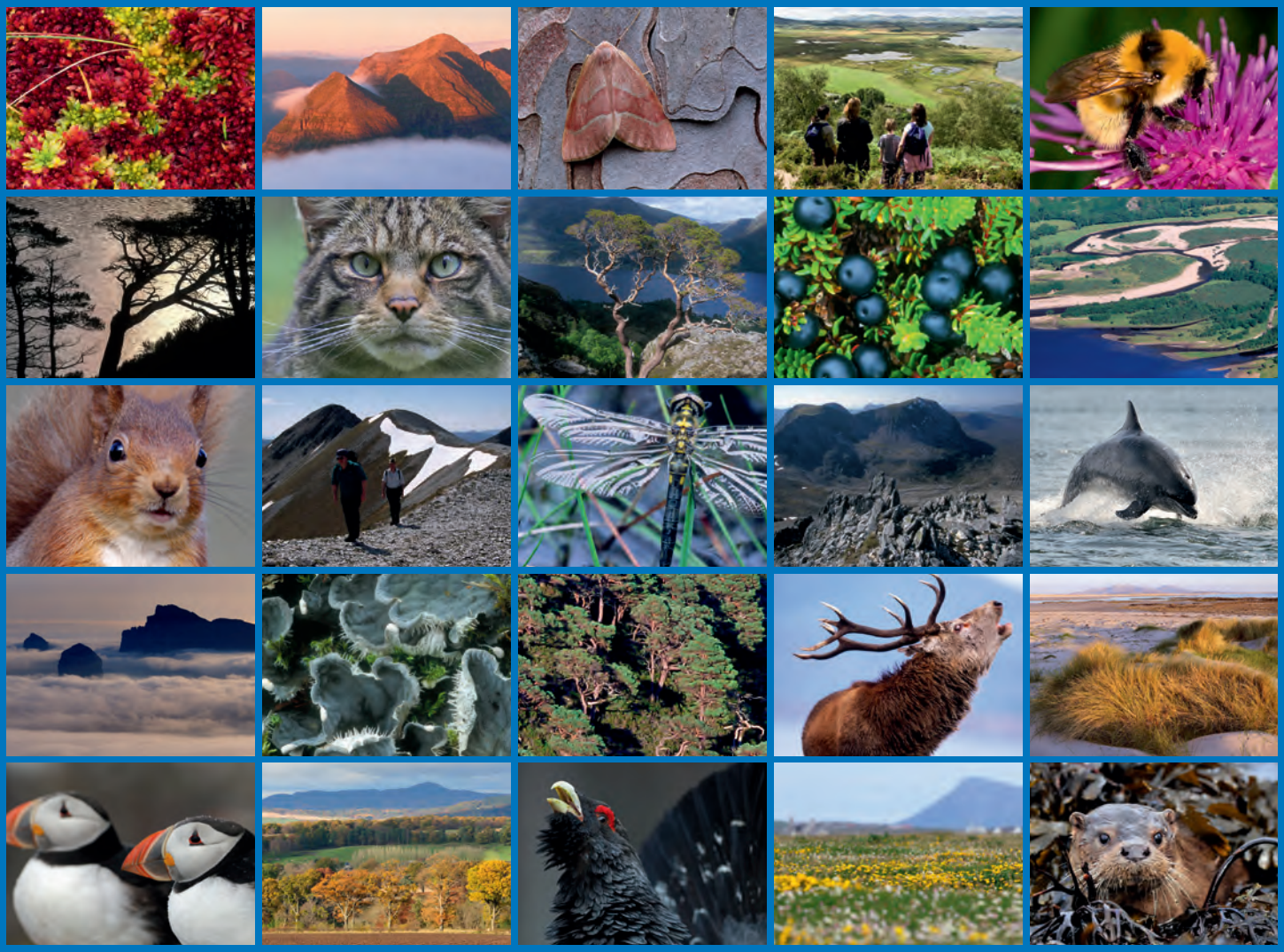
Scottish Natural Heritage
Commissioned Report No. 630

Applying wildlife welfare principles to individual animals



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COMMISSIONED REPORT

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Applying wildlife welfare principles to individual animals

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COMMISSIONED REPORT

Summary

Applying wildlife welfare principles to individual animals

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Background

Welfare of wildlife has increasingly become a focal point for SNH in recent years. SNH has developed a draft position statement on wildlife welfare which sets out essential principles on welfare which the organisation will adopt. This report is presented as part of an extension of such principles in seeking to establish how SNH's welfare principles should be applied at the level of individual wildlife animals.

Main findings

- At any one point in time an individual animal's welfare status lies on the continuum between negative/bad welfare and positive/good welfare.
- Welfare must be considered as more than simply the avoidance of negative states: any welfare concept should extend to embrace promotion of positive status.
- Short periods of 'negative welfare' may be inevitable if these are understood as triggers to release appropriate behavioural or physiological responses to adapt to these challenges.
- A welfare issue arises only when an animal or group of animals have insufficient opportunity (freedom) to respond appropriately to a potential welfare 'challenge' by adaptation and changes in its own behaviour.
- A positive (individual) welfare state would be safeguarded when the animal has freedom to adequately react to the demands of the prevailing environmental circumstances.
- Assessment of welfare should thus focus not so much on the challenges which any animal may face at a given moment but on whether or not the animal has freedom and capacity to react appropriately (i.e. adaptively).
- Because of differences in behavioural repertoire and coping strategies, welfare status may vary considerably between individuals even when exposed to the same environmental conditions.
- Any animal's status must be assessed against its own individual adaptive capacity and can only really be considered in relation to how that status is perceived and judged by that animal itself.

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1. INTRODUCTION

1.1 Background

There has been particular concern over the years about rights and responsibilities in the management of wild deer in Scotland, and in working towards the recent Code of Practice on Deer Management, SNH has been exploring the welfare implications of current management practices through a series of former contracts (e.g. Findlay, 2007). These explorations were however primarily focused on deer and deer management and addressed rather specific issues rather than attempting to establish a more general framework for assessing both positive and negative welfare of wildlife more generally. Welfare of wildlife more generally has increasingly become a focal point for SNH in recent years, with internal discussions culminating in a developing Position Statement on Wildlife Welfare, establishing a series of key principles.

