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Faculty of Tropical AgriSciences



**Faculty of Tropical
AgriSciences**

**The working donkey welfare in Mediterranean
area**

BACHELOR'S THESIS

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Declaration

I hereby declare that I have done this thesis entitled “The working donkey welfare in Mediterranean area” independently, all texts in this thesis are original, and all the sources have been quoted and acknowledged by means of complete references and according to Citation rules of the FTA.

In Prague, 17th April 2024

.....

Pavla Brejchová

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Abstract

The number of donkeys in Europe dramatically decreased in the last 100 years, whereas in many developing countries the population grows. In some countries, donkeys are still used as working animals, in others, they are kept as pets or used for leisure activities, therapy programs, or milk and meat production. Objective information about donkey welfare conditions is limited or fragmented. Donkeys may suffer from malnutrition, parasites, inappropriate handling and other problems. This study aims to review the current literature resources dealing with donkey use and welfare in the Mediterranean area, to characterise the most problematic areas and to suggest strategies to improve working donkeys' life. It was found that there was insufficient mapping of the number of donkeys and their workload. The main welfare deficiencies associated with donkey work were found to include non-fitting harnesses that caused wounds and lesions. Unclean harnesses were causing skin health problem. Beating from owners or handlers was causing wounds to donkeys. There was neglect of preventive veterinary care and unavailability of acute veterinary care. Welfare issues in donkey housing were unsatisfactory in terms of unavailability of drinking water or sufficient shade. The donkeys were kept alone, which puts the donkeys under stress by being separated from the bonded donkey. During the work deployment, the most common welfare violations of the donkeys were due to the absence of water, insufficient feeding time, and violations of the physical limits of the donkeys, be it the length of the donkey's work day, the weight of the load, or the donkey's exposure to the harsh environment. Donkeys are undoubtedly the subject of cheap labour, and in the Mediterranean area their welfare is often affected, and the five animal freedoms are violated. Steps such as better mapping of the welfare of working donkeys would improve their condition and workload, education of owners and handlers, ensuring veterinary care and improving welfare laws and their implementation. Further studies focusing on the welfare of donkeys have been commissioned to investigate this issue in more depth, especially on working donkeys, about which there is often less information than on donkeys for milk and meat production, as these products are subject to human consumption.

Key words: donkey, welfare, health issues, Mediterranean countries, working equine

Contents

1. Introduction	1
2. Aims of the Thesis.....	2
3. Methodology	3
4. Literature Review	4
4.1. Determination of working donkey welfare.....	4
4.2. Health problems in working donkeys.....	5
4.2.1. Ocular problems.....	5
4.2.2. Hoofs and limbs problems	6
4.2.3. Wounds and lesion.....	8
4.2.4. Respiratory diseases.....	9
4.2.5. Hyperthermia	9
4.2.6. Colic.....	10
4.2.7. Gastrointestinal parasites	11
4.2.8. Hyperlipemia	12
4.2.9. Dental problems	13
4.2.10. Neurological problems of the donkeys	14
4.2.11. Dermatology issues.....	15
4.2.12. Conclusion - health	17
4.3. Welfare of working donkeys in Mediterranean countries	17
4.3.1. Jordan.....	17
4.3.2. Egypt.....	19
4.3.3. Morocco	21
4.3.4. Spain	22
4.3.5. Turkey.....	24
4.3.6. Albania.....	24
4.3.7. Croatia.....	26
4.3.8. France	26
4.3.9. Montenegro.....	27
4.3.10. Greece	28
4.3.11. Libya	29

4.3.12.	Algeria	29
4.3.13.	Tunisia	30
4.3.14.	Israel	31
4.3.15.	Palestine	32
4.3.16.	Lebanon	33
4.3.17.	Italy	33
4.3.18.	Malta	34
4.3.19.	Cyprus	34
4.3.20.	Slovenia	35
4.3.21.	Bosnia and Herzegovina	35
4.3.22.	Syria.....	35
5.	Discussion	37
6.	Conclusions	42
8.	References.....	43

List of tables

Tab. 1. The most common health problems caused by improper handling. (Source: Haddy et al. 2020).

List of figures

Fig. 1. Example of a second-degree club foot on a 16-year-old donkey caused by overloading (Mostafa et al. 2018).

Fig. 2. Example of padding that prevents the worsening of the wound. (Source: Sells et al. 2010).

Fig. 3. Example of colic treatment by nasogastric intubation (Ajabe et al. 2020).

Fig. 4. Types of dental problems for working donkeys in Egypt (Serag et al. 2020).

Fig. 5. Types of the padding used in tail area and scar made by unsuitable padding. Padding from synthetic fabric (a) cotton webbing (b) partially padded rope (c) serious case of tail-base lesions (d) (Source: Burn et al. 2008).

Fig. 6. Photos showing working donkey in a full harness (a), wounds caused after using breeching (b), neck collar (c) and saddle (d) (Farhat et al. 2020).

Fig. 7. The most common wound is caused by beating (a) and limb wounds due to improper treatment (Source: Farhat et al. 2020).

Fig. 8. Berdaa used in Northern High Atlas and lowlands of Morocco (Source: Seels et al. 2010).

Fig. 9. Working donkeys in Digor, Kars, Turkey (Source: Yilmaz & Ertugrul 2011).

Fig. 10. Use of working donkeys in Albania (Source: Papa & Kume 2012).

Fig. 11. Working donkeys on small scale farm in France (Source: Rousseaux, unknown).

Fig. 12. The use of donkeys in tourism in Fira, Greece (Source: Thiemann & Foxcroft 2016).

Fig. 13. Example of the condition of a working donkey in Israel (anonymous 2022).

Fig. 14. Example of a working donkey in Palestine (source: The Donkeys Sanctuary 2021).

Fig. 15. Example of Lebanese donkey used for a transport (Source: Discover Lebanon).

Fig. 16. Example of a workload for a donkey in Cyprus. (Source: The Donkey Sanctuary Cyprus, unknown).

Fig. 17. A picture of the effective reduction of the angle, to make more efficient use of the donkeys used in draught (Source: Sims & Inns 2002).

List of the abbreviations used in the thesis

FAO - Food and Agriculture Organisation of the United Nations

AWIN - The European Animal Welfare Indicators

1. Introduction

The roles of donkeys in the Mediterranean area differ depending on the country or region where donkeys are kept. Donkeys (*Equus asinus*) in Africa are considered to be the cheapest form of agricultural power, except for manpower (Fernando & Starkey 2004). African donkeys are also working as the carriers of loads, tourism (Burn et al. 2008) and transport (Abdel-Hady et al. 2017), in contrary to Europe where donkeys are mostly used for tourism, recreation, and milk production. The number of donkeys in Europe has decreased by 50 % during the last 20 years (Camillo et al. 2018). Donkey labour plays a crucial role for many households, but their welfare is often overlooked (Ali et al. 2016). The welfare of donkeys is violated on a physical and psychological level. Donkeys are often faced with inadequate housing conditions, overwork, or lack of access to veterinary care (Adam et al. 2022). Although donkeys' physical needs are met in some parts of Mediterranean, they may face psychological problems due to being kept in inappropriate social conditions (Papa & Kume 2012).

2. Aims of the Thesis

The aim of the bachelor thesis was to review the literature dedicated to the welfare of working donkeys in the Mediterranean area. Based on the results the main areas where the working donkey welfare is compromised will be identified and the reasons discussed.

3. Methodology

This thesis is a review based on the scientific literature. The data sources include articles from Google Scholar, Google books, FAOSTAT, ResearchGate, Science Direct, annual documents recording the status of donkeys in individual countries or relevant annual reports of NGOs operating in specific countries. The thesis does not use self-collected data. The keywords used in the literature research include: donkeys, welfare of working donkeys, health issues of donkeys, working equine, welfare assessment, animal work. The bachelor thesis was written in accordance with the Methodological Manual for Writing a Bachelor Thesis Literature Review Type of the Thesis of Faculty of Tropical AgriSciences, Czech university of life sciences Prague.

4. Literature Review

4.1. Determination of working donkey welfare

Welfare can be measured by four welfare principles such as good feeding, housing, health and appropriate behaviour (AWIN 2015). The welfare of working donkeys depends on the country in which they are kept and the work they do. Working donkeys face problems with housing conditions, such as lack of shade, shelter, and clean water (Haddy et al. 2020), and the cleanliness of bedding is often inadequate (Cuomo 2021). Working donkeys are often exposed to pain at work, which, in some cases, results in permanent consequences in the form of wounds (Farhat et al. 2020).

Several different approaches were used in the studies. The collection of data on the donkeys' welfare can be done by approaching the owner, who self-reports the living condition of their working donkeys (Farhat et al. 2020) or by NGOs or researchers who determine the living conditions of donkeys through observation (Arsenos et al. 2010). Questionnaires were used where the owner self-reported the animal's welfare and researchers assessed the condition of the animal independently (Haddy et al. 2020) or studies where the animals and their working environment were completely monitored by external researchers (Farhat et al. 2020). The fundamental measurement of donkey welfare is through the five freedoms approach (Passantino 2011). Welfare of donkeys is expressed by five freedoms: freedom from thirst, hunger and malnutrition, freedom from discomfort, freedom from pain, injury and illness, freedom to exhibit normal behaviour patterns, freedom from fear and anxiety (Passantino 2011).

The most detailed and up-to-date document based on the five freedoms, which is a step-by-step guide to assessing donkey welfare, was produced by EU experts in 2015 (AWIN 2015). The expert observer assesses using 22 welfare indicators ranging from physical condition assessment to health and behaviour to housing conditions. There is currently no comprehensive welfare document available focusing on the welfare of working donkeys. The AWIN document focuses mainly on the physical condition of the animals and their housing, but the behaviour of the donkeys is also considered (AWIN

2015). However, donkey welfare studies do not usually test all five freedoms but focus on selected aspects. The chapters below focus on each group of physical health problems found in working donkeys. This is followed by a mapping of donkey status in each Mediterranean country and their working status. Welfare studies of working donkeys in the area is analysed where it has been carried out.

4.2. Health problems in working donkeys

Working donkeys are often subjected to excessive amounts of work, unsuitable working conditions, inappropriate harnesses, handler behaviours that cause injury and, above all, long-term neglect and lack of veterinary care.

The following sub-chapters explain the prevalence of health problems, their association with working donkeys, possible case studies dealing with this issue and potential solutions in local conditions.

