Watertight

The case for providing farmed ducks with full body access to water

"When ducks are given access to open water they will use it to perform a wide range of bathing behaviours, such as sieving, dabbling, preening and head dipping."

Guiomar Liste, University of Cambridge, 2012

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Executive summary

There is no generic legal requirement to provide farmed ducks with access to open water. Therefore, water may be provided for drinking purposes only via metal nipple drinkers. Furthermore, where ducks are provided with access to open water the facilities used may only permit the birds to dip their heads in water, thus preventing full body access. This report reviews the evidence relating to providing ducks with access to open water and identifies what should be provided to commercially-reared Pekin ducks to enable them to adequately perform their important water-related behaviours. Consideration is also given to how such water facilities should be managed to maximise bird welfare.

Ducks are waterfowl and have evolved, and are therefore well adapted, for a life in and around water. Pekin ducks have shown a clear preference for open water even without prior experience (Heyn et al., 2006; Heyn *et al*., 2006b), indicating an innate need. When Pekin ducks have been denied access to open water for bathing, this led to a more intense use of open water when they were subsequently given access (Heyn *et al*., 2009; Jones *et al*., 2009). Also, an absence of open water can lead to the performance of abnormal behaviour (Rodenburg *et al*., 2005), including that indicative of frustration (Jones *et al*., 2009). Consequently, in free-choice tests, Pekin ducks have demonstrated a preference (Heyn *et al*., 2006; Heyn *et al*., 2009) and have worked hard to obtain access to open water (Cooper *et al*., 2002).

Access to open water has been shown to be essential for improving and maintaining the health (particularly of eyes and nostrils) and plumage condition and cleanliness of Pekin ducks which, in general, have been shown to improve as the level of body access to water increases. For example, the best health scores for plumage and nasal condition have been achieved with facilities providing full body access to water, such as baths, compared with troughs or bell drinkers that restrict the level of access to head only (Knierim *et al*., 2004; Jones *et al*., 2009; O'Driscoll and Broom, 2010; O'Driscoll and Broom, 2011). Some studies have also reported increased growth (Reiter *et al*., 1997) and an improvement in body weight when Pekin ducks have open water. Provision of open water in a commercial environment has been reported not to affect negatively the health or productivity of ducks, as long as it is properly managed (Liste *et al*., 2012b).

Access to open water is also necessary for ducks to perform many of the behaviours that form part of their normal species-specific behavioural repertoire, such as head dipping, wet preening, wing rubbing, and different types of shaking movements (Heyn *et al*., 2009; O'Driscoll and Broom, 2012). As such, when Pekin ducks have been given access to open water they use it, spending a large proportion of

"Facilities that permit full body access to open water, such as small baths, are considered the most appropriate provisions for Pekin ducks reared in commercial environments."

Dr Marc Cooper, Senior Scientific Manager, RSPCA

their time engaged in these types of water-related activities, indicating a behavioural need (Liste *et al*., 2012). Pekin ducks have demonstrated they have the highest preference for facilities that permit full body access to water and therefore for a greater range of water-related activities to be performed (Cooper *et al*., 2002). However, although not definitive, Pekin ducks have not demonstrated an overall preference for swimming water. Instead, water that is at least 10cm deep, but not too deep that it is not possible to stand, appears to be most important to ducks. Nevertheless, ducks use different depths of water to perform different behaviours and therefore facilities with a varying water depth may be considered ideal.

It is strongly advised that open water resources be provided separate from the littered area and over properly constructed drainage areas, to minimise contamination of the litter with water (Bergmann *et al*., 2011b; Heyn *et al*., 2012; Knierim *et al*., 2004; O'Driscoll and Broom, 2011; Simantke, 2002, in Rodenburg *et al*., 2005; van Krimpen and Ruis, 2011). With regards to water quality, there is no clear evidence to indicate that this deteriorates overall with an increasing level of body access (Liste *et al*, 2013). However, as water can become dirty in all types of open water facilities regardless of the level of body access they provide, even after a short period of use, it is recommended that facilities are cleaned out and replenished with water at least twice daily (Liste *et al*., 2013). Ducks should also have a separate supply of clean water for drinking purposes only.

In summary, the weight of the evidence suggests that facilities that allow full body access to water are more beneficial to Pekin duck welfare than those that allow head-only or restricted body access. Being able to enter the water fully offers ducks a greater opportunity to perform a wider range of bathing behaviours, better promotes the performance of water-related behaviours, and improves duck health. Pekin ducks also show a greater preference for facilities that allow a greater level of body access. Furthermore, facilities permitting full body access appear to be no more harmful to duck health compared to head-only provisions. Bell drinkers, however, are considered inadequate for providing open water to ducks for bathing purposes. Facilities that permit full body access to open water, such as small baths, are considered the most appropriate provisions for Pekin ducks reared in commercial environments.

The RSPCA has developed evidence-based welfare standards for farmed ducks, including requirements on the provision of open water to ducks. These have been informed by scientific research and practical knowledge and experience. The standards specify open water facility dimensions and water depth, as well as management practices that must be implemented to maintain adequately the ducks' environment. Duck producers in the UK and overseas have implemented these standards, demonstrating that providing ducks with full body access to water in this way is both practical and commercially viable. Moreover, it has been acknowledged at a government level that ducks should be provided with open water, and it could be argued that there may already be a legal basis to require this under existing animal welfare focused legislation overseen by the relevant governments within the UK.

- Ducks are waterfowl and demonstrate an innate need for open water.
- Access to open water has been shown to be essential for improving and maintaining health, which has been shown to improve as the level of body access to water increases.
- Pekin ducks have demonstrated they have the highest preference for facilities that permit full body access to water and therefore a greater range of water-related activities can be performed.
- Providing ducks with full body access to water has been shown to be both practical and commercially viable.

Introduction

The lack of access to open water has been reported to be the most important welfare issue in commercial duck husbandry today and is therefore the focus of this report. Domesticated ducks are waterfowl. As such, they have evolved and are well adapted for a life in and around water: they have hollow bones and internal air sacs to aid buoyancy, interlocking feathers to trap air, an oil gland to maintain their feathers in a waterproof condition, webbed feet for enhanced movement in water, and a bill designed to sift water.

Unlike some other farm animal species, such as meat chickens, laying hens and pigs, there is no specific, detailed UK or EU legislation concerning ducks. In particular, there is no generic legal requirement to provide ducks with water for anything other than drinking, which can be provided using metal ball-bearing nipple drinkers – similar in design to those given to pet rabbits and hamsters.

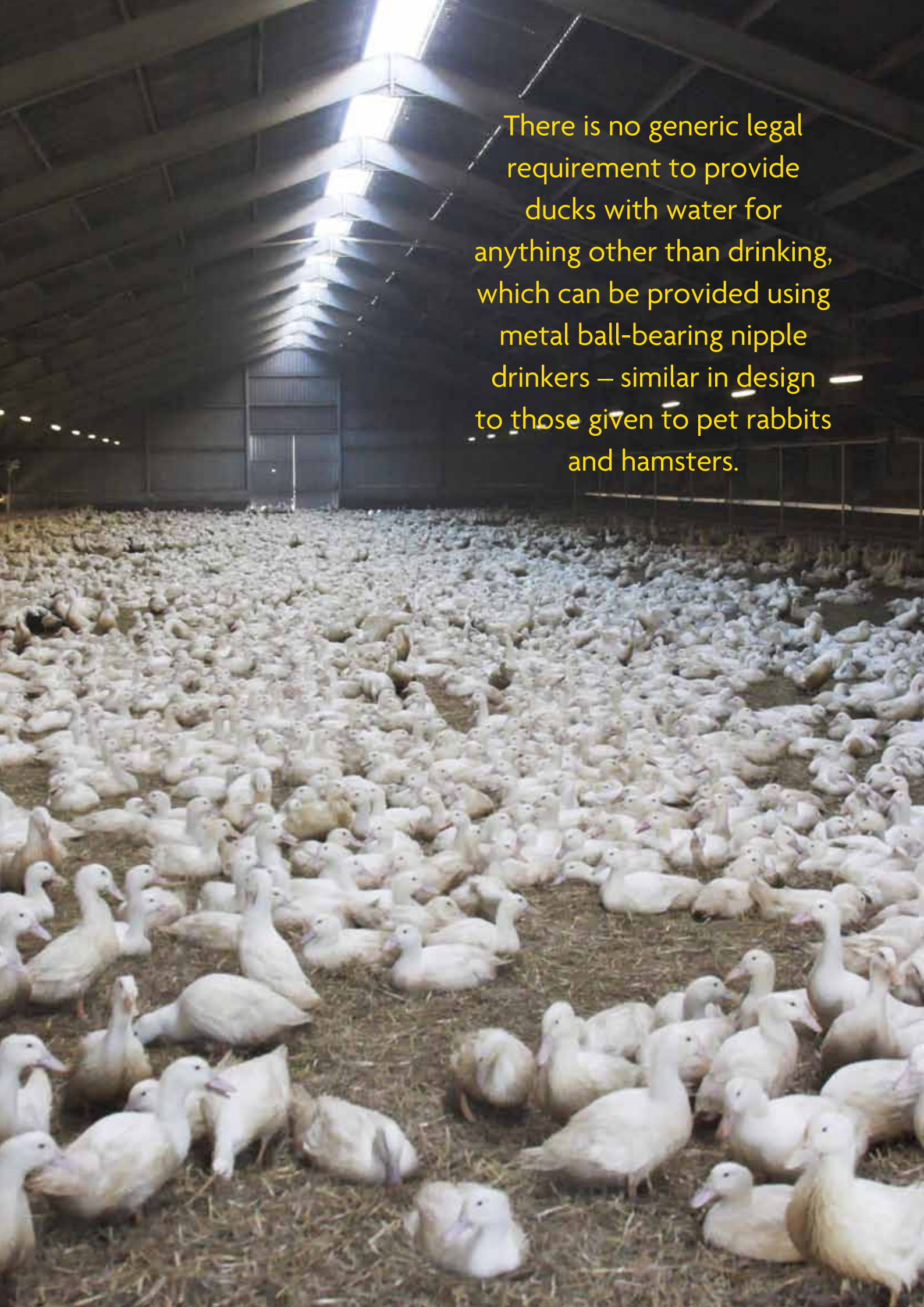
Encouragingly, the duck meat industry has developed its own assurance scheme standards for ducks, which cover some important areas and, to some degree, help regulate duck production in the UK. The standards require open water to be provided to enable ducks to cover their head with water, and bell drinkers are permitted to achieve this, but the standards do not require ducks to have full body access to water.

Commercially produced Pekin ducks* have demonstrated the strongest preference for facilities that provide full body access to water. This corresponds with the weight of scientific evidence demonstrating that providing Pekin ducks with full body access to water is more beneficial to their welfare overall than facilities that restrict the level of body access. For example, duck health, particularly eye, nostril and plumage condition and cleanliness, have all been shown to improve as the level of body access to open water increases, and the best results for plumage and nasal condition can be achieved with full body access provisions. Full body access also enables ducks to perform their important water-related behaviours more fully and freely. However, as with any resource, open water facilities, regardless of the level of body access they permit, must be managed appropriately.

The RSPCA believes that there is a sufficient weight of scientific evidence available to demonstrate that ducks should be provided with access to open water facilities that enable them to perform their water-related behaviours fully and freely. Although there are general legal provisions that could perhaps be used to enforce such a requirement, UK law, as well as the standards used by farm assurance schemes, retailers and others involved with duck production, should all require ducks to be provided with full body access to water which is of a sufficient depth.

There are some ducks producers in the UK that already provide their ducks with full body access to water. However, it is the responsibility of all – consumers, producers, retailers, and the government – to ensure farm animals are provided with conditions that aim to provide them with a good life.

*Pekin ducks are the most widely used breed in the UK for the production of meat. Some breeds of domesticated duck have been bred to produce eggs. The market for duck eggs, however, is relatively small in the UK. Therefore, this report concentrates on ducks reared for meat, but the welfare issues presented and the requirement to provide full body access to open water applies to all domesticated ducks regardless of the purpose for which they are kept.



There is no generic legal requirement to provide ducks with water for anything other than drinking, which can be provided using metal ball-bearing nipple drinkers – similar in design to those given to pet rabbits and hamsters.

Natural history and behaviour

The domesticated duck (*Anas platyrhynchos domesticus*) is one of the most common species of farmed ducks reared throughout the world (Rodenburg et al., 2005). All breeds of domestic duck originate from the wild Mallard (*Anas platyrhynchos*), and of these it is the Pekin that is the most commonly used for commercial meat production today (Rodenburg *et al*., 2005). The Pekin descended from the Mallard and has maintained many of its wild ancestor's biological characteristics (Rauch *et al*., 1993; Council of Europe, 1999).

