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**Faculty of Forestry and Wood Sciences
Department of Forest Harvesting**

**Buildings and equipment in game preserves
differentiated according to kept game**

BACHELOR THESIS

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Thesis title

Buildings and equipment in game preserves differentiated according to kept game

Objectives of thesis

The aim is to describe each type of game preserve according to the type of bred animals with focus on structures and equipment.

Methodology

It will be processed literature review dealing with the general types of hunting structures and equipment in the game reserves. Further will be game reserves categorized according to types of bred game and associated equipment. In the practical part will be carried out field research study. Equipment and structures will be documented and developed their profiles.

The proposed extent of the thesis

50 pages

Keywords

game reserve, structures for hunting, game management

Recommended information sources

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Statement

I declare that I have developed this thesis on the topic “ Buildings and equipment differentiated according to kept game” by myself and independently and I have quoted only from the sources listed in bibliography. All used photos are my work. These data I have added by information which were the outcome of my own research.

In Prague 18th April 2016

.....

Petr Kotrba

Abstract

The aim of this bachelor thesis is to characterize buildings and equipment used in game preserves. Purpose of this structures and it's use. To introduce game keeping management as a profession executed on area of Bohemia for many centuries, it's history and present. Explains the meaning of term "game preserve". Describes methodics and way of management in game preserves. Subsequently compare facilities of visited game preserves, according to their acreage and kept game species.

Hlavním cílem této bakalářské práce je za použití odborné literatury charakterizovat stavby a zařízení používané v oborách a jejich uplatnění. Představit obornictví, jako profesi vykonávanou na území našeho státu již řadu století, jeho historii i současnost. Vysvětluje pojem obora, jakožto zařízení určené k intenzivnímu chovu spárkaté zvěře. Popisuje metodiku a způsob hospodaření v oborách. Následně porovnává vybavenost navštívených obor, vzhledem k jejich rozloze a druhu chované zvěře.

Keywords: game preserve, structures for hunting, game management

Klíčová slova: obora, lovecká zařízení, myslivost

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1. Introduction

Game preserve management is profession with a deep history. The meaning of my work was to learn issues and methodology of management in game preserves and get more knowledge about buildings and equipment used in this discipline. I consider game preserves as a valuable teaching aid and a tool offering opportunity for modern population to get in touch with wild animals. Respect to wild animals, interest in game management and presence of game preserve close to my hometown inspired and motivated me for selection of this topic.

1.1. History and background of game preserves in Europe and on the area of our country

Game preserves doesn't belong between elements that were created originally in our country. Its roots can be found in southern Europe, where old age Romans kept game in preserves. People in our lands probably have met game keeping as a participators of Crusaders and from literature. In 14th century latin document „Ruralium commodorum liber XII” written by Bolognese senator De Crescenciis has spread in many monasteries and nobles libraries. In his eight book we can also find a guide for establishment of game preserve (Wolf, Chroust, Kokeš, Lochman,1976)

Game preserves and lately game management in game preserves has even so rich and old tradition in our country. First game animals, which were game preserves build for, were Deer game. Beginnings of keeping deer game in preserves belongs in first half of 14th century, in the age of Luxemburghs. But there are no rules without exceptions.. Our oldest known game preserve was not established by Luxemburghs, but earlier by Ottokar II. .It was preserve close to village Ovenec, on the area of todays Prague's district Letná, called Ovenecká preserve. It's second name was kept in Prague's topography as King's preserve (Královská Obora). Ottokar gave order to fence this area in 1266, build villa in it and release there deer game. With progressing colonization in 12th and 13th century, there is no doubt about decrease of game in

wild nature. Higher importance undergone game keeping especially in 15th century. Game preserve meant certain economical progress in sense of production of venison and partially substitute decreasing game in wild nature (Řehák a kol., 1998)

According to Wolf, Chroust, Kokeš and Lochman (1976) game preserves were not just fenced part of forest. Former luxury-loving Nobles were preferring to resort in game preserves instead of inhospitable and tough conditions in field, to enjoy hunting in much more comfortable environment of fenced and well maintained preserves. At the beginning has game preserves hunting propose only, but during time specialized game management and care has developed.

Noble's senior employees with high competence were responsible for establishment of new game preserves. In case they succeed, they were often recommended and send to other Nobles to do their job. This job was often hereditary.

The establishment of new game preserve was not only about setting boarders and build fence. Game preserve contained also many other units such as ponds for maintaining water regime, or fields where rye, barley and oat were cultivated for production of fodder for kept game. In old preserve belonging to Noble family Pernštejn in Kladruby nad Labem were built beside the castle many buildings including church for servants and a flat for chaplain. Biggest and most expensive construction (if we pass out buildings) was fencing of game preserve. The most important role played wood and stone resources. In areas rich to stone were built stone walls. (Wolf, Chroust, Kokeš, Lochman, 1976)

Game preserves were originally established for cloven-hoofed and small game. By small game we mean hares, wild rabbits and pheasants which were kept by aviary way. Representatives of cloven-hoofed game in game preserves were originally red deer, later fallow deer, wild boars, mouflons and in some cases roe deer. In last century also representatives of Asian and American deer, even African and Australian game were introduced. Currently game preserves serves for intensive breeding of red deer, fallow deer, mouflons, wild boars, sika deer, eventually white-tail deer.

In the era after World War II. The level of game keeping has decreased on many places, many game preserves were damaged or canceled. There was a gradual decadence of condition of game preserve buildings, equipment and fences. In some preserves they pass away the main goal of game keeping which was breeding of cloven-hoofed game. Radical improvement in game keeping was achieved in 1964,

when revision of management in game preserves was made. Since that time the condition of game preserves and kept game is gradually increasing.

Since middle ages till modern times there were only harvesting in forests and regeneration was on the shoulders of nature. This system was not sufficient in game preserves, where was necessary to afforest the forestless areas by suitable tree species. These stands were not just important part of landscape but also serves the game as a protection against insect or heat. It was necessary to supplement nutrition of game by fruits. Planting of these trees has been known for a long time but for the first time in forestry was purposefully applied just in game preserves.