4.2.1. Ocular problems

Although ocular defects and diseases are common in donkeys there are only a few studies addressing this issue (Attaai et al. 2022). Horses and donkeys have different eye anatomy, as donkeys have a smaller eyeball relative to their body size (Mendoza et al. 2018; Laus et al. 2014). However, donkeys have similar diseases to horses, such as foreign particle damage to the eyes (Mendoza et al. 2018; Archer et al. 2021). Nails and glass have been found in 2 % of working donkeys eyeballs in the Amhara region of Northern Ethiopia (Getnet et al. 2014).

Eye problems have been proven in working donkeys. One example is a study completed in 2019 from Wolaita Sodo in Southern Ethiopia, focusing on donkeys pulling carts. Out of a total of 384 individuals, which were of both sexes and varying ages. Ocular discharge was found in 40.7 % of the sampled donkeys, mostly caused by using unsuitable harnesses and improper blinkers. This is 29.5 % higher than animals with a properly fitted harness. Another problem is that traumatic wounds occurred in 17.6 % of the donkeys and the inflammation found in 14.2 % of them was also influenced by improper blinders. Due to the fact that cart drivers are using whips, donkeys often suffer from entropion (60.3 %) and ectropion (7.2 %); entropion is a medical condition in which the lower eyelid

folds inwardly and ectropion is when the lower edge of the eyelid is exposed outwards (Fesseha et al. 2020).

4.2.2. Hoofs and limbs problems

If donkeys are kept in damp conditions, for example in an unsuitable stall with dirty bedding, it negatively affects the quality of their hooves (Cuomo 2021). The consequences of a damp environment can be observed mainly in the weakening of the hooves (Chateau et al. 2010). Although the horn of the donkey hoof has a higher moisture content than is found in horses (Thiemann & Rickards 2013), staying in moist bedding or on unsuitable pastures increases the risk of infection because donkey hooves tend to be softer and the gaps in the white line allow bacteria to enter the hoof (Cuomo 2021). The hoof horn's stiffness is also negatively affected with increasing environmental moisture (Collins et al. 1998)

A descriptive clinical report from (Reix et al. 2014) describes the status of lameness in Pakistan's working donkeys. Each of the draught working donkeys observed showed signs of lameness, and of these, 89% showed signs of lameness in each limb. Lameness can not only indicate poor hoof condition, but in working donkeys, there is often a general neglect of hoof care and flexural deformation. Flexural deformation occurs in 1.09% working donkeys in Luxor, Egypt (Abdel-Hady et al. 2017) and it is described as deviation of the limb in a sagittal plane, which is negatively affected by overloading the donkey when pulling a cart (Buil 2014). The results were demonstrated by radiographic images (Abdel-Hady et al. 2017).

Another health problem is laminitis, a painful health condition which leads to the damage of the soft tissues located in internal part of the hoof and contains many nerve endings. This soft tissue also attaches the donkey's pedal bone to the hoof wall (Eades et al. 2015). It occurs frequently in donkeys, but is difficult to diagnose early, as donkeys show signs of pain later than horses due to their stoic nature (Mendoza et al. 2018). The aforementioned neglect of hoof hygiene and a damp environment also leads to pedal abscesses (Mendoza et al. 2018). Laminitis is often associated with obesity, hyperinsulinemia, and an inappropriate diet (Menziés-Gow 2018) and can often be caused by stress (Morrison 2019). Working donkeys are often exposed to thermal stress, work stress, and general overuse (Ayo et al. 2013). A study conducted in Egypt involving 1,140

donkeys working donkeys used for carrying and shifting in brick kilns showed that 48.3% were exposed to heat stress and 32.91% showed signs of overworking (Ali et al. 2015).

Club foot deformation occurs when the deep digital flexor tendon is shorter than the bones and the hoof can become pulled very upright (see Fig. 1), and it causes the hoof to elongate the heel (Mostafa et al. 2018). It appears in working donkeys that are overworked or overloaded, with pain and stress considered to be the main predisposing causes. This limb flaw can be classified into three degrees (O'Grady & Dryden 2012). Twenty-two working male donkeys were examined in Egypt between 2017 and 2018, during their work in brick kilns. The donkeys were working on hard concrete surfaces and the study showed that 29 hind hooves and three front hooves showed signs of club foot deformities (Mostafa et al. 2018).



Fig. 1. Example of a second-degree club foot on a 16-year-old donkey caused by overloading (Mostafa et al. 2018).

One condition that occurs most commonly in old animals or young donkeys whose joints have not developed sufficiently is called distal interphalangeal joint contracture, or ballerina syndrome (Thiemann & Rickards 2013). Ballerina syndrome is described as a donkey standing on the tip of its hoof because it cannot distribute its weight over the entire hoof (Thiemann & Rickards 2013). This condition is dealt with by selecting an appropriate forging intervention, and a change in diet, but if these steps are not sufficient, a surgery is performed. (Walmsley 1995).

It is also frequent in working donkeys for the dorsal wall of the hoof to become parallel to the surface of the ground, and in serious cases it can be caused by overwork, simultaneous pain in the distal limbs or poor nutrition. Of the donkeys who were working

in transport and used in carts located in Egypt, 68 working donkeys were examined and diagnosed for this condition using X-rays. (Abdel-Hady et al. 2017).

4.2.3. Wounds and lesion

Unlike non-working donkeys, working donkeys often show signs of wounds and traumatic skin lesions that are most often accompanied by parasitic or bacterial skin/coat infections (Mendoza et al. 2018).

A study conducted in the Northern High Atlas of Morocco by (Sells et al. 2010) shows, for example, that donkeys are more prone to developing wounds than mules. Out of 147 studied donkeys and mules, wounds were observed in 67 % of donkeys and 35 % of mules, both of which were investigated while working as packing animals in the wood trade and were handled by the same group of handlers. The most common wounds were found on the withers occurred in 40 % (Sells et al. 2010). The authors (Henneke et al. 1983) show an association between the incidence of wounds and body condition of donkeys, with lower conditions resulting in more wounds due to fat and muscle loss. Continuing then (Pritchard et al. 2005) also confirms that donkeys tend to be skinnier compared to other equids kept in the same environment. Unclean harnesses with sand particles were also a common reason for a high prevalence of wounds (Sells et al. 2010).

Prevention of wounds includes using a clean harness without sand, padding the affected spots (see Fig.2) and disinfecting already existing wounds. In the case of deeper wounds, surgical intervention such as stitching may be required (Sells et al. 2010).



Fig. 2. Example of padding that prevents the worsening of the wound. (Source: Sells et.al 2010).

4.2.4. Respiratory diseases

Horses and donkeys usually suffer from the same respiratory diseases, but donkeys are generally more resistant to parasitic diseases affecting respiratory system such as lungworm parasite (Thiemann 2012). Of the surveyed donkeys from an agricultural work background, 35.3% were positive for the presence of lungworm in Jimma Town, South West Ethiopia (Feye & Bekele 2016).

Equine influenza, also known as Equine Flu, is a contagious viral disease that usually is seen within 5 days of infection, endemic outbreaks of equine influenza are common in most European, Asian, and American countries (Cullinane & Newton 2013). Transmission of equine influenzas is between individuals by fomites (Jurado-Tarifa et al. 2018). Vaccination is a preventive measure against Equine Influenza (Elton & Bryant 2011). Influenza vaccination is suggested for donkeys (GTGAWP 2019). The most common symptoms of equine influenza in donkeys are a harsh, dry cough and nasal discharge, which may be watery and transparent or even thick and yellow green, but it is rarely lethal (Landolt 2014). Inter-species transmission between donkeys and other animals is a risk in countries where working animals are kept close to poultry, which happened in Egypt in 2010 (Abdel-Moneim et al. 2010).

4.2.5. Hyperthermia

Hyperthermia, also commonly called overheating, can occur for several reasons, increasing humidity and temperature play significant roles, as these factors negatively affect the thermoregulation of the donkeys (Zakari & Ayo 2021). Using animals which are not adapted to high temperatures, overloading the donkeys, and using donkeys which are already sick increases the risk of hyperthermia (Archer et al. 2021). Owners are advised to give attention to more sensitive animals such as lactating or pregnant females, young or elderly or sick animals. The consequences of exposing animals to hot temperatures are heat stroke, dehydration, and heat stress (Zakari & Ayo 2021).

As an example, out of seventy working donkeys performing various tasks in Pakistan, 38 were found positive for heat stress (Pritchard et al. 2006).

4.2.6. Colic

Colic is abdominal pain which occurs in donkeys, as in horses, but is less easily recognized in, due to their stoic behaviour (Thiemann & Sullivan 2019). The main signs of colic in donkeys include loss of appetite, sham eating or anorexia, or less general excretion of urine and feces (Archer et al. 2021). Colic is often associated with hyperlipemia in donkeys (Burden et al. 2011). Hyperlipemia is described as an occurrence of excessive fat in the blood and donkeys with this condition commonly show signs of depression or anorexia (Mendoza et al. 2018).

In Ethiopia between years 2003-2005 studies showed that 27 % of examined donkeys had colic (Bojia et al. 2007).

Donkey breeders can reduce the risk of colic by keeping the composition and ratio of donkey feed under control as much as possible, avoiding the sudden eating of fresh grass by donkeys and avoiding mouldy feed (Proudman 1992). When using supplementary feed, the animals should be fed in small doses and more frequently, and with following the procedures specified by the feed manufacturer. Any changes made to the feed ration should ideally be made within a month to allow the individual or herd time to adjust (Edwards 1999).

Owners may observe signs of acute colic in donkeys. Examples include the donkey kicking itself in the abdomen, lying down and rolling over, and specific behaviours where the individual repeatedly observes its flank (Thiemann et al. 2017). The reasons for this are lack of water, poor dental health, or high incidence of endoparasites in donkeys, and these conditions are mainly found in developing countries (Edwards 1999). The 85% of working equids in the world live in developing countries (Burn et al. 2010).

There are several types of colic that should be treated by a veterinarian. The vet will usually use analgesic or insert a nasogastric tube (see Fig. 3) (Proudman 1992). Using nasogastric intubation, a fluid can be applied that is a mixture of sodium bicarbonate, magnesium sulfate, electrolytes, and soap water (Ajabe et al. 2020). Due to lack of finances 83% owners of working equids in Morocco would not be able to afford veterinary care (Kalamanova et al. 2015).