Mallards, being waterfowl, are largely aquatic (Council of Europe, 1999), and spend much of their time in and around water to feed, bathe, swim, rest and perform complex social behaviours (Jones and Dawkins, 2010b). They can be found in a variety of wetlands, including small ponds, rivers, lakes and estuaries, as well as shallow inlets and open sea not far from the coastline. Mallards are attracted to bodies of water with aquatic vegetation and are classified as dabbling ducks, which feed mainly at the surface of the water. Mallard ducklings are fully capable of swimming as soon as they hatch and the mother will oil their feathers to protect them in the water.

Key issues affecting welfare

We are particularly concerned about five key issues that can have a detrimental affect on the welfare of farmed ducks. Concerns generally relate to the environment within which the birds are reared and one issue concerns the breeding of the bird itself.

Space allowance

The amount of space ducks have within a building is related to the stocking density permitted. Stocking density represents the total amount of bird weight per square metre of floor area. Therefore, the greater the bird weight permitted, the more birds can be placed within a building, and the less space there is available to each bird. For example, for birds weighing 3.3kg, a stocking density of 25kg/m^2 equates to an average of approximately 7.6 birds occupying each square metre of floor space. In contrast, a stocking density of 17kg/m^2 equates to approximately 5.2 birds of the same weight per square metre. This means that in a building with a floor space of 1320m^2, there will be 3,202 *more* birds when reared at 25kg/m^2 compared to 17kg/m^2 (i.e. 10,000 versus 6,800 birds).

The lower the stocking density, the fewer birds there will be sharing the same amount of space, and therefore there will be less impact from the birds on the litter (the substrate covering the floor, e.g. straw). This means the litter is easier to manage and remains in better condition. Maintaining dry litter is essential for good leg health (Raud and Faure, 1994), as walking ability has been shown to deteriorate with increasing litter moisture and ammonia (from faeces) (Jones and Dawkins, 2010; Jones and Dawkins 2010b).

Stocking density has also been shown to affect duck welfare in other ways. For example, De Buisonje (2001) showed that production, feather damage and product quality were negatively affected in Pekin ducks at a stocking rate of eight birds per square metre, compared with five, six and seven birds.

Lighting

The structure of the domesticated duck's eye has retained the properties and characteristics of its progenitor species, and light and vision have been shown to be important in many aspects of ducks' lives. Ducks have well-developed eyes with good colour vision. As such, sight is a primary sense that requires a good level of light to operate effectively.

Rearing birds at low light intensities can lead to various health issues, such as lameness, impaired visual development and increased fearfulness (Barber *et al*., 2004). Low light intensities may also lead to visual sensory deprivation of the birds (Rodenburg *et al*, 2005). This is perhaps why Pekin ducks prefer well lit conditions, as when given a choice between different light intensities (<1, 6, 20, or 200 lux) they consistently preferred the brighter lit environments at both two and six weeks of age (Barber *et al*., 2004).

Ducks should be provided with natural light, as this is likely to be beneficial to their welfare by, for example, increasing activity and enriching their environment. Natural daylight can provide a range of illuminance levels in different areas within the house, which changes throughout the day, and is spectrally different to artificial sources. Natural light is particularly good in this sense as it has been

reported that ducks prefer some variation in light level (Jones and Dawkins, 2010). Ducks also have UVA vision and, as UVA light is provided by natural daylight, failure to provide natural daylight can, *'limit or deny birds use of these visual cues, which may be important for the performance of a range of visually mediated behaviours'* (Barber *et al.*, 2004). To allow adequate time for rest, ducks should also be provided with a continuous dark period of at least six hours per day.

Litter

Ducks should be provided with good quality, suitable, dry litter, such as straw, to cover the floor of the building (Council of Europe, 1999). Straw, as well as being comfortable and good at absorbing the birds' droppings, can also serve as an important enrichment material for the birds (Rodenburg *et al.*, 2005). It has also been reported that ducks prefer straw for walking on (Leipoldt (1992), cited in Rodenburg *et al.*, 2005). It is permitted to rear ducks on fully slatted floors constructed from wood, metal or plastic (Rodenburg *et al.*, 2005). However, as well as causing skin irritations, slatted floors can make it difficult for ducks to balance, so they can slip and fall (Rodenburg *et al.*, 2005). Furthermore, research has shown that feather pecking is influenced by floor type and is primarily performed when Pekin ducks are reared on fully slatted floors, and reduces as the area of slatted floor is substituted for littered flooring (Leipoldt (1992), cited in Rodenburg *et al.*, 2005).

Open water

The lack of access to open water has been reported to be the most important welfare concern facing commercial ducks today (van Krimpen and Ruis, 2011). Ducks are waterfowl, which are highly motivated to access open water (Cooper *et al.*, 2002) and, when given the opportunity, spend a large proportion of their time in and around water (Liste *et al.*, 2012). Providing open water facilities to ducks is important to allow them to perform their water-related behaviours. Open water also helps keep ducks in good health, allowing them to clean themselves effectively. Furthermore, open water provides the birds with a source of enrichment, and has been shown to increase activity (Heyn *et al.*, 2006; Heyn *et al.*, 2006b; Heyn *et al.*, 2009). Well-managed facilities, which allow ducks full body access to sufficiently deep water, should therefore be provided to allow them to perform their key water-related behaviours fully and freely and maximise their health.

Growth rate

Commercial ducks grow very rapidly, and can grow faster than meat chickens, achieving a live weight of around 3.5kg at 44 days of age (Bird, 2010). In contrast, the most commonly reared UK meat chicken – a fast growing breed known as the Ross 308 – can weigh around 3.0kg at the same age. On average, over the last 20 years, the time to reach slaughter weight has reduced by approximately 0.5 days per year. Growth rates of up to 81.3g per day have been reported (Jones and Dawkins, 2010).

- Providing ducks with more space reduces the negative impact on their environment making it easier to manage and therefore maintain the health of the birds.
- Ducks have well-developed eyes with good colour vision. As such, sight is a primary sense that requires a good level of light to operate effectively.
- Providing open water facilities to ducks is important to allow them to perform their water-related behaviours and help keep them in good health.
- The rate of growth of commercial meat ducks may have gone beyond a level that is acceptable to welfare.

It is of concern that the rate of growth of commercial meat ducks may have gone beyond a level that is acceptable to welfare. For example, meat ducks can have difficulty walking and be subject to leg problems (Council of Europe, 1999) which, as in meat chickens, may be related to their rate of growth. One commercial study reported 13% (range 4.0–32.0%) of Pekin ducks with moderate, and 1.2% (0–8.0%) with severe leg problems (Jones and Dawkins, 2010). A watching brief should be kept on this issue.

"The lack of access to open water is the most important welfare concern facing commercial ducks today."

Dr Marinus van Krimpen and Dr Markus Ruis, Wageningen University, 2011

Commercial production

Around 14.3 million ducks were reared for meat in the UK during 2012 (FAOSTATS, 2014), making them the third most numerous animal reared for meat. In 2011, it was estimated that approximately three million ducks were imported from overseas (British Poultry Council, personal communication).

There are two duck producers that, between them, rear most (c.90%) of the UKs meat ducks: Gressingham Foods and Cherry Valley. Cherry Valley predominantly supply the catering trade throughout Europe, whereas Gressingham Foods (also known as Green Label Farms LLP) predominantly supply duck meat to the UK retail market.

Typical indoor production

It is estimated that approximately 95% of all ducks reared in the UK are housed indoors in large buildings where the temperature, lighting, ventilation (natural or mechanical), food and water are all controlled to ensure birds grow efficiently. Typically, between 6,000 and 13,000 birds are placed within a building at one day old. They remain together until they reach market weight at which time they are caught for transporting to the slaughter plant. Food and drinking water are typically provided in lines along the length of the building. For the performance of water-related behaviours, ducks may be provided with facilities that allow them to cover their head with water, but do not permit full body access. Straw is generally provided to cover the floor. There can be several buildings on a farm. Ducks are usually slaughtered between 42 and 56 days old when they weigh between approximately 3.1 and 3.5kg.

Unlike some other farm animal species, such as chickens, laying hens and pigs, there is no specific legislation concerning the rearing of ducks indoors and, as such, there are no requirements relating to the key issues affecting duck welfare, including stocking density, lighting, and the provision of litter and open water. Therefore, it is legal to keep ducks in overcrowded conditions, at low light levels, on fully slatted systems without litter and without access to natural light or open water (Table 1). Although it is also legal to trim the bills of ducks, it is not known to be practised on UK farms rearing Pekin ducks and is not permitted by any of the farm assurance schemes currently operating within the UK today.

Free-range and organic production

It is estimated that less than 5% of ducks in the UK are reared in free-range or organic systems. Here, the rearing systems are similar to those described previously for indoor birds, except the ducks also have access to an outdoor area. As described below, and summarised in Table 1, there is some legislation concerning the rearing of ducks in free-range and organic systems.

Legal requirements for free-range production

For birds reared as free-range, the stocking density within the house must not exceed 25kg/m^2, they must have daytime access to the range for at least half their lifetime and they must not be slaughtered before they are 49 days old. In addition, there must be at least 2m^2 of range space per duck. However, there is no legislation specifically concerning lighting or the provision of litter or open water (Table 1).

Legal requirements for organic production

For organic production, the number of ducks placed within a building must not exceed 4,000. For 'fixed' housing, there must be no more than 10 birds per square metre with a maximum stocking density of 21kg/m^2 but, where the birds are in mobile houses and have 24-hour access to the range, these figures can be increased to 16 birds and 30kg per square metre, respectively (Table 1). Wherever possible, ducks must have access to the range for at least one-third of their lifetime and, when using a fast growing breed, must not be slaughtered before they are 49 days old. There must be either 4.5 or 2.5m^2 of range space per duck, depending on whether ducks are provided with fixed or mobile housing, respectively. Ducks must have access to a stream, pond or lake. However, this only applies whenever the weather conditions permit and there are no rules relating to how deep or wide the water must be, or a requirement to provide open water indoors, where the ducks can spend two-thirds of their lives before being given access to the range. The building must permit 'plentiful' natural light to enter, but no minimum light level is specified. Natural light does not need to be provided to the housed birds until they have access to the range, and can be achieved via opening the popholes. A continuous period of at least eight hours' darkness must be provided for ducks to rest. Although litter must be provided, this only needs to cover one-third of the house – the remaining two-thirds can be slatted.

The majority of ducks reared in the UK are provided with open water facilities that allow them to cover their head with water, but prevent full body access.

Non-UK production

Some duck meat is imported into the UK from overseas. This meat is not sold fresh, but is generally used in further processed products, such as ready meals and sandwiches, or by the restaurant trade. The standards the ducks are reared to can vary considerably within and between countries. For example, some imported duck meat may be a by-product of foie gras production, whilst some may have come from countries such as Thailand where the production standards the birds are required to be reared to can be high. However, it can be difficult to find out exactly what standards are applied overseas. The RSPCA is, therefore, calling for better labelling of food products that have come from animals, so consumers can make a more informed decision regarding the welfare provenance of the products they purchase.

Table 1: Comparison of legal requirements for ducks reared in indoor, free-range and organic systems for the key concerns affecting duck welfare

	Indoor	Free-range	Organic
Space allowance indoors, expressed as kg/m^2. **(average number of ducks per square metre*)**	✗ **(–)**	25** **(8.3)****	21 or 30*** **(7.0 or 10.0)****
Lighting (indoors)			
Light level	✗	✗	✗
Natural light	✗	✓	✓
Dark period (hours per day)	✗	✗	✓(8)
Littered floor	✗	✗	✓
Open water	✗	✗	✓
Minimum water depth	✗	✗	✗
Head access	✗	✗	✓
Full body access	✗	✗	✓

✗ No specific requirement
✓ Required to some degree but with caveats that significantly limit its provision (see explanatory notes)
✓ Required

* Calculated from the space allowance figure using a bird weight of 3.0kg.
** Ducks will also have daytime access to a range area for at least half of their lifetime.
***Depends on whether ducks are housed in 'fixed' or 'mobile' buildings and the size of the building. Higher figure is for mobile buildings not exceeding 150m^2 floor space and which remain open at night. For at least one-third of their life, ducks will also have daytime access to a range area.

Explanatory notes

Free-range

Natural light: natural light only needs to be provided once the birds have access to the range. It is permitted for ducks to spend up to half of their lives indoors before being given access to the range.

Organic

Natural light: natural light only needs to be provided once the birds have access to the range. It is permitted for ducks to spend two-thirds of their lives indoors before being given access to the range.

Littered floor: only one-third of the floor area must be covered with litter.

Open water: birds must have access to a natural water body, but only when the weather conditions allow. There is no requirement to provide open water facilities indoors, where the birds can spend two-thirds of their lives before being given outdoor access.