According to already mentioned authors, the importance and value of game preserves is rated mostly according to how they suit demands for intensive breeding and hunting of kept game. But the landscape function of game preserves for society is often underestimated. This secondary value was taken into account especially in 17th and 19th century, when founders of game preserves divided the inner space of preserve to fulfill demands of game management but also to reach maximal scenic beauty. (Wolf, Chroust, Kokeš, Lochman, 1976)

Close to industrial centers, big cities will be necessary to solve the problem of recreation and intensive game keeping of cloven-hoofed game in way to combine and support these two function, not to excrete them. The possibility of establishing recreational – commercial game preserves should be considered.

Importance of game preserves as a game management device designed for intensive breeding and hunting of cloven-hoofed game have been changing during history. In the beginnings of game keeping on area of our country, the main purpose was to keep the game in smaller area to make the hunting easier with highest possible effectivity. That's why we can judge their purport as clearly hunting purport. In most of the cases there were organized mass hunts in game preserves. Landowners tried to battue into preserve as many animals from surrounding forests as possible to offer as large amount of pray as possible to their guests participated on these hunts. These hunst often offers opportunities for realization of economic and political meetings.

Since the half of 15th century has owners of game preserves participated on introduction of new cloven-hoofed game on areas of our country. For example fallow deer as a representative of newly introduced cloven-hoofed game found in environment of game preserves suitable conditions and its acclimatization was

without any problems. Later it was mouflon who famed our game management the most and also Asian and American deer. We must also mention wild boar which survived in our country for more than two centuries thanks to game preserves.

As the time goes by we can say that environment of game preserves has affected also art, music and literature. However game preserves had and have important role in field of intensive agricultural production, where they suit their role as an important element in deforested lands. (Wolf, Chroust, Kokeš, Lochman, 1976)

Owners of game preserves continuously tried to improve the quality of cloven-hoofed game during second half of 18th century and mainly during 19th century. After enclosing wild boars in game preserves together with other cloven-hoofed game it's negative influence on some species of cloven-hoofed game started to show. On the limited area of game preserve the wild boars fed themselves at the expense of other cloven-hoofed game and often eliminated offspring of these species. Despite big difficulties which partly appeared, the development of game keeping continued. If canceling of some game preserves occurred, it was mostly motivated by effort to move breeding to more suitable environmental conditions.

Breeding knowledges gained in game keeping in game preserves were not yet fully utilized in free game management. During the end of 19th and beginning of 20th century scientific knowledge in game keeping started to exercise mainly in game preserve management. Efforts of increasing quality of individuals populations of cloven-hoofed game by intraspecific selection. These efforts are much more taken into account not only in case of deer game but also in other kept species using elements of complex solutions based on modern knowledges of these days science. As example can serve efforts of overall improvement of game preserve's environment namely in area of it's natural carrying capacity. The techniques and technology of supplementary feeding. And there is also big progress in case of health status of game using modern veterinary medicine.

Game preserves and it's management has substantiation even today. Count of intensive breeding enclosures get fame on area of our country which resulted also in demand for our experts.

(Wolf, Chroust, Kokeš, Lochman, 1976)

It is probable that game preserve breeding will be in forefront in our republic even in future even though it's indisputable expensiveness. We should keep in mind that

management in game preserves should be indicator of versatile quality of game and also an exemplar and enlightenment in game management in wild nature.

(Collective of authors, 2004)

1.2. Current state of game keeping in Czech Republic

Latest information about quantity and quality of game preserve breeding can be get from the report about hunting grounds, state and hunt of game in Czech Republic. This report is released yearly as review of Ministry of Agriculture of Czech Republic. The differences between summaries released before 2000 and nowadays are resulting from adoption of the new hunting law no. 499/2001 Coll., which estate the minimal acreage of game preserve as areas of 50ha, but older game preserves with smaller acreage can be left. Adoption of this provision led to establishing of new small acreage game preserves. From 101 game preserves registered before 2000, the smallest one had acreage 5 ha (Budyně, South Bohemian region) and the largest 4480ha (Soutok, South Moravian region). Up to 31.12.2004 was in Czech Republic 176 game preserves of which the smallest one had acreage just 1 ha (Jezbořice, Pardubice region) and the largest one was still Soutok. According to establishing of small acreage game preserves the average acreage of game preserves decreased from 375 ha to 248 ha, that means 34% decrease of average game preserve acreage.

(Collective of authors, 2004), (<http://www.mze.cz/>)

Tab. No. 1 – Numbers of game preserves in Czech Republic (<http://www.mze.cz/>)

Ownership	12.31.1991		12.31.2014	
	quantity	acreage [ha]	quantity	acreage [ha]
Personal	96	37175	177	45202
Hunting communities	5	710	21	2085
Total	101	37885	198	47287

Tab. No.2 – Basic data about game preserves in Czech Republic (<http://www.mze.cz/>)

Acreage of game preserves [ha]	31.12.1999	31.12.2014
Farmland	3200	6176
Woodland	33579	37699
Water area	335	538
Other sites	771	2874
Total	37885	47287

1.3. Term “Game preserve”

The term Game preserve is defined by § 3 law no. 449/2001 Coll. (Game management law) as a kind of hunting area with conditions for intensive breeding of game which is permanently and perfectly enclosed to prevent free leaving of game. Conditions of permanent and perfect fencing and prevention of free escaping of game were codified already in § 7 law no.23/1962 Coll. Typing guideline of Lesprojekt (1988) about game preserves for breeding of cloven-hoofed game complements limited law conditions by information, that purpose of game preserve management is intensive breeding focused on genetically quality and healthy game with emphasis on valuable trophy. Goals of game preserve management are both economical and societal interests. More about perception of the concept of game preserve at the end of 19th century we can found in definitions of Černý (1895) and “Ottův slovník naučný”(1890). Černý defines game preserve as permanently and completely fenced part of forest of larger or smaller acreage, in favorable place, designed for keeping and breeding of game in numerous number, established mainly for interest hunting. In “Ottův slovník naučný” is written, that game preserve is permanently and solid fenced forest of adequate acreage, in favorable place, destined for keeping and breeding of game for a purpose of joyful and plentiful hunt. In one game preserve can be kept several species of game. Keeping of red deer and fallow deer together with roe deer and hares can be recommended. Wild boars fits less for combined keeping together with other cloven-hoofed game. Game preserve’s forest should be consisted of various stands of different age, spinneys and older trees in adequate admixture, also of less dense forest stands with grass. There should be also numerous representatives of old furtive oaks, beeches and crones. Main condition is at least one stable, live stream and valley, meadows, lowlands and few smaller swamps, grassy glades, slopes and rocks. Walls on the periphery are usually made of wooden planks with stony or woody uprights.