Fig. 3. Example of colic treatment by nasogastric intubation (Ajabe et al. 2020).

Gastric ulcers associated with colic are caused by acidic fluid, originating from the lower part of the stomach moving to the upper part of the stomach, and it appears as a loss of appetite and causes pain to the donkey. Gastric ulcers in donkeys are mainly associated with exposing donkeys to stressful situations such as transport or isolation from paddock-mates and is especially common in working donkeys (Mendoza et al. 2018). Research conducted between 2014 and 2016 in Italy, on a total of 39 donkeys, showed that gastric lesions occur in 51.3% of examined donkeys in Italy, on a total of 39 donkeys. Their exact workload is unknown (Sgorbini et al. 2018).

4.2.7. Gastrointestinal parasites

Working donkeys are exposed to gastrointestinal parasites, which contribute to their morbidity and mortality and negatively affect their productivity (Fesseha et al. 2022). The prevalence of gastrointestinal parasites is higher in countries where owners have limited financial resources to care for their donkeys and there is a poorer standard of hygiene (Mathewos et al. 2021).

According to (Uslu & Guçlu 2007), *Strongylidae sp.* was found most frequently in all of the sampled working donkeys which were working to transport people and carts in the hillside villages. The research was carried out on a total of 111 horses and 81 donkeys. A high prevalence of *Strongyloides westeri* was found in 12.3 % of examined

donkeys, and 22.2 % had *Eimeria sp.* parasites in their faeces. The data are from the Konya region of Turkey for the period 2003-2005 (Uslu & Guçlu 2007).

As a comparison, a study of 395 working donkeys from Ethiopia found *Strongyle spp.* with prevalence 100 %, followed by *Strongyloides spp.* with a prevalence of 47.8 % and *Parascaris equorum* was found in 23.8 % (Fesseha et al. 2022). The donkeys studied were of different ages and sexes and worked both in the field and in transportation (Fesseha et al. 2022).

4.2.8. Hyperlipemia

Hyperlipemia, is described as excessive fat in the blood and donkeys with this condition commonly show signs of depression or anorexia (Mendoza et al. 2018). It is a life-threatening condition caused by a sudden and rapid reduction in feed intake. Is also caused by inappropriate dietary management such as the failure to provide an adequate diet to cover the energy expenditure of a working donkey (Mendoza et al. 2019). The cause of this disease is primarily starvation or negative energy balance and the total free fatty acid in the bloodstream increases (Watson et al. 1992). Hyperlipemia, is a common disorder and mortality can reach up to 60-80% (Archer et al. 2021). It is proven that stress and starvation lead to hyperlipemia (Perez-Ecija et al. 2021). It often appears as a secondary to another disease, such as colic or liver disease (Burden et al. 2011). As the hyperlipemia progresses, fat infiltrates the organs and triglyceride concentrations rise (Reid & Cowan 1995).

As the disease worsens, more symptoms appear but the level of curability decreases. It is recommended that owners observe minor changes in the behaviour of the donkey, such as unnatural smells, decreased appetite or changes in the faeces, such as the amount or presence of mucus (Reid & Cowan 1995).

Treatment is similar to that in horses, consisting of correcting the energy balance, reducing stress factors and stopping fat mobilization (Tarrant et al. 1998). In conclusion, the disease is curable but if the disease is not treated, the donkey will die of liver failure (Svendsen 2008). As a result of intensive treatment, the mortality rate can decrease to 0-33 % (Waite & Cebra 2009). Intensive treatment includes intravenous nutrition with 50 % glucose and 15 % amino acids (Durham 2006).

4.2.9. Dental problems

Dental problems are as common in donkeys as in horses, but take longer for breeders to recognize them, due to donkeys' stoic behaviour (du Toit & Dixon 2012).

Approximately 90% of old donkeys suffer from dental problems such as diastemata, which can be described as a gap between the teeth, which leads to necrosis and receding gums, (du Toit et al. 2008) also called cheek teeth (du Toit et al. 2009).

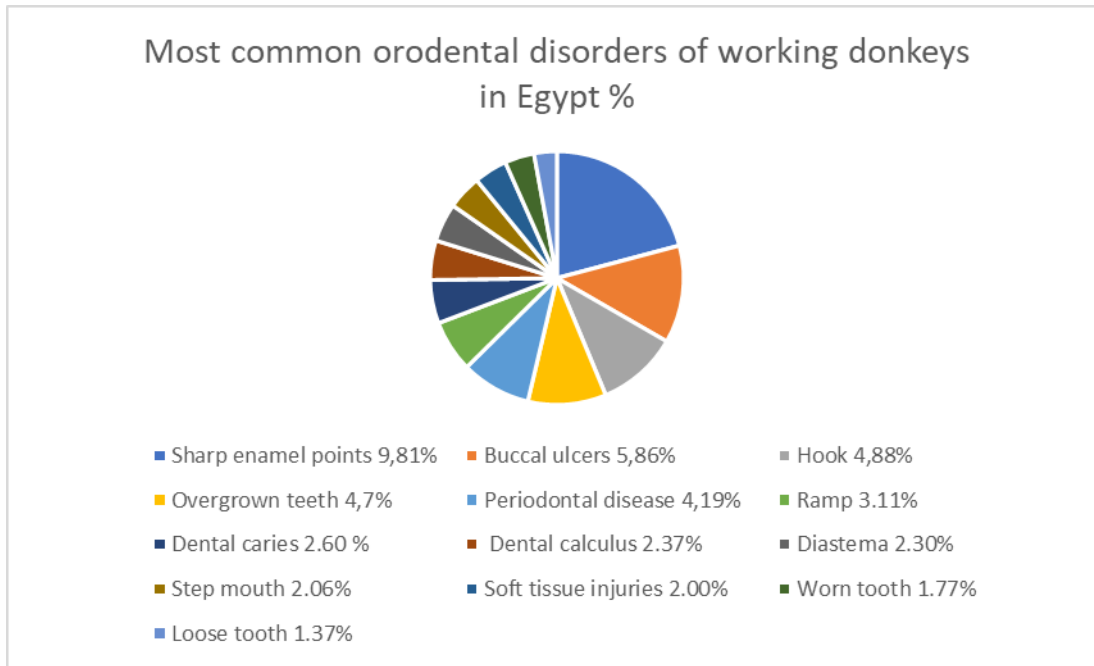
In Mexico 203 working donkeys from 10 different villages mostly used for a transport of materials or water were examined. The results showed that 62% of the donkeys had dental problems of which 98% had sharp enamel points, 16% had worn teeth and further overgrown teeth, and 18%, diastemata in 3.9% and fractured teeth 2% (du Toit et al. 2008). Donkeys did not receive any dental veterinary care in the past, but 18% of the working donkeys examined had to be provided with urgent veterinary care to stop their distress (du Toit et al. 2008).

Overall if donkeys are suffering with dental problems, it is often reflected by weight loss, hyperlipemia and oral pain (du Toit et al. 2008; du Toit & Dixon 2012). Another common health problem is a wave mouth, or vertical asymmetry of the molars (Gunter & Borgdorff 2017).

Unlike mules, donkeys have more problems with sialoliths. As (Young 2021) described, sialoliths are a salivary stone, which are made of a calcium. They are located in cheeks and can cause infection and make it more difficult for donkeys to ingest food. The best prevention is regular dental care.

Over a period of 4 years, research was carried out on the dental problems of working donkeys in six different regions in Egypt. A total of 3,791 working donkeys were studied, of which half were males. Examined working donkeys were from a rural village where temperature during summer is above 40 °C. Donkeys were used in different work as carriers or used for dragging. Overall, 25% of the donkeys had orthodontal disease (see Fig. 4). In addition, oral injuries are also caused by the improper use of unsuitable bridles with the snaffle bit for controlling powerful donkeys. Working male donkeys showed poorer dental condition because their workload was more intense, and they had shorter time for feeding compared to mares that are used less intensively for breeding (Serag et al. 2020).

Fig. 4. Types of dental problems for working donkeys in Egypt (Serag et al. 2020).



4.2.10. Neurological problems of the donkeys

Venezuelan equine encephalitis is a viral disease with a high mortality rate (Taylor & Paessler 2013). Determining Venezuelan equine encephalitis can be complicated, but usually the symptoms are sudden high fever, depression, and lack of appetite (Gilyard 1945). Compared to horses, donkeys and mules have milder symptoms but can still transmit the disease to human beings or horses (Mackenzie et al. 1976). Diseases such as Eastern equine encephalitis and Western equine encephalitis, are transmitted by mosquitoes (Gonzalez-Salazar et al. 2003).

Rabies is frequently found in donkeys living in Asian and African countries (Gautret et al. 2015). Donkeys and horses show similar symptoms when infected with rabies, generally showing signs of aggression, an increased need to gnaw on objects, paralysis, and salivation (Barnard 1979). When donkeys show signs of rabies infection, they die within a few days. Data were collected in 14 counties from the State of São Paulo (Carrieri et al. 2006). A rabies-infected animal most often bites a donkey on the muzzle or limbs and thus the rabies is transmitted (Quiambao et al. 2009). A study examining working donkeys in Ethiopia ranked rabies as one of the five most influential diseases

affecting working donkeys (Stringer et al. 2017). There is currently a vaccine to protect equids against rabies (Green et al. 1993), but if an unvaccinated animal becomes infected, it is necessary to separate the individual from the herd and ensure euthanasia for the infected animal.

Neosporosis is a neurological disease that is caused by parasites (Javanmardi et al. 2020). The protozoan disorder neosporosis is provoked by the cyst-forming coccidian (Pitel et al. 2003). It is caused by *Neospora*. *Neospora caninum* or *Neospora hughesi* have negative effects on the pregnancy of jennies and may lead to the abortion of the foal (Leszkowicz Mazuz et al. 2020). A study conducted in the territory of Israel and Palestine focused on donkeys exposed to *Neospora spp.* Of the 98 tested donkeys, 49 of them were working in the territory of Palestine and 49 were in a shelter in Israel. The donkeys studied had a median age of 7 years and 61 % were males. The donkeys placed in the shelter were not actively working but were taken from neglected conditions. The seroprevalence of *Neospora spp.* was shown in 70% of all examined donkeys. Living conditions and exact work use of working donkeys in Palestine was not stated, but the authors state that the animals were mainly used for draft or riding (Tirosh-Levy et al. 2020). The survey of *Neospora spp.* in southern Italy included 238 donkeys, 207 of which were females. Antibodies to *Neospora spp.* were detected in 11.8 % of the donkeys examined. The donkeys examined ranged in age from 1 to 24 years and the prevalence of antibodies to *Neospora spp.* was more frequent in younger animals and decreased with age. Five breeds and their crosses were included, with 36 % of Sicilian-Grey donkeys being the most positive. Living conditions were not precisely described but in donkeys living on large farms, farms with more than 10 donkeys had a prevalence of 82 %. For donkeys living with horses, the prevalence was 100 %. Treatment steps were not recorded, and all authors agree on the potential negative effect of concrete on large farms (Machačová et al. 2013).