Farm assurance scheme standards

In the UK there are three main farm assurance schemes that cover meat duck production: the food industry's own Red Tractor Assurance scheme ('British duck standard'); the Soil Association's certification scheme ('organic duck'); and, the RSPCA's Freedom Food scheme ('higher welfare duck'). The industry's own standards were previously developed and owned by the British Poultry Council's Duck Assurance Scheme (DAS). The standards used by each of these schemes address the key concerns affecting duck welfare, but to varying degrees (Table 2).

Freedom Food

Freedom Food was set up by the RSPCA in 1994 and is unique in being the first and only UK farm assurance scheme solely focused on animal welfare. It is a charity in its own right, non-profit making and entirely independent from the food industry. The standards have been developed by the RSPCA's Farm Animals Department and are informed by scientific research, veterinary advice and practical farming knowledge and experience. The RSPCA welfare standards for ducks have been developed as a 'best practice' document to ensure that higher standards of animal welfare are met at all stages of the ducks' lives – rearing, transport and slaughter. The standards cover indoor, free-range and organic production. For further information about the scheme visit: **www.freedomfood.co.uk**

Soil Association

Soil Association Certification is the wholly owned certification body of the Soil Association charity and has been certifying since 1973. It is the largest UK organic certification body and the scheme covers production standards relating to areas other than just animal welfare, such as the environment. It is non-profit making and independent from the food industry. The standards, which cover the rearing, transport and slaughter of animals, have been developed with input from industry experts and exceed the EU organic regulations minimum requirements in many areas. For further information about the scheme visit: **www.soilassociation.org**

Red Tractor

The Red Tractor is a food assurance scheme and was developed by UK farmers, food producers and retailers during the 1990s. It operates independently on a not-for-profit basis. The standards are developed by experts from industry, academia and an animal welfare charity, and informed by scientific research, veterinary advice and practical farming experience. The scheme covers production standards relating to many areas, including food safety, hygiene, animal welfare, the environment and traceability, and apply at all production steps, including rearing, transport, slaughter and processing. The Red Tractor duck standards are valuable in setting a standardised level of protection to birds, especially in the absence of any legal minimum requirements, and cover indoor as well as free-range production. For further information about the scheme visit: **www.redtractor.org.uk** or the specific duck standards at: **www.britishduck.org.uk**

Note: where the logo of more than one assurance scheme appears on a product, the producer must have implemented all of the standards required by all of the schemes shown.

In the UK there are three main farm assurance schemes that cover meat duck production. The standards used by each cover the key welfare concerns but to varying degrees.

Table 2: Comparison of requirements for ducks reared within Red Tractor, Soil Association and Freedom Food farm assurance schemes for the key concerns affecting duck welfare

	Freedom Food[a]	Soil Association[b]	Red Tractor[c]
Space allowance indoors, expressed as kg/m^2. **(average number of ducks per square metre*)**	17 **(5.7)**	21 or 30** **(7.0 or 10.0)****	25 **(8.3)**
Lighting (indoors)			
Light level	✓	✗	✗
Natural light	✓	✓	✗
Dark period (hours per day)	✓(6)	✓(8)	✓(6)
Littered floor	✓	✓	✓
Open water	✓	✓	✓
Minimum water depth	✓	✓	✓
Head access	✓	✓	✓
Full body access	✓	✓	✗

✗ No specific requirement
✓ Required to some degree but with caveats that significantly limit its provision
✓ Required

* Calculated from the space allowance figure using a bird weight of 3.0kg.
** Depends on whether ducks are housed in 'fixed' or 'mobile' buildings and the size of the building. Higher figure is for mobile buildings not exceeding 150m^2 floor space and which remain open at night. For at least two-thirds of their life, ducks will also have daytime access to a range area.
a RSPCA Welfare Standards for Domestic/Common Ducks (November 2011 and February 2015 editions) (RSPCA, 2011 and 2015).
b Soil Association Organic Standards (April 2012 edition) (Soil Association, 2012).
c Duck Assurance Scheme Standards for the production of duck meat (July 2012 edition) (Red Tractor, 2012).

Explanatory notes

Freedom Food

Light level: a minimum light level of 20 lux is required.

Natural light: natural light must be provided from seven days of age and the total amount of windowed space provided to allow natural light to enter the building must equal at least 3% of the floor area of the house.

Open water: a minimum water depth of 10cm is required.

Soil Association

Light level: it is a legal requirement that the building must permit 'plentiful' natural light to enter, but no minimum light level is specified.

Natural light: it is a legal requirement to provide natural light, but this only needs to be provided once the birds have access to the range. The standards permit ducks to spend up to one-third of their lives indoors before being given access to the range.

Littered floor: at least half of the floor area must be covered with litter.

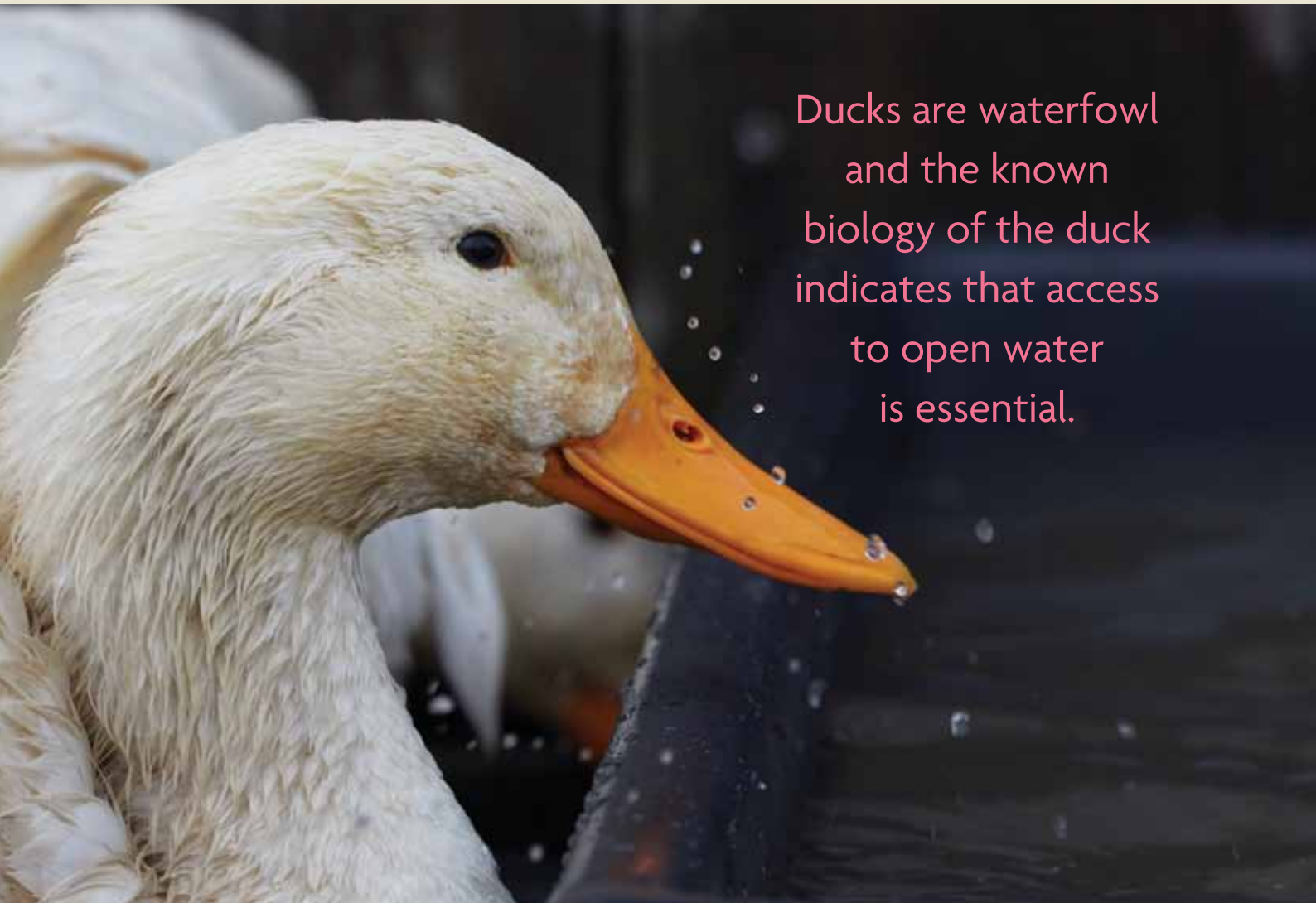
Open water: birds must have access to a natural water body (i.e. stream, pond or lake), but only when the weather allows. No minimum water depth figure is provided but there must be: "...sufficient water for them to dip their heads". There is no requirement to provide open water facilities indoors where the birds can spend up to one-third of their lives before being given access to the range.

Red Tractor

Light level: the standards state that ducks must be provided with a light level that allows them to see one another and to be seen clearly, but no minimum light level is specified.

Natural light: the provision of natural lighting is not mandatory, but is encouraged.

Open water: the standards state that facilities must allow water to cover the duck's head, but no minimum water depth figure is specified.



The evidence for open water

This section reviews the evidence relating to providing commercially reared Pekin ducks with access to open water and identifies what should be provided to enable them to adequately perform their important water-related behaviours. Consideration is also given to how such water facilities should be managed to maximise bird welfare.

Unless stated otherwise, the studies cited involved the use of commercially reared Pekin ducks (*Anas platyrhynchos domesticus*). Wherever possible, the emphasis has been on citing results that have been consistently reported within a number of studies.

How do we know ducks need access to open water?

Biological: ducks have evolved to use it

Ducks are waterfowl and the known biology of the duck clearly indicates that access to open water is essential for them to perform their normal species-specific behavioural repertoire. Ducks have also shown a clear preference for open water without prior experience (Heyn *et al*., 2006; Heyn *et al*., 2006b), demonstrating an innate need.

Motivational: ducks show they want it

In free-choice tests, ducks have shown a clear preference for open water facilities over nipple drinkers (Heyn *et al*., 2006; Heyn *et al*., 2009). Other studies have assessed ducks' strength of preference, i.e. motivation, to gain access to open water. In one such study, techniques developed for the assessment of behavioural priorities in animals were used to 'ask' the ducks what was most important to them. Through a series of tests where vertical barriers of different heights were used, Pekin ducks worked harder by overcoming significantly higher barriers to obtain access to open water compared to nipple drinkers (Cooper *et al*., 2002), demonstrating a greater motivation for open water.

Ducks have also shown their need for open water in other ways. For example, when Pekin ducks were denied access to open water for bathing, this led to a more intense use of open water when they were subsequently given access (Heyn *et al*., 2009; Jones *et al*., 2009), indicating the ducks were behaviourally deprived when they did not have open water (Jones *et al*., 2009). Furthermore, free-range ducks without access to open water have been observed digging pits in the soil with their bills to form puddles of rain water, which they then used for bathing in (Cooper, personal observation).

Health: ducks need it to be healthy

Access to open water has been shown to be essential for improving duck health, particularly eye, nostril and leg health and plumage condition (see Open water and health section on page 21).

Behavioural: when you provide it they use it and without it they can suffer

When ducks are given access to open water they will use it to perform a wide range of bathing behaviours, such as sieving, dabbling, preening, and head dipping (Liste *et al*., 2012). Observing how ducks use water in these ways indicates a behavioural need (Liste *et al*., 2012) that can only be met with the provision of suitable open water facilities. Furthermore, the very performance of such behaviours may be important

to the duck, and signs indicative of frustration have been observed when ducks have been reared without access to open water (Jones *et al*., 2009). Open water can also provide ducks with an important source of enrichment and has been shown to significantly increase bird activity (Heyn *et al*., 2006; Heyn *et al*., 2006b; Heyn *et al*., 2009). (See Open water and behaviour section on page 24).

Production: it can improve productivity

Some studies have reported an improvement in body weight when ducks have been provided with open water. For example, Erisir *et al*. (2009b) reported that ducks provided with a bath had higher body weights after six weeks than those without access to open water. In particular, this was the case when ducks had access to an outdoor exercise area. They concluded that a management system that was more natural, i.e. outdoor access, combined with a facility that permitted the expression of normal water-associated behaviours, had resulted in the increased growth. Similarly, in another study, Pekin ducks provided with access to a bath had increased growth, compared to ducks without access to open water (Reiter *et al*., 1997). Although one study has reported a negative impact on duck performance when providing pools, these were placed directly over the litter (Erisir *et al*., 2009), which is not good practice (Liste *et al*., 2012b) (see Open water management section on page 30). It has also been shown that increasing the level of body access that ducks have to water can increase productivity, as ducks with access to troughs and baths had higher body weights than those with access to bell drinkers only (O'Driscoll and Broom, 2011).

Access to open water has been shown to be essential for improving and maintaining duck health, particularly eye and nostril health, and plumage condition and cleanliness.

