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METHODICAL RECOMMENDATIONS ON MOOSE CALVES RAISING; MOOSE COWS KEEPING AND MILKING

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The recommendations are intended for workers of experimental moose farms, zoos employees, hunting managers and other persons who are engaged in catching, raising or the keeping of moose.

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The techniques of moose captivity and domestication have been developed in our country for more than 50 years. First-ever in the world experimental moose farm was established in 1949 in Pechoro-Ilych reserve in Komi Republic. Employees of the moose farm E.P.Knorre and M.V.Kozhukhov have developed basic principles of moose husbandry on moose farm. These basic principles include how to raise moose calves, maintain adult moose, milk moose cows and veterinary service of moose on a moose farm. The recommendations on moose husbandry on moose farms issued on the farm at Pechoro-Ilych reserve in 1967, have not lost its value today despite certain additions of new data are required.

Moose domestication work at Kostroma state regional agricultural experimental station has been conducted for more than 20 years. During the past ten years Kostroma state regional agricultural experimental station has raised more than 300 moose and produced more than 17,000 kg of moose milk. The station maintains 10 or more milking cow moose every year for the last 10 years. Kostroma moose farm has become a base for widespread scientific researches and attracted scientists from many research organizations – many research works were carried out and published with their collaboration. These research works include the development of methods and technology of raising moose and training of milking moose cows; the study of moose milk and moose dags curative properties; to investigate helminthes invasions upon moose and to develop the helminthes prevention methods on moose farms and so on. These works are carried out according to tasks of the State committee on a science and techniques at Ministerial council of the USSR #209 from 23.4.74 and #240 from 20.5.77

The further development of moose husbandry and creation of new experimental moose farms (in particular, in Bashkir Republic and Gorky region) have demanded the generalization of existing rich experience in raising of free-ranging moose in the outline of the present methodical recommendations.

1. RAISING AND KEEPING OF YOUNG MOOSE CALVES

1.1. Preparation of a premise for moose calves home

Within first two-five weeks of their life moose calves should be held in moose calves shed. The shed area should be larger than 2 m^2 per calf. The premise must be dry and clean, provided with ventilation exhauster, without draughts. All the straw used for bedding should be preliminary checked up for absence of *aspergillus fumigatus* infection and other fungoid and bacterial contaminations (1). There should be a separate calf feeding room and a kitchen built in the close proximity of the calf shed. The walls of calf moose shed should be sheathed with plane wood, hardboard or a polymeric film at least up to 1 meter from a floor to prevent moose calves from chewing heat-insulating oakum, wooden chips, and so on.

During the spring, prior to the beginning of moose cows parturition, the premise of calf moose shed should be disinfected with caustic or chloramines. The walls are to be whitened with whitewash chalk or slaked lime and dried. A paddock yard area, ideally with grass, trees and bushes, and clean of other objects should be fenced adjoining to the moose calves shed. The fenced paddock should be not less than 3 square meters per calf (2).

Inside the moose calves shed and in the paddock several washtub-like feeding troughs of 30-40 cm in width and 50 – 60 cm in height from a floor should be mounted for feeding moose calves with green forage; and also supports for salt-licks and for buckets with water must be built. Use of this paddock yard for the keeping of adult moose or any other animals even for short time in other periods is inadmissible.

1.2. Moose cows parturition and separation of moose calves from mother

Creation of new moose farms usually begins with purchase of some livestock of the tamed animals, including pregnant moose cows. The success of raising moose calves in many respects depends on correctness of carrying out parturition and separation moose calves from mothers.

Before parturition tame moose cows should be placed in a fence with wood vegetation, spacious enough, so every moose cow herself could choose a suitable place for labor. It is even better to have several fences to avoid contact between moose cows who at this time often exhibit aggression to each other. Moose breeders should examine fences at regular hours and observe behavior of animals, to find out approach of labor in due time.

It is difficult to specify unequivocal evidences of labor approach. Some animals during this period refuse to eat delicious food; almost always the udder of a moose cow before parturition is swelling and colostrums appear in teats. In most cases during one-two days before labor moose cows start to exhibit the raised locomotor activity which gradually increases (directly ahead the labor the general excitation in moose cows is often observed: sometimes they even run along a fence). Such an excitation is sharply replaced by rest. It means that moose cows soon will start to give birth. She chooses a place suitable for labor and lies down.

The calf birth since the appearance of fetal bubble takes average 45 minutes (in

concrete observed cases this interval ranged from 15 minutes to 2 hours 16 minutes). Primiparous usually give birth to one calf, and parous moose cows – usually two. The second calf appears in average of 20 minutes after the first one.

It is recommended that moose breeder or the milkmaid stay nearby moose cows during labor – no more than 5 meters away from them (3). In this case the person is imprinted by the moose cow, as one of favorable components of an environment in which the parturition has occurred. Therefore a human can manipulate the calf freely enough in the further, not causing aggressive reaction in the moose cow. Besides, moose cow gladly gives milk to the person who was present at the parturition, which facilitates the milk training.

If parturition was not noticed, and it is necessary to approach a moose cow in some hours after it, it is necessary to take great precautions. As a rule, a moose cow defends her place of parturition and can even attack a person coming towards it. If another moose cow will approach the parturition place, the parturient one will surely exhibit signs of aggressive behavior. Depending on the distance, the signs may vary from menacing pose to more active actions. For example, parturient female can rise and then charge towards another female, rise on hind legs and even strike her by fore hooves.

