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The importance of animal welfare when re-wilding herbivores for biodiversity re-establishment

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Abstract

The emotional and cognitive welfare of ponies used as tools for increasing biodiversity has not been carefully considered. A brief history of different approaches is given. Establishing the appropriate lifetime experiences is crucial, particularly appropriate experience with humans. This is a description of how a small group of young unhandled wild Exmoor ponies could be captured, transported, and released to live in a nature reserve in the French Prealps without distress or trauma. The necessary familiarization with humans was achieved by cooperative handling and teaching with an equine tutor. These young wild ponies handled by trained personnel, using no violent negative reinforcement, needed a maximum time of 5 h 30 min/individual before allowing themselves to be (i) caught (ii) and handled anywhere on their body, (iii) allowing their four feet to be lifted and held, and allowing themselves (iv) to be led, (v) loaded, (vi) transported, and (vii) released without showing behavioral or physiological distress. Their behavior, heart rates, and body condition were monitored. No chemical treatments were used. Despite the dramatic environmental and climate differences, the ponies needed no human intervention, remained in good condition, and had no serious health problems for 20 months after re-wilding. This small group had little obvious effect on the overall biodiversity, but there was a spread of wild orchids where they grazed heavily. Wild indigenous orchids might be an indicator of biodiversity in some locations as they are not grazed by most large herbivores.

Keywords: *equine behavior, re-wilding, Exmoor ponies, welfare, handling and teaching wild mammals*

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1. Introduction

Today, there are a growing number of projects re-wilding large herbivores in Europe and around the world since the importance of large herbivores for re-establishing biodiversity in Europe has been established [1–4], but re-wilding or re-introduction must not cause the animals to suffer, be traumatized, injured, or starve. The physical and mental welfare when re-wilding herbivores has been compromised or ignored in some cases. One of the most well-known re-wilding projects is Oostvaaderplassen in the Netherlands [5]. Although it increased biodiversity, it failed to take into account the welfare of the re-wilded horses, and some died of starvation, resulting in a public outcry [4]. Conservation grazing as practiced by the National Trust and other organizations in the UK has given rise to many questions concerning animal welfare, such as the following: (i) Are they kept too long in small, enclosed areas, and do they lose weight? (ii) Should groups be mixed and split? (iii) Are they not allowed to breed often? (iv) Do they often suffer excitement and injury during capture and transportation? (v) Does the inability to handle individuals result in the inability to administer veterinary care without chemical or physical immobilization and risk to the animal's health and the human time and expense that this involves?

Questions such as the number of each species to maximize biodiversity recovery have not been answered either, although there is information from agricultural grassland studies, and multi-species grazing encourages growth because different herbivores eat different floral species during different growth stages and protect against parasites [6]. Grazing habits and other uses of the environment vary with the species. For example, cattle prefer longer grasses than equines [7]. The grazing effects can be assessed by factors such as (a) species eaten, (b) parts of the plant, and (c) growth stages [7]. Patterns of defaecation and urination also affect sward changes [8]. For example, cattle defaecate randomly, but more in resting areas, whereas equines have defaecation areas separate from their grazing areas, resulting in the establishment of different flora [7]. How far each species moves and how they conduct their social lives also affect their grazing and the subsequent species diversity [9].

Large herbivores are also individuals who have different effects on the environment [10]. Their different emotions affect their grazing, whether this is fear [11], curiosity [12], timidity, attention, pleasure, delight, or sexual lust. Thus, each individual may have different effects on the sward. Further studies emphasizing the different effects of age, gender, and personality as well as species and numbers are also needed.

1.1. Chemical capture and restraint

In Southern Africa, the capture and translocation of traditionally wild mammals has been developing for over 50 years with the use

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of immobilizing drugs. When large animal "re-wilding" or "translocation" began in Africa, mistakes were made, but much has been learnt since concerning the method, drugs, dosages, antidotes, and their keeping and handling [13]. As a result, today, in Southern Africa, before immobilizers can be used, the user must be qualified, and deaths rarely occur [14]. This is not always the case for the use of immobilizers, as in some countries, veterinarians are permitted to use them without previous training. Great care is also exercised in Southern Africa when the animals are kept prior to transportation in a holding area.