Open water and health

Access to open water has been shown to be essential for improving and maintaining duck health, particularly eye and nostril health, and plumage condition and cleanliness. In general, these parameters have been shown to improve as the level of body access birds have to open water increases (Graham and Sandilands 2001; Ruis *et al*., 2003; Bulheller *et al*., 2004; Knierim *et al*., 2004; Heyn *et al*., 2006; Heyn *et al*., 2006b; Heyn *et al*., 2009; Jones *et al*., 2009; Waitt *et al*., 2009; Jones and Dawkins, 2010; Jones and Dawkins, 2010b; O'Driscoll and Broom, 2010b; Bergmann *et al*., 2011; Bergmann *et al*., 2011b; O'Driscoll and Broom, 2011; Heyn *et al*., 2012). For example, ducks provided with nipple drinkers were unable to keep their eyes, nostrils, and feathers fully clean compared to those provided with open water facilities (Knierim *et al*., 2004; Heyn *et al*., 2006; Heyn *et al*., 2006b; Heyn *et al*., 2009; Jones *et al*., 2009). Also, ducks with access to troughs have been shown to have better eye, nasal and plumage condition than those provided with bell drinkers (Graham and Sandilands, 2008; Jones and Dawkins, 2010). Furthermore, those with access to baths have cleaner feathers compared to those with troughs (Jones *et al*., 2009). These results indicate that access to open water is necessary for ducks to perform several behaviours that have a direct and positive impact on their health.

When ducks are not provided with access to open water, the build up of dirt and food particles around their nostrils could lead to infections and respiratory problems. Similarly, it has been reported that without open water their eyes can become scaly and crusty and, in extreme cases, blindness can follow (MAFF, 1980). Research has also shown that without open water ducks can develop cataracts, which is believed to be the result of eye injuries and dryness (Schmidt and Toft, 1981; Keymer, 1977). Keeping their plumage in good condition is also considered important for ducks, as dirty, soiled feathers are likely to affect their ability to maintain thermal comfort.

Ducks also use open water for thermoregulatory purposes and can suffer from heat stress if this is lacking (Abd El-latif, 2003). Pekin ducks have been observed to pant at relatively low temperatures of around 15°C, indicating a requirement for cooler temperatures (Jones and Dawkins, 2010b), and increased panting has been linked with increased levels of wet preening (Jones and Dawkins, 2010b). This demonstrates the important role of open water in maintaining thermal comfort, as open water facilities promote wet preening behaviour (Bulheller *et al*., 2004) and can allow the ducks to perform this behaviour more freely. In addition, providing Pekin ducks with access to a bath has been shown to have a positive influence on feather development, compared to ducks without access to open water (Reiter *et al*., 1997).

Foot pad lesions have been shown to be more severe in both Muscovy and Pekin ducks when reared with nipple drinkers, compared to when reared with open water in the form of bell drinkers or troughs (Knierim *et al*., 2005, in Rodenburg *et al*., 2005; Jones and Dawkins, 2010; O'Driscoll and Broom, 2011). The level of body access ducks have to water has not been shown to affect foot pad lesions. For example, under commercial conditions, no difference was observed in the severity of foot pad lesions between ducks provided with full body access (baths and wide troughs) compared to those with head only access to water (narrow troughs) (Liste *et al*., 2012b). Although the study did report marginally worse foot pad lesions for ducks reared with the baths compared to those with wide troughs, foot condition could be considered good for all the facilities assessed*. In another study, although Pekin ducks with bell drinkers were reported to have better feet condition than those with troughs, the ducks with bell drinkers were provided with fresh litter twice daily, compared to once a day for those with troughs, which is likely to have positively influenced the condition of the feet (Jones and Dawkins, 2010).

Results suggest that the provision of open water is unlikely to affect walking ability. One study did report that ducks provided with open water in the form of wide bell drinkers had marginally poorer walking ability, and were dirtier, than those with nipple drinkers, but this was when both drinkers were placed directly over straw (O'Driscoll and Broom, 2011), which is not

***Lesions were scored on a four point scale, with score zero being no lesions present and score three indicating a severe lesion. For all the open water facilities, the average score was between 0.65 and 0.90.**

recommended (Liste *et al*., 2012b) (see Open water management on page 30). Also, as bell drinkers have been shown to cause wetter litter compared to nipple drinkers (O'Driscoll and Broom, 2011), and as walking ability has been shown to deteriorate with increasing litter moisture (Jones and Dawkins, 2010), it is likely that this was the cause of the negative impact on leg health rather than the provision of open water per se. In contrast, where ducks were provided with various open water provisions but these were placed on solid sloped areas with good drainage, no negative effect on posture, i.e. standing straight, or walking ability was observed compared to ducks with access to nipple drinkers only (Jones *et al*., 2009). The open water provisions provided in this study varied in the level of body access to water they provided – from head only to full body – but bell drinkers were not examined. In another study, where various open water provisions – bell drinkers, troughs and baths – were compared, those provisions that provided a greater level of body access to open water, i.e. the troughs and baths, were shown to be associated with marginally better walking ability (O'Driscoll and Broom, 2011). The results of the studies cited above indicate that although the provision of open water does not affect walking ability, bell drinkers do not make suitable open water provisions for ducks with respect to leg health.

Evidence of no harm

There is concern amongst some duck producers that providing open water will increase the incidence of disease, resulting in ill birds and higher mortality. This has meant ducks may either not be provided with any form of open water, or that if open water facilities are provided then they limit the birds' level of access to head only. Clearly, providing water per se will not harm ducks but, just as in the case of any other resource, it could present a risk if it is poorly managed. For example, in the case of open water provision, hygiene problems could arise from the presence of dirty water or spoilage of the litter from spilt water. However, when appropriately managed, the generalised argument that the provision of open water systems has an adverse effect on duck welfare, including health, cannot be substantiated (Bergmann *et al*., 2011b).

Although some studies have reported no improvement in productivity or in some health parameters when ducks are provided with open water (Jones *et al*., 2009; O'Driscoll and Broom, 2011), provision of open water, and providing different levels of body access, including full body, has not been conclusively reported to affect negatively the health or productivity of ducks.

Liste *et al*., (2012b) conducted one of the most comprehensive studies examining the effect of open water on duck health and production. In this commercial-scale study, individual flocks of Pekin ducks were provided with access to either narrow troughs (head only access to water), wide troughs or baths (both providing full body access). All facilities were provided from 21 days of age, placed on raised perforated plastic flooring over drainage areas, and emptied and cleaned out twice daily. The ducks were reared at a stocking density below 17kg/m^2, and assessed for a wide range of important health and production parameters, including mortality, walking ability and nose, eye, feet and feather condition. For all the open water facilities, mortality levels were below 5%, demonstrating provision of open water does not have a negative effect on production compared with industry norms of 5.2% (range 2.6 – 9.9%) (Jones and Dawkins, 2010). These results were comparable to those in another study that examined mortality levels for ducks reared with access to either bell drinkers, troughs (head only access) or baths (O'Driscoll and Broom, 2011). After examining the results for all the health and production parameters assessed, Liste *et al*. (2012b) concluded: *"Properly managed open water did not have any major negative effects on the health or production of commercial Pekin ducks."*

In particular, it is the high bacterial counts and the presence of harmful contaminants that can build up in the water that has been reported to be a major concern to some producers, as ducks can consume this dirty water. However, although the water can become contaminated with, for example, feed, faeces and dirt, leading to high values of microbiological contents (Liste *et al*, 2013), in the commercial-scale study cited above, no overall negative impact on bird

health was observed between the facilities examined despite water quality being considered poor for all the open water facilities (Liste *et al*., 2012b). This is supported by other studies, where no negative effects on duck health, mortality or performance have been found to be associated with the provision of open water (Kuhnt *et al*., 2004; Jones *et al*., 2009; Bergmann *et al*., 2011b). Also, it is expected that if microbiological examination of the house flooring or bedding were examined, then the levels of harmful bacteria found would likely exceed those found in open water and the ducks would be subjected to these high bacterial levels when preening. Furthermore, Heyn *et al*. (2012) examined water quality (total germ count and Enterobacteriaceae levels) in nipple drinkers, large bell-type drinkers and nipple drinker cups, and found the worst results in the nipple drinker cups. They also concluded that: "The general argument that the use of open water drinking systems is detrimental to animal welfare and health therefore cannot be confirmed." If the bacteriological quality of water in open water facilities was considered a factor that did need to be addressed then water quality could be significantly improved by adding anti-bacterial supplements to the water (van Krimpen and Ruis, 2011).

In addition, there is no clear evidence to indicate water quality deteriorating overall with an increasing level of body access (Liste *et al*., 2013). In a commercial-scale study, ducks were provided with access to either narrow troughs (head only access to water), wide troughs or baths (both providing full body access), and a large number of important chemical, physical and microbiological water quality parameters were measured. There was no significant difference between the baths and narrow troughs for most (i.e. seven out of 11) of the parameters assessed (Liste *et al*., 2013), and only one of the three bacteriological parameters was marginally higher for the baths compared to the narrow

troughs, whilst one of the chemical parameters was higher for the narrow troughs compared to the baths. Although water quality was considered poor for all facilities, water quality was generally the best for the wide troughs, but water usage for this facility was approximately twice as high as both the narrow troughs and baths, suggesting the improved water quality was due to the greater throughput of clean water. This study concluded that open water facilities that have been designed to prevent full body access, e.g. narrow troughs, have no clear advantage in improving water quality (Liste *et al*., 2013).

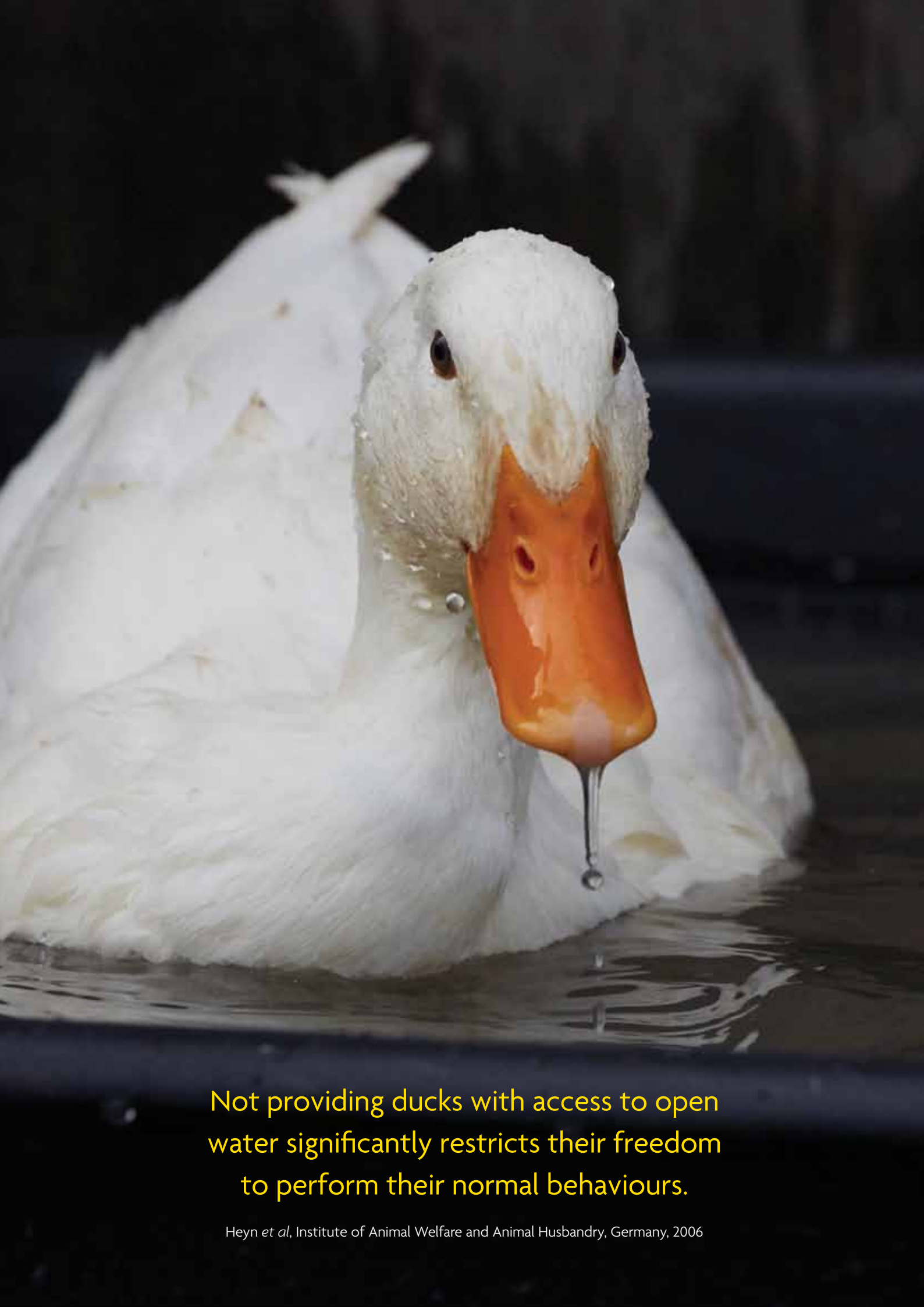
Open water and behaviour

Access to open water is a necessary requirement for ducks to perform many of the behaviours that form part of their normal species-specific behavioural repertoire (Heyn *et al*., 2009; O'Driscoll and Broom, 2012). For example, ducks require open water to perform key water-related activities, such as dabbling, head-dipping and wet preening (Rodenburg *et al*., 2005; Bergmann *et al*., 2011). Therefore, not providing ducks with access to open water significantly restricts their freedom to perform their normal behaviour (Heyn *et al*., 2006b).

