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Growth and Development of Red Deer Calves in Captivity*)

[With 1 Fig. & 3 Tables]

Two calves of red deer, *Cervus elaphus* Linnaeus, 1756, were reared in captivity since June 1966 until July 1967. At the moment of capturing they were 1 and 3 weeks old. The purpose of rearing was to obtain tamed deer for further studies on their food habits. The paper presents results of observations on: (1) growth of calves during their first year of life, (2) seasonal changes in pelage, (3) development of antlers, (4) feeding, (5) selection of natural food, and (6) behaviour of calves. The increase in body weight was compared with the total weight before cleaning (undressed) for 31 wild calves killed at corresponding time. It was found that during the first period (September—December) tamed and raised in captivity calves yielded in weight to their wild relatives, while later (January—February) they revealed a higher weight when compared with their wild relatives. In all measured characters the stronger calf »B« dominated over the smaller calf »A«, with differences increasing in the course of 13 months of measurements. Growth and development of both reared calves did not deviate, in general, from that of free roaming calves watched in field. There are given quantities of fodder taken by calves during subsequent months of the first year of rearing as well as observations on the selection of natural food by them. Observations on the behaviour of calves included: relation to people and animals, relation to the other calf, playful behaviour and baths, and reaction to atmospheric phenomena.

I. INTRODUCTION

In connection with studies on food habits of red deer there arose the need for taming several individuals in order to follow them later in the course of feeding. The raising of captured calves provided many opportunities to watch their growth and development. Results of these observations form the body of the present paper.

Two calves were in rearing. The first one was captured on June 18, 1966 on the area of the forest-district Smolniki, in which the raising was later carried out. This was a male calf, 2—5 days old at the moment of capturing. It was denoted with symbol »A« and named »Maciek«.

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On 20 June 1966 there was received from the forest district Moldaniec another calf, also male. This calf was approximately 20—25 days old at the moment of delivery. It was denoted with symbol »B« and named »Wojtek«.

Woodden shed surrounded with a small run grown with fruit trees and shrubs was constructed for calves. Later the run was enlarged to include the whole orchard and a pond grown with reed.

During the first year of calf raising they were at weekly intervals subjected to following measurements: body weight (measured on decimal weigher with the accuracy to 0.1 kg), height at withers (measured with tapeline), length of middle toes in hind foot, length of ear, and length of face (from nostril to ear base). Besides, at monthly intervals, there were taken measurements of: body length, girth of chest and neck.

Weighing of calves was carried out since 10 July 1966, when the younger of them was 4 weeks old and the older — 6 weeks, until 1 March 1967, when they were 37 and 39 weeks old, respectively. The weighing had to be discontinued then, because grown up calves could not be forced to enter the scale bridge.

II. GROWTH AND DEVELOPMENT OF CALVES

1. Growth of Calves During Their First Year of Life

From the course of curves (Fig. 1) it can be seen that the difference of 7 kg in the weight of 6 weeks old calves did not decreased during their further growth, but increased and at the age of 37 weeks it

Table 1.

Increase in total length, girths of chest and neck in red deer calves (in cm).

Date	Calf »A« — »Maciek«				Calf »B« — »Wojtek«			
	Age, months	Body length	Girth of chest	Girth of neck	Age, months	Body length	Girth of chest	Girth of neck
10.VII.66	1	91	61	35	1.5	108	71	42
7.VIII.66	2	109	71	39	2.5	118	81	44
11.IX.66	3	117	79	41	3.5	131	90	45.5
9.X.66	4	122	87	46	4.5	136	98	50
6.XI.66	5	134	93	49	5.5	141	108	56
8.XII.66	6	146	100	52	6.5	156	113	59
8.I.67	7	158	108	55	7.5	170	118	61
10.II.67	8	161	109	56	8.5	175	118	62
15.III.67	9	164	112	58	9.5	176	119	63
20.IV.67	10	168	114	60	11	178	120	65
21.V.67	11	170	115	61	12	179	121	66
22.VI.67	12	173	116	62	13	181	122	67
23.VII.67	13	177	117	63	14	187	124	68

amounted already to 18 kg. Thus, in spite of uniform conditions of raising, growth of both calves did not run at the same rate. Discrepancy in the growth of raised calves could result from differences in genetic characters of their parents. Besides, the higher rate of the growth of

»B« calf could result from a better start connected with its longer stay under the care of mother hind. Also the fact that directly after capturing the calf »A« was watered with diluted cow milk may be also important here. This resulted in a scour during the following week. Markgren (1966) who raised two calves of moose (*Alces alces* L.) under similar conditions also noted a slight difference in body weight between them. The difference was maintained during the whole period of measurements (22 weeks), but curves of weight increase ran roughly parallelly to each other and the differences at the age of 22 weeks was smaller, than that at the beginning of measurements.