Holub, Kopečný (1952) are in Etymological dictionary taking the view, that term game preserve (“obora” in Czech) meant in Old Czech fenced pasture for mares to keep them separated from stallions. Evidences that term “obora” was earlier understood differently, can be found in Křivoklád region. For example in 1608 near Nový Dvůr was established equipment called “obora” for horses and for cattle near

Požáry. Term “obora” as a fenced forest destined for game keeping and hunting started to be precieved later.

Nowadays we must mention that game preserve has several purposes. Not only hunting, but mainly breeding and keeping of healthy genotype of kept game and production of best quality trophies. In a forestry view is necessary to mention esthetic and recreational function of game preserve, because , for example, just relaxation of president and his guests is one of the main reason for service of Lány game preserve.(Zřizovací listina lesní správy Lány, 1993)

2. Objectives

Objective of this thesis is to summarize and describe buildings and equipment used for intensive breeding in game preserves. Its purpose and way of use. Determine its quantity and placement in visited game preserves and describe them using reviewing of technical literature. Subsequently determine its numbers according to acreage of chosen game preserves. Describe game preserves according to its facilities and environmental conditions. Point out specific buildings and equipment characteristic for certain game preserves. In conclusion compare distribution of landscape with average of all game preserves in Czech Republic.

3. Literature retrieval

3.1. Description of visited game preserves

3.1.1 Game preserve Boubín

3.1.1.1. Characteristics

Boubín game preserve is situated in foothills of Šumava Mountains, in a middle of triangle made by surrounding towns Vimperk, Prachatice and Volary. Game preserve Boubín is known for it's intensive breeding of red deer on a beautiful

countryside of this region. Nowadays acreage of 1940ha for circa 250 red deer individuals, offers the real hunting experience. Good equipped hunting lodges as well as skilled hunting guides are commonplace.

Kept game:

Red deer: 250

Strongest trophy :

Red deer (*Cervus elaphus*) 233,68 CIC (gold medal till 210 CIC)

3.1.1.2. History

Red deer game is autochthonous in Šumava Mts. region. It's numbers were drastically decreased in the past due to wolf packs. Since 1756, when last wolf in this area was hunted, population of red deer game increased which caused considerable difficulties. This led to often conflicts between game managers and poachers , sometimes even with tragic end. Beside this, game was causing noticeable damages on fields of local people and they required compensations from lords. That's why prince Schwarzenberg ordered in 1790 reduction of red deer game in Šumava Mts. region, and in year 1817 it's complete extermination. Last red deer in Boubín region was hunted in 1827. The reasons of liquidation of red deer population were forgotten as time went by, and in year 1874 was red deer introduced again into Šumava region. After few years of strict defending, first red deer was hunted in 1886.

In an effort to reduce the damages on agricultural land of local people, started gradual fencing of forest. This effort finished around year 1900, when game preserve with acreage cca 3 000 ha was established. Numbers of game in this preserve exceeded norm of 300 individuals about 100%. That led to remarkable damages on forest caused by browsing and bark stripping. Part of this game preserve was unfortunately also Boubín primeval forest, where damaged regeneration led to nowadays absence of one development state in reservation.

Game preserve disappeared in 1960 after destruction of fencing by windblown trees. Red deer game spread into surrounding areas. Follow-up overpopulation

and increase of damages was necessary to solve. On basis of this fact construction of new game preserve close to village Mlynářovice has begun. Goal was to focus red deer game into game preserve and reduce it's numbers in free nature to 4 individuals per 1000 hectares, which is state where no considerable damages appear and natural forest regeneration is possible. Construction of game preserve was finished in 1976 when it has 2 335 ha. Concurrently was built 11 feeding spots including storing cellars for fleshy feed. In first years of existence there were built two breeding compounds, one catching equipment and a system of high hides for watching and hunting of game. In 1982 The fodder mixing plant was built. Also hunting lodges are part of this game preserve. In game preserve are large maintained pasturing areas with willow and beech that offers sufficient trophy.

After settling of restitution claims of town Volary and decision about decreasing damages on vegetation on the upper parts of Bobík (1 263m a.s.l.) caused by red deer game, was in 1995 reduced area of game preserve by 395 ha. Nowadays acreage of game preserve Boubín is 1940 ha of which 1749 ha are covered by forest.

Game preserve Boubín is maintained and managed by forest district Mlynářovice. Professional game management and breeding is provided by game preserve manager. He is supervising everyday feeding, construction of game preserve equipment, harvesting of hay and management of fields for game.

One of the goal during management of game preserve is to focus breeding of deer game from free nature inside to the game preserve and improve breeding of geographic ecotype of Šumava red deer.

Nowadays target state of 250 individuals consist of 45 individuals of first age class, 35 individuals of second age class and 20 individuals of third age class of red deer stags. Hinds are represented by 100 individuals and fawns by 50 individuals. Coefficient of production is 0,7.

We believe, that red deer game of Boubín game preserve is high quality game and can be compared with game from other game preserves in our country.

(<http://lesy.cz/>)

3.1.2. Game preserve Stará Obora

3.1.2.1. Characteristics

On the left bank of Vltava river, north of Hluboká nad Vltavou is located Stará Obora (“The Old Game preserve”). Total acreage of game preserve is 1510 ha. Fallow deer, Mouflon and wild boar are the species kept here.

Thanks to large area of game preserve, the animals are keeping it’s natural shyness. That offers unique and almost natural experience for hunters. Hunting itself is done mostly in a way of stalking or with the use of high hides and the hunter is always followed by experienced hunting guide. Stará Obora is favorite place of hunters from all around the Europe for it’s interesting hunting localities and high quality of kept game (point value CIC). Characteristic feature of game preserve is it’s rugged terrain. There is an opportunity of accommodation for hunters in well equipped hunting lodges (electricity, WC, hot water, shower, kitchen, common room with fireplace or stove) inside the game preserve.