When given access to open water, ducks will spend a large proportion of their time engaged in water-related activities and spend more time in bathing behaviours (Jones *et al*., 2009) and perform higher levels of preening behaviour compared to when no open water is available (Ruis *et al*., 2003; Bulheller *et al*., 2004). In one study, where Pekin ducks were provided with pools, they spent on average 8.5 hours (36% of their time; range: 18–54%) performing water-related activities (in the pools, at the pool sides and with open water drinkers) and 2.1 hours per day (9% of their time; range: 2–16%) inside the pools (Liste *et al*., 2012). The ducks bathed on average 6.8 times per day, with each bathing bout lasting 28 minutes (range 4–52 minutes), which equated to three hours per day spent specifically performing bathing behaviours. Similarly, research by Jones *et al.* (2009) found that ducks spent an average of 22% of their time in water-related behaviours when provided with baths. Commercial free-range ducks that had access to a pond during the day spent 12% of their time on the pond (Cooper, 2010), which was about the same amount of time they spent walking. However, it was not stated how much time the ducks spent engaged in other water-directed behaviour from the water's edge. It has also been reported that ducks perform bathing bouts at a constant frequency throughout the day without any specific peaks of activity (Liste *et al*., 2012). Consequently, studies have shown that limiting the amount of time ducks have access to open water facilities (to two, four, six or eight hours per day) leads to a more intense use of the facilities per unit of time (Heyn *et al*., 2006; Heyn *et al*., 2009).

The intensive interaction with open water shown by domesticated ducks clearly demonstrates they still have a high affinity to open water (Heyn *et al*., 2006b). This is so much so that when ducks are not provided with open water this can lead to the performance of abnormal behaviour, such as head shaking and stereotypic feather preening, indicating a poor state of welfare (Rodenburg *et al*., 2005). The occurrence of such behaviours, which often occur in the absence of an appropriate resource, have been well documented in other poultry, such as laying hens when deprived of the opportunity to nest or dust bathe (Duncan, 1970; Koene *et al*., 2001). Denying hens the opportunity to perform innate behaviour can cause frustration (Duncan, 1970; Koene *et al*., 2001) and lead to suffering (Vestergaard *et al*., 1990), and the motivation to perform such behaviours remains high – only being reduced when provided with a suitable resource to fulfil this behaviour.

Several studies have shown that easily accessible open water, in the form of troughs, baths or even showers, promotes the display of natural bathing behaviours (Heyn *et al*., 2006; Waitt *et al*., 2009; Jones and Dawkins, 2010b; O'Driscoll and Broom, 2011; O'Driscoll and Broom, 2012). However, ducks have demonstrated a greater preference for facilities that allow an increased level of body access to water (Cooper *et al*., 2002). In a study by Cooper *et al*. (2002), Pekin ducks had to traverse a barrier of increasing height to access facilities that permitted different levels of body access to water: nipple drinkers, bell drinkers

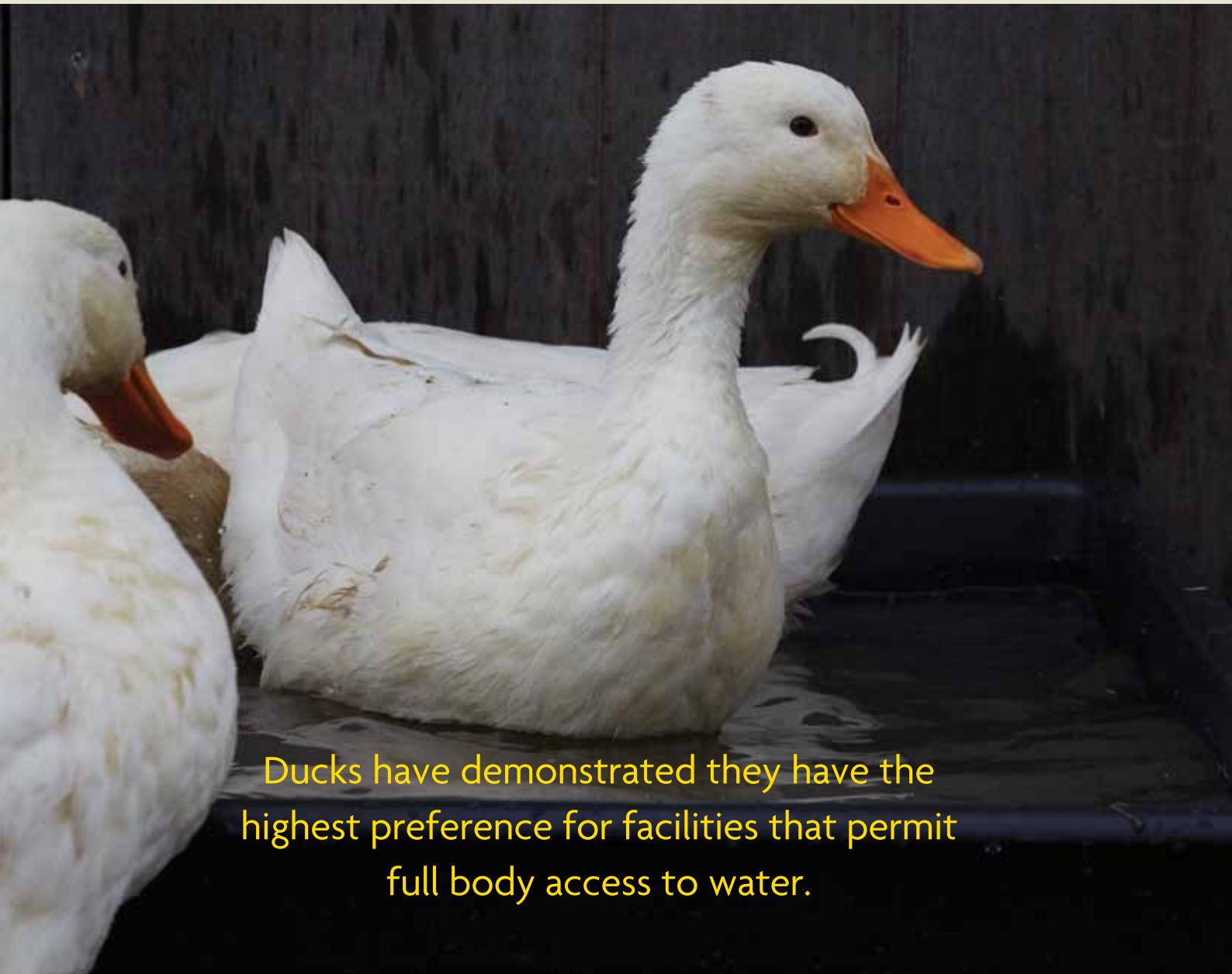


Not providing ducks with access to open water significantly restricts their freedom to perform their normal behaviours.

Heyn *et al*, Institute of Animal Welfare and Animal Husbandry, Germany, 2006

(narrow and wide) and troughs (10cm wide). Ducks paid a higher price, i.e. traversed a higher barrier, for access to troughs than to bell drinkers and would only cross the lowest barrier to access the nipple drinkers. Also, in terms of both number of visits and time spent with each resource, the ducks showed the highest preference for troughs and the lowest preference for nipple drinkers. This clearly demonstrates the motivation of ducks to seek access to facilities that enable them to perform a wider range of water-related activities which, in this study, was troughs. Such studies, where the strength of motivation for a resource is found to be high, demonstrate the resource's importance and value to the animal. Thus, access to water where a greater range of water-directed behaviours can be performed appears to be important to ducks.

Other studies have also shown that ducks have a greater preference for facilities that allow an increasing level of body access to water. When comparing nipples, wide-channel bell drinkers and troughs, where the amount of space allocated per bird was approximately the same, troughs attracted the most ducks to use the resource at any one time, followed by wide-channel bell drinkers and then nipple drinkers (Jones and Dawkins, 2010b). Similarly, it has been shown that as the level of body access increases, ducks spend more time in water-related activities (Graham and Sandilands, 2008) and perform more water-directed behaviour. For example, ducks spent more time (52% v. 33%), and performed more water-related activities with troughs compared to bell drinkers (Cooper, 2008). Finally, ducks with access to troughs have been reported to demonstrate less frustration than those with bell drinkers (Cooper, 2008).



Ducks have demonstrated they have the highest preference for facilities that permit full body access to water.

Why full body access?

Preference

Nipple drinkers and facilities that provide head-only access to water alone are not suitable for ducks to perform certain water-related behaviours (Cooper and McAfee, 2001). Ducks have shown that they want open water facilities – where they can easily and freely cover their bodies with water – more than they want other forms of water (Jones *et al*., 2009). As such, ducks have demonstrated they have the highest preference for facilities that permit full body access to water over all other forms of open water that restrict the level of body access to head only, such as bell drinkers and narrow troughs (Ruis *et al*., 2003; Ruis and van Krimpen, 2011; van Krimpen and Ruis, 2011). Thus, the evidence indicates that full body access to water, where a wider range of water-directed behaviours can be performed more freely and fully, is important to ducks (O'Driscoll and Broom, 2012). This has been acknowledged by the Council of Europe (1999) in their recommendations concerning domestic ducks which state that full body access to water is necessary for ducks to fulfil their biological requirements (Article 11, 1 and 2).

Health

Research has shown that the best health scores for plumage and nasal condition can be achieved with baths, which provide full body access to water, compared with troughs or bells that limit the level of access to head only (Knierim *et al*., 2004; Jones *et al*., 2009; O'Driscoll and Broom, 2010; O'Driscoll and Broom, 2011). This is because full body access to water is likely to promote more effective preening behaviour (O'Driscoll and Broom, 2012), which results in plumage that is cleaner and in better condition (Ruis *et al*., 2003; O'Driscoll and Broom, 2011). Also, when mortality levels were examined for ducks reared with access to either bell drinkers, troughs (head only access), or baths, the average mortality for ducks reared with baths was the lowest: baths 1.6, bells 2.8, and troughs 4.2% (O'Driscoll and Broom, 2011).