This report is presented as part of an extension of such principles in seeking to establish how welfare principles should be applied to individual wildlife animals. It is intended that this will help SNH promote and support the achievement of positive welfare states in individual wildlife animals. A companion report considers how we may extend these principles to animals within social groups or at the population level (Ohl and Putman, 2013a).

SNH's increased concern with welfare issues is mirrored elsewhere with a general increase in attention to issues of animal welfare and welfare management, especially from the social and political arenas (e.g. Bayvel and Cross, 2010; Ingenbleek and Immink, 2010). Animal welfare scientists have been assigned the task of defining objective and quantifiable parameters for measuring the welfare status of animals under a given set of circumstances. They are expected to provide scientific evidence which allows for solving animal welfare problems as perceived by society. However there is far from general agreement even amongst scientists as to how one might objectively measure the welfare status of any individual animal or the welfare implications of any given management practice.

In this report therefore, through review of published and unpublished materials we seek to provide overview of the current understanding of what constitutes both negative and positive welfare states and secondly, how these may and should be applied to deer and other wildlife. Much of the current literature on welfare or suffering (and indeed the legislation, within UK and elsewhere in Europe) is very context-specific: thus specific to laboratory animals, to companion animals or farm animals. We would propose to explore the common underlying principles and themes, and the extent to which both methods available for the assessment of welfare status and wider views on the responsibility for intervention may be applied to wild animals.

In all such analysis we must also recognise that whatever we may determine objectively or on biological grounds as good welfare is only part of the story and any objectivity in analysis cedes inevitably to the subjectivity of ethical assessment when determining whether any given welfare status is or is not "acceptable" to society. Thus the "translation" of welfare assessments into management practice and the way in which that management practice is viewed by society more widely are both affected markedly by public understanding and public attitudes.

In our treatment here (as in the draft SNH Position Statement) we draw a clear distinction between animal welfare and animal rights. Thus our considerations in the following paper relate only to responsibilities in relation to **animal welfare**; our considerations do not in any way address the rather separate issue of **animal rights** (e.g. Singer, 1989, Haynes, 2011; *inter alia*). Thus, quite explicitly and quite deliberately, we do not address here questions of

whether or not humans have the right to exploit animals for food, to use them as laboratory models, to hunt, or to keep animals as pets. Simply we consider what may be the duty of care and requirements of action to ensure acceptable welfare of wild or more closely managed animals, whatever the (philosophical) debate about rights and wrongs of management in the first place.

2. GENERAL CONCEPTS OF ANIMAL WELFARE

Welfare is relatively rarely explicitly defined; rather there is a general presumption that we implicitly understand what is meant by the term (as also the term 'well-being').The following definitions were extracted from various publications/usages and summarised in an early strategy document prepared within the, then, Deer Commission for Scotland, (Findlay, 2007: a paper prepared at that time to help focus DCS's own further discussion on animal welfare at the individual level).

2.1 Some definitions of welfare

– *'the state of the individual animal in relation to its environment, in particular its response to both pleasant and unpleasant stimuli. Animal welfare thus encompasses an animal's health and general physical condition, its psychological state, its biological fitness and its ability to cope with the environment in which it finds itself'.*
(The Scottish Society for the Prevention of Cruelty to Animals)

– *'welfare can be assessed from observations of: physical state and behaviour and the definition is therefore concern for their physical and psychological well-being'.*
(Draft Best Practice Guide on 'Welfare – Definition and Assessment')

– *Freedom from Hunger and Thirst, Freedom from Discomfort, Freedom from Pain, Injury or Disease, Freedom to Express Normal Behaviour, Freedom from Fear and Distress.*
(Farm Animal Welfare Council)

We may also note the definition on the current SNH website in relation to wild deer (Wild deer welfare: what is it?) that "Welfare is about ensuring the mental and physical well-being (of deer)".

In this paper we will explore further the implications of these initial definitions and try to refine and update them (to deliver new operational definitions in section 6). As is evident within, for example the SSPCA's definition above, there is also some confusion in the literature between concepts of welfare and evolutionary fitness; indeed the concepts of fitness and welfare have even been equated by some authors (see review by Appleby and Sandoe, 2002; see also Jordan, 2005; McGreevy and Bennett, 2010; Brosnan, 2011).

2.2 Fitness and welfare

Others however emphasise that individual fitness and welfare are not the same (Webster, 1994; Dawkins, 1998). Dawkins, as an example, explains that seeking for shelter in mice is of fitness value in nature but not under captive conditions, as the conditions afforded in captivity wouldn't include any predator risk. Nevertheless, she argues, welfare in mice would be improved under captive conditions by providing them with shelter; such a conclusion, implying that an individuals' welfare status might be increased by provision of a resource which no longer contributes anything to fitness, makes it clear that fitness and welfare cannot be equated.

There may, moreover, be other examples arguing against an equation of fitness and welfare: as discussed earlier, by for example Mendl and Deag (1995), a dominant position within a social group is likely to maximize fitness in terms of reproductive success but being of high dominance often means to end up continually being challenged for that key position, thus increasing for example the risk of injury or reducing the time to find sufficient food. Moreover, dominant individuals may be chronically stressed (Sapolsky, 1993; Ohl and Fuchs, 1999) which may result in significant impairment of general welfare (Barnett and Hemsworth, 1990). Thus even if both fitness and welfare are *sometimes* favoured by the same factors

(as in the example of shelter seeking in mice), both are also affected by other - very different - factors and by the same token may at times conflict (Barnett and Hemsworth, 1990; Mendl and Deag, 1995).