4.2.11. Dermatology issues

The most common skin diseases are sarcoids, aggressive tumours affecting the skin (White 2013). There is not just one cause of sarcoids, but research most often indicates that the disease is caused by the presence of bovine papilloma virus type 1 and type 2 (Goldschmidt & Hendrick 2002). Unlike most diseases where the prevalence does not depend on sex, males have a higher incidence of sarcoids, which are among the most

common types of skin tumours in donkeys. Previous wounds or injuries increase the risk of sarcoids (Reid et al. 1994). The presence of wounds has a significant connection with developing sarcoids due to the fact that wounds attract flies which increase the risk of sarcoids (Humphreys et al. 2004). At the moment there is not a completely effective treatment for sarcoids (Marti et al. 1993) but applying petroleum jelly to the wounds prevents flies from coming into contact with the wound (Humphreys et al. 2004).

A total of 394 donkeys in Ethiopia were tested, of which the majority (366) were working donkeys. In working donkeys, sarcoids were present in 9.1 % of working males and 6.8 % of working females. In comparison, in non-working donkeys, the disease occurred in 3.5 % of the donkeys studied (Gebre et al. 2018). A study of 156 donkeys in Europe at 4 different locations identified sarcoid and superficial pyoderma as the most common occurrence at 25 % and 16 % had a problem with dermatophytosis. The study included animals currently housed in veterinary schools but of unknown origin. (White et al. 2019).

Dermatophytosis is a fungal infection also known as ringworm and its occurrence is mostly associated with *Microsporum* and *Trichophyton* species (Knottenbelt 2019). The disease is characterized by scaling or alopecia (Abdalla et al. 2005). For donkeys in good health, dermatophytosis resolves on its own, but in those with poorer immunity or undernourishment, it takes longer. Since vaccination is not currently available for treatment, antifungal washes are used (Knottenbelt 2019). Equipment sharing, which is the use of multiple working donkeys, helps to spread dermatophytosis (White 2005). A study conducted in the Cairo area of Egypt examined 187 working donkeys in various unspecified work activities (the study reported that in this region donkeys are most used to transport goods or people), 18.7 % were diagnosed with skin diseases and four had dermatophytosis (Peano et al. 2022).

Parasitic skin diseases are common in working donkeys. In donkeys, the presence of ectoparasites can be indicated by symptoms such as itchiness and dermatitis (Knottenbelt 2019). The study investigated the prevalence of parasitic diseases in 120 working donkeys in Egypt. The donkeys were from Assiut, Giza, Fayoum, Monufia, Beni Suef regions and 75% were males. The living conditions of the donkeys were not described, since the collection of samples took place outside the residence or workplace of the donkeys. However, it is known that their work was field work, and the feeding was

marked as inappropriate because they receive a small amount of green fodder. None of the 120 donkeys studied ever got antiparasitic treatment. A total of five different external parasites were found in donkeys. *Boophilus spp* was present in 10 % of the donkeys examined, *Hippobosca equina* was found in 12.5 % of the working donkeys and *Haematopinus asini* remains prevalent at 7.5%. *Ctenocephalides felis* was found at 58.3 % and *Psoroptes equi* at 8.3 %. (Attia et al. 2018). Working donkeys in the studied regions had a poor welfare level due to neglected care and were also exposed to higher levels of infectious vectors in contrast to animals living in other regions such as Germany (Attia et al. 2018). However, major deficiencies in antiparasitic treatment were found in Italy, where prevalence was 94 %. (Attia et al. 2018).

4.2.12. Conclusion – health

The welfare of donkeys is affected by a number of factors, especially poor care, insufficient veterinary care, and inadequate housing conditions. The stress that donkeys are often exposed to increases the prevalence of health problems. These problems are worsened by inappropriate feeding patterns and lack of veterinary care. The situation is further made worse by poor treatment of donkeys by handlers, as well as dusty environments and lack of access to water and shade during the work period. The health issues of working donkeys are a complex problem requiring a solution. Addressing those issues is essential to ensure the health and well-being of these often-neglected animals, from improved housing structures to gentler handling practices, from better nutritional protocols to regular veterinary care.

4.3. The welfare of working donkeys in Mediterranean countries

4.3.1. Jordan

The latest data shows that the population of donkeys in Jordan in 2018 was 2,700 (Camillo et al. 2018) with an unspecified number of working donkeys. An analysis was conducted of 87 working donkeys used as carriers for tourists at Petra, the World Heritage Site, (Burn et al. 2008) was conducted on 86 individuals working as carriers for tourists. To climb 900 steps, hikers use donkeys (Burn et al. 2008).

The study demonstrates the occurrence of lesions in 79 % of working animals, an increase of 14 % compared to 2002 values. Lesions on the tail, especially around the base continued to occur in the same time frame with a frequency of 14 % (Burn et al. 2008). Tail-base lesions were found in 63 donkeys out of 86 examined (Burn et al. 2008), compared to values with working donkeys from the same developed region, which is 1.6 % (Pritchard et al. 2005). The authors (Burn et al. 2008) give several reasons for the increased incidence of lesions in the tail area, the first being inappropriate material used. In this case, poor quality, synthetic or cotton straps and ropes which are too thin (see Fig. 5). These ropes are used as part of the harness to stabilise the donkey's saddle. Compared to other countries, in the area of Petra, the handlers are not donkey owners, and they handle donkeys with less care due to several factors such as education, low salary, and the low age of the handler (Starkey 1997; Pearson et al. 1999). The depth of the lesions was beyond the subcutaneous layer (Burn et al. 2008), below which the muscle itself is located. Such deep lesions were found in 33% of donkeys with lesions (Burn et al. 2008). The incidence of lesions increased with more padding and tightness of the straps (Burn et al. 2008).



Fig. 5. Types of the padding used in tail area and scar made by unsuitable padding. Padding from synthetic fabric (a) cotton webbing (b) partially padded rope (c) serious case of tail-base lesions (d) (Source: Burn et al. 2008).

Authors such as (Dibbitts 1997; Pearson et al. 1999; Burn et al. 2008) agree that changing from thin unsuitable ropes to thicker cotton webbing is recommended to alleviate welfare problems. They also found that synthetic material used for padding is more suitable than cotton or wool (Burn et al. 2008).

4.3.2. Egypt

Egypt's donkey population accounts for 3.7 % of the world's donkey's population (Ali et al. 2015). The current number of donkeys living on the territory of Egypt is reported (FAO 2019) as five million, and of which, three million are working donkeys (FAO 2019). Several studies have been carried out to assess the welfare of donkeys working in Egypt. Donkeys are used for porter work, more specifically carrying bricks transporting, or pulling (Starkey 2000). The authors agreed, that working donkeys in Egypt have inadequate veterinary care and their nutritional needs are not met, so it affects their lifespan (Al-Salihi & Farhat 2014; Farhat et al. 2020).

The study of Farhat et al. (2020) evaluated the welfare of working donkeys in Egypt. In the El-Saf area, a sample of twenty brick kilns out of one thousand were selected and 179 male donkeys were examined (Farhat et al. 2020). At least one type of wound was found in 80% of the working donkeys studied (Farhat et al. 2020). During the four months of the research (Farhat et al. 2020), the most common health problems of male donkeys were determined to include, in order of frequency: wounds caused by beating (49 %), the second most common were illfitting or insufficient harnesses, more specifically: breeching (10 %), saddle (43 %), neck collar (40 %), shaft of the cart (12 %). Working near the kiln negatively affected the health of 54.70 % of donkeys, as they are exposed to higher temperatures. Donkeys pull overloaded carts and underpaid children handle animals, which resulted in the poor treatment of donkeys; beating wounds were identified as the most serious and were found in 49 % of working donkeys (Farhat et al. 2020). The load of bricks pulled by donkeys weighed at least six to 12 times more than a working donkey (Ali et al. 2015; Farhat et al. 2020) Adult working donkeys have a weight range of 74 to 252 kg (Pearson & Ouassat 1996). When examining the physical condition of the male donkeys, immediately after the work was done, the donkeys underwent observation to assess their psychological state, such as the level of alertness, depression, and apathy. Furthermore, behaviour towards the observer was observed and

chin contact was tested. From the results it is known that 89 % of the donkeys showed signs of depression or apathy, 68 % of the donkeys showed signs of aggression, escape or were avoidant and 64 % of them did not accept chin contact (Farhat et al. 2020). Donkey shelters were evaluated by assessing the quality of the water and, in 65% of cases, the donkeys did not have access to good quality water, defined in this case as non-salty and clear (Farhat et al. 2020). Another negative factor affecting welfare was the lack of ventilation and, in 85 % of cases, the poor condition of the stables, such as large amounts of faeces and mud (Farhat et al. 2020). On average, the donkeys walked 54.7 kilometres during one working day, which lasted six hours and thirteen minutes (Farhat et al. 2020). More detailed information on harness materials from the El-Saf area is not available (Farhat et al. 2020), but the results suggest an increased abrasiveness of the harness and a negative impact on the skin of the donkeys if the harness is sandy or dirty (see Fig. 6). This causes more pain to the animals and their unwillingness to work and results in increased beatings by child workers (see Fig. 7).