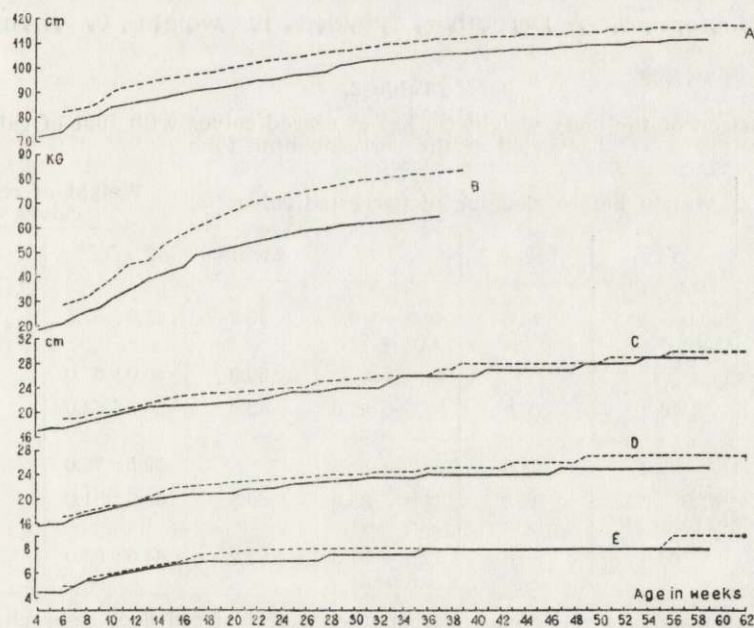


Fig. 1. Curves of height at withers, body weight, length of face, length of ear, and length of middle toes in hind foot for two red deer calves. A — Height at withers, B — Body weight, C — Length of face, D — Length of ear, E — Length of middle toe in hind foot.

Curves of the growth of length of middle toes in hind foot, length of ear and face (Fig. 1) reveal a similar course and always values of measurements for the bigger calf were higher or equal to corresponding measurement values for the smaller calf. Differences in size between both calves were maintained in all measured characters.

The difference in height at withers is maintained in both calves during 54 weeks of their life, although the course of both curves is rather parallel (Fig. 1). Markgren (*l.c.*) obtained a very similar

course of both curves and differences in the height at withers in both measured moose calves were negligible.

Table 1 presents the increase in total body length, girth of chest and neck in both calves. In all measured characters the bigger calf »B« dominated over the smaller calf »A«, differences in size increasing during 13 months of measurements.

In table 2 there was compared the weight of two reared calves with the weight of wild calves killed at corresponding time. The material is not abundant and its distribution in individual months of hunting season is not uniform. Its analysis seems, however, to lead to the following conclusion: tamed calves reared in captivity during the initial period (September — December) yielded in weight to their wild

Table 2.

Comparison of the body weight (in kg) of reared calves with that of calves harvested at the corresponding time.

Month	Weight before cleaning of harvested calves*)				Weight of reared calves	
	♂♂	Mean	♀♀	Mean	2 ♂♂	Mean
Sept.	40.0 — 68.0 (n = 7)	56.0	40.0 — 70.0 (n = 7)	55.8	41.0; 57.5	49.2
Oct.	—	—	53.0	53.0	50.0; 67.0	58.5
Nov.	76.0	76.0	53.0 — 85.0 (n = 2)	69.0	55.0; 73.0	64.0
Dec.	93.0	93.0	—	—	59.5; 78.0	68.8
Jan.	61.0 — 74.0 (n = 3)	68.3	34.0 — 83.0 (n = 4)	60.5	62.0; 81.0	71.5
Febr.	66.0	66.0	53.5 — 87.5 (n = 4)	72.2	64.0; 83.0	73.5

* Author's own data collected under another aspect of red deer research project.

relatives of the same sex and then (January — February) indicated the higher weight than wild calves of both sexes. The time of winter deficiency in food, which resulted in the lower weight of calves harvested in January and February, omitted the tame and well fed calves, which at this time revealed weight gains. The rate of gain was, however, lower, when compared with the preceding period.