But chemical methods of capture and restraint are costly and risky, and it is not known if immobilizing with today's drugs will totally suppress consciousness. Even if this were the case, the immobilized animal still suffers trauma when shot, running and collapsing, when being loaded into transport, or after the antidote is administered. Such experiences are likely to cause considerable mental distress immediately or in the long term since it has been established that these animals have memories.

When the animals are not being transported between large "wild" areas and where experienced, licensed, and qualified personnel are not easily available (e.g., in Europe, Great Britain, and Australasia), it is advisable to avoid chemical immobilization for the welfare of the humans and animals, unless there is no alternative.

One important question is whether domestication has caused genetic behavioral changes. For example, it is widely believed that certain breeds or races are more suitable for re-wilding ([3] p. 136), as it is maintained that

"Cattle…have been so highly bred, with herd behaviors modified that it is hard to imagine them ever being wild".

As a result, much effort and more money are being directed to re-breeding large extinct herbivores such as the Konig pony and Aurochs [14–16] from "ancient" breeds that are not commercially farmed. This may be interesting, but it is questionable if these animals are able to adapt better to re-wilding than existing commercial livestock because commercial cattle, when given the option to show "herd behaviors", behave very similarly to their wild counterparts [17]. In 1980, 10 pedigree "modern" commercial South Devon adult cows with calves and a bull were translocated from Sussex, where they had been bred and reared on a 16 ha alkaline ecological lowland farm, to the highlands of Mull (Hebrides) where, over winter, they had over 1000 ha of sheep-grazed acid moorland. It was widely believed by agricultural advisors and local farmers that these cattle would not survive or thrive. Within 18 months, however, they had adapted to the conditions and produced twice the income (because their calves grew bigger) than the indigenous Galloway cattle on the same rations and moorland [18]. There are many other instances of commercial cattle and even thoroughbred horses being able to adapt to wild-type conditions (e.g., thoroughbreds in the Namibian desert). It is genetically programmed that mammals *learn*, so their lifetime experiences are of great importance.

1.2. Effect of past experiences on behavior (learning)

One of the important concerns is the effect of lifetime experiences on animals' ability to survive and thrive when transported and released to "wild" areas [19]. There have been many failures [20], and it has been shown repeatedly that *individuals' past experiences are crucial for success* [21]. Since all mammals are sentient, learn, and have individual experiences and knowledge, much of their behavior is the result of their lifetime experiences, whether they are traditionally "domestic" or "wild" [22]. Re-wilding or re-introduction is not new. For the last 40 years, zoos have often maintained that their "raison d'être" is to breed endangered species to re-introduce them to areas from which they came. These re-introductions are often unsuccessful [23] because the zoo-bred animals do not have either the necessary *ecological knowledge* (e.g., what to eat, where to shelter, or how to find their way around) or the *social knowledge* (who is who, who to follow, who to avoid, etc.) about their own and other species' societies.

Re-wilding animals must also have a degree of familiarity with humans in order for them not to suffer in the process.

1.3. Familiarization with humans

The handling of many wild species has been practiced throughout human history. When young wild species have been found abandoned or their mothers have been killed, they were raised in contact with humans. In Africa, this includes small and large antelopes, elands, kudus, giraffes, rhinos, elephants, zebras, warthogs, hippos, buffalo, hyaenas, lions, leopards, and cheetahs. Some individuals who were raised in this manner have become important members of the farm or household and have bred. Some, when adults, have been used to produce non-life-threatening products such as milk (e.g., eland milked in the 1950s in Zimbabwe) or energy to help on farms (e.g., elephants and buffalo worked on the land in Zimbabwe in the 1990s) [24]. Elephants reared and living in human care are also ridden by rangers to police the boundaries of nature reserves against poachers in Southern Africa. Only recently has scientific knowledge been combined with ethics and human economic interests to ensure good welfare of animals under human care and/or re-wilded animals. Earning income from tourists with "tame" wild animals is increasingly important worldwide but has raised concerns, often correctly, about how the animals are handled, taught, and used. For this reason, standards have been developed for the welfare of elephants under human care, agreed upon by all stakeholders, and should be developed for other species [25].