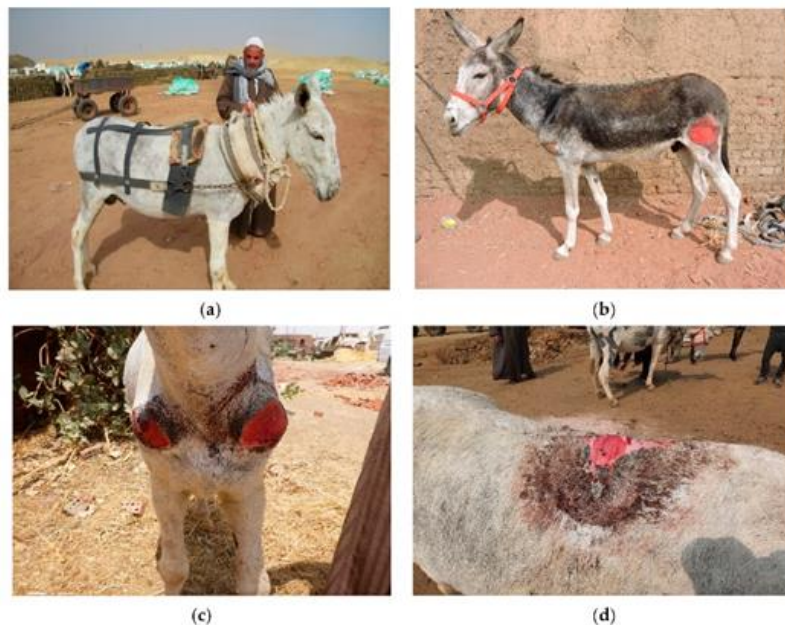


Fig. 6. Photos showing working donkey in a full harness (a), wounds caused after using breeching (b), neck collar (c) and saddle (d) (Farhat et al. 2020).



Fig. 7. The most common wound is caused by beating (a) and limb wounds due to improper treatment (Source: Farhat et al. 2020).

4.3.3. Morocco

The mapped donkey population in Morocco is 880 000 donkeys with a decreasing trend. Donkeys are used for transport in rural regions of Morocco, but in wealthier communities working donkeys are slowly being replaced by motorized vehicles (Starkey 2000). Working donkeys in Morocco rarely have access to shelter or paddocks. For these purposes, the use of hobbles on donkeys has been observed, which is described as most often a rope binding that restricts the movement of the donkey (Azelhak et al. 2023).

Research, focused on welfare issues of working donkeys in Morocco was carried out between December 2007 and February 2008 in Midelt (Northern High Atlas region of Morocco) more specifically in the wood trade (Seels et al. 2010). The population of working male donkeys in the wood trade was compared with working male donkeys in two other regions, the first also in Midelt and the second from the Khemmiset region, but both working in non-wood trade (Seels et al. 2010). The research included both mules and donkeys, with donkeys having a higher tendency to form wounds, which were present in 67 % of donkeys (Seels et al. 2010).

Donkey owners used berdaa, saddle-pack made by local manufacturers with wares that keep the berdaa in place during activities, they are made from wool and should be heavily padded (see Fig.8) (Seels et al. 2010). It is uncommon that the straps of the berdaa are padded, in most of the cases, rope is used that is made from local non-synthetic materials (Seels et al. 2010). The absence of a supporting girth and a satisfactory breast plate are considered as shortcomings of the berdaa (Seels et al. 2010). The dirtiness of the

berdaa increases the occurrence of wounds in working donkeys, as the sand accumulates on unclean parts of berdaa and increases abrasion (Seels et al. 2010). Owners were also asked whether they repaired the berdaa themselves or used street market repairs, but this difference did not have a significant impact on the condition of the wounds in the donkeys. The presence of sand increased the abrasiveness of donkey harness during work. (Burn et al. 2008; Seels et al. 2010).



Fig. 8. Berdaa used in Northern High Atlas and lowlands of Morocco (Source: Seels et al. 2010).

4.3.4. Spain

Spain has an active population of 140,000 donkeys, with Zamorano-Leonés, Catalana, Andaluza, Balear, Asno de las Encartaciones among the most common breeds (Camillo et al. 2018).

In Spain's Zamora Province, they studied a total of 57 donkeys used in agroforestry, sowing, harvesting, and ploughing land (Haddy et al. 2020).

Donkeys (81 %) worked under three hours a day. Stalls of working donkeys whose main purpose was to provide shade were rated as inadequate in 44% of cases. Natural shade was rated as a well-rated alternative and occurred in 13% (Haddy et al. 2020). Working conditions were evaluated from several factors such as the presence of water, bedding material, and grazing availability. Bedding was dirty in 58% of the cases and in 23% of the cases it was unsatisfactory. In the rest of the cases, no bedding was found at all. Owners reported that donkeys in their ownership can graze all day long, a statement

that was true for 80% of the donkeys surveyed. The limited water source had 75% of the working donkeys (Haddy et al. 2020).

Exactly 57 donkeys were examined: 52 females, one stallion, and three geldings. The age of the animals ranged from three years or more, but the average was 11 years. The condition of the donkeys was ranked and 8.3 % of the donkeys were considered lean, 28.3 % were ideal, 35 % were fat and the rest 28.3 % were obese (Haddy et al. 2020).

The behaviour of the donkeys was assessed by two different assessments. In the first, 88% of the donkeys were alert and the remaining 12% were relaxed. Out of 57, 53.3% were rated as friendly, 30% were not moving at all, 13.3% reacted to contact by moving their head away, 1.7% were aggressive and 1.7% moved their whole body during the process (Haddy et al. 2020). Signs of improper practices in 60% of the working donkeys were found, 51,8 % of donkeys had scars and 80 % had skin system alterations (Tab. 1). Of the 57 examined, 6.6 % showed the use of serrations, or metal pieces used in the noseband or chin strap (Haddy et al. 2020).

Donkeys can show feelings by the position of their tail. The tail can be relaxed, lifted out, tucked and swishing. Tail swishing is associated with the presence of insects, tucked is associated with discomfort (Regan et al. 2014).

Tab. 1. The most common health problems caused by improper handling. (Source: Haddy et al. 2020).

Signs of harmful practices	Prevalence in %
skin system alterations	80%
limb tethering or hobbling	55%
had scars	51.8%
open wounds	33.5%
alopecia	31.7%
signs of the use of serreta	6.6%
swellings	5%

4.3.5. Turkey

The recorded number of donkeys in Turkey is 300,000, with a decreasing trend (Yilmaz & Wilson 2012). According to (Ekiz et al. 2004) donkeys are mainly used for draught at 60 %, recreation 25 % and 5 % are used for culture purpose. The background of donkeys reared in Turkey is described by (Yilmaz & Ertugrul 2011) as being smaller farms with limited financial resources and limited feed supplies. Consequently, donkeys fill up on available green food. Working donkeys in the rural part of Turkey perform activities as package carriers, water barrel carriers (see Fig. 9) or are used to transport various loads such as firewood, and livestock feed (Jones 2007; Yilmaz & Ertugrul 2011). At the moment there is no study on the welfare of working donkeys in Turkey, but the following is known, donkey foals are underfed which results in them reaching a smaller size at maturity compared to other countries (Barzev 2004), Additionally, the general condition of adult working donkeys is also unsatisfactory (Yilmaz & Ertugrul 2011)



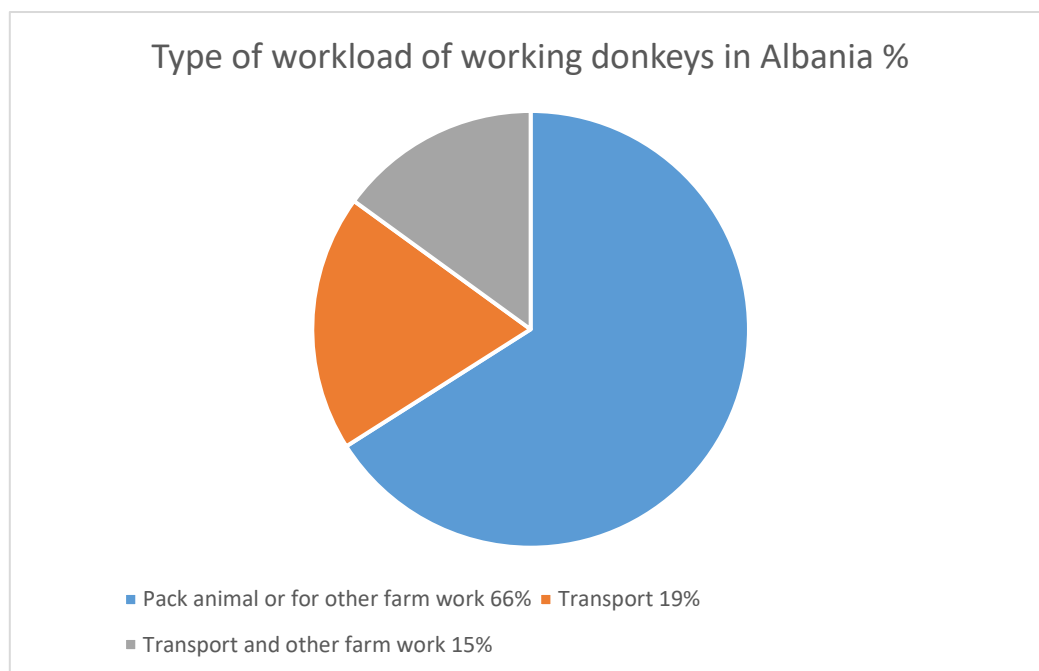
Fig. 9. Working donkeys in Digor, Kars, Turkey (Source: Yilmaz & Ertugrul 2011).

4.3.6. Albania

The current population of donkeys in Albania is estimated to be from 35,000 to 56,000 (Papa & Kume 2012). Trends in the donkey population in Albania have been on an upward trend, as data from 1996 shows an increase in the number of donkeys to 113,000 compared to the donkey population in 1980, when the number of donkeys was estimated at 50,000 (Starkey 2000). On the territory of Albania, the most common breed is the Albanian donkey “gomari“ originally from the Nubian donkey. The Albanian donkey is smaller due to the historic trend of keeping donkeys in harsh living conditions and the insufficient fulfilment of the nutritional requirements (Papa & Kume 2012).

About 66 % of donkeys are used for farm work or carrying loads. Approximately 18 % of the working population of donkeys are used for transport. The remaining working donkeys are used for a combination of transport and farm work (see Fig. 10) (Papa & Kume 2012). In Albania, the economic situation is reflected in the number of donkeys, so if the inhabitants cannot afford a vehicle or agricultural machinery, they use donkeys for this purpose (Kugler et al. 2008). A total of 92 % of working donkeys are kept alone and 8 % are kept in pairs (Papa & Kume 2012). The Five Freedoms also include freedom to express normal behaviour and freedom from fear and distress. These values can be violated if the donkeys are kept alone. The pair-bonding companionship of the donkey plays an important role in donkey welfare. As animals that have long-lasting pair bonding, keeping only one individual has a negative impact on donkeys. If a donkey is kept in a stable social group, it positively affects its longevity and reduces stress (Murray et al. 2013).