Kept game:

Fallow deer: 400

Wild boar: 200

Mouflon: 200

Strongest trophies:

Fallow-deer (*Dama dama*) : 222,29 CIC (gold medal till 180 CIC)

Wild boar (*Sus scrofa*) : 129,45 CIC (gold medal till 120 CIC)

Mouflon (*Ovis musimon*) : 234,25 CIC (gold medal till 205 CIC)

3.1.2.2. History

First historical mention about game preserve is from year 1480. That means that Stará Obora is one of the oldest game preserve in Bohemia. More accurate surviving reports about establishing of game preserve on the area of Hluboká nad Vltavou manor came from year 1535, when game preserve for roe deer and hare was established. Till the year 1771, acreage and borders of game preserve are quite similar as today.

In history there were many attempts of keeping different species of game, such as white fallow deer, white deer, wild goat. In 1930s was done experiments focused on breeding of exotic animals (antelopes from Africa, Asian deer, ostriches from South America, Australian kangaroos or groundhogs from Vysoké Tatry region), but mostly without positive results. One part of game preserve is so called “Zlatěšovický park”. This nearly English type park is located on area of former village Zlatěšovice which was moved to today’s Zbudov by Schwarzenberg family (former owners of this land) due to establishing of game preserve .
(<http://lesy.cz/>)

3.1.3. Game preserve Sedlice

3.1.3.1. Characteristics

Game preserve Sedlice is situated in South Bohemia region. It is found in triangle between towns Strakonice, Blatná and Písek – situated 12km south-western from Písek.

The shape of preserve resembles elongate hexagon, divided by lines to eight parts. Oldest mentions about this enclosure are nearly 270 years old. Game preserve is part of Blatenská basin characterized by many ponds. It is situated in altitude 450-500 m a.s.l.. Great part of enclosure is covered by coniferous and broadleaf forests. Rest of preserve is composed of meadows and water reservoirs. Along roads and dividing lines have been planted Oaks and Horse-chestnuts of different age to increase carrying capacity of game preserve. Acreage of enclosure is 255 ha. Possibility of accommodation in administrative building (two double-bedded rooms with accessories) or in hunting cabin in a simple room. Accommodations serves only for hunting guests.

Trophies of wild boars are always reaching medal values – in a long term average 45% of trophies are evaluated for gold medal, 35% silver medal and 20% bronze medal. Trophies of Fallow-deer and Sika deer are evaluated from average to gold medals.

Kept game:

Fallow deer: 78

Wild boar: 100

Sika deer: 15

Strongest trophies:

Wild boar (*Sus scrofa*) : 134,35 CIC (gold medal till 120 CIC)

Fallow deer (*Dama dama*): 208,25 CIC (gold medal till 180 CIC)

3.1.3.2. History

Bavor family from Strakonice, owners of manor farm Sedlice built stony wall around game preserve in 1730s. In year 1931 J.K.Lobkowitz ordered to build hunting lodge in Siberian style. Till the end of second world war, many prominent guests and former nobles from European countries were visiting game preserve to enjoy hunting. At the end of second world war, soldiers of winning alliance with considerable help of local poachers killed off quite all game in game preserve. That led to abandonment of game keeping in game preserve for many years. Game preserve was managed as any other forest in surroundings, that led to cutting of very old and for game keeping management very valuable broadleaves. Many meadows were afforested by spruce monocultures.

In year 1972 was ordered to refresh game keeping management in area of game preserve Sedlice. Part of game preserve is natural reserve with acreage about 20ha. In this natural reserve is very rare 200 years old linden stand and also large beech stands. (<http://lesy.cz/>)

3.2. Buildings and equipment

3.2.1. Game preserve fencing and accessories

3.2.1.1. Game preserve fence

Fence is the main tool to keep the game inside game preserve. That means that fence must be solid and high enough to prevail the escape of game from game preserve. The types of fences are different in many ways. Besides height and strength it must also fulfill requirements for durability, cost efficiency and daintiness of used materials. Game preserve fence must be checked daily and properly maintained. On the access roads are build barndoor or entering gates, which must be solid, function and lockable. In places where gates are not used very often are established climbs. These allows to enter the game preserve without opening the gate. Important part of game preserve fence are also leap-ins or run-ins. These structures allows game living in game preserve surroundings to enter the game preserve or they offers easy way to get inside for game that somehow escaped from the preserve. (Wolf, Chroust, Kokeš, Lochman, 1976)

In earlier times the wood was the main material used for building of game preserve fences. It was used in many forms, such as unbarked rods, edging boards and planks or fully squared timber. The disadvantages of wood fences was relatively short durability and need to protect the fence against fungi and pests. Nowadays we can consider as disadvantage also relatively big amount of labor work which means costs.

In last years grows the popularity of various wire fences because of these four factors.

First very important factor is durability. According to expected durability we can divide the fences to several categories, such as “short-time fences ” (10 years), “medium-time“ (20 years), and “long-time” (30 years and more). Short-time fences are mostly composed of wooden uprights and low quality wire netting with one basic galvanizing. Medium- time fences are characterized by metal uprights from commonly accessible materials with wire netting by higher quality of galvanization. Long-time fencing are mostly on concrete or thick walled metal

uprights and wire netting with special surface treatment or distinctly thicker material.

Second factor is endurance with respect to species of kept game and game that lives in game preserve surrounding. If game species kept in preserve occurs also in surroundings, we can expect higher stress to game preserve fences during rutting season. In that case, there is also possibility to chose from two basic variants. First one is fencing with solid uprights close to each other (3 to 4 meters) and tough, hard fence that is resist deformation and is made of material at least 4mm thick. Second variant is flexible net wire fence made of steel with solid uprights further from each other (6 to 8 meters) .

Third factor is height depending on the configuration of terrain and species of kept game. In these case we talk about low and high fencing. Low fencings are characterized by height around two meters. High fencings are over 2,5 meters high and their use comes into consideration mainly in difficult rugged terrain.

Fourth and last factor is cost. This factor plays major role in these days. It's logic because economic return of game keeping in preserves is matter of long time period while biggest investments are just at moment of establishing. (Collective of authors, 2004)



3.2.1.2. Game preserve gates

Purpose requirement: ensure permeability of game preserve for usual service and during realization of agricultural measures in free areas, pastures, fields and forest. The width of gate must be sufficient for transit of agriculture and forestry machinery. Gate must be lockable. Game preserve gate could be constructed of wood, metal or combination of this two materials (That's the most frequent method).