Disastrous mistakes have also been made when handling zoo animals. A tiger in a British zoo killed a keeper in the 1990s, which resulted in many zoos developing a "no direct contact" policy for keepers and veterinarians looking after mammals. This has led to some ludicrous developments; for example, since zoo-born zebras are no longer handled, it is not possible to trim their feet. Consequently, they are chemically immobilized in the zoo for such routine tasks, although for centuries, young traditional wild and domestic equines have learnt, *without being immobilized or traumatized*, to tolerate trimming of the feet without excitement or stress (e.g., zebras in circuses [26]). As a result, today, many unhandled, zoo-bred animals suffer because they have *not* been properly handled by humans. It took one adult zoo-born zebra that was "re-wilded" to the Highland Wildlife Park 2 years of regular capture and handling before he allowed his feet to be trimmed! [27]. One of the major problems is that it is now recognized that handling of young livestock often reduces stress [12], and there are studies in the literature on its effect in several domestic species tested in experimental conditions [28], but how handling is conducted in practice outside experimental situations has not been studied. This is left to those who have experience or intuitive knowledge. Some have false pre-conceived notions learnt from others, such

as " non-humans cannot learn to understand human words" or "wild animals cannot be tamed safely". Rarely is intuitive and scientific knowledge combined with ethics and human economic interests. But recently important practical rules, based on psychological research with gifted children [29], have been developed and used [30]. The result of one field study was that a wild-caught 7-year-old zebra adult stallion learnt to be handled so that all routine treatments could be administered safely and without stress in 10 h.

Because the majority of humans today are urban, they are unlikely to have the practical experience of handling or teaching non-human mammals, which also applies to those who earn their living with other species, such as ecologists, tourist businesses, veterinarians, farmers, sanctuary workers, animal activists, and ethologists [31]. It is increasingly important to outline how non-human handling and teaching can be improved in practice.

Over-familiarization with humans can also be a problem. For example, when establishing a breeding herd of Exmoor ponies, a stable-kept Exmoor pony stallion who had never had free contact with other equines was let out with Exmoor mares to breed in a re-wilding project. Because he approached and scared walkers and riders on permitted paths through the area, he had to be disposed of (as detailed in [2] and personal consultation); yet, unhandled stallions who have had the appropriate lifetime experiences live and breed in many areas of the world without causing problems for walkers or riders (e.g., Exmoor, Dartmoor, Camargue France, Namibia, and the USA).

1.4. Selection of species and individuals for re-wilding

Ponies, not raised for meat, are not subject to veterinary disease restrictions in France. Exmoor ponies have similar DNA to the wild *Equus caballus* and are considered to be direct descendants of the equines that colonized Europe from America some 700,000 years ago [32]. They have, unlike many other ponies, lived undomesticated on Exmoor for centuries and proved successful in re-wilding projects in the UK. They are also a rare breed [33], so the establishment of a breeding re-wilded population in a different environment could help their conservation [34].

If possible, young animals of any species should be selected because they are likely to be able to adapt more easily to new environments since their behavioral tendencies and habits have not been well established [35]. To maximize the quality of life of the animals, a mixed age and sex breeding group should be established.

Equines learn a great deal by social and observational learning, so an equine "tutor", familiar with humans, easy to handle, and already taught, could improve their speed of learning and welfare [36].

Collars and GPS boundaries are increasingly used to control the movement of livestock, but they are expensive and have welfare and other disadvantages, such as requiring frequent handling to change the fitting or recharge the batteries, so they were rejected for this project.

Considering these concerns, an examination of the welfare of animals when re-wilding suggested the investigation of the following questions:

(1) Can these ponies adapt and thrive in a different climate with different geologies, soils, fauna, flora, and topographies?

(2) Can they thrive without any human interference (e.g., feed in the winter, foot care, de-worming, etc.)?

(3) Can the ponies cope with possible predators (e.g., wolves)?

(4) Why, when, where, and what amount of familiarization with humans (handling and teaching) is necessary for wild Exmoor ponies re-wilded to a strange place without trauma?

(5) If cooperative handling and teaching is used how long does it take.

(6) Is having an equine tutor who is familiar with humans useful?

(7) How will necessary transportation be achieved without drugs or distress and trauma?

(8) How much do the ponies move around in their new environment?

(9) What is the effect of their behavior, movement, and grazing on biodiversity?

(10) Can the ponies' physical, social, emotional, and intellectual needs [37] be served at each stage when re-wilding?

2. Materials and methods

The aim of this project was to introduce a small group of potentially breeding Exmoor ponies to the Prealps in France without causing them any trauma or distress to help retain the species diversity established by multi-species grazing of domestic herbivores (horses, cattle, and sheep) [18] that were removed 3 years prior. The mixed species sward was being overshadowed by dominant grasses, and some of the orchids, which had previously made a remarkable comeback, were threatened (**Figure 1** and **Figure 2**).

A brief ecological description of Exmoor and the Rocherousse Nature Reserve in La Drome, France, is as follows.

Figure 1 • Pyramidal orchids (*Anacamptis pyramidalis*).

Figure 2 • Lizard orchids (*Himantoglossum hircinum*).

Exmoor (**Figure 3**) is predominantly acid moorland (pH around 4–5) with occasional woodland and wet and dry heath. The dry heath is dominated by heather (*Calluna vulgarise*) in combination with gorse (*Ulex* spp.), bilberry (*Vaccinium* spp.), bell heather (*Erica cinerea*), other dwarf-shrubs, and bracken (*Pteridium)* and moor grasses (*Molinia* spp.), and nearly all of it is semi-natural, being derived from woodland through a long history of grazing. The wet heath is characterized by purple moor grass (*Molinia caerulea*), several species of *Sphagnum* moss, occasional sundew (*Drosera* spp.), and bent (*Agrostis* spp.). There are vestiges of oak and birch woodland in the valleys, and beech was planted. The topography is undulating with mixed geology rising to 519 m above the sea cliffs. The climate has an annual rainfall of 800–2000 mm, and it snows occasionally. The winter temperatures vary between −3 °C and 15 °C, and occasionally rise above 25 °C. There are sheep (*Ovis aries*), cattle (*Bos taurus*), Exmoor ponies (*Equus caballus*), and red deer (*Cervus elaphus*) on the moor throughout the year and occasional roe deer (*Capreolus capreolus*) in riverine forests; there are no large predators other than foxes and badgers (*Meles meles*).

Rocherousse (**Figure 4**) is on the northern edge of a large Jurassic syncline of the Foret de Saou, Drome, France. It is alkaline with a soil pH around 8–9. The elevation is from 650 to 2000 m. The total area is 174 h. It has steep limestone cliffs and approximately 10 ha of montane pastures with scattered juniper (*Junipers* spp.), broom (*Cystisus scoarius*), and dog rose (*Ros canine*). There is approximately 3 ha of old coppiced beech woodland (*Quercus robur)*; 3 ha of stunted oak (*Quercus robur)*, wild laburnum (*Laburnum anagyroides*), and *beech* (*Fagus sylvatica*); and 10 ha of riverine woodland with willow (*Salix* spp.) species. Scots pines (*Pines sylvestis*) are scattered in some of the montane pastures. Norwegian spruce (*Picea abies*) planted in the 1950s occupies around 10 ha. There is around 15 h of indigenous grassland and 5 ha reseeded with grasses and clovers between 8 and 15 years ago. No chemicals of any type have been applied to the land since 2003. In the winter, the temperatures drop as low as −30 °C but can rise to 20 °C in the sun. Night frosts are common between November and April, and snow stays on the ground for up to a week. The temperatures rise to over 40 °C occasionally in the summer but are usually around 25–30 °C. The annual rainfall is 700 mm. The evaporation is high, and the summers are hot and very dry. The reserve is fenced on all sides except at the top of the cliff where it adjoins the Foret de Saou, accessed by a precipitous path. The potential predators are foxes, badgers, and occasional wolves (*Canis lupus*).

Figure 3 • Exmoor looking north to the sea.

Figure 4 • Rocherousse nature reserve at the top of the cliffs.

After being rounded up from the open moorland in the south of the Exmoor National Park, the test group of 3 fillies and 1 colt was selected from the 65 wild, unhandled 7–10-month-old weanling foals as they ran through a crush. The selection was made on the

grounds of their overall physical health and ability to be representatives of the breed, assessed from their height, color, and conformation. An identity disc and a head collar with a 20 cm rope were fitted while they were in the crush.

2.1. Adaptation period with humans

Taking the ponies straight off the moor and transporting and releasing them in an unknown environment would be traumatic since the only contact they previously had with humans was negative, such as being rounded up and separated from their families, so an "adaptation period" to become familiar with humans, the equine tutor, and each other was organized. The equine tutor was a 3-year-old Exmoor mare, Emma. She had been obtained two years prior as a weanling from the same group in the same way. She had been cooperatively handled, taught, and integrated with the group of breeding/working horses who were residents on the farm, so she learnt horse/human culture. She was easy to catch, tie, handle all over, lead, lunge at, free school, ride, and drive without excitement or trauma.

After identification and selection, the young ponies were herded into a van and transported loose (not tied up) to an ecological farm in the north of Exmoor (a 1 h journey). Upon arrival, they were released into a straw-bedded barn (4.5 m × 13 m) with the equine tutor, where they remained for the next two weeks, while they were caught and handled for a total of 5 min per pony 5 times a week.

After this, they could choose to run into a 2 ha field, but to do this, they had to climb some steps and follow a 2.5 m wide path fenced on each side by a 2-strand electric fence that would give them a mild shock if they touched it.

2.2. Pony handling and teaching

Cooperative handling and teaching [30] were used to familiarize the wild ponies with humans.

Handling is defined as ponies learning to be handled anywhere on their body while standing calmly and immobile. Teaching involves the animal learning to perform some tasks voluntarily, which is necessary to ensure that the animals can undergo all the processes of re-wilding without trauma and distress.

Once the animal can be easily handled, they can learn to do something with humans (e.g., to be tied up or led). Cooperative handling and teaching use primary and secondary positive reinforcement (food rewards, appropriate gestures, smiles, giggling, and saying yes or good) and non-violent negative reinforcement (head shaking, frowning, appropriate gestures, and saying no). It is based on the developmental psychology of how pre-verbal infants become classified as gifted when they attend nursery school [29]. The techniques were developed over a period of 5 years with a set of rules to ensure quick, easy, and safe handling and teaching of large mammals [30].

2.3. The rules used for cooperative handling and teaching of mammals (adapted from [30] p. 112)

1. Reduce your own and/or the animal's fear by recognizing it and doing what will not frighten you. Build on this.
2. Repeat the action when touching, rubbing, or scratching until he or she finds it tolerable and pleasant.
3. Reinforce the lack of anxiety by food and secondary reinforcers such as talking quietly, smiling, and giggling. Use positive and negative primary and secondary reinforcements and reward a partial response initially.
4. Relax yourself (e.g. deep breathing and relax each part of your body in turn).
5. Attention. Do not look at the subject. Pay attention to other objects until s/he is confident, and then ensure your attention is on each other when learning.
6. Enjoyment. Make sure that both of you are enjoying the activity.
7. Sudden movements will frighten him/her so do not use them.
8. Odor. Do not smell strongly of something s/he does not know or is unfamiliar with (e.g., cosmetics). Odor can be used as a positive reinforcement (e.g., place the faeces of the animal to be loaded on the ramp or in the vehicle).
9. Speak. The voice conveys emotions that the animal will respond to. The meaning of words is quickly learnt if paired with appropriate reinforcement.
10. Be consistent with your voice and gestures.
11. Simplicity and clarity are key.
12. Ensure the safety of yourself and the animal.

In the first 2 weeks, each pony learnt the following activities in sequence in the barn:

(i) To be caught. The handler approached and caught hold of the short lead and tied it to a longer rope secured to an immovable post or gate. Initially, each young pony was cautious about the close approach of the relaxed handler, but this was achieved by waiting until they accepted the handler's presence. (ii) Tied up. The first time tied, all the new ponies pulled back, and one sat, but none fell. They rapidly learnt the basic physics: it is uncomfortable and impossible to get away when pulling but standing with the rope loose is comfortable. When tied, they could see each other but not become entangled with the ropes, and the bedding was deep in case of a fall. Equines learn in one trial *not to be tied up* if they break away. (iii) Handled. After 3 periods tied up, they were introduced to "handling" which involved, in sequence, touching and stroking the neck, shoulder, ears, face, and back; scratching the rump; and running the hands down the front legs and under the stomach until they could stand still while their heartbeat was taken with a stethoscope for one minute. (iv) Lifting the feet. When hands could be run down the front legs while the pony stood still, the hoof was lifted and held. (v) Leading. First, the animal followed Emma or another pony in the barn, and then they went to an unfamiliar place alone. (vi) Finally, the animals were loaded into transport, (vii) transported and veterinary-inspected overnight in new places, and (viii) released to live in the new area without feed, foot trimming, or requiring veterinary treatment.

3. Results

Introduction to the equine tutor. The young ponies approached her, she smelt their noses, heads, and necks, and they began to

watch and follow her, presumably because they recognized that she was older and familiar with the environment. There were no squeals, and no direct aggression (ears back or flat, biting, or kicking), although when Emma was approached too close, she showed an intention to kick by swishing her tail.

3.1. Handling and teaching of the ponies

(i) Time to first catching. The time to first catching of each pony varied from 10 s (Emma) to 10 min for one of the fillies who initially rushed around, but after 5 min, s/he became quiet, and after a further 5 min, s/he was gently caught.

(ii) Time to first tie up. Within 20 min, all had learnt the basic physics and stood quietly eating hay.

(iii) Time to allow handling and taking the heart rate with a stethoscope. The total time needed for this was 10 min for the most frightened pony. The heart rates were between 44 and 52 bpm, well within the resting heart rate of young ponies, which is an indication that they were not stressed behaviorally or physiologically. This was repeated for 4 days, 5 min/pony/day, necessitating a total of 20 min per pony.

(iv) Lifting the feet. By day 7 with 3 extra minutes/pony/day, all could have their front feet picked up and held for at least 20 secs without pulling away. By day 10, they allowed the hind hooves to be lifted and held for 20 sec without kicking or pulling away.

(v) Lead. Because the ponies had learnt to move towards tension when tied, this was achieved quickly: from 5 s to 5 min. None of the ponies tried to leap away or pull hard against the handler. By day 7, they were led to unfamiliar places outside the barn by initially following Emma. If they showed any suspicion of or curiosity about unfamiliar objects, they were allowed to stop and investigate. By day 9, they could be led to new areas alone outside the yard. The total time required to learn to lead alone to new places without pulling or refusing to move was 30–40 min/pony.

(vi) Loading into transport. In the week before travelling (6 weeks after arrival), the ponies were led into the transporting van and tied in their places. No negative incentives such as pushing/ropes/whips, etc., were used. They were given food when in the van. No unrest or anxiety was shown. The total loading time/individual was 1–10 min.

The total time from being caught on the moor to ensure the necessary familiarization and allow catching/handling, feet lifting, leading, and loading for transportation without any panic or anxiety was a maximum of 5 h 30 min for an individual pony.

(vii) Transportation. The ponies were then driven on small roads. After 10 min on a straight road travelling at approximately 80 kph, their heart rates were at resting rate or a little above (between 44 and 54 bpm; the resting rate for these ponies was between 44 and 48 bpm).

In April 2023, they were loaded into an unfamiliar van, individually tied, given hay ad libitum, driven to Oxford (about 3 h 30 min), and unloaded overnight into two adjoining stables. The next day, they were observed and examined, health-checked, and identified by a veterinarian, then re-loaded, driven to Dover, and put onto a ferry (7 h). In Calais, they were unloaded for a similar veterinary inspection by French vets before an overnight stop. The following day, they were driven to La Drome (7 h, mostly on motorways).

The heart rates could not be taken during transportation, but the transporters were asked to report if there was evidence that the ponies were anxious, excited, distressed, or tired during the journey every half hour when they stopped. Upon arrival, they were surprised how easy the ponies were to load, unload, and lead, and how well they ate hay during the journey (often a sign of relaxation). They mentioned that they were calmer than many of the domestic, trained horses and ponies that they transport.

(viii) Release upon arrival at Rocherousse nature reserve. The ponies were led into a small paddock (0.5 h), tied up for 10 min, given a small feed, and released to explore the paddock. After 36 h, they were caught and led to a 1.5 h steep sloping paddock adjacent to the nature reserve, and their head collars were removed. After 5 days, when they were caught and handled for 2 min each per day, they were released into the reserve.

During the next 15 months, including winter 2023–24, they were not fed, watered, de-wormed, or handled, nor were their feet trimmed. Visual inspections, which included their condition, any lameness or wounds, unusual behaviors, and their social distribution, were conducted about once a week for the first 2 months and thereafter occasionally by the reserve guardians when overseeing the game cameras, which are hidden throughout the reserve to record animals and illegal hunters.

One of the original handlers visited three times during the 18 months and was able to approach and handle all the ponies. She estimated their body condition by eye and feel after catching them, which was between 3 and 4 for all according to the Blue Cross horse condition scores [38].

In May 2024, they broke the fence to visit the neighbor's horses and were caught and returned by inexperienced people, which took 1 h 40 m. In June 2024, they were inspected and followed for a couple of days by two of the original handlers. Again, they visited the neighbor's horses but were caught and led back within 1 h. In September 2024, they were all caught and tied up by strangers following the rules for cooperative teaching within 15 min.

3.2. Unexpected developments

Emma, the tutor mare, within 6 weeks of arriving at Rocherousse, gave birth to a filly foal by a purebred Arab stallion resident on the ecological farm. The filly foal matured unhandled (**Figure 5**) and is an integrated member of the group. She has not been seen to behave any differently from the other Exmoor ponies.

3.3. Behavior and individual differences in the re-wilded ponies after 18 months in the reserve

The ponies retained their confident attitude towards humans after 18 months, during which they had very little contact. They still followed the tutor, Emma, but individual differences were showing; for example, one of the fillies was often at some distance from the group and appeared to be more curious and perhaps less socially orientated. The colt, now a 2-year-old stallion, was attracted to other mares and visited a neighbor's group of domestic horses, followed by the rest. One of the fillies, 5 days after arrival at La Combe, was mishandled by a visitor who approached too fast, waved his hands and arms about and frightened her, and was bitten. This filly had been particularly easily frightened and had taken the longest to have confidence in humans. This indicates that

inexperienced visitors should watch and learn about the re-wilded ponies (and other species) but not handle them.

Twenty months after introduction and at around thirty months old, their personalities and roles in society, whether an explorer, leader, follower, confident, timid, etc., were becoming evident [39].

Figure 5 • The 2-year-old colt in July 2024 in the front. Emma is being scratched behind.

3.4. Adaptation to different mountain terrains, physical wellbeing, and use of terrain

Introduction to the reserve in stages allowed the ponies to become accustomed to the place, terrain, and fauna and flora before release into the 164 ha reserve. There were numerous plant species that they had not encountered previously, but by the end of 20 months, they had broadened their selection to eat many species of grasses, shrubs, trees, and clovers growing on the alkaline soils that they had not previously encountered.

In June 2024, 15 months after release, they were all in excellent condition (see **Figure 5** and **Figure 6**) with a condition score of 3 to 3.5 [38], which had been maintained throughout the re-wilding process. Despite short periods of snow cover, there was plenty of available forage and the ponies showed no obvious weight loss.

There were no physical signs that they needed de-worming (from body shape or coat condition; the faeces were not checked) or foot trimming in June 2024, and they were in excellent condition (**Figure 5** and **Figure 6**).

A slight concern was a loss of hair suffered by Emma towards the end of the summer 2023, presumably from ecto-parasites, although she was not observed to scratch herself more. It was decided not to treat it as it was not causing annoyance or distress; it disappeared in 6 months.

In the first month after release, the ponies remained in the pine trees and open grassland adjacent to the paddock from which they were released. When disturbed, they returned to this area, which received greater grazing pressure. By the spring of 2024, they had found a barn shelter and new grassland on the north side of the reserve and attempted to join another group of horses in the NNE direction. Thus, over the year, they had extended their range to cover half the area available to them (80 hectares). This selected home area was ecologically varied with oak, beech, and conifer forests, streams, shrubs, grassland, steep slopes, and open grassland.

Figure 6 • The 1-year-old filly foal on the left, with 2 of the 2-year-old fillies on the right.

4. Discussion

Each re-wilding project will have different priorities requiring different behaviors from the subjects and the humans involved, but to avoid poor welfare, the subjects must have the appropriate lifetime experiences. In this project, they also encountered electric fences. When receiving a shock for the first time, many animals panic and rush through the fence (personal experience in Europe and Africa). As a result, various species are incorrectly believed to be unable to be confined by electric fences [40]. When they have their first shock, it is necessary to be controlled and, if possible, with an experienced conspecific to learn not to touch the fence. After training, herbivores, including elephants, can be contained by strategically electrified wire fences, *provided the fences retain their charge*.

4.1. Establishing the ponies' attitudes toward humans

All the ponies learnt remarkably fast using cooperative handling and teaching to be caught, tied up, handled, led, and loaded into a van. The time spent with each pony was a maximum of 5 h 30 min over a period of 6 weeks. Emma's tutorial role probably sped up the youngsters' learning, but it was clear that the behavior and emotions of the handlers were very important in helping to reduce fear. To save time and trauma, it is therefore advisable to have qualified cooperative handlers.

The ponies' behaviors were monitored throughout the re-wilding process. Their heart rates remained within the rest range for ponies (44–54 bpm), and they showed no indication of fear (shivering,

snorting, panicking, excessive excitement, and attempting to run away) after the initial catching and handling. Throughout the 25 months, their general health was good with a condition score of between 3 and 4 with no foot trimming, de-worming, or winter feeding.

We conclude that their welfare was good at all stages of the re-wilding process. What was surprising was how little time each individual required to achieve the confidence and familiarity with humans to ensure that all the processes did not cause trauma, which was a maximum total of 5 h 30 min per individual.

In June 2024, they were all in good health (**Figure 5** and **Figure 6**) with an excellent body condition score of 3.

5. Conclusions

It is suggested that monitoring the welfare and establishing positive animal/human familiarization when re-wilding large mammals is important, although these processes are not generally carried out. Most feral or wild ponies (and other species), if they have any previous experiences of humans, have had negative interactions, but to have trauma-free, safe re-wilding, it is necessary for the animals' experiences with humans to become positive. When carried out well, the maximum time required for each wild pony to be caught, handled, led, treated for veterinary problems, transported, and released was 5 h 30 min without any individual showing evidence of physiological or behavioral distress, trauma, or pronounced fear. Eighteen months after release, without having further close contact with humans, each pony was easily caught. The most important considerations are the presence of an equine older tutor familiar with humans, cooperative handling, and the training of skilled, qualified handlers to reduce trauma, increase safety, and reduce the time required to establish confident relationships. These techniques can be applied to other species to reduce animal suffering [30, 41], increase human and animal safety and pleasure, and reduce the time spent on this process [25].

5.1. The effect of the ponies on biodiversity

Because of the small size of this trial group, obvious signs of changes in biodiversity were restricted to small areas. Four years after the removal of the domestic large herbivores and 12 months after the introduction of the ponies, there was, however, a further spread of some wild orchids in the areas heavily used by the ponies. Wild orchids can be an indicator of the re-establishment of biodiversity. They are easily identified, charismatic, popular, and not grazed by large herbivores.

More species of large herbivores in the correct numbers (e.g., cattle, European bison, wild goats, and sheep) would aid the re-establishment of biodiversity, but the carrying capacity of the different species in any re-wilding project that will not compromise the animals' welfare needs considerable further studies.

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Author contributions

The author confirms sole responsibility for this work. The author approves of this work and takes responsibility for its integrity.

Conflict of interest

The author declares no conflict of interest.

Data availability statement

Data supporting these findings are available within the article at https://doi.org/10.20935/AcadEnvSci7648, or upon request.

Institutional review board statement

Ethical review and approval were deemed unnecessary as this study focused solely on improving the welfare of re-wilded animals. No interventions were conducted that could have caused harm or distress to the subjects at any stage of the study.

Informed consent statement

Not applicable.

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