Fig. 10. Use of working donkeys in Albania (Source: Papa & Kume 2012).



In Albania, 190 working donkeys with unspecified workloads from 26 different regions were examined. Internal parasites are considered a high health threat to equines, and the presence of at least one internal parasite was found in 44.2 % of working donkeys. *Strongylus spp* was the most common at 44.2 %, *Cyathostominae* at 35.2 %, *Strongylinae*

at 16.8% and *Dictyocaulus arnfieldi* at 5.8 %. The standard of living of the working donkeys was not recorded in detail, but the study referenced that non-profit organizations evaluate the living conditions of the working donkeys as very poor and insufficient. Regular prophylactic treatment of the donkeys was also provided by non-profit organizations (Postoli et al. 2010).

At the time of writing in 2024, no papers describing the welfare of working donkeys in Albania have been found.

4.3.7. Croatia

In 2021, the donkey population in Croatia was 5,269 (Sokolić 2022). Croatian local donkey breeds and the number of registered individuals are the Littoral Dinaric donkey (3680) and the Istrian donkey (860) (CAAF 2022). The population of the third local donkey breed in Croatia is the Northern Adriatic (124) (Vlaeva et al. 2019). Donkeys are used for draught (60 %), recreation (25 %), culture (5 %), environmental management (5 %) and meat (4 %) (Jakopović et al. 2003). There is no study dealing with the welfare of working donkeys in Croatia at this time.

4.3.8. France

According to (FAOSTAT 2017) the current population of donkeys in France is around 15,000. There are up to 300 donkey tourism providers in France, Belgium and Switzerland (Camillo et al. 2018). In France, working donkeys are engaged in agroforestry or organic farming production. Such working donkeys are mainly used for draught on agricultural land (see Fig. 11). Larger breeds of donkeys or mules are used in agroforestry, and their work includes careful removal of wood. Other working activities of donkeys in the territory of mountainous France include the use of donkeys for riding or trekking activities. In France, as in the rest of southern Europe, there is a growing trend in the employment of working donkeys in the therapeutic industry, and calmer individuals from native breeds of donkeys are chosen for this work (Rodrigues et al. 2021). Among the original French breeds of donkeys are, for example, Grand noir, Provence, Cotentin, Bourbonnais, and Normand. Among the larger French breeds that can be used for producing mules is the Baudet du Poitou (Kugler et al. 2008).

There is currently no study available focusing on the welfare of working donkeys in France. Donkeys in France suffer from general problems, such as insufficient mapping, vaccination of individuals and insufficient veterinary care. Such donkeys are often used, among other things, to graze neglected lands, where donkeys are kept in herds. Working donkeys in agriculture often compensate for the absence of a horse, because they are more affordable, and the manoeuvrability of the donkey is easier for many farmers. They thus work on small farms with a smaller production of biological products. A young donkey can be purchased for an amount of around 1000 USD. On such farms, working donkeys are most often kept in pairs. In addition to mountain tourism, donkeys are also used in areas with pilgrims or tourists, where a donkey is rented as a companion during a trip in the area. However, such donkey "rentals" are no longer monitored, so it is not possible to find out whether welfare conditions are being met (Mabilais 2020). A review of 49 donkeys of unspecified workloads living in the territory of France revealed the neglected condition of the animals. This included neglecting the teeth and hooves, untreated wounds, cases of attacks by wild animals, and neglect of the feed ration, which led to the death of the donkey (Lompech & Ricard 2020).



Fig. 11. Working donkeys on small scale farm in France (Source: Rousseaux, unknown).

In conclusion, the status of donkeys in France is uncharted and they are mainly used in areas of tourism for profit or, in the case of agriculture, to save costs compared to other agricultural animals.

4.3.9. Montenegro

The population of donkeys in Montenegro is decreasing due to an increased use of farming machines and a human population outflow from rural areas (Markovic et al.

2017). Sources claim total number of donkeys is between 220, with 150 mares and 70 sires (FAO 2018), or up to 500 total (Markovic et al. 2017). Most of the working donkeys are located in area of south and southwest Montenegro and they are used for transport of loads. The donkey population replaces the horse population in rural areas of Montenegro (Markovic et al. 2017).

4.3.10. Greece

Greece has had one of the highest declines in donkey numbers, as the current recorded figure is 8,547 (Norris et al. 2021) compared to 508,000 in 1955 (Arsenos et al. 2010). The welfare of donkeys and their health depended on their use and access by owners and their socio-economic background. The prevalence of disease was most commonly associated with malnutrition or parasites, and overall management problems were found (Arsenos et al. 2010). Animals were mainly used for transport, pack, or draught. Well-known problems included parasite infection, which was found in 31.8 % of the donkeys studied in Northern Greece. (Arsenos et al. 2010).

In Greece, donkeys are predominantly associated with tourism. More than 100 donkeys and mules are used for transport in Santorini, but the exact number is unknown (Thiemann & Foxcroft 2016). Donkeys are used for carrying tourists and local people or they are carrying loads up to main village, which is 600 steps up a hill, from the port to Thira (see Fig. 12). On average donkeys did seven round trips up to hill. Working donkeys are exposed to whipping and abusive behaviour. The increase in tourism had a negative effect on welfare of working donkeys, as abuse of donkeys and mules became higher. The background of the working donkeys was described as inadequate in terms of lack of shade, food, and drinking water. The inappropriate treatment of animals who were unable to work and were left to suffer with very little to eat, was documented as well (Prabowo 2022).

The working day for donkeys used to start at 9 am and go until sunset, but that changed after protests and now the workday is a maximum of 12 hours. Tourists, on the other hand, have the choice to use a different type of transport such as a cable car or hiking, because at the moment motor transport is limited. The situation is a concern for the organisations like the Greek Animal Welfare Fund and the Donkey Sanctuary. Changes are applied by The Greek Ministry of Rural Development and Food, which aims

to improve the welfare of working donkeys in Greece. For example, working donkeys must have a satisfactory level of fitness and the owner should take care of their living spaces. They settled that there would be a carrying limit of about 100 kilograms or 20% of total body weight of donkey (Prabowo 2022).

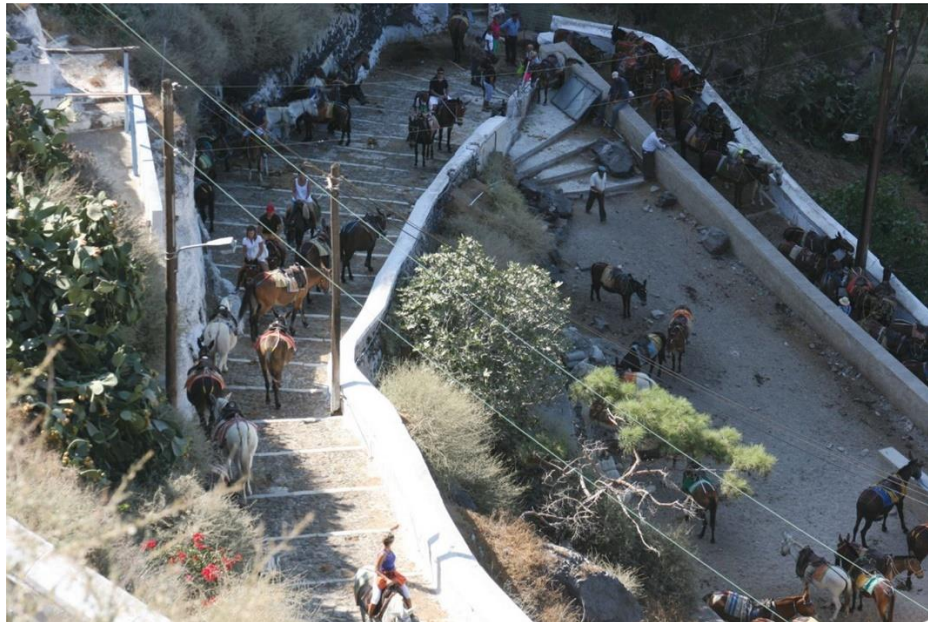


Fig. 12. The use of donkeys in tourism in Fira, Greece (Source: Thiemann & Foxcroft 2016).

4.3.11. Libya

The current number of donkeys in Libya is estimated at 30,000 (Allan 2021). Currently, Libya is one of the countries in North Africa where some of the working donkeys are being relocated to countries such as Ghana and Nigeria, where they are slaughtered for their skins (Reeves et al. 2022).

4.3.12. Algeria

Approximately 136, 000 donkeys inhabit Algeria, predominantly serving as working animals (Porter et al. 2016). Most of them are in the northern regions of the country and they are mostly used as draft or transport animals in areas with poorer accessibility (Ayad et al. 2019). A study of 65 working donkeys was carried out in Algeria, of which 32 were jacks and 33 were jennies. The donkeys ranged in age from 3 to 16 years. The study focused mainly on the morphology of the local breed of Eastern Algerian donkeys, which were used for traction work in the provinces of El-Tarf, Souk

Ahras and Tébéssa (Hannani et al. 2020). Separately measured values of working males and females showed that they have straight backs and are not overloaded.

The morphological values of working females and males were measured separately. The measured values included withers height, body length, rump height and others. The data indicates that both males and females have straight backs and are not overloaded. The size of the males was then described as medium, therefore they were suitable for work and the values of the females showed that they were larger than medium therefore they were also suitable for work. The data also showed that the donkeys had more body mass than their size, so they were overweight. Welfare values or other environmental conditions were not recorded (Hannani et al. 2020).

4.3.13. Tunisia

The current donkey population in Tunisia is 123,000 (Lahmar et al. 2014).