2. Changes in Pelage

Below comparison, illustrates dates of pelage changes in both calves. The bigger and stronger calf »B« earlier lost dots and earlier underwent seasonal changes in pelage.

	»A«	»B«
Beginning of moulting into winter pelage (lower part of neck)	25 Sept., 1966	28 Aug., 1966
Complete disappearance of dots in pelage	5 Oct., 1966	25 Sept., 1966
Completed process of moulting into winter pelage	20 Dec. 1966 ¹⁾	14 Nov., 1966
Beginning of moulting into summer pelage	(not recorded)	20 April, 1967
Completed moulting into summer pelage	7 May, 1967	7 May, 1967

3. Development of Antlers

The development of first antlers in the reared calves is illustrated by following comparison:

Age of calves in months	Height of antlers in cm	
	»A«	»B«
8	—	1
9	—	2
10	—	5
11	2	8
12	5	8
13	5	22—24
14	16—18	22—24

The growth of antlers was completed in July of 1967 and both deer were at that time spikers with above given height of beams.

III. NUTRITION OF CALVES

1. Nutrition of Calves During Their First Year of Living

The kind and quantities of food taken by calves during subsequent months of the first year of rearing were given in Table 3.

It should be mentioned that besides of the cited quantities of food, calves had a free access to vegetation growing in the enclosure and were frequently taken to forest, when their feeding on forest ground vegetation has been recorded.

2. Selection of Natural Food

The selection of natural food by both calves has been watched and recorded during their stay in the special pen and during numerous trips to forest. These trips covered mostly forest with the site type of fresh mixed coniferous forest and mixed coniferous forest. The selection of natural food was thus restricted to plant species characteristic for the two mentioned sites.

¹⁾ Winter pelage of the calf »A« was lighter in colour, than that of the calf »B«.

Table 3.
Kind and quantities of fodder taken by calves (in kg or l. -- milk).

Month	Kind of fodder	Quantity	Month	Kind of fodder	Quantity			
July, 1966 (July, 10—31)	leaves of oak, linden and apple tree	34	January, 1967	beets	217			
	clover	2		acorns	31			
	alfalfa	4		clover hay	124			
	twigs with leaves of oak, linden, tremble aspen, hazel, and willow milk	51 121		oats	31			
August, 1966	twigs with leaves of oak, linden, tremble aspen, willow milk	182 170.5	February, 1967	beets	221			
	September, 1966	coppice shoots of oak, linden, tremble aspen, willow, and ash apples plums beet leaves milk		240 17 5 19 165	acorns	28		
clover hay					112			
oats					23			
beets			248					
October, 1966	coppice shoots of oak, linden, willow, and ash leaves of beet and beets apples plums acorns clover hay milk	184 60 10 10 8 16 170.5	March, 1967	acorns	48			
				oats	31			
				clover hay	124			
				potatoes	30			
November, 1966	beets acorns clover hay milk	102 30 72 142.5	April, 1967	beets	240			
				acorns	60			
				oats	22			
				clover hay	120			
			May, 1967	potatoes beets acorns clover hay	8 18 36 152	May, 1967	potatoes	39
							beets	8
							acorns	18
							clover hay	36
							potatoes	152
							cut grass	18
December, 1966	beets acorns clover hay milk	158 31 106 61	June, 1967	shoots of oak, birch, willow, and ash	120			
				July, 1967	coppice shoots of oak, birch, willow, and ash	600		
					coppice shoots of:			
					oak	186		
willow	124							
December, 1966	beets acorns clover hay milk	158 31 106 61	July, 1967	birch	124			
				maple	93			
				ash	93			
				Total	620			