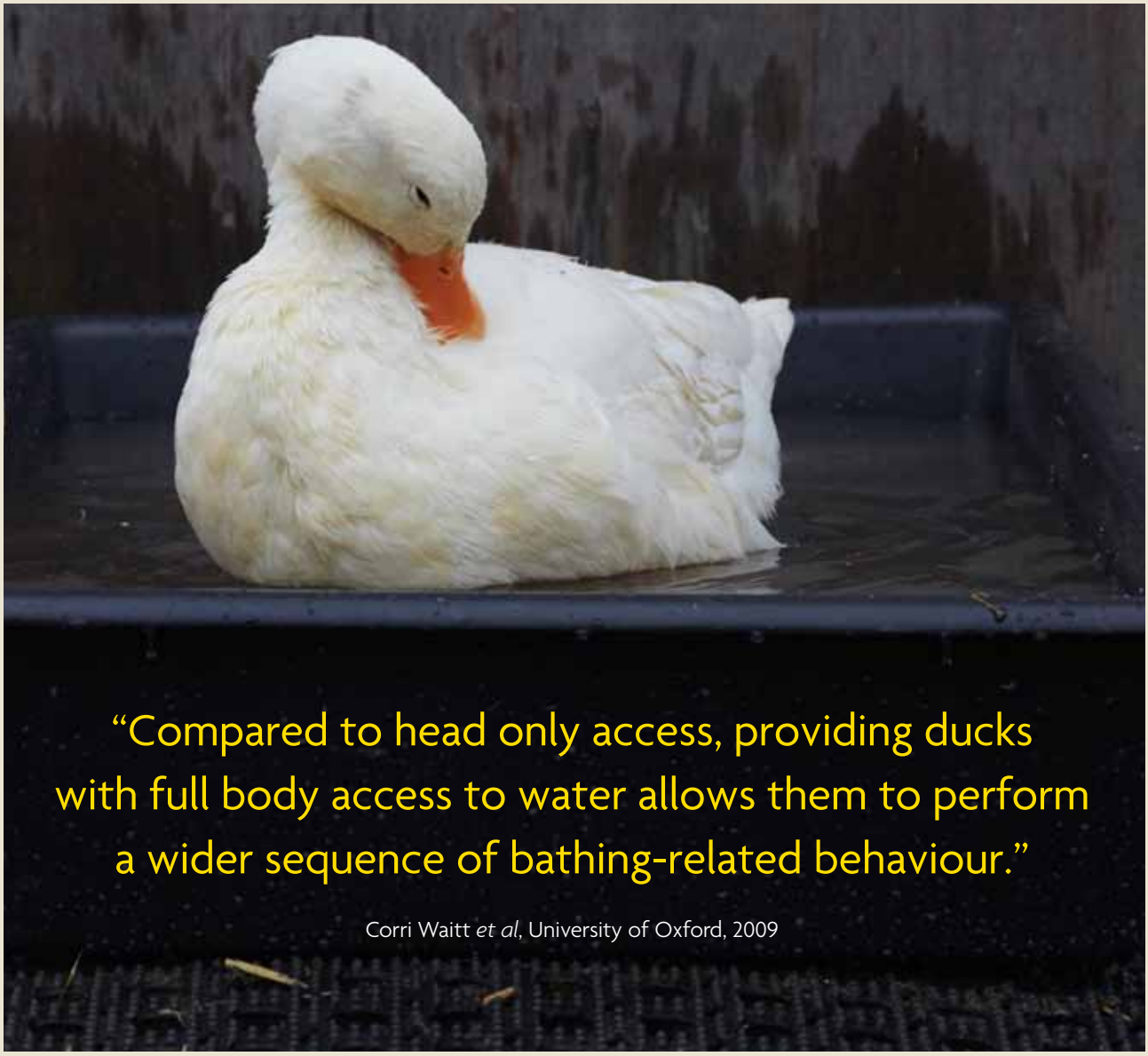
Behaviour

Ducks are more active as the level of body access to open water increases, resting the most when reared with nipples (66%) and the least when reared with baths (52%), with resting levels being intermediate when provided with troughs (59%) (Jones *et al*., 2009). Similarly, when provided with baths, ducks spent less time idling, i.e. more time in active water-directed behaviours, compared to those with troughs and bell drinkers (both narrow and wide) (O'Driscoll and Broom, 2012).

When ducks were given free access to a bath, shower and trough, ducks spent more time with the shower (Jones *et al*., 2009). However, when the behaviour of the birds was examined, there were clear differences in the way the ducks were using the resources. The additional time at the shower was spent resting, whereas most bathing behaviour was performed at the bath, followed by the shower, then the trough (Jones *et al*., 2009), indicating ducks prefer to perform bathing behaviours from a bath.

Compared to head only access, providing ducks with full body access to water allows them to perform a wider sequence of bathing-related behaviours (Waitt *et al*., 2009). This is because facilities that allow head only access to water can hinder, as well as restrict, the performance of water-related behaviours. For example, it has been reported that more head dipping, head tossing and wing rubbing took place at troughs compared to baths because the troughs limited the amount of water that a duck could toss over its body in one movement of the head (Waitt *et al*., 2009). Baths have also been shown to better

Ducks with full body access to water have shown to have better eye, nasal and plumage condition than those that have head only access to water.



"Compared to head only access, providing ducks with full body access to water allows them to perform a wider sequence of bathing-related behaviour."

Corri Waitt *et al*, University of Oxford, 2009

promote bathing behaviour over other types of open water resources that restrict the level of body access: the proportion of ducks preening and head dipping at an open water facility was highest for baths (c.40%) and lowest for bell drinkers (c.21 and 25% for narrow and wide bell drinkers, respectively) with troughs being intermediate (c.33%) (O'Driscoll and Broom, 2012).

Maintaining contact with water during pauses in bathing and when resting, which is not possible with facilities that allow head only access, is something that has also been reported to be important to ducks (Waitt *et al*., 2009). For example, when provided with access to both baths and troughs simultaneously, ducks spent more time with the bath than the trough (22% v 15% of time) (Waitt *et al*., 2009), whereby they were able to incorporate resting periods on the water. Similarly, ducks reared with access to baths spent more time resting with their water source than ducks reared with troughs, and ducks were not observed resting in association with nipple drinkers (Jones *et al*., 2009).

Finally, the provision of a water resource that permits full body access appears to promote efficiency of both drinking-related and preening behaviours (O'Driscoll and Broom, 2012).

Do ducks need to swim, and how deep should water be?

The requirement for ducks to have access to water for swimming has not been examined to any great extent and, as such, there is limited research available to inform an evidence-based view on whether this is something that should be provided. Some studies have investigated the preference of ducks for pools of different depths, with some pools being deep enough to allow swimming (Knierim *et al*., 2004; Jones *et al*., 2009; Waitt *et al*., 2009), but these studies were not designed in a way that allowed clear conclusions about preference for swimming to be made, as they compared water resources that substantially differed in various other physical dimensions. Although some researchers have claimed that it may not be necessary to provide ducks with swimming water in order for them to take proper care of their bodies (van Krimpen and Ruis, 2011) this does not mean that ducks do not want access to swimming water to fulfil other, for example behavioural, requirements.

Perhaps the most insightful paper exploring this issue to date is that of Liste *et al*. (2012), who investigated the preference of ducks for water of three different depths: 10cm, where ducks could stand but not swim; 20cm, where ducks could stand and swim; and 30cm, where ducks could swim but not stand. No difference was found between the usage of 10cm and 20cm deep pools, in terms of the number of visits and the total time spent in and around each pool, but ducks mainly chose to use the 10cm over the 30cm deep pools. Overall, 64% of all bathing bouts occurred in the shallow water (10cm), whilst 36% occurred in the deeper water: 20% in 20cm and 16% in 30cm. Therefore, 84% of all bathing bouts occurred in water that was 10cm or 20cm deep. The research concluded that there was no evidence of a preference for deep water where ducks could swim, but instead there was an overall preference for shallower water, but this was not definitive. This is supported by another study that also found ducks spent very little time swimming when given the opportunity (average 0.04% of their time; range: 0–0.19%) (Jones *et al*., 2009). It was shown, however, that ducks prefer different depths of water to perform different behaviours: ducks performed more sitting and floating behaviour and spent more time walking or swimming in the deeper pools, whilst more time was spent standing and dabbling in the shallowest pools.

- To adequately perform their water-related behaviours, ducks should be able to **enter** water that is deep enough for them to fully immerse their heads.
- Water that is at least 10cm deep, but not too deep that it is not possible to stand, appears to be most important to ducks.

What appears to be most important to ducks is to be able to enter water that is deep enough for them to fully immerse their heads and adequately perform their water-related behaviours, i.e. 10cm, but not so deep that it does not allow them to stand, e.g. 30cm. However, facilities that have a variable water depth that gradually increases from 10cm up to 20cm, or possibly 30cm, may represent the best option for ducks to allow them to perform the broadest range of water-related behaviours. This perhaps reflects the natural situation, e.g. ponds and lakes, where water is typically of a variable depth – shallower at the edges and increasing in depth towards the centre.

The results of this research would also, to some extent, be consistent with what has been observed in wild ducks. Wild mallards use deeper water for several reasons, including protection from predators, foraging, transportation and mating (Liste *et al*., 2012). However, they spend much of their time in shallower water, at the water's edge, performing social behaviours, feeding, resting, and parts of the bathing sequence, such as shaking movements, wing and leg stretches, bill dipping, dabbling and oiling (McKinney, 1965). As these behaviours are performed in shallower water, this suggests that being able to stand in open water is preferable to perform them (Liste *et al*., 2012).

What about showers?

The results from studies examining the use of showers by ducks and their effectiveness in enabling ducks to perform and fulfil their water related activities is mixed (Ruis and van Krimpen, 2011; van Krimpen and Ruis, 2011). Some studies have reported that ducks rarely use showers when provided (Kuhnt *et al*., 2004), whilst others have reported that showers match baths in terms of their provision of open water for the expression of bathing behaviour (Jones *et al*., 2009; Waitt *et al*., 2009). However, the latter assertion was based on baths which contained deep water (25cm) and, as it has been shown that ducks have a preference for shallower water in which they can stand (Liste *et al*., 2012), the results of those studies may have been heavily influenced by this factor. Furthermore, the ducks in those studies actually performed most bathing behaviour at the baths, but spent more time at the showers where they could maintain contact with the water when resting, which has been reported to be important to ducks (Waitt *et al*., 2009).

Clearly, there are also some behaviours that ducks are not able to perform, or at least perform as well, with a shower compared to an open body of water, such as head dipping (Benda et al., 2004; Waitt et al., 2010b). In one study, where ducks were given access to baths after they had access to showers only, they showed high levels of drink-dabble behaviour and more activity, indicating some behaviours were not being fully fulfilled by the showers (Jones et al., 2009).

There are also perhaps more challenging logistical problems to overcome when providing showers (Waitt et al., 2009), such as containing the free flowing water, minimising water wastage, and limiting its negative impact on air quality, i.e. humidity, especially if used within the house, which make them a less practical and viable option for providing an open source of water.

Open water management

Delivery of good farm animal welfare can sometimes involve striking a balance between behavioural opportunities and animal health. However, in this case, both behaviour and health-related needs can be met, since providing properly managed open water has been shown to improve behavioural opportunities as well as health, such as eye, nostril and plumage condition. Although providing access to open water can have a detrimental impact on water quality, as ducks will use the water to clean themselves, the potential health risks relating to this can be avoided through implementing good management practices. Thus, both behavioural opportunities and health are maximised and consequently a good level of overall welfare is achieved.

A number of producers have been providing a variety of open water facilities to ducks for many years without cause for concern. The view held by some producers that open water has a negative impact on bird welfare may therefore be a result of not fully implementing the necessary management practices required when providing open water. The weight of factual evidence demonstrates that it is in fact a lack of water that adversely affects duck health (see Open water and health section on page 21). However, open water facilities must be managed properly to minimise any potential risks of harm.

Placement

Maintaining litter quality is an important aspect of maintaining the correct environment for the welfare of ducks (Jones and Dawkins, 2010), and this has been recognised by the Council of Europe (1999) in their recommendations, which state that ducks: *"shall be provided with adequate litter maintained as far as possible in a dry, friable state"*. Good litter condition, along with good ventilation, is key to maintaining good body and plumage condition and to reducing mortality in ducks (Jones and Dawkins, 2010). Dry litter is particularly essential for good leg health (Raud and Faure, 1994), as walking ability has been shown to deteriorate with increasing litter moisture (Jones and Dawkins, 2010).

Placing water facilities directly on or over the litter can create negative environmental conditions, such as wet litter and increased ammonia concentrations, which can have a negative impact on duck production

(Allison, 2009; Erisir *et al*., 2009) and welfare (Raud and Faure, 1994; Jones and Dawkins, 2010; Heyn *et al*., 2012; Liste *et al*., 2012b). This includes facilities that provide even limited access to water, i.e. nipple drinkers and bell drinkers, which have been shown to result in litter moisture levels above the 40% limit recommended for best duck health (48.4 & 53.0%, respectively. O'Driscoll and Broom, 2011) (Jones and Dawkins, 2010). Also, it is considered good practice to empty the water facilities twice daily (Liste *et al*., 2012). When facilities are placed on the litter it is this cleaning out that is likely to have the greatest detrimental impact on litter quality if the water is emptied directly onto the litter.

The management of open water facilities, especially with regard to their placement, is therefore an essential consideration in order to avoid wet litter and ensure good duck welfare (Allison, 2009; Big Dutchman, 2014; Liste *et al*., 2012b). As such, it is advised that open water resources are positioned over a properly constructed drainage area, such as on slats, to minimise contamination of the bedding with excess water (Bergmann *et al*., 2011b; Big Dutchman, 2014; Heyn *et al*., 2012; Knierim *et al*., 2004; O'Driscoll and Broom, 2011; Simantke, 2002, in Rodenburg *et al*., 2005; Ruis and van Krimpen, 2011; van Krimpen and Ruis, 2011). This is consistent with the following Council of Europe (1999) recommendation: *"water facilities should be constructed over a well-drained area..."*. Providing open water in this way has been shown to improve bird cleanliness, body weight, and result in fewer birds with dirty and blocked nostrils (Knierim *et al*., 2004; O'Driscoll and Broom, 2011).