A study focusing on the oral health of working equines in Tunisia was conducted across working equids in Tunisia, a total of 174 working equines were included, and of which, 93 were working donkeys. The donkeys studied were from 3 different regions in Tunisia: Jendouba, Kasserine and Kébili. Dental irregularities were found in 37 % of the donkeys. The data describing the exact dental abnormalities is not specifically about donkeys but for all 174 working equines. The most common oral problem was overteeth occurring in 41.1 % of examined skulls. Overt teeth is a condition where teeth are worn down and have lower mass, this condition is usually found in elderly donkeys (Chabchoub et al. 2005). Traumatic lesions caused by a bad bite was found in 19.1 % of equines but the causes of such a high number of bad bites were not discovered. Incisor malformations were found in 11.7 % of all animals. Tooth fractures occurred in 4.4 % of equines. Overall, 25 % of abnormalities in working equines were due to traumatic cause, such as a bad bite, fallen tooth or fracture of tooth and an inappropriate trauma-inducing bit was found in 15 % of equines. The incidence of dental abnormalities increased with increasing age. The details of the working and living conditions of the donkeys were not the focus of the study. However, an association between feeding and the occurrence of abnormalities has been demonstrated. Working equines whose diets contained dates had a prevalence of dental abnormalities of 50.9 %, equines fed barley, 43 %, and grass 35

%. The higher prevalence of abnormalities for equines fed with dates was caused by the date residue between teeth. (Chabchoub et al. 2005).

The study shows that the dental health of working donkeys in Tunisia is influenced by the four factors, namely the presence of dental care, the appropriate composition of feed, the owner's attitude, and the age of working donkeys (Chabchoub et al. 2005).

4.3.14. Israel

Currently there is limited information available on the status of working donkeys in Israel, but from the sources available, it appears that donkeys here do not have sufficient welfare. The estimated number of donkeys living in Israel is 5,000 (Starkey 2000).

Donkeys in Israel are used for work, especially draught, for riding, and as pets. Donkeys kept for work are mostly used for carrying loads and are located in villages. Working donkeys receive less veterinary care compared to horses located in Israel. (Tirosh-Levy et al. 2020). According to NGO records, there is an active shelter on Israeli territory that cares for 250 donkeys removed from unsatisfactory conditions or bought out of suffering such as being sent to slaughter (Safe Haven for Donkeys 2022). As an example, this is the condition of donkeys coming into shelters in Israel (see Fig. 13).



Fig. 13. Example of the condition of a working donkey in Israel (anonymous 2022).

4.3.15. Palestine

Donkeys are actively exploited as a cheap labour force in Palestine, and the most common work includes, farm work, the transport of weighty loads, tourism, and recreation (Safe Haven for Donkeys 2018). The estimated population of donkeys was 16,354 in 2011 (FAOSTAT 2019). Due to poverty and the constant threat of evictions and home demolitions, Palestinians in the Jordan Valley cannot afford to take care of their working donkeys . There is no recorded research focusing on the welfare of working donkeys in Palestine. From the available data, a locally operating non-profit organization that, among other things, provides veterinary care to working donkeys, reports that working donkeys in Palestine have injuries and are overworked. Among the most frequent are injuries caused by illfitting work harnesses. Cases of very deep wounds, in extreme cases exposing the bones, on working donkeys, have also been recorded. Due to the long-term absence of veterinary care, donkeys often require care of their teeth and the farrier's care. All the above-mentioned health problems are caused by the long-term neglected care of a working donkey. The result of such long-term overloading and neglect of care is a worsened welfare of donkeys and a significantly shortened life span (Safe Haven for Donkeys 2018). External veterinary care provides care for working donkeys. The most common treatments include veterinary care, dental care, vaccinations, and shoeing. As there is a proven association between inadequate harnesses and wounds, the NGO provides repairs for inadequate harnesses, head collars, or provisions to get new harnesses (Safe Haven for Donkeys 2022).

Many farmers in the Bethlehem district use their donkey for farming, transport to farms, and herding (see Fig. 14). The Palestine Wildlife Society, a nonprofit organisation, mapped the welfare situation for donkeys and found several issues. Farmers have a lack of knowledge about donkeys' needs. Donkeys have an unsatisfactory amount of food; they are not provided a shelter for rest and farmers are commonly using sticks to command the donkeys. Veterinary care is not available at all. To improve the donkeys' welfare, the Palestine Wildlife Society applies several steps, including education for donkeys owners. Veterinary treatment will be provided to 300 donkeys and education of farmers will influence up to 2,000 donkeys (Palestine Wildlife Society 2016)



Fig. 14. Example of a working donkey in Palestine (source: The Donkeys Sanctuary 2021).

4.3.16. Lebanon

The population of donkeys in Lebanon is 24,000 and is decreasing (Starkey 2000). Working donkeys in Lebanon are mostly used for transporting vegetables and fruits, mostly in the major towns or regional farms in the Bekaa Valley (see Fig. 15) and the estimated number of working donkeys is 15,000 (Duggal 2015).



Fig. 15. Example of Lebanese donkey used for a transport (Source: Discover Lebanon).

4.3.17. Italy

The current population of donkeys in Italy is estimated to be 24, 900 (Camillo 2018). The number of working donkeys in Italy is not known, and the first study focusing on the welfare conditions of donkeys was conducted in 2014. A total of 12 farms with an average of 75 donkeys per farm were examined. Out of all examined donkeys, 25 % of them worked as assisted therapy animals, and 10 % were used for riding. The subject of the study was not to investigate their welfare at work and therefore this information is

unavailable. One quarter of the donkeys examined were overweight, 15.16 % of the donkeys had neglected or unsatisfactory hoof condition. Behaviour was examined using the avoidance distance test, where 18.05 % of donkeys showed avoidance behaviour (Dai et al. 2016). Italy is one of the leading producers of equine meat in Europe, so donkeys in Italy face an increased risk of being slaughtered for meat (Camillo 2018).

In conclusion, the welfare of working donkeys in Italy could be improved by better hoof care, the prevention of obesity, and an overall improvement of human interaction with animals who are not used to handling them (Dai et al. 2016).

4.3.18. Malta

Records of donkeys in Malta are very limited, with only the critically endangered Maltese donkey breed currently being officially monitored, of which, only 50 are left (Kugler et al. 2008). The population of donkeys in 1999 was 500 but research that was carried out in 2023 stating that there are no records of the population of donkeys in Malta (Wilson 2023).

4.3.19. Cyprus

Currently there are no studies focused on the welfare of working donkeys in Cyprus. The latest mapping of the donkey population shows that 1700 working donkeys are in rural areas of Cyprus with various unspecified workloads (Fig. 16), 300 donkeys worked in tourism and 170 were placed in donkey sanctuaries (Kugler et al. 2008). Cyprus also has a population of 94 groups of feral donkeys with a total of 464 individuals (Hamrick et al. 2005).



Fig. 16. Example of a workload for a donkey in Cyprus. (Source: The Donkey Sanctuary Cyprus, unknown).

4.3.20. Slovenia

Records of donkeys in Slovenia are very limited, with only the Balkan donkey breed currently being officially monitored (Bunevski et al. 2018). The number of donkey breeders in Slovenia are increasing (Žalig et al. 2013) and the number of donkeys living in Slovenia is estimated to be 200, and mostly crossbreeds (Kugler et al. 2008). Donkeys are used for sport activities, races, and fair events (Gojak 2016).

4.3.21. Bosnia and Herzegovina

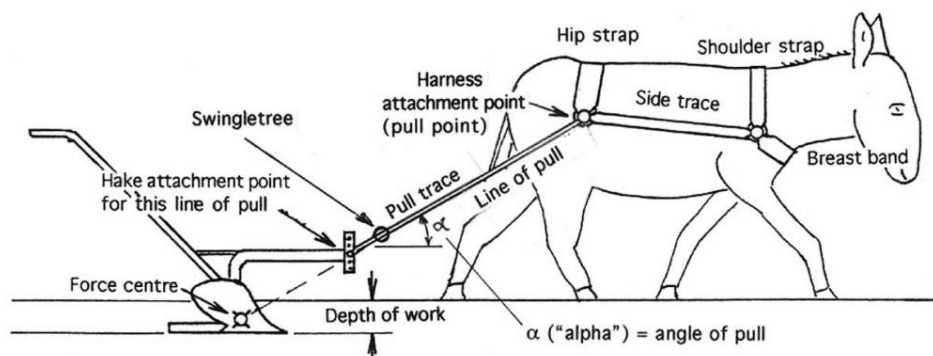
The Herzegovinian donkeys are small framed with colors ranging from grey to brown. There are an estimated 100 donkeys left (Kugler et al. 2008). These donkeys are mostly bred in mountain meadows and in rocky regions of Herzegovina. Detailed information about the breeds and numbers of donkeys in Bosnia and Herzegovina is currently unknown (Kugler et al. 2008).

4.3.22. Syria

The current population of donkeys in Syria was estimated to 69,373 in 2019. Syria has one of the most massive decreases of donkey population during recent years. Compared to the 1999 population, it has decreased by 68.33 % (Allan 2021). When horses

are not convenient in the area, farmers may consider donkeys, which have good survival instincts and are often more affordable for farmers. Donkeys are mostly used as pack animals, for personal transport, and as a draught animal. The most common non-work-related disease in donkeys in Syria is Trypanosomiasis, an infectious disease transmitted by tsetse flies or transmitted sexually. Most of the time supplementary feed is not provided to working donkeys, which are often left to find forage for themselves (Sims & Inns 2002).

Harnesses in Syria have a traditional design, and currently steps are being taken to improve the comfort of donkeys. Changes are also being implemented to improve the welfare of draught donkeys. Changing to lightweight implements with a high angle of pull makes the donkey's work easier and consequently reduces donkey tiredness (see Fig. 17). Donkeys are now able to do work that was previously considered too demanding for them (Sims & Inns 2002)



This harness gives an angle of pull of about 30° or slightly more

Fig. 17. A picture of the effective reduction of the angle, to make more efficient use of the donkeys used in draught (Source: Sims & Inns 2002).

5. Discussion

The aim of this work was to map the welfare of working donkeys in the Mediterranean area. As the available sources have shown, this topic is not treated comprehensively in the literature and there is a lack of studies on working donkeys in many of the target countries.

Neither the lifespan, numbers, nor the welfare of donkeys are mapped effectively. Even countries located in Europe often lack information on the actual numbers of donkeys and their use. In the Mediterranean countries it is obligatory to report the number of donkeys, however the figures given are very different and often not verified. The work of non-profit organizations often replaces the agenda of the Veterinary Administration in certain locations (Norris et al. 2021).

Welfare assessments include a comprehensive examination of the mental and physical condition of the animal, supplemented by an assessment of the environment in which the donkey works or is housed. However, no study focusing on the complete welfare assessment of working donkeys was available during the writing of this thesis.

