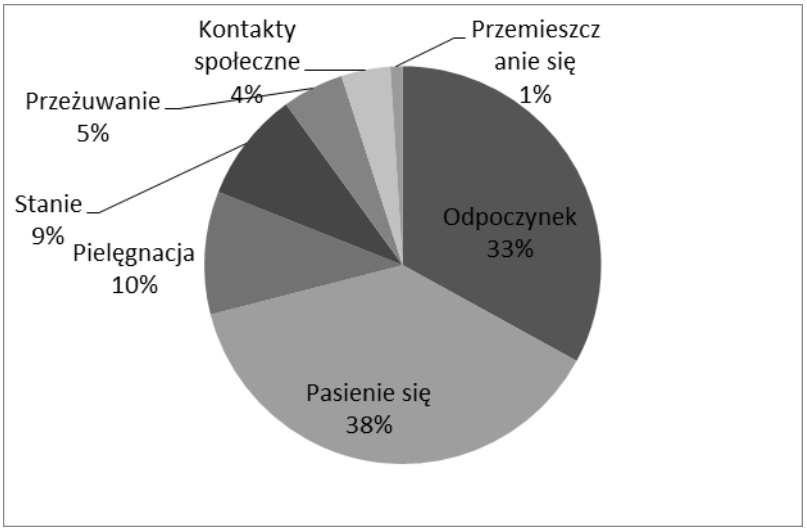

Fig. 4. Time budget of young individuals

Conflict situations between adult males most often have reproductive context and are associated with male rivalry for a sexual partner. During breeding season, the role of the dominant male is to keep the females together and drive away the other males trying to take over his territory and females from his herd (Tomka, 1992; Morales Villavicencio and Niżnikowski, 2012). When chasing, males exhibit various forms of aggression – attempts to bite the adversary in the area of legs, head and neck. In case of a very violent fight, they may even hurt themselves. The males also wrestle with their necks, trying to knock down each other, spit and make various sounds similar to roaring. Such types of reactions during a fight between male camelids were also mentioned by Komosińska and Podsiadło (2002) as well as Morales Villavicencio and Niżnikowski (2012). Manifestations of aggression in the form of spiting exhibited by guanaco and llamas were described by Hoffman (1993) as well as Cavalcanti and Knowlton (1998). In authors' own studies it was observed that in alpacas spiting is associated with a condition of strong emotional arousal and may be preceded by warning signals, such as throwing air from the mouth and a short spit of saliva often mixed with food that is present in the oral cavity. A defensive-aggressive reaction in the form of spitting towards the adversary may be associated with the use of a secretion composed of saliva mixed with contents of oral cavity and rumen. Male fights are connected with the function of leadership in the herd. Females do not fight between themselves and their aggression is restricted to spitting at each other and producing sounds similar to snorting. Escape is associated with disturbance of the individual distance and may be observed when people are approaching not entirely domesticated individuals. Alpacas are characterised by a wide variety of grooming behaviours, such as scratching with the hind leg (photo 3), rubbing against the fence or wooden elements, nibbling with teeth thanks to the long neck. Grooming reactions demonstrated by alpacas also include rolling in the hay (in stable stalls) and sand baths protecting them against external parasites. Alpacas exhibit a tendency to defecate only in specific places (the so-called "latrines") (Sharp et al., 1995; McGregor, 2002). Their excretory behaviour consists in a characteristic squatting during defecation and urination. It was observed that alpacas do not graze in the places designated for defecation or nearby that protects them against the spread of the internal parasites, which was also mentioned by other authors (Australian Alpaca Association, 2002; McGregor, 2002).

Authors' own observations indicate that in the area of the "latrine", males often demonstrate Flehmen response (head arched backwards, slightly opened mouth, sniffing, pricked ears, lowered tail) that enable them to recognize whether a female is ready for reproduction. Behavioural activities associated with reproduction include courtship and copulation. During the courtship, a male chases a female and tries to jump up on her producing gurgling and rasping sounds. The female runs away for some time and then lies down and allows the male to cover her. A female that does not want to be covered tries to discourage the male by making attempts to kick him, threatening to spit (extending the head to the male, with ears lying flat) and spitting. A very similar course of reactions associated with reproductive behaviour of alpacas was reported by, among others, Pollard et al. (1995) and Morales Villavicencio (2010). During pregnancy (that lasts for approximately 11 months) females may change their character (from being gentle to nervous), which disqualifies them from use, e.g. in alpaca therapy, for that time. Young alpacas are born in the spring and summer period. Females do not breastfeed the young that are not theirs, but are very caring towards their own offsprings (Morales Villavicencio, 2010). It is most convenient when young alpacas are raised together with a group of peers, because their mother and the other adult individuals do not play with the young. It has been observed that young individuals play together, frolicking and pretending to fight. Play behaviour is characteristic for young animals but sometimes it can be watched that an adult individual manipulates objects, which may be related to both curiosity and play.

Behavioural time budget of the studied group of alpacas (fig. 1) indicates the percentage contribution of duration of the individual categories of behaviour during 13 hours of studies conducted using a technique of observations in time intervals. It was concluded that alpacas spend most of the time on resting and grazing (35% each), and least of the time on moving around the area (1%). Twenty-four-hour studies by Sharp et al. (1995) demonstrated that alpacas graze most actively during daytime hours, whereas they exhibit significantly higher rumination activity at night and in early morning

hours. Based on authors' own observations it was concluded that in general rumination constitutes only 6% of the day time budget of alpacas (fig. 1), which is consistent with the results obtained by the previously mentioned authors. The classification of behaviour as active and passive (fig. 2) reveals a herbivorous nature of alpacas. They exhibit active behaviour for most of a day that is associated with eating large amounts of roughage food, rich in fibre and poor in energy. In morning hours (7:00–12:00) alpacas spent most of their time, compared to the other times of the day, on social contacts (photo 1) and ruminating, 17% and 10% respectively. During morning hours, the animals dedicated only 20% of the time to grazing that was related to the fact that before being allowed to graze, they had been fed oat in the stable. Rest took about 36% of the time, standing and grooming – 8% each, whereas moving corresponded to 1% of the time. In the afternoon (12:00–16:00), alpacas spent least of the time, in comparison with the other times of a day, on ruminating and standing, 2% and 4% respectively, while grazing took most of the time (57%). Twenty-eight percent of the time was dedicated to resting, 8% per grooming and 1% per moving. Social contacts were shown so rarely that they were not taken into account in the afternoon activity. In the evening (16:00–20:00), the animals rested for most of the time (38%) and spent more time on grooming (13%) and standing (12%) compared to other times of the day. Grazing took 31% of the time, ruminating – 4%, while moving and social contacts corresponded to 1% of the time each. Adult individuals (fig. 3, photo 4) rested (41%) and grazed (33%) for most of the daytime, whereas ruminating, social contacts (4% each) and moving (1%) lasted for the least of the time. On the other hand, young individuals (fig. 4, photos 5 and 6) spent most of the time on grazing and rest, 38% and 33% respectively, whereas social contacts (4%) and moving (1%) took the least of the time.

Summary

Alpacas are herbivorous animals active during the day, which is indicated by the advantage of active behaviour over passive one (2/3 vs. 1/3 of the observation time). It is connected with intake of large amounts of low-energy roughage food, mainly in daylight hours. Their gregarious nature reveals in a wide variety of communication signals (among others visual and sound ones) as well as dominant and submissive relations. Social contacts occur more often in stable stalls than on the pasture, which is associated with less space and shorter distance between the individuals. Behavioural observations of alpacas showed the phenomenon of social facilitation, especially when grazing, resting, defecating rolling and reproduction. These animals are most active in the afternoon and less active during the morning and afternoon hours. Adult alpacas spend more time on resting while young individuals spend more time on grazing activity. Studies concerning the specificity of alpaca behaviour are of both cognitive and application importance. It is connected with currently growing interest in conditions of maintenance of alpacas and their use not only to obtain fleece, but also in alpaca therapy. The presented information on the features of alpaca behaviour may be useful in the aspect of satisfying the behavioural needs of these animals, which allows to maintain a high level of welfare.

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BEHAVIOUR TRAITS OF ALPACAS BASED ON PASTURE AND STABLE OBSERVATIONS

Abstract

Alpacas are social herbivores and nowadays successful development of their breeding is observed in Poland. The aim of the study was to describe their ethogram and behaviour time budget with regard to the time of the day and the age of studied animals. Time sampling recording method was used during behaviour observations of 9 alpacas of Huacaya breed. In the daytime alpacas as typical herbivores spend more time on active behaviour (2/3 of observation time) than on passive behaviour (1/3 of observation time). It is connected with grazing great amount of low-energy feeds during the daylight. Behaviour observations of alpacas showed the phenomenon of social facilitation, especially observed during the situations connected with grazing, resting, defecation, rolling and reproduction. The most intensive behavioural activity of alpacas was observed during afternoon hours. Adult alpacas spend more time on resting while young individuals spend more time on grazing activity.

Key words: alpacas, behaviour, time budget

Illustrations in the work: J. Kapustka