3.2.1.3. Ladder climb

Simple ladder-like construction that allows access for game preserve management in places where are no gates. Allow entrance for visitors in places where touristic routes are crossing game preserve fences (like in case of Boubín game preserve)



3.2.1.4. Grate against leaking of game

Grate is purposed to prevent leakage of game from game preserve in places where is not permanent fence. Prevent mixing of game species in separated parts of game preserves among which is no gate due to increased traffic of game preserve manager's machinery. The length of grate must be sufficient to not allow game to jump over it.



3.2.1.5. Leap-in

Device used to allow entrance into game preserve for game from surrounding areas. Artificial or natural origin hump on outer side of fencing, reinforced by wooden wall and excavation on the inner side of wall. The height difference between inner and outer side should be circa two meters. This allows game to leap into game preserve but it can't leave the same way.



3.2.1.6. Run-in

Simple apex-shape device placed into game preserve's fence. Converging bars pointed inside game preserve, covering each other at the end. Allows game to push through and enter the game preserve. It is necessary to check this device frequently, even few broken bars offers escape for some species of kept game. (Lesprojekt, 1988)



3.2.2. Game feeding in game preserve

High concentration of game on small area must be taken into account during management of game preserve. The principles of game feeding are based on parasite prevention, overall hygiene of game and request for sustain amount of nutrients for each kept animal. Authors Wolf, Chroust, Kokeš and Lochman holds the opinion, that capacity of one feeding spot should be 30-50 individuals. Also game feeding only on one place in whole game preserve is unacceptable. Feeding spot must be accessible during whole year. Especially during winter months is game in preserves dependent on managers. It's physiological needs of kept game must be taken into account during feeding. Feed should be varied, and amount of minerals, vitamins and trace elements must be taken into account.

Not even after careful reasoning we can't set the time period when the game suffers by lack of nutrients, especially in free nature. That's why we must carefully watch it's demand for feed and adjust amount of served fodder for the game. (Wandel,2007)

Nowadays is possible to use various feed , mainly granulation and pelleting of feed, artificial drying of green fodder, industrially manufactured pithy granulated fodder, vitamin preparations and mineral admixtures.

3.2.2.1. Fodder

a. Roughages

It is appropriate to store required amount of this feed directly into game preserve, then import it during feeding season. Suitable feeding equipment is feed rack or haymow in which feed lays in feeding crib or on the ground where is spontaneously suppressed and offers feed as required.

b. Concentrated feed

For intensive management in game preserves are important fruits of oaks and conkers, which are most natural source of nutrients. Best way of submission of these fruits is they natural fall, when acorns and chestnuts stays for long time in perfect condition under the layer of fallen leafs. If this feed is imported into game preserve it is best to store it fenced place directly in stand, in thin layer covered by fallen leafs. Acorns and chestnuts is appropriate to serve to game in feed-trough, or place it directly on ground. In case of grain crops it is suitable to feed cloven-hoofed game by corn and oat.

c. Granulated feed

This feed has balanced contain of nutrients and it is enriched by needed minerals, vitamins and trace elements which are important for successful development of game. It helps the game by it's calorie and biological value to overcome the winter period of lack of feed and keep the game in good shape. This feed is very important to serve in roofed feed-trough. It is appropriate to serve it in small amount, to ensure that it will not stay in feed-trough for more than 24 hours.

d. Fleshy feed

The importance of this feed is considerable, that's why this feed should be grown on fields, not for harvest, but directly as feed for game. Most important fleshy crop is fodder kale. Kale grown on good stand

supported by sufficient fertilizing and care can produce significant amount of leafy substance. It has also advantage that it can tolerate low temperatures, so its available also during winter, or early spring, when it's influence on total organism of game is irreplaceable. Fodder beet, sugar beet, potatoes, turnip, carrot, etc. is grown rather outside the game preserve and then we store them in basements built ideally right near the main feeding spots. These fodder are served ideally in feed-trough or on feeding tables. These we serve on ground only in case of continuous snow coverage. Very important component of fleshy feed is also silage. We divide them roughly to agricultural and forest. We are trying to use mainly forest silages in game preserves (shoots of woods and shrubs)

e. Mineral additives

Salt is essential vital need of wild ruminants, because it helps them to regulate their water regime and stimulate some digestive processes. Sodium contained in salt helps to neutralize diarrheal effects of potassium which is contained in big amount in early spring greenery. Salt is submitted in various salt-licks. It's never added into fodder or layed on ground. For game preserve breeding is very suitable rock salt placed into split stump or in small wooden troughs. It is recommended to protect these salt-licks by roof against precipitation. It's quite frequent that medical salt-licks are placed into game preserves. These contains medicaments, but they lost it's efficiency and it is wrong to use them as a prevention, because game's organism get used to this substances and further submission of these medical salt-licks is completely worthless.

(Wolf, Chroust, Kokeš, Lochman, 1976)

3.2.2.2. Hygiene of feeding spot

Equipment used for feeding of game must be situated on easy accessible sunny places (It uses natural solar radiation redevelopment, which is destroying up to 50% of bacterial development stages). Feed racks are placed on naturally or artificially reinforced places, where is possibility to clean droppings and remnants of feed (even in winter), where is no muddy or waterlogged terrain.

On a feeding spot must be sufficient number of feed-trough so that game can reach them all at once. For young game must be constructed small fenced spots with fencing dense enough to allow just young game individuals to go inside. It is important especially in case when medicament admixture is served to young game (more frequent occurrence of strong parasites). It is practical to construct equipment and devices for feeding of game with respect to possibility of transporting these devices to another place in future. (In case of contamination of current place by parasites or germs of infection.)

In game preserves for wild boars in the feeding spot often reinforced by concrete, where laying of feed on the ground and frequent removing of droppings is possible.

Feeding equipment must be constructed to enable disinfection. Also surroundings of Feed racks must be disinfected, and allow frequent cleaning of droppings and remnants of feed. Feeding equipment must enable daily reloading of fodder.

In case of Feeding racks and storages of concentrated feed it is necessary to secure dry condition to avoid fungal diseases. Especially in case of granulated feed it's very important to avoid disturbance of medical harmlessness. (Frequent control is recommended.)