Other researchers, and some duck producers, have also highlighted the issues associated with placing open water facilities directly on litter and suggested such facilities be placed in dedicated wet areas, that are away from the birds bedded area, and have good drainage, such as in a veranda (Allison, 2009; van Krimpen and Ruis, 2011). Such systems have been described as the most appropriate way to manage open water facilities (Liste *et al*., 2012b). Where producers have provided baths to ducks in this way, they have reported no negative impact on mortality, rejects or production (UK commercial duck producer, personal communication). Welfare benefits have also been shown to exist in

"The management of open water facilities, especially with regard to their placement, is an essential consideration in order to avoid wet litter and ensure good duck welfare. "

Richard Allison, *Poultry World*, 2009

providing access to open water facilities located on the outside of a building (Cooper, 2008), such as the 'veranda concept' of the UK duck production company, Cherry Valley (Allison, 2009).

When open water facilities are placed over properly constructed drainage areas separate from the birds' littered area it has been shown that open water does not adversely affect litter quality, even as the level of body access that ducks have to water increases (Allison, 2009; O'Driscoll and Broom, 2011; Liste *et al*., 2012b). Providing open water in this way was examined in a commercial scale study whereby ducks were provided with access to either narrow troughs (head only access to water), wide troughs or baths (both providing full body access to water) (Liste *et al*., 2012b). In all cases, litter moisture was below the 40% limit recommended for best duck health (range 33.5%–36.9%) (Jones and Dawkins, 2010), and was considerably drier than when nipple drinkers (even with cups) or bell drinkers were provided over litter (48.4% and 53.0%, respectively) (O'Driscoll and Broom, 2011).

One study showed that increasing the level of body access to open water gave rise to better litter condition (Cooper, 2008). Here, bell drinkers and narrow troughs were placed directly over litter. The litter samples taken from the pens with troughs were consistently drier than those with bells (Cooper, 2008). This may have been due to the bells being free hanging and therefore water was more likely to be spilt if they were knocked by the birds. Also, because the design of the bell drinker restricts the birds' level of access to water to a greater extent, more water may have been spilt when the birds were attempting to access and utilise the water to perform bathing behaviours.

The results from the studies cited above illustrate the negative effect that a water resource that permits even limited access to water, e.g. nipple drinkers, can have on litter and therefore the importance of placing all water facilities over a properly constructed drainage area, and not directly on or over the litter (O'Driscoll and Broom, 2011; Heyn *et al*., 2012). Furthermore, it also highlights the inadequate design of bell drinkers as a facility to provide open water to ducks, which is further supported by research showing that placing bell drinkers over straw litter is detrimental to bird health and cleanliness (O'Driscoll and Broom, 2011).

Facility design

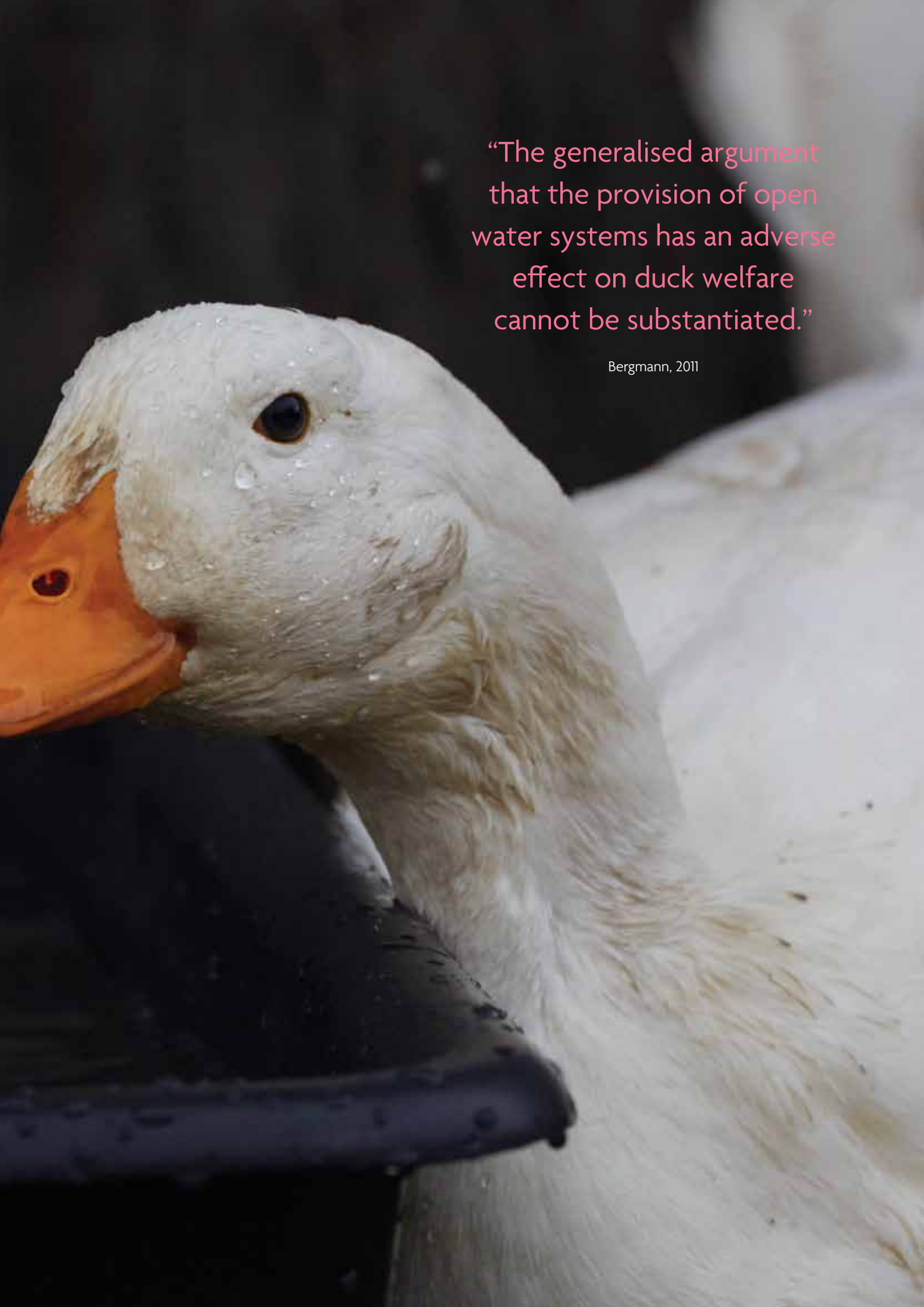
Open water facilities should be of a design that helps prevent water spillage. For example, they should have a slightly angled, outward-facing lip around the top edge of the facility, be sturdy and not free hanging so movement of the water is reduced if knocked, be designed to allow a 5cm gap between the surface of the water and the top of the facility, and be wide enough to prevent a wave effect displacing water when the ducks enter and are active within the facility. Facilities should also allow full body access, so water loss is reduced by birds not having to compensate for restricted access, e.g. by shaking water over the body when standing around the outside of the facility. Furthermore, open water facilities should have a continuous supply of clean water and be self-filling, with the water level being automatically controlled, e.g. by ball-cocks, so that the water level is maintained at the required depth at all times.

Cleaning

Whatever type of open water facility is provided, the water can become very dirty even after a short period of use (Liste *et al*., 2013). Water cleanliness has an impact on bathing behaviour, as it has been shown that ducks prefer bathing in clean water, where they will spend more time (including more time sitting rather than standing) in the water during bathing bouts (Liste *et al*., 2012). It has therefore been recommended that open water facilities are cleaned out and re-filled with water at least twice daily, leaving no more than 16 hours between each clean out (Liste *et al*., 2012). There are more elaborate and effective ways of maintaining good water hygiene by, for example, installing equipment that cleans and recycles dirty water (Knierim *et al*., 2004), including the use of bio-filters (Simantke, 2002), but it is uncertain how financially viable these options are.

Drinking water

When provided with simultaneous access to both baths and bell drinkers, ducks preferred to drink water from the baths. However, when the water in the baths became dirty, their preference switched to the cleaner water in the bells, demonstrating a preference for drinking clean water (Liste *et al*., 2012). Therefore, it is essential that clean drinking water is available at all times and provided as a separate supply from the open water facilities provided for bathing purposes (Allison, 2009). To ensure the drinking water remains as clean as possible, this should be made available via drinkers that restrict as far as possible the level of body access birds have to water (Liste *et al*., 2012). As ducks have also shown to greatly prefer open water facilities to nipple drinkers for their water consumption (Heyn *et al*., 2006b; Cooper and Skinn, 2001; Liste *et al*., 2012), evidence indicates that facilities such as wide bell drinkers or narrow troughs, rather than nipple drinkers, should be provided for this purpose.



"The generalised argument that the provision of open water systems has an adverse effect on duck welfare cannot be substantiated."

Bergmann, 2011

Commercial viability

Providing ducks with access to open water that is appropriately managed has been shown to improve health (see Open water and health section on page 21) and productivity (Reiter *et al*., 1997), and therefore this practice can improve the efficiency and commercial viability of production. In addition, open water can be provided without having a negative impact on litter quality.

Any costs associated with installing the required infrastructure, including water drainage, for the placement of open water facilities should not necessarily all be viewed as additional costs only associated with open water, as such provisions should be incorporated to some extent into all duck housing regardless of the type of water system being provided. Even when nipple drinkers are placed over litter they have been shown to have a detrimental impact on litter quality (O'Driscoll and Broom, 2011) to the extent that is not considered best for duck health (Jones and Dawkins, 2010). Hence, even these 'closed' water provisions should be positioned over well-drained areas, separate from the littered area.

Increasing the level of access to water from head only to full body has been shown to have no significant effect on water usage (Liste *et al*., 2013). In a commercial-scale study, water use was reduced when ducks were provided with full body access to water (baths), compared to when they were provided with head only access (narrow troughs) (1.5 litres v. 1.7 litres per duck per day, on average, respectively. Liste *et al*., 2013). In this study, wide troughs were also examined, which enabled birds to have full body access to water, but provided less room for them to move around freely compared to the baths. Although water usage was approximately twice as high for the wide trough compared to the narrow trough and the bath (3.3 litres per duck per day, on average), the increased water usage was believed to be due to the troughs having exposed ballcocks, which the birds could lean on and press, therefore discharging more water. Also, due to the design of the trough, a wave effect was created when the birds entered and utilised the water, which may have resulted in a greater level of water spillage.

Providing ducks with access to open water can improve the efficiency and commercial viability of production.

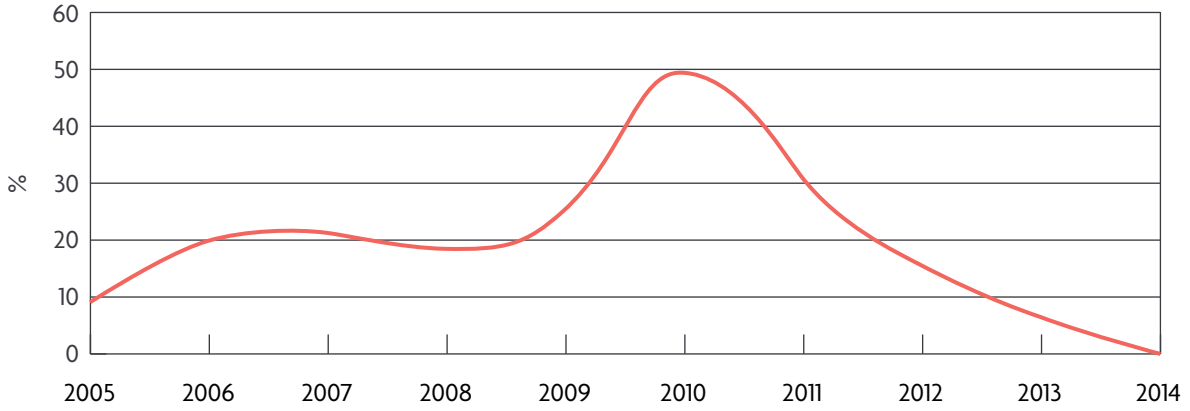
Although it is acknowledged that there may be some additional costs associated with providing open water provisions, such as those associated with disposing of dirty water, some UK producers have provided ducks with access to appropriately managed baths, demonstrating that such a set-up is commercially viable (Allison, 2009).

Duck meat in the UK retail sector

In 2010 around half (49%) of the 13 million ducks farmed for meat in the UK were reared to the RSPCA Welfare Standards for Ducks and therefore provided with full body access to water. These ducks were reared primarily for the UK fresh duck meat market under the Freedom Food scheme.

However, over the last five years there has been a significant decline in the number of ducks reared to RSPCA standards with no ducks being reared to these standards by the end of 2014 (Graph 1). The start of this decline coincided with the launch of the duck industry's own standards in 2010 (Red Tractor standards), which have significantly less stringent requirements regarding the level of access birds have to open water – head only and not full body.

Graph 1: Market penetration of Freedom Food duck as percentage of UK flock year on year.



Gressingham Foods, which is the main producer of fresh duck meat for the UK market and once produced a significant number of ducks according to the RSPCA Standards, adopted the industry standards for its own duck production and eventually ceased rearing ducks to the RSPCA Standards. As Gressingham Foods is the dominant supplier of fresh duck meat to UK retailers, retailers have reported that they are unable to source UK duck meat reared to the RSPCA higher welfare standards.

It is very difficult for consumers to find any meat from ducks reared to welfare standards that the RSPCA would find acceptable. So, unless they can be confident that this is the case, they are strongly encouraged to avoid buying duck meat due to the welfare concerns associated with poorer rearing conditions.

Consumer demand for higher welfare duck

A report by Kantar (2011), found that duck meat was most frequently purchased by a group of consumers who were affluent, post-family and aged 45+ earning more than £30,000 a year. For this group of consumers, price is not so important and they seek out premium products and are willing to pay for them.

Animal welfare is an issue of growing importance among more and more consumers. A recent report by QA Research (2013) found farm animal welfare was important for 79% of shoppers when deciding which food products to buy. However, for the key group of consumers who buy duck meat, animal welfare is of above average concern and it is considered either 'important' or 'very important'.

In a retail setting, duck is seen as a premium product and mainly purchased by affluent shoppers in which price is not so important.

Based on this primary consumer group for duck meat, there is an opportunity that any associated costs with providing farmed ducks with full body access to water can be added to the price of duck, as has been done in the past.

In fact, in a retail setting, duck is seen as a premium product and consumers assume it's reared to higher welfare standards (Forster, 2011). There is a risk that if this group of consumers are made aware that ducks are farmed in systems without full body access to water, they will not associate the meat as a quality and higher welfare product and may stop buying it.

The key group of duck meat buyers are willing to pay more for a higher welfare product. With duck assumed to be premium meat, the costs of providing those ducks with full body access to water can be absorbed by the cost of the meat.

Retailer case study

Although it is not currently possible for retailers to source Freedom Food labelled duck meat (see 'Duck meat in UK retail sector' section, above), in 2009 a major retailer introduced Freedom Food labelled duck meat into their stores and gradually increased this offering across their own-brand range. During a three year period the retailer saw a 222% increase in sales of Freedom Food labelled duck meat, clearly demonstrating both a demand for higher welfare duck meat and that providing ducks with full body access to water is a commercially viable practice.

- In 2010, around 50% of the ducks reared for the UK market were from farms required to provide full body access to water.
- Animal welfare is important to consumers when choosing meat products.
- Duck meat is seen as premium product and mainly purchased by affluent shoppers.

Legal requirements and government recommendations

Since 1999 the devolved national governments within the UK have had authority over various levels of farm animal welfare legislation. Although there is no specific or explicit legal requirement to provide ducks with access to open water, the need to provide open water to ducks has been acknowledged at a government level, as well as by the UK duck industry in their own assurance scheme standards for ducks. The government's recommendations concerning domesticated ducks, published in 1999, state: *"Consideration should be given to the provision of water troughs which are deep enough to allow the ducks to get their heads completely under water"* (MAFF, 1999. Paragraph 38). This is similar to the wording within the UK duck industry's assurance scheme standards, which state that ducks must be able to cover their heads with water (Red Tractor, 2012). A later re-draft of the government recommendations document, which was circulated for consultation in 2004, but has yet to be put before the UK Parliament for consideration in England, further recognised the biological need to provide ducks with open water. This time they stated: *"...water for bathing can assist ducks in meeting their biological requirements"*, and through the use of the term *'unlimited access'* insinuated that this referred to providing ducks with full body access to water (Defra 2004, paragraphs 53 and 54). However, the subsequent wording for this recommendation went on to state that ducks "should" be provided with head only access to water, and therefore considered this more limited level of body access to be acceptable.

The wording of the Council of Europe (1999) recommendations go further, and state that the duck's environment must: *"allow for the fulfilment of essential biological requirements, in particular in respect of water..."* (Article 11, 1), and that: *"Access to... water for bathing is necessary for ducks, as water birds, to fulfil their biological requirements"* (Article 11, 2). Here, they also explicitly characterise bathing as providing full body access to water (Article 11, 2). The Council of Europe recommendations are of significance to the UK situation, as once a member state ratifies a Council of Europe Convention, it agrees to be bound by it. In 1978, the UK ratified the Council of Europe Convention for the Protection of Animals Kept for Farming Purposes, under which these recommendations were made. Although the recommendations also make reference to providing ducks with head only access to water, they regard this as permissible only where full body access is *"not possible"*.

Furthermore, there is a well-established set of principals which provide a core framework encompassing an animal's basic needs, including when on-farm, which are known as the Five Freedoms (FAWC, 2013). They declare a series of 'freedoms' and implied husbandry requirements, which underlie good farm animal welfare and originated from the government's independent advisory committee on farm animal welfare issues. The Five Freedoms provide widely accepted guidelines to all concerned with the rearing of livestock, as they outline the key elements that need to be addressed if those caring for farm animals are to meet their responsibilities effectively. One of these freedoms is the 'Freedom to express normal behaviour'. If ducks are to express their normal behaviour fully and freely then they should be provided with full body access to water of a sufficient depth.

It could be argued that there are already legal provisions under The Welfare of Farmed Animals (England) Regulations (2007) that could be enforced to require ducks to be provided with bathing water. Section 4 of the Regulations state that in taking all reasonable steps to ensure the general conditions specified within the legislation are complied with: *"the person responsible for a farmed animal must have regards to its... **adaptation** and to its ...**ethological needs** in accordance with **good practice** and **scientific knowledge**"*. Taking each of these key elements in turn:

- **Adaptation:** clearly, ducks are adapted for a life in and around water, and they require open water to perform sufficiently their water-related behaviours, such as head dipping, wet preening, wing rubbing, bathing and different types of shaking movements.
- **Ethological needs in accordance with scientific knowledge:** there is a strong scientific basis for the view that providing ducks with access to open water is important. In summary, researchers have concluded that there is: *"...clear evidence that duck welfare is related to the nature and extent of their access to water."* (Jones *et al*., 2009) and that: *"Pekin ducks have a behavioural need for freely accessible open water"* (Ruis *et al*., 2003).
- **Ethological needs in accordance with good practice:** the RSPCA Welfare Standards have been independently recognised for their unique, primary and explicit focus on animal welfare and being informed by science (FAWC, 2001). The RSPCA Welfare Standards for Ducks could therefore be used to represent good practice.

Thus, the only element that appears to be lacking in ensuring ducks are legally provided with what they biologically require is application and enforcement of these legal provisions.

The Animal Welfare Act 2006 (s9(2)(c) in England and Wales) also places a legal obligation on a person responsible for an animal to take such steps as are reasonable in all the circumstances to provide for the needs of animals to the extent required by good practice. One of the animal's needs includes: *"its need to be able to exhibit normal behaviour patterns"*. As the term 'normal' is generally used to refer to behaviours that are usual, expected or 'natural', in terms of species-specific behaviours (Robertson and Matthews, 2012), and the behaviour of an animal is, in part, a function of its evolutionary history, this legislation perhaps could, again, provide a lawful instrument to enforce the requirement to provide ducks with adequate access to open water, as it is not possible for ducks to adequately fulfil their species-specific water-related behaviours with nipple drinkers, or even narrow channels of open water, such as bell drinkers (Bergmann *et al*., 2011; van Krimpen and Ruis, 2011).

There is, therefore, clear acknowledgement at a government level, by the UK duck industry, and by scientists that ducks should be provided with open water for bathing purposes, and there also appears to be a sound legal basis to require this. However, despite this, ducks can be, and are, reared without access to such provisions. This highlights the need for legal clarity on this issue, and there may be good grounds on which to question why the relevant legislation is not interpreted accordingly. It is also essential that there is legal clarity regarding what facilities should be provided to ducks to ensure they can perform their important water-related behaviours fully and freely.

"It could be argued that there are already legal provisions that could be enforced to require ducks to be provided with bathing water."

Dr Marc Cooper, Senior Scientific Manager, RSPCA.

Summary

Safeguarding and improving animal welfare requires awareness of animal needs and both caring and careful efforts on the part of those involved (FAWC, 2001). In particular, amongst other aspects, it requires appropriate living conditions and the recognition of animals as sentient beings. As such, those caring for farm animals should strive to ensure on farm conditions that provide animals with a 'good life'.

Ducks are waterfowl and demonstrate an innate and behavioural need for open water, being highly motivated to access it. When ducks are provided with open water their behavioural repertoire is enhanced, as is their health and, in some cases, their productivity. In addition, when denied access to open water, ducks can perform behaviours indicative of frustration. As such, ducks' welfare is directly influenced by the nature and extent of their access to water (Jones *et al*., 2009). Access to water for bathing is something that ducks want (Jones *et al*., 2009).

The weight of the evidence suggests that facilities that allow full body access to water, e.g. baths, are more beneficial to duck welfare than those that allow head only or restricted body access, e.g. troughs. In any case, bell drinkers are not considered suitable open water provisions for ducks to perform their bathing behaviours. Being able to enter the water fully and freely offers ducks a greater opportunity to perform a wider range of bathing behaviours, better promotes the performance of water-related behaviours, and improves duck health the most. Ducks also show a stronger preference for facilities that allow a greater level of body access. Furthermore, facilities permitting full body access are no more harmful to duck health compared to head only provisions. Water that is at least 10cm deep, but shallow enough to enable them to stand, also appears to be preferred by ducks.

Open water provisions must be properly managed, i.e. provided separate from the littered area and over good drainage. Provided in this way, and when well managed, open water has been shown not to have any major negative effects on the health or production of commercially reared Pekin ducks (Liste *et al*., 2012b).

It has been acknowledged at a government level, by the UK duck industry and through scientific research that ducks should be provided with open water, and there may be a sound legal basis to require this. However, legal clarity is required on this issue, as well as regarding what should be provided to ducks to ensure they have appropriate facilities that allow them to perform their important water-related behaviours fully and freely.

There is no specific or explicit legal requirement to provide ducks with access to open water. However, there is clear acknowledgement at a government level, by the UK duck industry and by scientists that ducks should be provided with open water for bathing purposes.

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Glossary of terms

Bell drinker: a drinking water facility for poultry. It is a similar shape to a sombrero hat with the drinking water contained in the 'brim'.

Lameness: difficulty walking normally, and can be associated with pain.

Litter: A substrate, usually straw, that is used to cover the floor of the duck house.

Lux: a measure of light intensity, whereby '0' is complete darkness.

Nipple drinker: A drinker provided to ducks which is similar in design to those given to pet rabbits or hamsters, i.e. a suspended metal tube with a metal ball-bearing at the end which, when pressed, releases water.

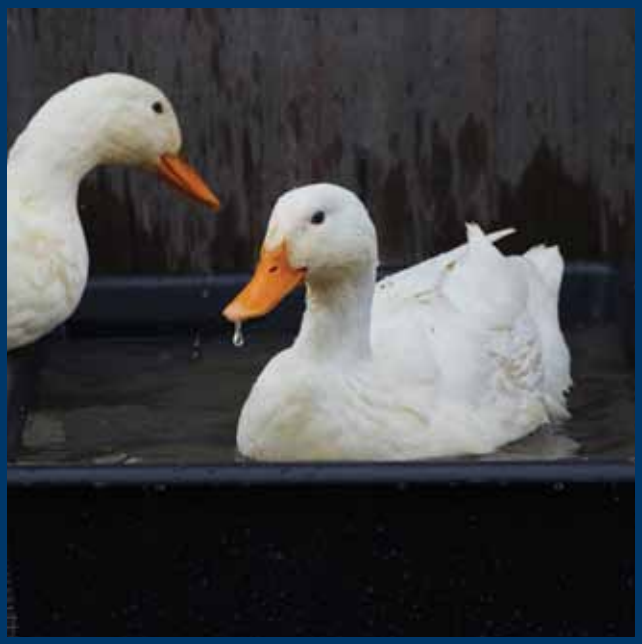
Popholes: doorways along the side of a building that allow birds access to the range area.

Stocking density: refers to the amount of space allocated to each bird and is expressed as total bird weight per square metre. The higher the figure the less space there is available to each bird.

"Full body access to water has been shown to improve the health of ducks and allow them to carry out more natural behaviours."

"We now hope that the UK governments, duck producers and food businesses implement policies that require this important welfare provision for farmed ducks."

Dr Marc Cooper, Senior Scientific Manager, RSPCA



"Being able to enter the water fully offers ducks a greater opportunity to perform a wider range of bathing behaviours, better promotes the performance of water-related behaviours and improves duck health."

Dr Marc Cooper, Senior Scientific Manager, RSPCA

Photographs: Andrew Forsyth/RSPCA and Joe Murphy/RSPCA.

Royal Society for the Prevention of Cruelty to Animals
Wilberforce Way, Southwater, Horsham, West Sussex RH13 9RS
0300 123 0100 www.rspca.org.uk