We must in fact recognise (after Korte *et al.* 2009) that natural selection exerts genetic benefits by maximising reproductive success of the adapted organisms even at the expense of individual happiness, health and longevity. In effect: if we presume welfare to mean positive or negative "well-being" (e.g. Fox, 1990) then that welfare status may be compromised without affecting the ability to leave offspring (unhappy animals can still reproduce successfully). By converse: even if fitness is compromised in some way and, in consequence, the animal's ability to leave progeny is reduced, this fitness issue is not *necessarily* a welfare issue as animals' ability to carry out behavioural routines that, under natural conditions, may simultaneously enhance fitness.

From all this (and see also review by Mendl and Deag, 1995), it seems clear to us that welfare is not identical to fitness. But following the concept that animal welfare might be defined by the animal's freedom to adapt to changing environmental circumstances (paragraphs 4.3 - 4.7 below), perhaps welfare might depend on the animals' ability to carry out behavioural routines that, under natural conditions, may simultaneously enhance fitness. These considerations of the relationship between welfare and individual fitness are developed further in Ohl and Putman (2013b).

3. TRADITIONAL APPROACHES TO ANIMAL WELFARE

The Brambell Committee's report on (farm) animal welfare of 1965[1] has cast a long shadow. While unquestionably a major advance at the time and heralding a major change of attitude to the management and treatment of livestock animals, there have been many subsequent improvements in our understanding and scientific knowledge, which require some re-examination of the Brambell principles and the concepts of the Five Freedoms. Despite such advances, the Five Freedoms continue to dominate much of welfare practice and welfare thinking nearly 50 years after their original formulation.

In all fairness, the Brambell Committee's report never set out to be a 'welfare concept', but was developed specifically to establish minimum requirements to ensure the absence of negative welfare.

The committee formulated the idea that compromise to animal welfare is avoided if the animals are kept free from:

- hunger, thirst or inadequate food,
- thermal and physical discomfort,
- injuries or diseases,
- fear and chronic stress,
- and were free to display normal, species-specific behavioural patterns.

The first four of the five *freedoms* were formulated from the perspective that the absence of actual negative impact assures welfare; only the fifth, although more indirectly, potentially implied an expectation of facilitation of more positive aspects of welfare.

There have been various reformulations of these essential principles (Webster, 1994; Anon. 2009), including an attempt by Mellor to substitute the concept of "five domains of potential welfare compromise" (Mellor and Reid, 1994. The five domains are defined in terms of: nutrition, environment, health, behaviour and mental state).[2] But these different incarnations change the basis of the construct little and as an instant index, the five freedoms today remain widely used today as a guideline for welfare assessment protocols, with the actual state of welfare of an animal being characterised as unimpaired if it complies with the five freedoms (e.g. Rutherford, 2002; Veissier & Boissy, 2007; Knierim & Winkler, 2009; Mendl *et al.,* 2010). In fact, the five freedoms form the basis for the so-called Welfare Quality Project, which currently forms the backbone of European animal welfare guidelines (http://ec.europa.eu/food/animal/welfare/sum_proceed_wq_conf_en.pdf).

However, we should emphasise that these freedoms were primarily derived in relation to the welfare of farm animals and may only have restricted utility when applied to animals whose environment is less rigorously controlled by human intervention. Except in regard to the fifth freedom, the animal is conceived as undergoing its personal life conditions somewhat passively. This was perhaps legitimate in that Brambell's freedoms were originally developed primarily for application to domestic animals or animals whose environment was otherwise largely controlled by human management, but if these freedoms are to be more widely be applied to the assessment of welfare, including the welfare status of wild, or free-ranging,

[1] Brambell Committee: a technical committee set up by the UK Government in 1965 to inquire into the welfare of animals kept under intensive livestock husbandry systems [Brambell Committee (Report), HC Deb 15 December 1965 vol 722 cc279-80W]

[2] although this latter idea has not been widely adopted (other than by Mellor himself in subsequent publications: (Mellor and Stafford, 2001; Mellor, 2004b; Mellor *et al*., 2009)

animals, then they are somewhat over-restrictive (see review by Ohl and van der Staay, 2012).

More significantly, it is apparent that, although the Five Freedoms were never originally conceived as more than a minimum safeguard to protect the welfare of farm animals, over the years, many have taken them to define what is implied by welfare itself, and taken the provisions of the Five Freedoms to be necessary and sufficient to ensure positive welfare. This is clearly a misinterpretation of their intention.

More recent analyses of animal welfare acknowledge the fact that at any one point in time, an individual animal's welfare status lies on the continuum between negative/ bad welfare and positive/good welfare (e.g. Dawkins, 2008; Yeates & Main, 2008) and continued adherence to the Brambellian focus on the simple avoidance of negative states masks consideration of the fact that in assessing and delivering welfare, we must pay equal attention to those factors which may help promote positive welfare as much as avoidance of negative welfare states.

More fundamentally, a view of welfare which is dominated by an emphasis on the avoidance of negative states neglects the fact that, except in the specific instances where natural selection processes have been largely countermanded by deliberate selection by humans, animals have evolved, optimising the ability to interact with and adapt to (changing conditions within) their environment and that thus exposure to environmental challenge and short periods of 'negative welfare' may be inevitable if these are understood as triggers to release from the animal's repertoire the appropriate behavioural or physiological response to adapt to those challenges (see for example Barnett and Hemsworth, 1990 among others).

More recently a number of authors (see 4.2) have advocated a more dynamic view of welfare which recognises that wild and domestic animals have adaptive responses which enable them in normal conditions to respond appropriately to address some environmental or physiological challenge, to restore a more positive welfare state (except perhaps in those cases where artificial selection may have resulted in loss of some responses from domestic stock).

In such a view, assessment of welfare should therefore focus not so much on the challenges which any animal may face at a given moment but on whether or not the individual possesses the appropriate (behavioural or physiological) responses to adapt appropriately to both positive and potentially harmful (negative) stimuli and has adequate opportunity to express those responses.

Further, this recognition that welfare is in large part a function of an animal's ability to respond appropriately and in some adaptive way to its environmental circumstances makes it clear that we may expect considerable variation between individual animals in their capacity to perceive and respond to apparently idential environmental conditions or challenges, while currently, animal welfare generally is understood as an 'universal' state, that is, a state that would be experienced identically by each individual when exposed to identical conditions.

In the paragraphs which follow, we explore the biological basis of animal welfare and try to develop more biologically-justified protocols for assessment of the welfare status of the individual. We will argue that welfare can only be defined in relation to an animal's own perception of its welfare status or well-being and that thus an individual's welfare status can be assessed by outside observers only in terms of observations of behavioural adaptation to changing environmental circumstances (or lack of such adaptive behaviour). We review the literature which explores the mechanisms by which animals may assess their own well-being

and show that there exists considerable variation in what individual animals may determine for themselves as satisfactory or unsatisfactory in terms of their welfare status in given conditions.

Thus, instead of considering individual welfare as a ‘universal’ or ‘objective’ state under given environmental conditions, we suggest that welfare is the result of a subjective self-assessment, which may vary significantly between individuals. Acceptance of such variation clearly has significant implications for the assessment of animal welfare and when striving to deliver acceptable welfare both at the individual and population level.

4. MORE MODERN APPROACHES TO THE ASSESSMENT OF ANIMAL WELFARE

4.1 Positive and negative aspects of animal welfare

As noted in the previous section, most modern concepts of animal welfare generally recognise that, at any one point in time, an individual animal's welfare status lies on the continuum between negative/bad welfare and positive/good welfare (i.e. well-being) (e.g. Dawkins, 2008; Yeates and Main, 2008).Despite this agreement, the majority of current approaches to safeguarding animal welfare however, still tend to focus on the exclusion of factors that are understood as compromising welfare by being 'negative' for the animal, such as being ill, wounded or stressed.

The majority of animal welfare scientists however agree that this persistent emphasis on the avoidance of negative states is somewhat minimalist - and over-restrictive, in that it ignores the active promotion of positive welfare or well-being and it overlooks the biological functioning of 'negative' experience. Accordingly, in this report we emphasise that welfare must be considered as more than simply the avoidance of negative states but any welfare concept should extend to embrace promotion of positive status (Fraser and Duncan 1998; Boissy *et al.*, 2007; Dawkins, 2008; Yeates and Main, 2008; Mellor, 2012; Ohl and van der Staay, 2012). Further, and again as in section 3 we would argue that, from a more biological perspective, welfare should not be considered as a static, or rather passive status but should be considered in relation to the adaptive capacity of the animal or animals concerned.

4.2 An adaptive view of animal welfare

The idea that animals have generally evolved adaptations to their environment, optimising the ability to adapt to changes within that environment through the expression of a variety of physiological and/or behavioural responses, was first applied within a welfare context some 3 decades ago (see for example Dantzer and Mormede, 1983; Broom, 1988; Barnett and Helmsworth, 1990) and has more recently been championed by (for example) Duncan (1993) Fraser *et al.* (1997), Fraser and Duncan (1998) Korte *et al.*, (2007) Ohl and van der Staay (2012) among others. In such a concept, the animal's welfare is not at risk as long as it is able to meet environmental challenges, i.e. "when the regulatory range of allostatic mechanisms matches the environmental demands" (Korte *et al.*, 2007).

Despite the fact that this idea was first mooted some years ago, it has taken some time for the concept to be more generally adopted, and it is still by no means universally reflected in the literature. However, many now do advocate this more dynamic view of welfare, with the implication that a welfare issue arises only when an animal or a group of animals have insufficient opportunity (freedom) to respond appropriately to a potential welfare 'challenge' through adaptation by changes in its own behaviour (e.g. Broom, 2006; Korte *et al.*, 2007; Ohl and van der Staay, 2012).

On this basis we may then suggest that a positive welfare state would then be safeguarded when the animal has the freedom adequately to react to the demands of the prevailing environmental circumstances, resulting in a state that the animal itself perceives as positive. In such a view, assessment of welfare should therefore focus not so much on the challenges which any animal may face at a given moment but on whether or not the animal has the freedom and capacity to react appropriately (i.e. adaptively) to both potentially positive and potentially harmful (negative) stimuli (Ohl and van der Staay, 2012).

As noted, this view is NOT necessarily embraced by all commentators and, in the interests of balance within this review, it is important to emphasise that some authors still adhere to the more traditional views of welfare enshrined in various modifications of the Brambellian

freedoms. However, these more adaptive approaches are gaining ground and in truth do represent a more biological basis for considerations of welfare status.

In passing we may note, as Broom (2006): “A key point concerning the concept of individual adaptation in relation to welfare is that welfare may be good or poor while adaptation is occurring”. By extension, this implies that welfare should not be considered as an instantaneous construct to be assessed at some moment in time. An adaptive response may take some finite period of time; **crucially therefore our assessment of welfare not simply consider the status of any individual at a given moment in time, but needs to be integrated over the longer time periods required to execute such change.** We will return to this point later.

4.3 Welfare as the animal’s own perception of its status

A further problem implicit in standard methods for objective assessment of welfare status is that such protocols inevitably reflect the observer’s perspective and subjective judgement, whereas most modern commentators would now acknowledge that to some significant degree, any animal’s status must be that perceived and judged by that animal itself (Duncan, 1993; Fraser and Duncan, 1998; Broom, 2006; Taylor and Mills, 2007; Nordenfelt, 2011; Webster, 2011). It is perhaps self-evident that if some animal is perceived by the observer to be in a negative welfare status, but has opportunities (correct behavioural repertoire, appropriate environmental conditions) to improve its status, yet fails to take that action, then it may simply perceive its own status as satisfactory.

Instead of approaching individual welfare as a ‘universal’ or ‘objective’ state, therefore, we suggest that, to the animal itself, welfare is the result of a subjective self-assessment, and recognise that, importantly, that may vary between individuals even within a species or single-species group (Ohl and Putman, 2013c).

In effect the ‘decision’ by any individual animal to accept its current status or to engage in behaviour designed to bring about some change of status must in part be determined by an assessment of physiological condition (hunger, thirst etc.) but also by an assessment of a sense of ‘well-being’. It is clear that emotions play an important role in this assessment and in the performance of adaptive behaviours. There is a growing literature to suggest that much of the function of emotion or emotional status may indeed be to provide a convenient proximate surrogate to reinforce behaviours which are (or were) in some way adaptive, to make performance of these appropriate behaviours in some sense pleasurable or rewarding and thus promote their expression in appropriate circumstances (Cabanac, 1971, 1979; Broom, 1991, 1998; Mendl and Deag, 1995; Dawkins, 1998; Panksepp, 1998, 2011; Lahti, 2003; Webster, 2011).

As nicely summarised by Nesse and Ellsworth (2009): “Emotions are modes of functioning, shaped by natural selection, that coordinate physiological, cognitive, motivational, behavioural, and subjective responses in patterns that increase the ability to meet the adaptive challenges of situations that have recurred over evolutionary time.” In other words, emotions would appear to play a pivotal role in decoding and evaluating positive and negative feedbacks, in perceiving the individuals’ own emotional state and, finally in regulating the execution of its behaviour (Ohl and Putman, 2013c).

What is significant in this context however is that there is clear variation between individuals in sensitivity/ responsivity of central nervous circuits processing emotions and thus that different individuals may ‘perceive’ the consequences for themselves of one and the same environmental challenge in very different ways (see 5.1)

5. INDIVIDUAL VARIATION IN WELFARE STATUS

Both in (emotional or other) perception of its own internal status, and in an animal's capacity to respond adaptively (in terms of its individual behavioural or physiological repertoire) there may exist significant individual variation.

5.1 Variation in coping strategies

There may also be quite substantial variation in the way different individuals may respond to the same stressor and the strategies which they may use to cope with environmental or social challenge - not simply in relation to differences in the adaptive repertoire available to different individuals, but also in relation to coping strategy adopted.

Mendl and Deag (1995) and Ohl and Putman (2013c) offer a detailed exploration of this concept of alternative coping styles and present a range of examples (primarily in relation to the different way in which individuals may respond to a given status within social groups). As illustration here, extensive behavioural and physiological analyses show that there exist clear and distinct strategies or 'styles' in the way in which male mice may cope with different environmental challenges. In a series of studies, Koolhaas *et al.* (2008, 2010) have presented experimental evidence for significant individual variation in coping style which is closely related to predictable variation in behaviour and underlying physiology: aggressive male mice tend to cope actively with their environment whereas non-aggressive males seem more easily to accept the situation as it is.

Such variation is perhaps not unexpected since after all, individual variation is accepted as a necessary prerequisite for evolution. Notably, in nature, mouse populations are known to go through phases of growth and decline and it seems that while the more aggressive, actively coping males are dominating the group during the phase of colony-growth, the non-aggressive phenotype is more successful in establishing a new colony than the highly aggressive phenotype (Korte *et al*., 2005).

Given that non-aggressive males indeed "find it easier to accept the situation as it is" (Koolhaas *et al.*, 2010) we may conclude that their adaptive capacity is higher than that of individuals of the aggressive phenotype (Coppens *et al*., 2010). Further, aggressive and non-aggressive male mice have been demonstrated to differ in terms of emotional processing and it seems reasonable to conclude that non-aggressive, passively coping males perceive their subordinate situation within any social hierarchy differently from their aggressive counterparts.

Further evidence for considerable variation in individual response to a given level of stress/ challenge is provided by Erhardt *et al.* (2009) whose investigations of the responsiveness of inbred laboratory strains of mice when exposed to a standardised stress-procedure showed extreme variation in individual response both at the behavioural and the hormonal level. High variance in behaviour was noted even within lines of laboratory rats selected and developed specifically to be more, or less, 'anxious' in response to novel stimuli (Henniger *et al.*, 2000).

Whatever the detail of these examples (and see again Mendl and Deag, 1995, Ohl and Putman, 2013c for further examples), the significance is a clear recognition of substantial individual variation in coping strategy and the way in which individuals respond to, or deal with, the same environmental challenge. That variation in coping strategy must itself imply clear difference in the impact of one and the same stressor on the welfare of those different individuals. As noted by Blumstein (2010): "Intra-specific variation [in behaviour/ personality] was previously treated as statistical noise, but behavioural ecologists and animal welfare scientists now realise that these personality types may be adaptive and useful for management".

5.2 Optimising or satisficing?

Clearly therefore, there is growing evidence that individual animals may show significant variability in the way that they perceive or respond to the same challenges to welfare status. In addition, we should not necessarily presume that all individuals seek to maximise welfare status at any given instant of time.

At this point it is of relevance to consider the concept of ‘satisficing’ that has been developed by Simon (1955) as a psychological concept and that has subsequently been applied by ecologists to explain foraging behaviour in animals (Myers, 1983; Ward, 1992, 1993). Satisficing is an alternative to optimization for cases where there are potentially many possible alternative options which cannot effectively be fully-evaluated. A decision maker who gives up the idea of obtaining an optimal solution but obtains the optimum he can compute under given time or resource constraints is said to satisfice (Krippendorf, 1986).

In this approach one sets lower bounds for the various objectives that, if attained, will be "good enough" and then seeks a solution that will exceed these bounds. The satisficer's philosophy is that in real-world problems there are often too many uncertainties and conflicts in values for there to be a realistic probability of obtaining a true optimization and that it is far more sensible to set out to do "well enough" (but better than has been done previously).

Satisficing thus may not be understood as being satisfied with the absence of a ‘negative state’; in contrast, this concept explains behavioural strategies that allow for reaching an optimum state by accounting for prevailing environmental conditions. As we have outlined above, indeed a variety of scenarios seem to exist, at least for socially living animals, where the behavioural strategy of distinct group members is more likely to be explained by a strategy of optimizing or satisficing its own state of welfare than by assuming that a universal maximum state of welfare is to be reached.

The logical extension of such argument is now clear: if, as seems apparent, there exists significant variability in how different individual animals may assess their own welfare status; if in addition a group of animals may consist of individuals some of whom seek to optimise welfare status while others (at that moment in time) are content to satisfice, then we, as external observers, may expect to observe within any group of animals a series of group members with different “absolute” welfare status (assessed by an external observer against some fixed set of criteria) yet which perceive their own welfare state as being optimal (or at least sufficient not to require action to alter that status). In such a case then, the (objectively determined) welfare status of all members of that group may appear to vary over a considerable range, yet all members perceive their own welfare state as optimal – or at least satisfactory.

Such conclusion makes clear that purely objective functional scales for measuring the welfare status of individual animals can have little validity in that, even under identical conditions, the actual welfare status of different individuals may vary widely.

6. DEFINITIONS OF WELFARE AND WELFARE STATUS

On the strength of such review, can we provide simple and robust definitions of positive and negative welfare states for any individual animal? Can we clarify a distinction between negative welfare states and suffering? Based on the considerations explored above, we would propose the following definitions in place of the rather more nebulous characterisations reviewed in 2.1, **although accepting that such definitions are not necessarily universally embraced.**

6.1 Adaptive capacity

The adaptive capacity describes the set of innate (physical and mental) abilities with which an animal species is naturally endowed and which an individual develops in the course of its own existence. The species-specific abilities form a basis, which is refined and developed in each individual. The adaptive capacity of an individual is not static; it is dependent on the individual's internal state as well as on its changing environmental conditions.

6.2 Welfare

Welfare describes an internal state of an individual, as experienced by that individual. This state of welfare is the result of the individual's own characteristics, as well as the environmental conditions to which the individual is exposed. Human determination of an animal's state of welfare is only as good as the observer's perception of the signals that the animal emits. A negative state of welfare is perceptible via reactions that are aimed at changing the existing situation. A neutral or positive state of welfare is perceptible via lack of any reaction or reactions aimed at keeping the existing situation as it is.

6.3 Positive Welfare

Positive (or good) welfare describes the state in which an individual has the freedom adequately to react to the demands of the prevailing environmental circumstances, resulting in a state that the animal itself perceives as positive. With, in addition, a growing emphasis on the importance of positive experiences (Fraser, 1993; Fraser and Duncan, 1998; Duncan, 2005), good animal welfare is not ensured by the mere absence of negative states (Knierim *et al.*, 2001; Duncan, 2005; Broom, 2010, see also Mellor, 2012) but requires the presence of positive affective states.

6.4 Negative Welfare

In our view, and as a view increasingly expressed in the wider literature (e.g. Broom, 2006; Korte *et al.*, 2007; Ohl and van der Staay, 2012), welfare status is compromised (welfare status is negative or bad) when an animal or a group of animals have insufficient opportunity (freedom) to respond appropriately to a potential welfare 'challenge' through adaptation by changes in its own behaviour (where environmental challenges exceed the adaptive capacity of the animal or the opportunities available are inadequate to permit the animal effectively to express the appropriate adaptive responses). Negative welfare, thus, describes a state that the animal itself perceives as negative but that still lies within the animals' adaptive capacity.

6.5 Suffering

Suffering describes the negative emotional experience resulting from being exposed to a persisting or extreme negative state of welfare. Short-termed, negative welfare states such as suffering from hunger and fear serve as triggers for the animal to adapt its behaviour. They therefore serve a function. A brief state of negative welfare may fall within an animal's adaptive capacity, and would not necessarily require intervention. If an individual lacks the ability or the opportunity appropriately to react to suffering (for example, by escaping from a

frightening situation), a challenge is created that may exceed the adaptive capacity of the individual. In such a case, the situation is one of suffering for which intervention may be required.

7. ASSESSMENT OF INDIVIDUAL WELFARE STATUS IN WIDLLIFE SPECIES

7.1 Traditional views of welfare and welfare as a dynamic state

Given all the above, how may we set about actually assessing the welfare status of wildlife individuals? The main protocols available for assessing welfare status have, in general, been developed for application to farm animals, pets or (separately) laboratory animals and are not immediately transferable to free-ranging species which are less closely managed.

Further, as we have noted, many such protocols have been based on the avoidance of negative states ("avoidance of suffering"): with approaches to the assessment of welfare status based on the supposition that this positive welfare merely implies freedom from:

• hunger, thirst or inadequate food,
• thermal and physical discomfort,
• injuries or diseases,
• fear and chronic stress,
• and are free to display normal, species-specific behavioural patterns.
(see again, at section 3 and
http://ec.europa.eu/food/animal/welfare/sum_proceed_wq_conf_en.pdf)

But as we have already noted (sections 3 and 4.1), these criteria are rather directed towards the avoidance of suffering and more recent commentators on welfare suggest that society's responsibility may not be limited simply to the avoidance of negative states in animals that are directly managed by humans, but that there may also be an implicit responsibility for active facilitation of positive welfare-states (see for example Dawkins, 2008; Yeates and Main, 2008; Ohl and van der Staay, 2012).

In addition (section 4.2), it is generally accepted that welfare should not simply be assessed as a single static measure at one given instant of time, but as a more dynamic, interactive state reflecting an animal's capacity to adapt to environmental challenge by changes in its own physiology or behaviour.

Crucially therefore our assessment of welfare not simply consider the status of any individual at a given moment in time, but needs to be integrated over the longer time periods required to execute such change.

The necessity of such a dynamic concept for the assessment of animal welfare becomes even more apparent when applied to free-ranging, wild animals. For example, the natural dynamics of natural environmental processes in seasonal environments result in seasonal changes in food availability for populations of grazing animals such as wild deer, resulting by definition in periods of hunger. Temperate grazers, however, have evolved to be able to cope with changing conditions by building up fat reserves in periods of food abundance which supplement the shortfall in periods of more restricted food intake.[3] Thus welfare will only be compromised if food restriction persists beyond their adaptive capacity (i.e. extreme depletion of their body fat reserve).

Perhaps most importantly for our deliberations in this section, it has also now been generally (if not universally) accepted that an individual's state of welfare is not a fixed parameter which can be assessed by external indicators or 'scored' by some external and fixed criteria,

[3] [eg. red deer, *Cervus elaphus* (Mitchell *et al.,* 1976; Kay, 1979; Kay and Staines, 1981); white-tailed deer, *Odocoileus virginianus* (McEwen *et al.,* 1957; Short *et al.,* 1969; Moen, 1976; 1978); black-tailed deer, *O. hemionus columbianus* (Wood *et al.,* 1962), *Rangifer tarandus* (McEwan and Whitehead, 1970; Leader-Williams and Ricketts, 1982); free-ranging ponies (Pollock, 1980; Berger, 1986; Mayes and Duncan, 1986; Gill, 1988, 1991; Burton, 1992)].

but is coloured to a large extent by the animal's own perception of its status. And within any given population, individuals may well vary in their internal perception of and response to the same 'absolute' status.

Considerations above challenge the more functional protocols developed for assessing welfare status, even for more closely-managed animals - and especially in terms of any attempt to apply such protocols to free-ranging wildlife. It becomes clear that if we accept that welfare is defined by an ability to adapt and respond to environmental challenge in an appropriate way (and that thus both positive and negative welfare states are a function of the actual adaptive capacities of the individual animal and the opportunity it has to express those responses) then our assessment of welfare must be primarily based on detailed observation of the physiological condition and behavioural responses shown by individual animals over time.

7.2 The role of stress

In general, physiological approaches have focused on the concept of measuring levels of stress experienced by individuals based on the belief that if stress increases, welfare decreases (Dantzer *et al.,* 1983; Dantzer and Mormede, 1983; Moberg, 1985). However, there are a number of problems with such an approach. Short term stress responses are an inevitable part of the process triggering an adaptive response from the animal and thus may be functional in maintaining a longer-term positive welfare status. In such analysis a more relevant measure might be evidence of chronic and 'traumatic' stress, something which is not trivial to differentiate by means of physiological measurements from acute stress (McEwen *et al.,* 1992; de Kloet *et al.,* 2008 a,b).

Physiologically, stress is characterised by an activation of the Hypothalamus-Pituitary-Adrenocortical [HPA]-Axis, resulting via a complex cascade into the release of cortisol into the blood (Selye, 1950). Thus, the majority of approaches to the measurement of stress consider stress levels reflected in the identification of elevated cortisol levels, (although a variety of other blood or tissue parameters have been considered as well (below)). However, chronic stress can result in a blunted HPA-response and, in consequence, a *reduced* release of cortisol in response to acute stress (McEwen *et al.,* 1992). In other words, based on low levels of peripheral cortisol alone it is impossible to discriminate between absence of stress or a chronically stressed status. Further, for many of the other parameters assessed [lactic dehydrogenase: LDH-5, muscle glycogen, bilirubin etc.] (e.g. Jones and Price, 1990, 1992; Price and Jones, 1992; Bateson and Bradshaw, 1997; Cockram *et al.*, 2011), there is some difficulty again in separating the effects of chronic or acute stress from those which may simply be associated with vigorous or prolonged physical exertion.

Where only some average assay is required for the welfare status of a population of animals (see 'Applying wildlife welfare principles at the population level', Ohl, F., Putman, R. J., 2013) then various samples can of course be derived from culled individuals - as long as it is certain that the method and process of culling does not itself impose additional stress. Where assay is made of levels of cortisol in sources that reflect accumulation of cortisol excretion over time, such as hair or dung, some of the confusion between measures of acute and chronic stress may be avoided (Sheriff *et al.,* 2011).

It has however been shown that best evidence for stress levels that exceed the adaptive capacities of an individual can be found at the brain level. Here, activity of the HPA-axis is regulated via the concerted action of the mineralo (MR) - and the glucocorticoid (GR) receptor system and it has been shown in rodents and humans that acute and chronic levels of stress translates into differential regulation of these systems (de Kloet *et al.,* 2008b).

Currently, this method is being established for analysis of deer brains (Heidi Lesscher *in progress* University of Utrecht), which is expected to allow for further validation of non-invasive physiological measurements in individuals that can be proven to have been chronically stressed.

Where such methods are to be applied to the assessment of stress within living individuals it is clear that collection of blood or tissue samples from free-ranging wild animals is technically complex and, here especially, elevated levels of stress-related products may simply be due to the acute stress associated with capture. Once again, more recent approaches are now assaying accumulated cortisol levels from hair or dung (Sheriff *et al.,* 2011), which may, in combination with analyses at the brain level, offer more reliable assessments of chronic levels of stress.

Some pioneering work currently in progress at the University of Glasgow suggests that chronic stress may reduce core body temperature (and significantly eyeball temperature) in birds. Extension of these pilot studies proposes to explore whether or not sophisticated thermal imaging cameras may be able to detect such changes in eyeball temperature in the field, in a range of species, and whether differences recorded are consistent with/correlated to differences in known levels of chronic stress (Ruedi Nager *in progress,* University of Glasgow).

This may in due course offer an alternative tool; but in reality many of these methods are technically complex and costly in application and perhaps more suited to research than to routine management. In addition, interpretation in relation to actual welfare status is always difficult, given comments above about the extent of individual variation in perception of and response to even apparently identical stressors. It would appear that for managers, behavioural observations offer a simpler and more robust approach to assessing welfare in the field.