Big fodder storages are built in different places than feeding spots itself. They must allow long term storing of fodder in dark conditions and good manipulation with feed. That means they must be spacious, enclosed and ventilated (gassing, pest protection, damming of grains, etc.) (Lesprojekt,1988)

3.2.2.3. Cellar for storing of beet

There are several types of cellars for storing of beet. Concrete cellar such as in game preserve Sedlice, wooden A-shape cellar or digged cellar reinforced by wooden boards such as in Boubín game preserve. This simple equipment serves for long term storage of beetroot. It's good to have such cellar close to feeding spot (economical reasons). (Wadel 2007)



3.2.2.4. Feed rack with roughages reservoir

Purpose of this key equipment in game preserves is simple: To offer good quality roughages in any weather. These feed-racks are build on well accessible lee sites. These feed-racks are often composed of three basic parts: space for roughages with hay bin, small storage for fodder and small tools, space for concentrated feed.



3.2.2.5. Feeding tables

Feeding tables are simple wooden tables for serving concentrated and fleshy feed to game. These wooden tables are situated around the feeding spot, far enough from each other (4 to 8 meters) to avoid conflicts of game in feeding spot and provide the possibility of comfortable feeding for as many game as possible.



3.2.2.6. Feeding troughs

Principle much the same equipment as feeding tables. Feeding troughs can be made of wooden boards, or carved in log, rarely also stony troughs can be used. Game preserve manager in Stará Obora is using self made feeding troughs made by splitting of plastic tube, as he said, the cleaning and regular disinfection is easier.



3.2.2.7. Semiautomatic feeding device for concentrated feed

Device for serving concentrated feed by using simple bin for storing of fodder with small cranny on bottom, so the fodder is pouring out of the magazine every time it's eaten. This device is equipped by roof to keep the fodder dry.



3.2.2.8. Feed pen for young animals

These feed pens serve for comfortable feeding of young animals and ensure their daily feed intake. Young animals can easily enter the pen just by scrape through the fencing. Often happens that young animals are chased away from food by older and stronger individuals. This pen prevents young animals during feeding and offers them required serenity.



3.2.2.9. Salt lick

Salt licks are integral to feeding equipment in game preserves. Variability of their design is very rich. Natural materials takes place here (hollowed stumps or round billet from thick log, cleft logs, etc.) or they can be made of wooden boards as a troughs of various sizes. Salt licks are often roofed to protect salt rock against precipitation. It is possible to use for this purpose also troughs for concentrated feed.



3.2.3. Trophic areas in game preserve

For game kept on small area is necessary to establish and manage enough trophic areas which serves as a valuable sources of natural feed. By trophic areas we mean fields, meadows, pastures, stands for browsing, road borders and distributive networks. Fields for game are not primary determine to harvest, but all crops grown there are left for game in natural form. These areas must produce as big amount of natural feed as possible, especially during poor seasons such as spring, autumn or winter. Meadows must produce first-class sweet grass and should be perfectly drained, regularly fertilized and cultivated. Pastures serves the game for whole year. On stands intended for browsing are grown broadleaves with good sprouting capacity and different shrubs. (Wolf,Chroust,Kokeš,Lochman, 1976)



3.2.4. Equipment for hunting

To hunting in game preserves should be given much more care than hunting in free nature. It's necessary to secure successful hunt in shorter time period and beforehand precisely define and select hunted individual. In many cases is needed to fulfill security more than in nature because game preserves are often close to populated areas, towns, parks and so on. That's why is necessary to use all the advantages that high hides can offer to hunter. High hides must be built in sufficient quantity on every distribution lines, crossroads, or on the borders of pastures frequently used by kept game. High hides in game preserves should

offer enough inner space for hunter and his guide. Sufficient quantity of comfortable high hides which are appropriately placed in game preserves and fits well into the overall environment of game preserve, on one hand offers successful hunt, monitoring of game and on the other hand serves as a quality indicator of game preserve. Equipment for hunting is often supplemented by natural or artificial protection which offers the hunter to reach them without being spotted by game. These covering hides are often built on the borders of pastures, along hunters paths or around hunting stands. For successful hunt and monitoring of game serves also distributive network and roads inside game preserve. Distributive network of all types is continuously spreading so as roads. That provides new places for pasture and alley planting of fruitful trees. (Wolf,Chroust,Kokeš,Lochman, 1976)

3.2.4.1. Pulpit high seat

Covered, roofed equipment for two or three persons that serves for hunting and watching of game. In a good managed hunting ground as well as game preserve is appropriate placement of hide is commonplace. Hide should not interrupt the landscape character. High hide is place correctly only if hunter can reach it and leave it unspotted by the game. (Wandel , 2007) The rule "To see and not to be seen" takes place here, because we want to stress the game as least as possible.



3.2.4.2. Ladder high seat

Equipment that serves for hunting and watching of game. Biggest advantage compared to pulpit hide is easy construction, low cost and mainly it's easy repositionability. On the other hand as disadvantage we can consider that hunter is not hidden so good and he is not protected against bad weather. (Wandel,2007)



3.2.4.3. Hide

purpose requirement: cover for hunter on ground level. Simple hide made of straw, bale of hay, branches or simple wooden construction covered by small branches that offers hunter needed cover. Disadvantage of this hunting equipment is that hunter must pay attention on changes of wind direction much more than in case of high hides.(Wandel, 2007) This kind of hide is also not very comfortable and it's use in game preserves is very rare.



(source: Penzum znalostí z myslivosti,2009)

3.2.5. Equipment for catching of game

In every game preserve should be equipment for catching of game, which should be sold, exchanged, marked, veterinary examined etc.. There are many types and systems of game catching equipment, although all of them must meet these requirements: They must be safe for game, should allow quick catch, sorting of game and it's safe enclosing into trapping cages or capturing boxes.

3.2.5.1. Catching compound for deer game

Small fenced area with trap gate system, equipped by watchtower, from where are gates controlled by using a system of ropes. This equipment can be use in different ways. When the game went inside the catching compound, game manager can control gate system and the game can be enticed into smaller part of this compound and then captured into transport box. (Vyskot, 1962) Or, for example, in case of medical surgery game manager can narcotize selected individual from watchtower by using a tranquilizer rifle (safely and without need of tracking of shot individual).



3.2.5.2. Catching compound for wild boars

Device using system of individual chambers with trapdoors, used for easy catching of wild boars. Boars are enticed into chamber, when game preserve manager pulls the rope, trap door shuts and wild boar is captured. In case of young individuals is possible to enter this chamber and manipulate with wild boars manually. (Oral statement: Ing. Jindřich Brožovský [Holušice 22, Blatná] 2016)



3.2.5.3. Equipment for transport of living game

Cloven-hoofed game, caught in catching compound, is forced to go through tunnel corridor inside transport box. Transport boxes for cloven-hoofed game are made of solid materials. Trapdoor is usually hammered. Although transport boxes should be light, transport boxes for wild boars are made of thicker boards and reinforced by metal fittings. (Vyskot,1962)



3.2.6. Breeding and acclimatization compound

Breeding or acclimatization compound should be part of every game preserve with intensive breeding of cloven-hoofed game. These equipment serves for rearing of first-quality game, for acclimatization of imported game, as parasitic quarantine , or as a meeting place of catching game. Well equipped breeding compound is another expertise and quality indicator of game preserve management in each game preserve. (Wolf,Chroust,Kokeš,Lochman, 1976)

Acclimatization compound is permanently fenced area with acreage of few hectares (5-20ha) established in game preserves for acclimatization of newly imported game. Game is usually bred there with everyday care and after second birth of young, the game is released into new environment.(Bejček, Blecha, Dvořák, et al., 2009)

3.2.7. Water regime in game preserves

In each game preserve must be permanent source of clear water. Ideal source is wider brook flowing through whole game preserve with sufficient gradient that prevents water logging in surrounding soils. Natural or artificial pits and hollows serves as collectors of water in drier areas. These must be regularly maintained and cleaned. Also ponds and water reservoirs are built. Water regime in game preserves is very important and can't be underestimated.(Wolf, Chroust, Kokeš, Lochman, 1976)

Permanent year-round source of water is one of limiting factor during establishment of game preserve. In lower forest vegetation zones except floodplains, this requirement can be met only with difficulties. In middle and higher altitudes, water should not be any problem. On the contrary, in many cases is necessary to waive the plan for establishing of game preserve due to large areas of waterlogged localities, because these areas are very suitable for evolution of parasites. The conception of adjustment of water regime in planned or currently existing game preserves is based on character of stand. (Lesprojekt, 1988)



3.2.8. Base of game preserve

In area considered as a base of game preserve are situated many objects, such as administrative building of game preserve, house for game preserve manager, storage of fodder, cold storages for venison, parking lot for farm machinery or, for example, storages for materials used for maintenance of game preserve's fencing.

3.2.8.1. Storage of fodder

Storing of fodder is mostly done in ground of farm buildings of game preserve. The fodder (roughages so as concentrated feed) is stored in well ventilated halls divided by wooden boards into separated boxes, where is further loaded on trails and then transported to empty feed racks on feeding spots.



3.2.8.2. Storage for venison

Nowadays storing of venison is realized individually, mostly by cooling boxes in place of forest enterprise. In case of larger game preserves are as a part of game preserve's base built cold storages with advanced rooms for final cleaning of venison. This way of storing of venison is recommended for newly established game preserves, preferably near farm buildings. This also allows next expedition for further processing. (Lesprojekt, 1988)



4. Methodology

Buildings and equipment mentioned in the literature retrieval were compared with buildings in visited game preserves. Main equipment like feeding spots and high seats were counted, others were described. Feeding spots were visualized in Map 2.3; 3.3 and 4.3, high seats were not due to its high count. Few geographical characteristics like land cover or allocation of kept game species were reflected.

Land cover of each Game preserve was vectorized in ESRI ArcGIS 10 software on the grounds of orthophotomap of Czech republic (CUZKa, 2016), except Water sites that were gained from Digital Base of Hydrological Data (VUV TGM, 2016). Borders of game preserves were from the online forest maps (UHUL, 2016). We use three categories of Land cover - Woodland, Farmland and Water area. Other site category was not included, due to its difficulty to be recognized from orthophotomaps and bad accessibility to gain data. Area of each type of Land cover was summarized by software (Map 2.2; 3.2 and 4.2), and compared to each other and also to the national mean (Diagram No. 1)

Location of inner fencing and feeding spots were mapped in situ, or gained from game preserve managers. Density of each game species and density of feeding spots were counted from these data.

5. Results and Discussion

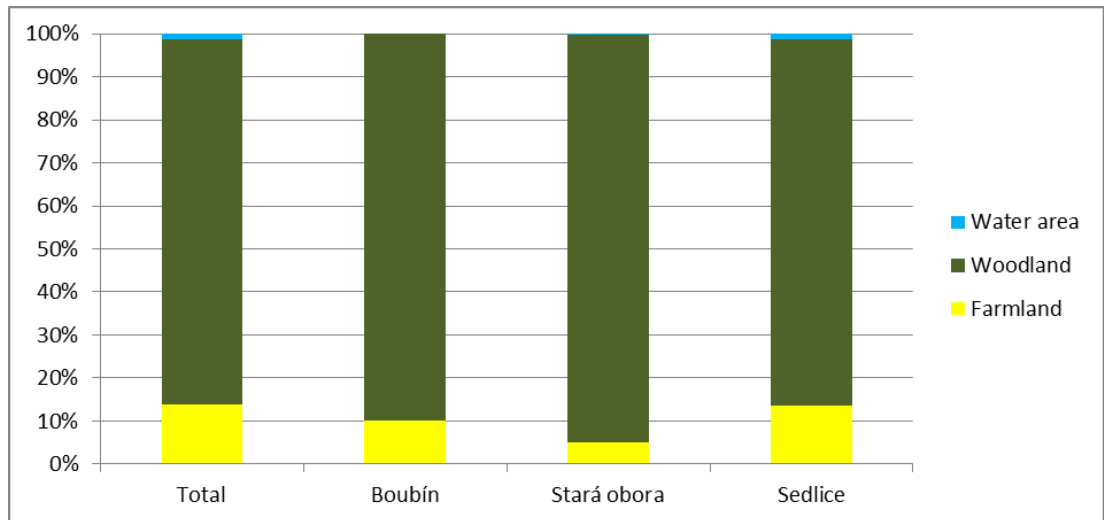
Buildings and equipment and its placement in visited game preserves is different according to species of kept game in the area of game preserve or in specific parts of game preserve (For example in Boubín game preserve we can not found troughs placed on ground, but there are feeding tables because no wild boars are kept there and feeding tables are suitable for red deer game. It is also logical that catching compound for wild boars is not there.)

All previously described constructions and equipment were found and analyzed during my field work in visited game preserves. During my field work was examined technical and natural background of all three game preserves, game populations and numbers of game preserves facilities.

Tab. No. 3 – Numbers of devices in game preserves

	Boubín	Stará Obora	Sedlice
Feeding spots	11	20	27
High seats	85	40	20
Gates	18	45	4
Grates	0	0	3
Acc. and breeding compounds	2	1	2
Leap-ins	5 (4 closed)	5 (closed)	3 (closed)
Salt-licks	24	40	9
Catching devices	0	18	4
Waterholes	5	11	8
Feed pens	8	4	3
Fodder storages	1	1	1
Cellars for beet	4	2	1

Diagram No.1 – Comparison of landscape proportions of game preserves in Czech Republic according to three selected game preserves.



On this diagram we can determine game preserve Sedlice as most representative game preserve according to mean of all game preserves in Czech Republic. On the other hand we can say that Boubín game preserve is extreme in way of percentages of water area and game preserve Stará Obora in percentages of farmland.

5.1. Boubín game preserve

In Boubín game preserve are kept 250 individuals of red deer on acreage of 1940 hectares. Population density is 0,13 individuals per hectare. Feeding is ensured by 11 feeding spots equally spread on area of game preserve (Map 2.3), that mean density of 0,006 feeding spots per hectare. Density of salt licks (20 pcs.) is 0,012 pcs/ha. Game preserve Boubín is equipped with 85 high seats, providing density of 0,26 high seats per hectare. Percentage distribution of landscape is 10,15% of farmland, 89,53% of woodland and 0,007% percent of water surface.

Specific features: Feeding tables

Tab. No. 4 – Landscape distribution of Boubín game preserve

Boubín	[ha]	%
Farmland	197	10,15
Woodland	1737	89,54
Water area	0,14	0,01
Total	1940	

Tab. No. 5 – Population distribution of game in Boubín g.p.

Boubín	[individuals/ha]
Red deer	0,13

Tab. No. 6 – Facilities distribution in Boubín g.p.

Boubín	[pcs/ha]
Feeding spots	0,006
High seats	0,044
Salt-licks	0,012

5.2. Stará Obora game preserve

Stará obora game preserve with its 1510 hectares offers home for 800 animals, that means population density 0,53 individuals per hectare. Game preserve is divided to smaller fenced areas to separate wild boars from other species (wild boars can be dangerous for young fallow deer and mouflon). Species kept here are Fallow deer (400 heads, 0,33 indiv./ha), Wild boar (200 heads, 0,66 indiv./ha) and Mouflon (also 200 heads, 0,16 indiv./ha). They can feed themselves officially on 20 feeding spots (during field work detected 14, marked on Map 3.3) It results 0,013 density of feeding spots per hectare. In Stará Obora game preserve is placed 40 high seats with density of 0,026 high seats per hectare. Occurrence of salt licks is 40, that provides density of 0,026 pcs/ha. In Stará Obora game preserve is placed 18 catching devices with density of 0,012 pcs/ha. Landscape distribution in percent is following: Farmland 5,1%, Woodland 97,8% and water surface 0,15%. Specific features: Old Schwarzenberg feed rack, combination of high seat and feed rack

Tab. No. 7 – Landscape distribution of Stará Obora game preserve

Stará Obora	[ha]	%
Farmland	77	5,10
Woodland	1477	97,81
Water area	2,3	0,15
Total	1510	

Tab. No. 8 – Population distribution of game in Stará Obora g.p.

Stará Obora	[individuals/ha]
Fallow deer	0,33
Wild Boar	0,66
Mouflon	0,16

Tab. No. 9 – Facilities distribution in Stará Obora g.p.

Stará Obora	[pcs/ha]
Feeding spots	0,013
High seats	0,026
Salt-licks	0,026
Catching devices	0,012

5.3. Sedlice game preserve

In Sedlice game preserve are kept 193 individuals, on acreage 255 hectares. That means 0,76 individuals per hectare. Wild boars (100 individuals) are again separated on area of 122 hectares (density is 0,82 indiv./ha). Fallow deer is kept together with Sika deer on area of 130,3 hectares. Population density is 0,6 indiv./ha for fallow deer and 0,12 indiv./ha for Sika deer. In Sedlice game preserve is situated 27 feeding spots with density 0,106 feeding spots per hectare. Game preserve is equipped with 20 high seats in density of 0,078 high seats per hectare. Salt licks are represented by 9 pieces with density of 0,035 pcs/ha. In Sedlice game preserve are 4 catching devices with density 0,016 catching devices per hectare.

Specific features: Grate against leaking of game, Game preserve shape

Tab. No. 10 – Landscape distribution of Sedlice game preserve

Sedlice	[ha]	%
Farmland	34	13,33
Woodland	214	83,92
Water area	3,2	1,25
Total	255	

Tab. No. 11 – Population distribution of game in Sedlice g.p.

Sedlice	[individuals/ha]
Fallow deer	0,60
Wild Boar	0,82
Sika deer	0,12

Tab. No. 12 – Facilities distribution of Sedlice g.p.

Sedlice	[pcs/ha]
Feeding spots	0,106
High seats	0,078
Salt-licks	0,035
Catching devices	0,016

6. Conclusion

This thesis contributes to gain further coherences about game keeping management in Czech game preserves. Comparative data are not available in comprehensive form. Thesis outlines a methodological process, how to compare and research basic characteristics of game preserves. Cataloging of these data gained from bigger amount of game preserves could lead to trend detection in game preserve management on the area of Czech Republic and to its further research.

Game preserve management may become important if we decide to reduce numbers of game in damaged forests (Krušné hory, Šumava). Nowadays game inflicts the major damage in forests, more than bark beetles, gale-storm winds or snow. One of possible solution for supporting natural rejuvenation of damaged forest would be significant reducing of numbers of big herbivorous. Game may be in kept in game preserves here and only small amount of animals living in open countryside. In result it will help in regeneration of fir and beech, which are most vulnerable to game browsing (MZe 2014, PRŮŠA 2001).

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