It was already in the first month of life, when the food of calves comprised tender foliage of trees and large amounts of milk, when it was noted that calves prefer leaves of apple-tree and oak over leaves of linden given to them simultaneously. Besides they consumed clover (*Trifolium* sp.) and *Plantago indica* L. growing within the pen. With the beginning of August they were finding and willingly consuming apples fallen in the orchard situated within enclosure. They started also to drink water from pond. New food item has been taken first by the bigger and older calf »B«, the another calf ventured to try a new food with some delay. E. g. »Wojtek« drunk water from the pond for the first time on 7 August, 1966, while »Maciek« — on 15 August, 1966. In August there was noted also the barking of hazel (*Corylus avellana* L.) shrubs by calves. During trips to forest both calves willingly consumed leaves of the red oak (*Quercus rubra* L.) and the older calf tried needles of the Scots pine. Rarely occurring rowan tree (*Sorbus aucuparia* L.) was eagerly taken by them. From among herb layer vegetation most willingly were selected plants being at the phase of flowering. An exception provided *Oxalis acetosella* L., which was consumed by calves throughout the whole period of their trips to forest. In September it was noted that calves consumed the honey-fungus [*Armillariella mellea* Vahl. ex Fr (Karst.)] and *Sambucus nigra* L. With the end of this month during their trips to forest calves discovered a new food — acorns fallen on ground. In the orchard at this time they looked after apples and plums fallen from trees. Besides, one of calves willingly consumed nettle (*Urtica dioica* L.), while the other preferred leaves of trees. In December there was noted that calves learned to peel the bark of Scots pine and the mentioned already *Sambucus nigra*. In January both calves most willingly fed on heath [*Calluna vulgaris* L. (Salisb.)] and flower buds of hazel, while juniper (*Juniperus communis* L.) was very rarely consumed. At this time there was recorded also feeding on lichens growing on oaks. During the early spring, when from beneath the snow there appeared small patches of litter calves consumed it in small quantities. In spring the preferred food provided developing, tender foliage with twigs of oak and birch.

IV. BEHAVIOUR OF CALVES

1. Relation to People and Other Animals

In the course of first few days of rearing both calves quickly learned to distinguish caretakers. They responded to sound of bottles struck by each other during feeding with milk. They followed people, mostly caretakers. It was noted that they recognized voice of strange people of

that of caretakers. Towards strangers they maintained some reserve, especially the bigger calf »B« which did not like to approach unknown people.

At the age of one month they tried to play with people. The smaller calf »A« touched their caretaker with his front leg and then ran around as inviting him to running. The bigger calf »B«, on the other hand, gently pushed the caretaker with his head. The smaller calf was fond of stroking and accepted it with pleasure, while the calf »B« did not like it, particularly from strangers.

In December of 1966, when calves were 6 months old they started to reveal their dislike to measurements and weighing. The calf »B« had to be forced to enter the cage situated on weigher's bridge.

In March of 1967 further weighing appeared unfeasible, because 9 months old calves could not be lured nor pushed by force to the weighing cage. In July 1967 the bigger calf »B«, which was at that time one year old, did not allow even for measurements blowing his caretaker with front legs.

During the first period of trips to forest calves were keeping close to caretaker and took flight on each unknown shape or sound. In November, for instance, 5 months old calf »B« got frightened and attained a threat posture on the sight of running hare. At this time both calves did not respond to tracks of other deer met in forest. As they get familiar with forest they started to leave their caretakers and with the end of January 1967 they escaped from their pen to forest. After more than two hours they returned to it. The caretaker followed their tracks on snow and found that they visited places known from previous excursions. During following months they were becoming ever more self-dependent and ever more frequently were alone coming back from trips to their pen.

In contacts with unknown objects smell played in calves the most important role. When one month old they saw for the first time a motor-car. During 5 minutes they thoroughly smelled it from all sides and touched with nostrils.

Calves paid no attention to animals smaller than them, as dogs, cats, poultry met each day in the farm. They were afraid of cows and horses. In autumn it happened, however, that one of them trampled to death a duck. Probably it tried to eat something from his bowl.

During first three months of life they revealed no aggressive behaviour towards adult people nor children. Later, particularly the bigger calf »B«, reacted to disliked smells or movements by blowing with their front legs. They reacted so *e. g.* to puffing with cigarette smoke or to body measurements. In September of 1966 their caretaker

after killing a deer in forest returned home with hands soiled with fresh deer blood. »Wojtek« after smelling it snorted and immediately blew him with his front legs.

2. Relation to Another Calf

During the whole year of raising there has been noted the domination of the bigger and older calf over the smaller and younger one. This was revealed by the fact that »Maciek« followed »Wojtek« and imitated him. »Wojtek« was the first to approach new, unknown to him objects, first to start feeding, first to try unknown plants. In their trips to forest without caretaker »Maciek« followed »Wojtek«. There was never noted any fight between calves, except of simulated attacks in the course of plays. There was also never recorded that the weaker calf would be driven away from food by the stronger calf »B«.

3. Play and Bath

From first weeks of life calves performed plays consisting mainly in mutual flights and simulated fights. At the beginning the bigger calf »B« was limping on one leg and hence abstained from playing. »Maciek«, provoking to play, was attacking his mate with front legs and head and »Wojtek« was jumping aside and kicking with his healthy leg. Thus »Maciek« played alone running around forest-ranger's house. In the second half of July, when »Wojtek« was not limping any more, he dominated in playing, started flights and simulated attacks. In August, 1966 there was noted a play of calves which turned to the exchange of blows with front legs. Both calves had raised on hind legs in front of each other. In September playful flights became longer and lasted even for 20 minutes. In November, during cool days the purpose of these flights was, probably, to warm oneself after a night spent in a shed. In January while returning from a trip to forest, calves turned back from the gate, ran back towards forest at a distance of ca 800 m and came back. Several days later they jumped over the fence, ran in fields and also returned by themselves. In February the independent trip to forest of both calves was prolonged for some 2.5 hours. They returned from forest by themselves. It has been noted that during common trips calves while playing were leaving caretaker for ever increasing distance. In this connection calves were being taken for walks by one what gave the result that they were closer keeping themselves to the caretaker. In November of 1966 the bringing of a heap of gravel on the yard of forest ranger's house gave the idea of a new play. Calves entered the heap of gravel in turns and jumped off it.

On August 28, 1966 the bigger calf »Wojtek« for the first time ventured to take bath in the pond and »Maciek« imitating him obviously took bath only on September 2, 1966. Since then both calves were taking bath almost each day. In December they were taking bath in mud.

4. Reactions to Weather

When 6—8 weeks old calves saw their first summer storm with thunders. Shortly before storm they were obviously nervous, they even refused to drink milk. After the storm they calmed and willingly drunk milk. During another storm they seeked shelter with people. They were allowed to enter corridor where they waited until the storm was over. They were nervous and refused to eat.

During hot days they enjoyed bath in pond even for several times in day. They seeked shelter against flies in the shed. It was noticed that they licked each other keeping thus flies away. In November calves saw snow for the first time. The falling snow disturbed them to such extent that they escaped it in barn. It was noted also that calves responded to rain and strong wind with a flutter and lack of appetite.

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WZROST I ROZWÓJ CIELĄT JELENIA SZLACHETNEGO W NIEWOLI

Streszczenie

W okresie od czerwca 1966 r. do lipca 1967 r. hodowano w zamknięciu dwa cielęta jelenia szlachetnego, *Cervus elaphus* Linnaeus, 1756. Wiek cieląt w chwili schwytania wynosił 1 i 3 tygodnie. Celem hodowli było uzyskanie oswojonych jeleni do dalszych badań nad doborem pokarmu. Praca zawiera wyniki obserwacji nad: 1) wzrostem cieląt w pierwszym roku życia, 2) sezonowymi zmianami sukni, 3) rozwojem poroża, 4) żywieniem, 5) doborem pokarmu naturalnego i 6) zachowaniem się cieląt. Wzrost ciężaru ciała porównano z ogólnym ciężarem przed patroszeniem 31 dzikich cieląt odstrzeliwanych w tym samym czasie. Stwierdzono, że w początkowym okresie (wrzesień—grudzień) oswojone i hodowane w niewoli cielęta ustępowały ciężarem swym dzikim krewniakom, a następnie (styczeń—

luty) wykazywały wyższy od nich ciężar. We wszystkich mierzonych cechach silniejsze cielę „B” górowało nad słabszym cielęciem „A”, przy czym różnice powiększały się w ciągu 13 miesięcy pomiarów. Wzrost i rozwój obydwóch cieląt nie odbiegał, na ogół, od wzrostu i rozwoju cieląt obserwowanych na wolności. Podano ilości karmy zjadanej przez cielęta w poszczególnych miesiącach pierwszego roku hodowli oraz obserwacje nad doborem pokarmu naturalnego. Obserwacje nad zachowaniem się cieląt (behawiorem) obejmują: stosunek do ludzi i zwierząt, stosunek do drugiego cielęcia, zabawy i kąpiele cieląt oraz reakcje na zjawiska atmosferyczne.