If the labor is normal, after break of fetal bubble, it is possible to see sticking out hooves of fore legs. If, instead, there is only one hoof or three hooves at the same time, it is necessary to call a vet for assistance. Calf comes into the world, having extended for whole length: first appear extended fore legs on which lays the head densely pressed to them, then a trunk and, at last, the extended hind legs.

After a birth of fetus, and frequently already after its liberation of three quarters, moose cow stands up, and thus breaks off the umbilical cord. Moose cow turns round, bends to a calf, starts to lick him and lies down again. Licking a calf by mother not only accelerates his drying and thus normalizes it thermoregulation, but also provides necessary massage of muscles and internals. Moose cow, in turn, during licking a calf, obtains amniotic fluid liquid which contains biologically active substances necessary for involution of birth canals and for stimulating the lactation function.

During parturition of primiparous cows it is necessary to very closely observe the attitude of cow moose towards her newborns. In some cases the functional system of parental behavior in that moose cows appear immature. They, instead of licking their calves, exhibit signs of aggression, down to striking them with hooves. If a moose cow demonstrates this kind of behavior, a calf should be taken away from her immediately.

The newborn lifts his head few minutes after birth, and soon starts to try to rise on legs. First he tightens legs under himself, and then raises a trunk above the ground leaning on bent in hock joints fore legs, then unbends hind legs and, at last, unbends metacarpi. All this process, broken usually by repeated falling, proceeds, according to our observations, 12–58 minutes (26 minutes on the average). Usually calf completely learns to stand up on legs if he succeeded this once.

As a rule, moose cow and calf do not require assistance. From the human it is required only to disinfect an umbilical cord of the newborn – cauterize with a powder of potassium permanganate. If umbilical cord is longer than 10 – 15 cm, it must be preliminary cut with sterile scissors. The umbilical cord gradually dries up and by 7-10 days of a calf life disappears.

If a moose cow does not start to lick the newborn at once, it is necessary to clear newborn's mouth and nostrils of slime with a clean towel so that he could breathe freely, and bring the calf to the mother's head for licking. If a moose cow does not exhibit a normal parent-calf behavior or even shows attributes of aggression towards calf, the moose breeder should vigorously rub down the calf dry with a clean towel.

In newborns moose calves a so-called «oral automatism» is very early noticeable: already during the birth of a fetus it is possible to observe a series of smacking movements by calf's mouth. This automatism represents innate reaction – the precondition of formation of normal nutrient behavior. In some minutes after a birth moose calves take bush branches, leaves, and mother's hair in a mouth with chewing and smacking movements. They actively try to approach all objects outstanding against the background, and their mother first. The duration since birth till the first sucking is on the average more than 70 minutes, so searching a teat is a difficult task for a calf. Colostrums of a moose cow contain the most valuable nutrients and immune bodies which provide calf resistibility to infections in the first days of his life. Therefore it is necessary, if possible, to let moose calves suck her repeatedly before separation from mother. Usually for this purpose it is enough to leave moose calves with mother for 4 – 5 hours.

After this period, it is necessary to separate calves from mother to tame them to man and to provide milk training to moose cow. At separation of moose calves it is necessary to consider, that at the first hours of their life there is no close bond between them and mother which is formed in the further if they remain together. First days both moose cow and calf react to «key signals» emitted by each other. These «key signals» promote formation of close bond «mother – infant». For example, moose cow reacts to calf intensive movements and on his restless squeak. Therefore it is possible to take a sleeping calf gently on hands and to carry him away in a view of mother, not causing any sign of aggression. For better success it is possible to distract moose cow attention from the newborn – for example, to give her a tasty food or to begin to milk.

Calf, in turn, reacts only to some, rather nonspecific characteristics of mother. For example, innate «reaction of following» the mother is exhibited by a newborn calf in relation to any «large» moving object. This feature of calf behavior can be successfully used for his separation from the mother: if a moose breeder retires from the newborn, the least starts to follow him, and thus can be withdrawn from a parturition place. As the calf does not exhibit signs of anxiety, the moose cow (during the first day after labor she mainly lays) allows withdrawing him.

Moose calves very well follow a human if appear in unfamiliar conditions. Therefore by means of reaction of following the newborn himself can come behind the breeder to a calves shed, which can be remote from a place of parturition for 1000 m and more. This way of moving calf to calves shed is the most natural, it does not cause any stress.

If moose calves are weak and badly move, they are to be carried to the shed on hands, (two people bear a basket with a calf) or transported in a big basket or a box on any kind of transport.

1.3. Keeping and feeding moose calves in the moose calves shed

First two-five weeks moose calves live in moose calves shed, requirements to which have been formulated above (see 1.1.).

During the first three days a calf should drink colostrums, and then mother's milk. If for any reason parent colostrums is not available or it is not enough of it, it is possible to use colostrums (and as a last resort – milk) of another moose cow (4). For nursing moose calves it is necessary not to use children's soft bottle nipples, but to use lamb bottle nipples instead. They are firm and their size and form are closer to a moose cow teat. For nursing special mamillar drinking feeders or bottles with screwed caps having holes of a nipple diameter are used. The aperture of the nipple should be small (no more than 1.5 mm in diameter). To estimate suitability of a nipple, it is necessary to measure time during which a healthy calf exhausts through it a normal portion of milk. If this time is less than 30-40 seconds the aperture of a nipple is too large for the nipple to be used. If it takes 2–3 minutes or more – it is necessary to increase an aperture.

One of the most difficult moments in moose calves bottle feeding is their schooling to a nipple. If a moose calf did not suck his mother, he is accustomed to the bottle feeding very easily. If a calf sucked his mother even once, he can for a long time refuse to drink milk from a nipple. It is necessary to remember, that in a calf, taken away from mother and taken to the moose calves shed, the two motivations coexist: nutritive and defensive. Therefore noise, sharp movements of the moose breeders, attempts to force a calf in a "suitable" pose and to forcedly keep the nipple enclosed in a mouth can lead to domination of defensive and suppression of nutritive motivation. Therefore it is necessary to accustom a calf to a nipple in the conditions to which he already has had time to get habituated, and thus it is necessary to avoid application of any strong stimuli which can cause negative reaction of a calf.

The rubber nipple parameters essentially differ from warm and soft mother's nipple. Therefore a calf, to which a nipple is put in a mouth, will spit it out until he «tastes» the milk and until presence of a nipple in a mouth will be associated with getting milk. Therefore it is not necessary at any cost to keep a nipple in a calf mouth. On the contrary, if calf has spat out a nipple, it is necessary to wait a little to let him calm down and feel taste of the milk which has poured out from a nipple, and then begin new attempts.

If a calf exhibits expressed negative reaction to a nipple, it is necessary to leave him alone and to wait, when hunger will become aggravated. If a moose breeder behaves correctly, the calf gradually ceases to spit out a nipple from a mouth and starts to swallow milk draining from a nipple, and then starts sucking movements.

If the defensive dominant in a calf was occasionally generated, his schooling to a nipple becomes a very difficult task and demands from a moose breeder special art and intuition. In such cases it is expedient to begin schooling calf to a nipple when he is slumberous, gently raising a tip of a muzzle and inserting a nipple in a mouth. With care, and patience, thus it is possible to accustom to a nipple even those moose calves which have been separated from mother in age of 20–25 days.

To exclude negative influence of new conditions on a calf, it is rather desirable to accustom him to a nipple on the birthplace, near to mother. In this case calf receives the freshest colostrums in one-two minutes after milking (5).

In the nature moose calves in the first days of their lives suck mother up to 20 times a day. It is evidently, that at manual nursing it is impossible to feed calves such often. Depending on quantities of moose calves and breeders, the number of nursing per day can be reduced down to five-six (6). The further gradual reduction of nursing frequency is possible after two months of moose calves life. Intervals between feedings should be approximately equal. In the night time it is possible to increase an interval between feedings (for convenience of the personnel) for 1-2 hours, with a little increase of milk quantity in the last evening and the first morning nursing respectively.

In hot days it is necessary to increase some intervals between nursing, in the hottest time of day, because moose calves are inactive in a heat and eat without appetite. Before feeding with colostrums and milk it is necessary to warm them up to 37–38°C. Giving too hot or too cold milk leads to diseases of the digestive tract in moose calves, with very heavy patterns sometimes. After nursing it is necessary to wash up the used utensils carefully with a special washing powder for dairy, and to boil nipples.

Within first one-two days newborn moose calves are fed from a bottle which a moose breeder holds in hands. As soon as moose calves will learn to suck milk actively, it is possible to attach bottle with a nipple to a wall using a support (angled 45–60 degrees to a vertical) at such a height that calf, having raised a head, could hold a nipple in a mouth without a tension. By using such supports or special drinking feeders, it is possible to feed simultaneously 5–20 moose calves; which essentially facilitate the work of moose breeders. The norm of given colostrums and milk depends on calf weight, his age and development. Estimated milk quantity for average calf is given in table 1.

Moose milk is a valuable nutritious and even a medical product. To use it in a national economy, it is gradually (since 30–40 days of moose calves life) excluded from a moose calves diet, and corresponding (having equivalent quantity of nutrients) quantity of a dairy substitute is added instead. For this purpose usually a substitute of whole cow milk (WCM) or a substitute of the sheep milk (SSM) are used. It is better to enter SSM (WCM) into a moose calves diet before begin to relearn them to drink milk from a bucket instead of nipple.

At this time their food behavior is automated, and they suck milk from a nipple with gradually increasing impurity of SSM (WCM), without any negative reactions to changing taste of the liquid. If a substitute is added to a diet at the same time with schooling to a bucket or immediately after they have learned to drink from a bucket, then some moose calves refuse to drink it.

As a last resort it is possible to use the cow milk for raising moose calves. M. V. Koshukhov (Pechoro-Ilych moose farm) recommends to use fresh colostrums or milk of cows after parturition in whole of 2,5 liters of milk per calf per day (smaller moose calves in first two days are given 1,5–2 liters). This norm gradually increases up to 3 liters per day, and, after moose calves start eating green forages on a pasture, gradually decreases.

In the nature moose calves start to take in a mouth, beslaver, chew, and then swallow grass and leaves of bushes in the very first days. By 14–17 days of a life they have a cud. At the age of 2 weeks they spend more than two hours per day eating green food if it is available. To assure the process of eating of greens training, it is necessary to provide calves with green branches (with leaves) of aspens, willows, mountain ashes, birches and other plant species eaten by moose, and also grassy plants, such, as spiraea, bistort, blooming sally, wild

geranium, river bennet and others. The green forage should be always fresh.

There should be buckets with fresh water from the first day of moose calves appearance in the shed (during the first 5–10 days of life moose calves should drink boiled water), and in a feeding trough there must be a piece of salt-lick. Daily (1–2 times a day) moose calves should get mineral supplements: fodder precipitate, a bone flour, di-calciumphosphate and so on. The mineral supplements are given mixed with milk or right after nursing with a teaspoon.

In the nature, up to age of two-three-weeks, moose calves periodically actively eat soil, river sand, dry old grass and foliage, dust of rotten stubs and even excrements. The same reaction is observed in moose calves, grown up by humans. Eating the contaminated soil in a walking paddock yard can cause gastroenteritis in moose calves, therefore it is expedient to put a bucket with pure river sand and (or) with "pure" soil, dug in a forest. As our experience shows, moose calves eat them without any harm. In 1984 24 calves have eaten in total about three buckets of sand and could freely eat the soil during walks, and the number of digestive tract diseases was minimal.

Regular walks on fresh air are necessary for moose calves normal development. In hot days animals are let out into the yard in the earliest morning and late evening hours, but they stay in the shed during hot time in order to prevent overheating in the sun. Sometimes moose calves remain in this paddock yard for the night. In cool weather the animals must have access to a paddock all through the day. At the age of three-four weeks moose calves can be walked in the forest to accustom them to browsing in the presence of a moose breeder. In the beginning moose calves are accompanied by two people on such a walk, but then, in process of their accustomization to moose breeders, when moose calves can pass from a place to a place on their call, already one person can take the whole group to a forest walk.

From early age of moose calves it is necessary to form skills which in the further will help to control the behavior of adult animals. To make all calves come to milk feeding at the same time, the feeding must be preceded by a sound signal. It can be a horn sound, a gong or simply a loud sound from impact of heavy metal objects. Moose calves quickly remember this signal; and when they will live free on pasturage in woods, they will come on the signal to get milk (replacer). It is necessary to aim at every calf being fearless in approaching to a human and responding to his nickname. It is possible to accustom moose calves to a delicacy at three-four-week age – to give them the bread cut by thin slices, potato, apples, sugar (7). Moose calves easily get acquainted to these delicacies because at this age their wholesome food behavior is intensively formed. At the same time it is necessary to remember, that in an overabundance these products can cause indigestion and consequently up to three-monthly age calves should eat them no more than 50-100 grams per day. At the same age it is necessary to put on moose calves halters to which they quickly get accustomed. In the further it will essentially facilitate their schooling to a bridle.

To watch the growth and development of moose calves within the first year of their life it is necessary to weigh them at scheduled time. Weighing can be done in a pen or on an open platform. It is expedient to keep balance with these appliances in the same premise where moose calves constantly receive milk to accustom calves to their appearance and to avoid fear. Moose calves are quickly habituated to enter a platform or pen led with a delicacy or with bottle and a nipple, so the procedure of weighing does not cause any difficulties.

By the end of the second month of moose calves life it is necessary to learn them to drink milk from a bucket (8). It is hard to do, because skill of sucking milk from a nipple was already automated; as a matter of fact, it is necessary to destroy old functional system of food behavior and to create a new one. Process of relearning can be essentially facilitated, if moose calves will be preliminary learned to suck milk from a nipple with lowered head first. For this purpose it isn't hard to make flexible bottle supports which let change the position, height and direction angle of the nipple gradually.

The animal hygiene requirements for keeping moose calves in a shed basically are the same, as those for raising cow calves: it is necessary to clean premise at least twice a day, to remove partially eaten branches, to change a litter, to ventilate premises regularly, to make sure that moose calves always have fresh water and salt-lick.

In order to prevent the digestive tract diseases it is necessary to watch regularly the daily defecation frequency of each calf; what the excrements look like; check whether the tummy is not distended; whether there are no residual liquid excrements under the tail or on hind legs. In the latter case it is necessary to wash them off regularly. It is necessary to see a veterinary if first signs of a diarrhea or, in the contrary, of constipation are noticed. If the veterinary is absent at the moment, the treatment of moose calves should begin under the scheme which should be known to everyone on moose farm.

1.4. The moose calves keeping in mobile camps

At 2-5 weeks (9) moose calves are taken to free pasturage in woods near a mobile camp. To fix a camp a well-grassed and covered with eatable trees and bushes area is to be chosen. In the nature, moose prefer damp areas of forests with plentiful marsh and river vegetation. They willingly bathe in rivers and lakes. However in the vicinity of a moose farm where concentration of adult animals is usually high, favorable conditions for helminthes invasions exist. Therefore parasitologists recommend using dry areas of woods as camp sites. In a «feeding station» – «canteen» of such a camp moose calves receive milk replacer regularly; there should be corresponding fodder equipment such as special troughs divided into separate cells, or the buckets fixed on the holders.

On the Kostroma farm such a feeding station has a mobile installation with the fodder equipment surrounded with a fence made of a wire grid or a rail fence attached to poles or trunks of trees. On Kostroma moose farm well proved is the design of mobile installation for forage dispensing equipment offered by P.T.Grib.

The two ten-local sections of cattle feeder УВТ-20 are placed on two sides of a tractor sled platform. Between them a 0.5-0.6 meter width pass is left. In the front part of the platform a kitchen-box with a gas cooker, shelves for utensils, first-aid set and a chest for forages stock is placed. To facilitate the calves approach to feeders, additional demountable wooden floorings are built along the both feeders sections. During the camp relocation these floorings can be shipped on the platform in the pass between the sections. The floorings must be made and attached to the platform without gaps between boards to prevent calves traumatism. The fence which surrounds feeders must have the size of approximately 4X5 m at each side and have a gate. Outside the fence, supports for salt-licks and buckets with water are established, so moose calves coming for milk replacer feeding have an opportunity

(before a prearranged signal) to have a drink and salt lick.

It is necessary to move moose calves from the calves shed to a camp all at once. Experience shows, that if a part of animals were left for some days in moose calves shed when the others moved to a camp, in the further they prefer to keep separately from other group, which very much complicates work of moose breeders.

Feeding moose calves is carried on according to the established daily schedule. On a prearranged signal to which moose calves are accustomed, they gather near a feeding station. Moose breeders spill into feeding troughs heated milk or its substitute (and later – other kinds of attractive food) then let in moose calves through a gate into a fence where they are distributed themselves among feeding troughs. After feeding and washing of feeding troughs the moose breeder opens the gate and leads moose calves on pasturage in a forest. During this period of a life moose calves exhibit a great devotion to breeders and do not depart far away. For the night moose calves are left alone in a forest where they, as a rule, do not miss and keep all together.

To prevent helminthes invasion, it is necessary to change the camp location as often as every 20 days or even more often. During this period moose calves usually already eat all accessible forages around the camp. It is possible to return camp on already used place not earlier, than in 1.5-2 months when there again will be enough greens and there will be a natural disinfection.

The camp equipment relocation to a new site takes 2 people no more than four hours. It is the most convenient to start changing the location of camp after the moose calves were fed. Moose breeder calls them on pasturage in a forest, and after this workers dismount the fence and load sections of the fence and poles on the tractor carriage. The tractor transports sled with feeding troughs to an in advance chosen place, and then – the carriage with fence sections. By next feeding time the camp should be ready to feed calves. Moose breeder leads there the moose calves, feeds them, and then invites them to browse on a new place. As a rule, moose calves at once remember a place where they even have once received milk (or replacers), and they do not leave far from the feeding station.

As our experience shows, such a mobile camp can be successfully used for keeping moose calves up to one-year-old age. The components of attractive feed and feeding frequency thus are gradually changing (table 1).

Table 1

THE ROUGH SCHEME*)

Feeding moose calves up to age of 12-months (Birth weight of 14 kg is used for calculation) with use moose and the cow milk and a substitute of the sheep milk (soluted as 1:4)

Month	Ten-days	Alive weight in the end of the period, kg	number-in feedings in day	Food per day							
				Moose Milk, l	Cow Milk, l	SSM, l	Green forage, **) kg	Salt, g	phosphatides, g	Potato, kg	Oats, kg
1	2	3	4	5	6	7	8	9	10	11	12
1	1		6	1,0			learn.				
	2		5	2,0			1,0	5	5		
	3		5	1,0	1,0		2,5	5	5		
Total		26		40,0	10,0		35,0	100	100		
2	4		4	1,0	1,0		3,0	10	10		
	5		4	1,0	0,5	0,5	4,0	10	10		
	6		4	0,5	0,5	2,0	5,5	10	10		
Total		42		25,0	20,0	25,0	125,0	300	300		
3	7		3			3,0	6,0	10	10		
	8		3			3,0	7,0	10	10		
	9		3			3,0	8,0	10	10		
Total		60				90,0	210,0	300	300		
4	10		3			2,0	9,0	10	10		0,2
	11		3			1,5	10,0	10	10		0,3
	12		2			-	11,0	15	15		0,5
Total		90				35,0	300,0	350	350		10,0
5	13		2				11,0	20	20	1,0	0,6
	14		2				11,0	20	20	2,0	0,6
	15		2				11,0	20	20	3,0	0,7
Total		125					330,0	600	600	60,0	19,0
6	16		1				10,0	20	20	3,0	0,7
	17		1				10,0	20	20	3,0	0,7
	18		1				10,0	20	20	3,0	0,7
Total		150					300,0	600	600	90,0	21,0
7			1				10,0	30	50	3,0	0,5
Total							300,0	900	1500	90,0	15,0
8-12			1				>>	>>	>>	>>	>>
Total for the first 6 months of a life				65,0	30,0	150,0	1300,0	2250	2250	150,0	50,0
For the second 6 months of a life							1800,0	5400	9000	540,0	90,0

*Table is given according to A.P.Mihailov

** During winter time - branches, needles

Since the age of four months moose calves are to be accustomed to eating oatmeal: first, a finely ground oats is gradually added to SSM (WCM), and then dairy substitute is completely reduced and eliminated from the diet, and moose calves are fed with ground oats cooked in a warm water with some salt added. Potato or others root crop (carrots, beet, turnip, fodder cabbage and so on) washed and cut into 3-5 cm slices can be given to five-month old moose calves.

From three to four-monthly age moose calves are accustomed to a bridle: to walk behind and to stand still on bridle with moose breeder. Trainings should be spent every day. After schooling moose calves to bridle females are trained to imitation of milking, such as udder massage and teats pulling.

During winter time it is necessary to choose mobile camp site with especial care. The most suitable places for this purpose appear to be coasts of the rivers and ravines, osiered bogs, with aspen and a mountain ash, and also old wood cuttings with predominance of brushwood of above trees. Moose calves are willingly browsing in woodcuts, and quickly get accustomed to the noise of machines, close to people and working loggers.

During entire winter moose calves are kept in a group. They well obey moose breeder and come to feeding station for attractive feeding in regular time. In the spring, with the growth of fresh greens and appearance of blood-sucking insects, the bent for migration is often observed in moose calves. During this period it is necessary to have a free big fenced area on moose farm where it would be possible to keep moose calves for some time in this crucial period (10).

1.5. The organization of work

Two moose breeders should work constantly with a group of young moose calves, and the third moose breeder substitutes someone of the basic workers for the days of rest and in the case of diseases. Work will be organized in two shifts. If necessary the working day of every moose breeder can be divided into two parts with a long break.