Health issues have a major influence on donkey welfare. Donkeys are often exploited for their affordability in developing countries, and therefore, there is a greater likelihood that donkey owners have fewer financial resources to provide adequate veterinary care, which is often expensive. Another factor displayed in this chapter is lack of accessibility to acute veterinary care. The health problems were influenced by several factors such as owners' attitudes towards working donkeys, and a lack of preventive care (especially in terms of dental care), anti-parasitic and hoof care, vaccinations, and appropriate harness usage. Herd size, the presence of other species in the herd, the diet of the donkeys and their exposure to stress were also factors. Available resources indicate that the health issues of working donkeys are closely connected to their overall welfare and their location.

On the environmental level, donkey health is influenced by, for example, the state of their facilities and how well they meet the donkeys' requirements. Donkeys that are exposed to unsuitable conditions such as dust or high temperatures have health problems. Welfare standards can be put into context by comparing them with, for example, working donkeys in Ethiopia. The findings with Mediterranean donkeys are consistent with those

with Ethiopia, as a properly fitting harness is considered to be a significant factor to reduce the incidence of wounds (Herago et al. 2015). The prevalence of ectoparasites was higher in working donkeys in Egypt than in Ethiopia (Getachew et al. 2010). Due to their numbers, donkeys in Ethiopia have received more attention than donkeys in other countries examined in 4.3. Detailed examples of studies of the welfare and health problems of working donkeys in Ethiopia can be seen throughout this thesis, but similarly comprehensive sources from the Mediterranean area are very rare.

Working donkeys often have traumatic eye injuries. Injuries are caused by whips, foreign objects in the eyes and inappropriate blinkers covers. The hooves and limbs of working donkeys are adversely affected by the conditions in which they are kept, and problems with neglected hoof care have been identified in the Mediterranean area. Overworked donkeys in Egypt had deformed hoof structures (Mostafa et al. 2018). Injuries and lesions in donkeys are most commonly caused by unclean harnesses, beating or the presence of abrasive sand. For comparison, an example from Pakistan where withers wounds occurred in 26% of working donkeys (Regan nee Ashley et al. 2015), compared to donkeys working in Egypt where the prevalence of withers wounds was 40% (Seels et al. 2010). This high difference in wound prevalence was most likely due to the cleanliness of the harness, whether the harness was fitted properly, and the weight of the load the donkeys had to carry. The environment in which donkeys are exposed to is related to their respiratory health, but no association has been found between a donkey's work and an increased prevalence of respiratory health problems, other than lung pollution in donkeys working in dusty environments (Seels et al. 2010).

What working donkeys are exposed to, on the other hand, is hyperthermia, especially those working without sufficient shade or donkeys that are not in good condition. Poor nutritional management of working donkeys is considered a problematic aspect of colic of working donkeys, and this is also true for hyperlipemia, where the stress to which donkeys are exposed contributes to the occurrence of this condition, among other things. Gastrointestinal parasites and dental problems have their origin in the lack of preventive veterinary care for donkeys. In the case of parasitic diseases, the condition is exacerbated by poor hygiene conditions. For comparison, data from donkeys used for human transport in Turkey, where the prevalence of *Strongyloides westeri* was 12.3 %, can be compared with Ethiopia, where the prevalence in working donkeys was 11 %

(Getachew et al. 2010). The lower prevalence of this parasitic disease may be mainly due to the more extensive veterinary care or to environmental conditions that prevent such a rapid spread of the parasites. The dental health of the working donkeys may be a factor in the lower prevalence of this parasitic disease. The dental problems in working donkeys are the same as in non-working donkeys, except for traumatic causes such as poor use of the bridle with snaffle bit. Neurological problems are not associated with a demonstrably higher incidence than in non-working donkeys. Skin disease is potentially higher in working donkeys because this disease is conditioned by past injuries.

Of the countries covered, those in the Middle East have a significantly different mapping of the welfare of working donkeys. According to Jordan's study, working donkeys are mainly used as carriers for tourists and, thus, suffer from lesions predominantly in the tail area (Burn et al. 2008). In countries such as Turkey, Palestine, Syria and Israel, donkeys are mainly used as pack animals, for traction, agricultural work, transportation, or riding. In these countries no study has been carried out on the welfare of working donkeys, but some health problems have been reported. Donkeys have less veterinary care and nutrition than is considered inadequate. This absence is mostly compensated by the presence of non-profit organisations providing emergency veterinary care (Safe Haven for Donkeys 2018). Positive developments include an active shelter for neglected donkeys in the territory of Israel (Safe Haven for Donkeys 2022) and positive changes in harness structure in the territory of Syria (Sims & Inns 2002). In Lebanon, in contrast, there is minimal information regarding working donkeys except that they are used to transport goods.

Working donkeys in North Africa are used to pull or carry wood or bricks in the territories of Egypt and Morocco. Welfare studies have been conducted in both countries, showing that donkeys had wounds. The skin sores are mainly caused by non-fitting harnesses, and unclean saddles that contain grains of sand. Studies have shown that the welfare of donkeys has been significantly affected by the behaviour of their handlers (Seels et al. 2010; Farhat et al. 2020). For comparison, a study from Pakistan where donkeys also worked on brick kilns can be used. In Pakistan, the prevalence of lesion was 50% (Dennison et al. 2005), mainly in the spine region and for donkeys in Egypt, the prevalence was 80%. However, the difference is that the workers in Egypt were found to frequently beat the donkeys, and this may explain the higher incidence of wounds.

Education on how to handle donkeys was not conducted in Egypt. However, the question remains about whether the prevalence of wounds in donkeys in Egypt would have been reduced by, for example, reducing their workload, improving facilities, and educating handlers on how to treat donkeys (Farhat et al. 2020). Handlers are often uneducated on proper donkey handling, and are under financial stress, which is reflected in the donkey's wellbeing. All of these initiatives would, most importantly, have to be controlled for impact and continuity. Algeria and Tunisia face shortcomings when it comes to mapping the welfare of working donkeys. Although both countries have a donkey population of over 120,000, there is minimal mapping of working donkeys. Sources do map the health of donkeys and their body condition and structure, but there is no mapping of donkey behaviour or even their living conditions. Libya has a critical lack of mapping of the condition of donkeys, but they are also transported from Libya to other countries, such as Ghana and Nigeria, for slaughter to make leather and other goods (Reeves et al. 2022). Libya is an international transportation point for donkeys and should be more closely monitored to prevent the protentional decreasing of donkeys' welfare (Reeves et al. 2022).

The Mediterranean countries in Western Europe have a variety of trends regarding their donkey populations and their uses. Their use in agro-tourism and alternative agroforestry and horticulture are developing. Behavioral problems have been investigated in donkeys living in Spain, where donkeys are mainly used in agroforestry (Haddy et al. 2020). While it may be expected that donkeys with owners from a financially secure background would be less likely to have problems with welfare violations, but up to 80 % of donkeys were known to have scars and donkeys faced limited sources of drinking water and shade (Haddy et al. 2020). This, again, points to the findings of the paper that donkeys face substandard conditions even in developed countries. Welfare studies of working donkeys have not been carried out in France and Italy. From the available sources, it can be concluded that donkeys in France are close to reaching a potential peak in terms of further development of their sustainable use in agroforestry, drought, tourism, and therapy. France is the only Mediterranean country actively developing these alternative uses of donkeys. However, a potential problem of breeding only one donkey is that a single donkey living without a herd is a violation of a donkey's natural behavior (Murray et al. 2013). Italy has not recorded any working donkeys, but it is a major producer of donkey milk and other products. Italy should focus on equivalent mapping of

working donkeys, just as it has mapped donkeys used for meat and milk production. Malta is one of the few countries that faces a severe lack of any mapping of the number of donkeys living on its territory, with the last records of donkey numbers dating back to the 1990s. Donkeys undoubtedly face better conditions in these countries than in the rest of the Mediterranean countries, but there is still a lack of attention from breeders and veterinary control.

There is a long-term decline in the number of donkeys in the Balkan region. Mapping of donkey numbers and welfare is poor except in countries such as Greece and Albania. Greece has been facing criticism for a long time, not only from NGOs, on the use of donkeys in tourism (Prabowo 2022). Compared to other countries, however, there are alternatives that do not involve animal labour, but donkeys are used to attract tourists, among other things. Thus, the main welfare deficiencies of working donkeys are the lack of rest and water during working hours and the physical hardship of carrying tourists up the hill (Prabowo 2022). There has been an improvement in the working hours of the donkeys and their numbers have now stabilised at 12 working hours per day (Prabowo 2022). Veterinary surveillance by the state and enforcement of welfare improvements would undoubtedly contribute to improved welfare. Albania is the only Mediterranean country facing a very small increase in the number of donkeys. However, this is due to the fact that donkeys are acquired for the purpose of cheap labour and are used in farm work and transport. The main welfare problems therefore include the fact that the vast majority of donkeys are kept as individuals. This welfare deficiency could be avoided by steps such as owner education or a possible financial contribution.

In conclusion, steps such as detailed mapping of their condition and numbers would help to improve the welfare of working donkeys. The current information is insufficient, and the veterinary authorities do not have an accurate overview of the animals. Furthermore, the education of owners or handlers is currently insufficient across the board. An increase in the purchase price of a working donkey has the potential to motivate the owner to improve the welfare of donkeys already in the owner's possession. There would also be great potential to reduce the labour requirements on donkeys and reduce the financial stress on owners. For example, demanding higher prices for the final product in which the working donkeys participate in the production would reduce financial stress on owners.

As donkeys are some of the cheapest and most available labour, it is important to ensure affordable, regular veterinary care, improve welfare laws and, most importantly, monitor compliance.

Conclusions

Although many farms and households in the Mediterranean depend on donkeys, they receive disproportionately little attention. This trend is evident just from mapping their population. Further research on working donkey issues is recommended to better understand this issue. It is recommended to raise the standard of welfare mapping of working donkeys in Europe, as working donkeys are neglected and put on the sidelines. In the North African territories, efforts to record donkey welfare in more detail can be made, but these efforts are not consistent across the region. The same is true in the Middle East. Throughout the Mediterranean, the same pattern is evident, namely the low mapping of working donkey and the absence of veterinary care. These two steps can start the way to improving the welfare of working donkeys. A change in society's perception of donkeys would undoubtedly lead to at least a partial improvement in their living conditions.

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Appendices

List of the Appendices: