

# Unassisted weighting of European bison

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**Abstract:** Since the summer of 2018, six European bison (*Bison bonasus*) born in 2016, graz over an area of 12 ha at Nordens Ark on the west coast of Sweden, where E. bison used to occur during the early Holocene. In order to collect their weight in a stress free manner on a regular basis, an unassisted weighting station was designed and constructed. After a 53-day period of habituation, animals calmly entered the scale when passing between enclosures. Some of those individuals tended to be repeatedly startled as changes were made in the setup. A wide fence opening and covering of the platform floor with naturally occurring soil and faeces seemed to encourage a calm passage. When entering the scale, the weight and identity of the animal was recorded by a trail camera triggered by the movement. Weights have continuously been recorded since October 2018. A knowledge of the body mass of particular individuals provides an information regarding their physiological status and is important for proper management. According to obtained results the body mass of E. bison at Nordens Ark exceeds that of free-living E. bison of similar age, from Białowieża Forest.

**Keywords:** unassisted weighing, body mass, Sweden, habituation, European bison

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## Introduction

European bison went extinct in the wild during the first half of the 20th century. Thanks to reintroductions of captive-born individuals, in 2018 there were more than 5 000 free ranging individuals, and repopulation of the natural range of the species is progressing. For this purpose, captive breeding is still the most important source of animals (Raczyński 2004). There are, however, several drawbacks connected with *ex situ* breeding of wild species for reintroduction. One is the genetic adaptation to captivity induced by the captive environment (Frankham 2008). This may have a negative impact on the success of future reintroduction attempts and animal welfare. Comparing data on captive individual features to a reference set of data derived from wild populations could be a way to assess individuals and breeding conditions in order to guide management in the right direction. Records of animal body mass could provide such data.

In large bovine operations, automatic walk over scales or squeeze chutes are used to record body weight which value is matched to individuals through electronic identification (EID) ear tags. However, we were looking for a non-invasive and affordable solution for possible future appliance in wild or semi-wild E. bison populations. In this study, we tested and evaluated the use of a standard cattle scale together with a movement triggered camera to record the weights of E. bison in captivity.

## Materials and methods

In the summer of 2018, one male and five females of E. bison born in 2016, were brought to Nordens Ark (Åby Säteri, Hunnebostrand, 58°26'25.1"N 11°25'39.1"E) on the west coast of Sweden. The region represents temperate climatic conditions which are similar to that of early Holocene when E. bison used to live there. Two females (from Czech Republic) and one bull (from Sweden) were reared under zoo conditions (< 3 ha) while three other females came from larger enclosure (~900 ha, Sweden) with no previous experience of being handling by man.

The enclosures cover 12 ha of grassland, forest, marshy areas and hills with rocky outcrops. A pasture rotation scheme was used to increase regrowth of natural feed and to decrease parasite infections. Hay is harvested from 4 ha in the main winter pasture once every year and provided to animals as hay silage.

The E. bison are provided with free access to salt, minerals and water. A low energy hay silage was provided *ad libitum* from the middle of December to late March when it was abandoned for natural feed. During winter season animals alternatively foraged between supplemented hay silage and natural grazing/browsing.

A setup for unassisted weighing was designed (totalling about 1500 €) consisting of following components:

1. Load bars
2. Platform (2,2 m x 0,5 m)
3. Weight scale/display
4. Trail camera (camera triggered by movement)

The equipment was set up so that the camera would catch the displayed weight, the platform and the animal in the same picture (Fig. 1). This enabled visual matching of a weight to an individual and assuring the platform was entered properly. The display and the camera were adjusted to achieve a clear visual reading during both: daylight conditions and night-time record-

ing using infra-red light. Still/static pictures do not reveal whether stabilized weights are displayed and therefore the video recording feature was used. The results from the footage was manually entered into an excel spreadsheet.

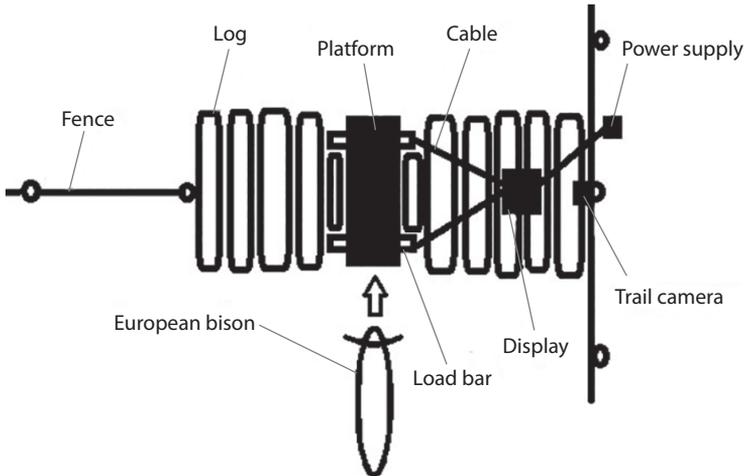


Fig. 1. Drawing of the complete scale setup as seen from above

An extensive habituation period (Tabl. 1) was started as the platform was placed in an open area inside the E. bison enclosure. Behaviour of the animals was documented with a trail camera and through occasional direct observation. Occasionally naturally occurring feed, namely acorns, wild apples and red clover, was placed in and around the platform. Eventually the platform was moved to a previously used passage leading to another enclosure. Initially the platform was turned opposite to the direction of passage, enabling for animals to pass without touching it with all feet. Subsequently, the passage was narrowed with a wooden fence to prevent side passing. The narrow opening seemed to deter some individuals. The platform was moved then to a wider opening (5 m) where logs, serving as a cattle-grid, were used to avoid side-passing. It was again turned opposite to the direction of passage to facilitate crossing. After 14 days it was turned into the direction of passage (Fig. 1) so that the whole its length had to be passed. Nevertheless some individuals were trying to jump over or side pass the scale. However when the upper part of the platform was covered with loose soil and E. bison faeces, within minutes, all individuals were passing through in a calm manner.

After one year of recording animals' weight in different passages, a rubber mat of standard design for cattle stalls was installed on the platform floor and vertical inner sides. After this change some animals appeared to be less relaxed when passing the scale and often they tried to jump above or side-pass

it. This behaviour decreased when soil and faeces were spread on top of the mat. The bull, however, continued to side-pass the scale. When the animals returned after grazing in another enclosure for about a month, the visible rubber covering the inner vertical sides of the platform had been removed and all animals passed through calmly.

## Results and Discussion,

A wide passage with logs covering the space between the platform and the fence have advantages compared to a narrow passage, apparently reducing the stress of animals. It also enables more individuals to move very quickly through the passage (over the logs) if they become startled, thus avoiding squeezing. The round shape of natural logs and placing them loosely should also decrease the risk of animal feet getting stuck in between. A larger log size prevented the bull from moving the logs around. Analogous effect may have also the presence of similar material (eg. naturally occurring dead wood/logs) in the enclosure/surroundings.

The covering of the platform floor with loose soil and faeces seemed to calm the animals. It was probably due to more natural appearance of the platform in terms of smell and looks as well as dampening noise and surface hardness. The rubber mat was also installed to increase surface softness, as such has been reported to be preferred by domestic cattle compared to harder material (Telezhenko *et al.* 2007). However, it seemed to be initially deterring, probably due to the new smell or visual impact.



Fig. 2. Three-year-old European bison entering the automatic weighing station

The platform was elevated as little as possible as not to become an obstacle. However, once the animals were used to it, the elevated position of the platform seemed to encourage halting on its top to scan the surroundings (Fig. 2). This greatly increased chances of obtaining an accurate weight.

The period from the start of habituation to successful weighing was 55 days (Tabl. 1).

**Table 1** European bison habituation procedure to scale equipment and setup

Date	Day	Action and behaviour
<b>2018</b>		
2018-08-28	1	Platform placed inside enclosure with clover ( <i>Trifolium media</i> ) on the top. All E. bison remain calm around the platform.
2018-08-29	2	Platform refilled with clover
2018-09-10	14	Opening, 65 cm, made in wooden fence to fresh pasture. No passages recorded.
2018-09-12	16	Fruits of European crab apple ( <i>Malus sylvestris</i> ) placed around scale and opening, no passages recorded.
2018-09-17	22	Separate fence opening of 185 cm added beside the first one. All E. bison passed through the larger one, individuals from zoos first.
2018-09-24	29	The 185 cm opening is split into two smaller, 75 and 100 cm. All E. bison passed through. Initial hesitation of individuals #3 and #5 (unhandled females from large game park)
2018-09-28	33	Platform placed alongside two largest passages with acorns ( <i>Quercus robur</i> ) on the top. Hesitations from individual #3 and #5, otherwise calm passages.
2018-10-03	38	Platform moved to a 5 m wide opening and positioned opposite to direction of passage with logs and branches obstructing on sides. All E. bison passed calmly.
2018-10-17	52	Platform turned to final position in direction of passage, logs and branches obstructing on sides. #3 and #5 from game park jumped/side-passed, others passed calmly.
2018-10-18	53	Soil and E. bison faeces added to platform. All E. bison passed calmly.
2018-10-19	54	Electronics installed.
2018-10-20	55	First weight recorded.
<b>2019</b>		
2019-08-15	1	Rubber mat installed on platform. Several animals appeared to be nervous and side-passed.
2019-08-20	5	Soil and faeces spread on rubber mat. All E. bison were relaxed when passing except bull which side-passed.
2019-08-27	12	All E. bison moved to an enclosure without scale.
2019-08-28	13	Visible rubber removed from inner vertical sides of the platform.
2019-09-24	41	E. bison were moved back to enclosure with scale. All animals passed the scale in a relaxed manner.

In October 2018 recorded mean weights of females was 242–292 kg and the males 371 kg. One year later, in October 2019, the weights had increased to 304–330 kg and 436 kg respectively.

Recorded body weights of *E. bison* at Nordens Ark were higher than the mean weights of free living *E. bison* of similar age from Białowieska Forest as reported by Krasińska and Krasiński (2002). Animals in captivity often experience a less hostile environment compared to wild counterparts, possibly resulting in a more positive energy budget and hence larger body mass. Comparing data on individual features of animals in captivity to a reference set of data derived from wild populations, could be a method to assess both individual condition and various circumstances in captivity, from intensively managed zoos to semi-reserves and reintroduction projects. Results could then be used to increase animals' welfare and success in *E. bison* conservation activities.

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### Ważenie żubrów bez asysty

**Streszczenie:** Od lata 2018 roku sześć żubrów (*Bison bonasus*) urodzonych w 2016 r. bytowało w Nordens Ark na zachodnim wybrzeżu Szwecji w zagrodzie o powierzchni 12 ha. W miejscu tym we wczesnym holocenie występowały żubry. W celu bezstresowego bieżącego kontrolowania ich masy ciała zaprojektowano i zbudowano stanowisko do samodzielnego ważenia. Po 53-dniowym okresie przyzwyczajania zwierzęta spokojnie wchodziły na wagę przechodząc między zagrodami. Wielokrotnie wprowadzano zmiany w konfiguracji czym zaskakiwano żubry. Szeroka przerwa w ogrodzeniu i pokrycie podłogi nad wagą ziemią i odchodami wydawało się zachęcać do spokojnego przejścia. Podczas przejścia przez wagę identyfikowano zwierzę i rejestrowano masę ciała przy użyciu fotopułapki uruchamianej ruchem. Masa ciała jest ewidencjonowana nieprzerwanie od października 2018 roku. Wiedza o masie ciała dostarcza informacji o stanie fizjologicznym poszczególnych osobników i jest ważna dla prawidłowej opieki. Na podstawie uzyskanych wyników można stwierdzić, że średnia masa ciała żubra z Nordens Ark jest większa niż wolno żyjących żubrów w podobnym wieku z Puszczy Białowieskiej.

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