The daily routine of a moose breeder depends on many factors, such as distance from the residence of the moose breeder to a calve moose shed; to milking shed; to summer camp, and also a degree of mechanization of their work. In the daily routine it is necessary to schedule time for writing a diary, in which should be noticed all deviations from the accepted routine, features of behavior of each animal, moose calves diseases and instructions from veterinary, weather conditions and so on. Since breeding of moose is still an experimental branch of animal industries at present stage, careful keeping of a diary should be considered as one of the primary functions of a moose breeder. It is helpful to organize regular seminars so that the skilled moose breeders can acquaint young employees on the moose farm with physiological features of moose calves development at different age and explain them the sense of the applied and especially modified methods of moose calves raising.

2. KEEPING MILCH MOOSE COWS

2.1. Preparation to labor and the start of training of moose cows for milking

Parturition of moose cows is seasonal. On the Kostroma moose farm the most part of

parturition naturally occur in the first part of May though in some cases delivery were observed in April and in the end of May (one case was registered on June, 4th).

In the nature a moose cow during the first days after parturition stays at one place, defending the place of her parturition, and then starts to make short tours within the limits of her home range (the home range area is up to 25 km^2). Our observations show that moose cows are sedentary. They move together with moose calves, but sometimes leave them browsing for 5-6 hours and then come back to that place where they have left their calves. These behavior features of moose cows are utilized for free ranging moose farming to hold them on experimental moose farms.

About 10-15 days prior to parturition, since April, 15-20th, pregnant moose cows are kept in a separate fence. The milkmaid continues to train them preparing for milking. In the morning and in the evening moose cows are fed with potato and oatmeal in a milking shed. During feeding a procedure of milking is simulated. The forage is given in milking stalls. A bridle is to be put on moose cow, and tied to the stalls frame. Then a milking machine must be turned on (to acquaint a moose cow to noise) and a milkmaid makes a gentle massage of an udder imitating milking. The condition of an udder as a sign of forthcoming parturition is simultaneously checked.

The fenced moose cows are fed with tree branches – such as aspen, birch, willow, and mountain ash, etc. The tree branches are brought to fences and put in piles or in special feeding troughs to which moose cows must have an easy access. Moose cows willingly gnaw the bark from aspen logs which are laid close to the tree branches.

A quiet condition for forthcoming parturition should be kept inside the fences. Visits of extraneous persons are definitely not permitted (11). Many times a day it is necessary to look on moose cows to reveal prognostic of parturition: an unquiet condition of moose cow, circulation or running along a fence, unwillingness to eat tasty food, swelling of a vulva, presence of colostrums in nipples, increase in sizes of udder and nipples.

The description of moose cow labor is given in section 1. 2. More than 80 percent of all parturitions occur at the daylight time. So consequently, if the labor was noticed in time, it is possible to be present at parturition place and to observe all this process. It is forbidden to disturb animals during their labor. The milkmaid attending parturition should not make sharp movements, loudly talk, and rustle.

The first milking of moose cows is done manually at parturition place not later than in 1–2 hours after a birth of moose calves. M. Kozhukhov recommends leading a moose cow behind her calf into a milking premise and milking her there. However in this case a very strong innate reaction of a moose cow to defend a parturition place can be transformed into a defending of the place where she will give milk, and henceforth fights will arise between cows coming for milking. In some days this reaction becomes less expressed. Nevertheless it is necessary to avoid a congestion of moose cows in a milking premise and near it to prevent possible conflicts which can make worse a process of galactopoiesis.

As a rule, for the first time moose cow is milked when she lies on her parturition place. The moose cow is given some warm salty water before milking. Then the hair around nipples is to be removed with a scissors; the udder is washed with warm water and wiped with clean towel, the teats are greased with vaseline. The first portions of milk are forced out on the ground to clear dairy channels of the nipples and to check whether the moose cow has

mastitis. As a response to the touch of an udder moose cow reflexly raises a hind leg and allows the milkmaid to milk a corresponding half of the udder. After that the milkmaid waits, when moose cow will rise, and in case of need helps her to rise. After a little standing, moose cow usually lies down on other side then second half of udder is milked dry. Lying moose cow is milked usually by milkmaid with one hand, while another hand holds utensils to gather milk (a small plastic bucket or a mug). After milking some vaseline is applied to a nipple again.

Moose cow gives milk to those people who were present at time of her parturition, or to the milkmaid whom she knew well before parturition, especially during the previous lactation. Perhaps a moose cow transfers the parent feeling on these people and exhibits the corresponding behavior (12).

As a rule, several hours after parturition (not later, than in 6–8 hours) aftermath is excreted from moose cow. Usually a moose cow eats placenta or chews it for long. No infringements of digestion in moose cows after eating aftermath were noticed. The uneaten placenta should be removed and buried (13). It is important to be sure that all placentas were extracted. If any placenta left in a cow more than for a day, intervention of a vet becomes necessary.

When moose cow gets stronger after labor, she will rise on her legs for milking. A bridle is to be put on her and tied to a trunk of the nearest tree. During milking a moose cow should have an opportunity to eat attractive food from a bucket.

On 3–4th day after parturition moose cows can go to a milking premise and begin to be milked there manually or with a milking machine. Moose cow is led by leash to the milking stall, tied to it, and attractive food (oatmeal) is given to her. After washing the udder, the milking must start immediately.

2.2. The keeping of milch moose cows

First time after parturition moose cows are held in a fence. It is better to have several fences to separate pregnant moose cows from those already parous (14). In 5–6 days after parturition moose cows usually well get acquainted to the stalls and milking; they start to come to a milking premise themselves when they feel time of the milking or when they hear the call of the milkmaid or a prearranged signal. When they are completely got used to milking, they can be let out from a fence on free pasturage. Now they are free ranging: during evening, night and morning moose cows are grazing at nearby pastures around moose farm, and have rest on the farm or in a forest in the afternoon. In cool days moose cows are grazing also in the afternoon.

To make moose cows come for milking at the scheduled time, a special signal will sound from the milking premise: a natural sound of a horn or a tape record of a horn and the voice of the milkmaid through a loudspeaker. Milch moose cows are sedentary and do not leave far away from the moose farm. Free-ranging of moose cows enables them to get a multivarious and high-grade feed, that positively affects quality of milk, reproductive ability and fatness of animals.

Moose cows eat the bulk volume of forage on a pasture. In each region moose have their preferred forages. As a whole a moose diet includes up to 360 of plants species.

Sometimes moose eat poisonous plants, but, most likely, these plants appear in food casually, and there is no need to add them in moose diet specially. As an attractive dish, small amount of rye bread, washed slices of potato, ground oats in the form of oatmeal, stirred in the water with some salt are given in a bucket to cows during milking.

Table 2

Forages	The contents in a diet					
	In whole, kg	forage units, kg	protein, g	Ca, g	P, g	Carotene, mg
Wood leaves	20.0	7.0	800.0	200	32.5	1400
Forest grasses	20.0	4.0	400.0	24	16.5	800
Oats	1.0	1.0	85.0	1	3.0	-
Fluorine-free phosphate	0.05	-	-	15	8	-
Salt	0.05	-	-	-	-	-
In whole		12.0	1285.0	240.0	60.0	2200

Milking moose cows (manual or machine) is carried out twice a day, and in the end of the lactation (in August-September) – once.

Manual milking of moose cows is a difficult operation because teats of a moose cow, in comparison with a cow, are very small, so the fingers of the milkmaid get too much of strain. A 3–5 liters plastic bucket with a long self-made bail hangs on the neck of the milkmaid and is used to gather milk. So, the milkmaid has both hands free to milk. The milkmaid sits down sideways from a moose cow and milks first the forward and back shares of one side of an udder, and then, not changing position, the other side. After the first minute of milking, a massage of an udder must be performed, and then the rests of milk are milked dry. After milking moose cows are let out in a fence or to pasturage.

Machine milking is the procedure to which the majority of moose cows are well accustomed. Milking and preparation procedures are the same, as those for cows. The milking machine is turned on a little bit earlier, than milking will begin.

As the fore shares of the udder have less milk than hind ones, they are milked dry a little bit quickly. To prevent them from loose milking, the fore teat cups necessarily must be removed and their hosepipes must be pinched until hind quarters will be milked dry, too. The rests of milk are milked dry manually.

The keeping of milch moose cows without separation from a natural environment allows us to obtain a valuable product – curative moose milk. During 4–5 months of

lactation, with a daily yield of milk up to 5–6 liters, a moose cow can give about 500–600 liters of milk. In facilities having suitable large forests, it is possible to have moose farms with a livestock of 20–30 milch moose cows and 10–20 of young stock. It will allow obtaining annually about 10,000 kg moose milk (15).

2.3. End of lactation, rut and interlactation period

The lactation of moose cows lasts 4–5 months (in some animals – up to 7 months). In August the milk yield decreases significantly, so moose cows will be milked only one time a day. The majority of moose cows stop lactation in September. At this time rut season begins and reaches the highest intensity in the last 10 days of September. During the rut a high concentration of wild male moose appears in the vicinities of moose farm. They form pairs with milch moose cows. One strong male, as a rule, mates with several females (he spends 1-6 days with each of moose cows before coitus). On Kostroma moose farm all moose cows are radio-tagged. Owing to the round-the-clock supervision it is possible to determine exact date and time of coupling. Pregnancy of moose cows longs about 220 days. Since November till the middle of April the attention of moose farm employees should be concentrated to carrying out controlled moose pasturage (16). During this period all animals from age of one year and up are assembled in one group. The main food during this period is forest food. To bait animals to moose farm they are given an attractive food once a day: potato, oats, tree branches, mineral supplements (tab. 3). During this period training of moose cows is continued: walking in a bridle, attachment in the milking stall and udder massage.

Table 3

Forages	The contents in a diet					
	In whole, kg	Foraging units, kg	protein, g	Ca, g	P, g	Carotene, mg
Branches and needles	15.0	3.3	240	120	13	200
Potato	5.0	1.5	60	1	3	
Oats	2.0	2.0	170	3	7	
Phosphatides	0.05				15	
Salt	0.05					
In whole		6,8	470	124	38	200

Baiting moose to a farm leads up to degradation of adjacent forest pastures because they are browsing on adjacent territory. That's why during the latest years moose cows of Kostroma farm spend the winter periods in mobile camps. Thanks to this method of keeping moose the cows have good fatness and give strong, healthy offspring, while pastures near the

farm have a rest from browsing, and in the spring young trees give good fresh shoots.

For the organization of the keeping and feeding moose cows in mobile camps in October – November at distance of 15-20 km from a farm the wood area abundant of a wood forage for the winter period is chosen. On the chosen site individual feeding troughs of the corresponding size for moose cow feeding are equipped.

In the morning moose cows are convoked by a signal of a horn. As bait feed moose cows get the washed cut potato or ground oats, preliminary immersed in boiled water.

To satisfy the moose cows needs of branch forage it is recommended to cut daily for them 3–4 trees (for every 10 moose cows). In a thawing weather moose cows eat mostly an aspen, in a frost – a birch is preferred. It is better to cut trees during food dispensation in troughs, because otherwise moose cows gather attracted by a sound of a chainsaw or knock of an axe and can be traumatized with a falling tree.

2.4. The organization of work

Working with moose cows which are free ranging, has a lot of specific features. One of the main of them is necessity of constant moose cows training from the earliest age. For the best taming the animals are to be temporarily contained in fences, especially in spring, and sometimes in autumn periods when they might have the most bent to migration. It is hard to depasture the groups of moose in a wood, take milk from small and inconvenient nipples of a moose cow, and incur danger because of hyperexcitability of moose cows in a combination with absence of fear before a human and so on. All of this recoils upon schedule, organization and payment for the work.

Our experience shows, that one milkmaid at two-shift work can milk 7–10 moose cows with manual milking and 15–20 – with machine one. Three milkmaids should work two cores and one additional, with a herd of 20-30 moose cows in the summertime. Work is organized in two shifts. Duties of the milkmaid include gathering and checkup of moose cows, preparation and distribution of attractive food, milking moose cows, washing utensils and the milking machine, cleaning of a premise.

During the winter period the staff can be reduced. At this time a moose breeder or a milkmaid at 8 o'clock assembles moose, leads them to the moose farm, prepares and distributes attractive food, and then while moose have a rest in a fence, washes utensils. At 13 o'clock moose are led into a wood where they are browsing under the control of a moose breeder till 17 o'clock. At night moose stay in a forest without herdsmen (17).

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In the wild nature moose live in rather sterile conditions. In this connection there are a number of serious requirements to conditions of the keeping and feeding of the tamed animals. First of all it is necessary to pay a special attention to cleanliness of all moose-breeding premises: to disinfect them periodically, and also to care of a good-quality of all kinds of supplementary food.

Moose are subject to the same diseases, as cattle, therefore in relation to them it is necessary to spend the same preventive actions which are taken in facilities on meat-and-milk farms.

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Contents

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Notes and comments to this Internet edition
by Alexander Minaev:

During 24 years since this book was printed, some improvements and amendments must be done to this text. Unless specially noted, I am not an author of the methodical improvements, but only describe the accepted standards.

1. Use of straw as a litter is forbidden now. The good replacement is minute spruce branches with needles.

2. The square must be at least 15-20 m^2 per calf.

3. In my opinion, the more people are crowding the cow during parturition, the tamer she becomes later, but every moose cow has her own threshold of agitation, so the approach of every next human must be very gradual not to disturb the animal and not to force her to leave the parturition place.

4. Goat milk is the best replacer of moose milk for a calf, if moose milk is not available at all. Modern human plastic sucking bottles with plastic nipples are acceptable, too.

5. This method is forgotten, maybe, because breeders have no problems with accustomization calves to nipples now. If a calf came from the wild, and his age is estimated as over 10-20 days, it is better to teach him to get milk from a pan (or a bucket).

6. Now the calves are nursed not less than 6 times a day during the first month.

7. Carrot is found to be a good and harmless delicacy. Sugar, tarts and sweets are forbidden on the farm, though I noticed no harm giving small amounts (5-10g) of bread and sweets since first days of calves' lives. I think that more dangerous is the excess of lactose in cow milk and milk replacers available here in Russia. Some special replacers for wild (see Purina Mills, for instance) do not contain it at all: only proteins and fat are present.

8. To facilitate the moose breeders' job, in the latest years on the Kostroma farm moose calves are trained to drink milk from a bucket (or a pan) in the age of 1 week. Bogomolova and Kurochkin, the authors of this paper, say that this is not a good idea; the minimum age for drinking milk from a bucket is 1 month.

9. Soon after relearning the latest calf to a bucket. The problem is: calves are not born simultaneously; parturition period may draw as long as a month. There is no choice but to relearn the latest calves to a bucket in late May – early June and leave the shed for a forest camp.

10. Late spring-early summer is the only period when yearling calves and two-years-old animals should necessarily be kept in captivity to avoid emigration. That's why this method of moose raising is called semi-free.

11. The Kostroma farm now became a tourist attraction, thus it is very hard to meet this condition; but moose got well acquainted to voices and children laugh. Children, of course, have no access into a pregnant cows' fence.

12. There is an unsolved puzzle: in the nature a moose cow starts to shoo away her latest offspring several days before new birth; on the farm a milkmaid is a substitute for a moose calf, but we never observed an aggression towards last-year milkmaid neither on parturition place nor in milking shed even if she was not present at the parturition.

13. I see that a couple of crows clean the moose farm territory very well feeding birding with placenta leftover. As a rule, they must avoid humans' neighborhood, but these two mad crows built their nest on a spruce tree on the tourist trail just where guides use to stop and begin their narration.

14. This is a mistake. A moose cow must return to the same fence after milking to continue to defend her parturition place. Several fences will only help to separate cows that may be individually aggressive to each other or to separate younger from older.

15. Now we know that a «stationary» moose farm has a limit of 13-15 milch cows because they all use, though free ranging, a fixed area for summer browsing. My GPS-tracking research revealed the

browsing range to be only 3000 ha around the milking shed. Therefore their summer food stock is limited, too.

16. The idea of controlled moose pasturage along with «inoculation of a herd instinct» was given up more than 20 years ago. Moose are solitary animals, and no cowboy can keep an adult moose herd together in the forest.

17. See (16) again. In winter all the farm animals «keep themselves» in one group near the winter camp. They are baited with oatmeal and fed in abundance with aspen bark and branches on a woodcut, so they have no idea to emigration.

Of course, all these recommendations imply that a moose farm exists as a tourist attraction, diary farm, research center and ecological education center, but not as a meat husbandry, because slaughter is not compatible with free-ranging. No one moose farm established as a meat husbandry exists any more.