7.3 Behavioural responses as indicators of welfare status

Thus, in theory (and certainly in application to more closely-managed animals such as domestic livestock, laboratory animals, companion animals - even wild species in captivity in zoos or other menageries), behaviour may be scrutinised for the occurrence of persistant appetitive behaviour - as indicating that an individual is seeking to express some adaptive behaviour in response to a given environmental challenge, but is unable to do so effectively - whether because it lacks the correct adaptive response or because the constraints of its environment do not offer it the correct opportunity to express that behaviour effectively.

In addition, close observation may reveal persistent behavioural indicators of frustration (defined classically as the lack of some expected stimulus) or thwarting (again defined strictly as the animal being physically prevented from expressing some behaviour for which all internal and external stimuli are present); responses to frustration or thwarting are characteristically expressed as rapid alternation of behaviour, performance of incomplete behaviours or redirection of behaviour to 'inappropriate' objects as well as classic 'displacement activities' (for review see Eilam *et al.,* 2006).

Where such 'deprivation' is maintained over long periods, animals may develop clear 'stereotypic' patterns indicative of persistent frustration (Insel, 1988, Eilam *et al.,* 2006).

Obvious examples of such behaviours are crib-biting in horses (Hothersall and Casey, 2012), tail-biting in confined pigs (Taylor *et al.,* 2011), feather-picking in birds (Eilam *et al.,* 2006), and a variety of other self-mutilating behaviours in different species (Danzer & Mormede, 1983; Fraser & Broom, 1990). In captive wild animals, repetitive motor rituals are common (for review see Eilam *et al.*, 2006) that either may be **stationary** (movements

executed without progressing in the environment) or **pacing** (progressing along fixed paths). Following Eilam *et al.* (2006) stereotyped pacing may be more prevalent in animals that range over large territories in the wild, while stationary movements are more typical to farm animals and pets.

In free-ranging animals however, environmental conditions that exceed the adaptive capacities of an individual are likely to translate into a lack of expression of positive emotional states (such as comfort-behaviour) as well as a lack of behaviour necessary to fulfil actual demands (such as foraging) (Fraser *et al.,* 1997, Watson *et al.*, 1999, Mellor, 2012). Further, behavioural extremes may be observed, such as high levels of intra-group aggression (Koolhaas *et al.,* 2010) or changes in group structures. All such changes not only indicate that prevailing environmental condition are exceeding the animals' adaptive capacities, but are exerting chronic stress themselves and will therefore facilitate a further decrease in physiological condition as well.

Positive affects or emotional states may include pleasure, comfort, contentment, curiosity and playfulness (Mellor, 2012) which suggests that regular observation of such 'positive' behaviour-types might argue for the individual(s) concerned being in a status that it perceives as positive itself indeed. We should note though, that the absence of positive indicators is not sufficient to prove a negative welfare state.

However, routine protocols of behavioural observations should include positive indicators such as play behaviour and notice that the regular absence of play behaviour in young/adolescent individuals is likely to indicate high environmental pressure (Held and Spinka, 2011). In adult animals, play behaviour may be observed less regularly, while e.g. active exploration, social- and self-grooming behaviour can be expected to be present at a regular basis (Crofoot *et al.,* 2011, Kikusi *et al.,* 2006).

While such observations may be practicable for individuals or groups which we may study over prolonged periods of time (and may well be applicable to closely-managed animals including closely-managed wildlife), such an approach is clearly not likely to be feasible in application where encounters with individuals or groups are typically occasional, fleeting and at a considerable distance.

Here, inevitably, we must base assessments primarily at the group level and these will be biased in favour of physical condition scores or rather coarse behavioural indicators. Further such measures will largely be applied at group rather than individual level. This may well be appropriate, given that effective management measures (mostly 'non-specific measures' *sensu* Swart, 2005; see section 8.3) can only be targeted at the group or population level. But where decisions are made which aim to optimise the welfare of the group as a whole, we should acknowledge that the welfare status of the **group** may be optimised while the (apparent) welfare states of its individual members may vary over a considerable range.

While we also accept that what is or is not deemed acceptable (to the animal itself) may vary significantly between individuals because of phenotypic differences in sensitivity of self-assessment[4] or because of the presence within the population of satisficers as well as optimisers, it is appropriate to ensure, in balancing measures which seek to assess or satisfy an adequate welfare status for a group, an additional constraint that no individual should fall below an acceptable threshold.

[4] whether these differences are of genetic, epigenetic or ontogenetic origin

7.4 Using wild deer as an example

The terms of reference for this report suggest that in offering detail, the report should focus on deer as a worked example. In this analysis therefore, what specific indicators might be used to assess the welfare status of an individual (or group) of deer? While accepting that prolonged observation of any individual wild deer is unlikely we would still advocate the use of behavioural cues where possible, including the identification of clearly appropriate and adaptive behaviour (or lack of appropriate response in given circumstances); the expression of appropriate appetitive behaviour - where an animal can be seen to be searching for the appropriate resources to address some perceived deficiency (seeking shelter from wind or adverse weather conditions; moving appropriately to woodland cover or to more sheltered feeding grounds etc.).

Observation should also reveal lack of expected behaviour (even when opportunity to express that behaviour may be present) and also any clearly inappropriate or atypical behaviours (such as an individual separated at some distance from an obvious social group; animal clearly being rejected or shunned by others within the group; an animal in poor condition suffering continual displacement etc.).

In the absence of an opportunity to record such behaviour, assessment inevitably has to rely on more physiological measures such as physical condition scores (e.g. Riney, 1955, 1960 for red deer) which may be applied to scoring live animals at some distance, or condition recorded from lardered carcases (body weight, kidney fat, parasite burden; Putman, 2005) although these latter measures inevitably record only average condition of the wider population.

Similar, species-specific cues based on observation of normal or more aberrant behaviour could doubtless be developed for other wildlife species.

Table 1: Suggested indicators of welfare at the individual level: assessment should not be based on any single indicator but should attempt to integrate information from as many of these indicators as possible.

Assessment of Animal Welfare		
Based on the animals' adaptive capacities		
	Positive indicators	Negative indicators
The animal(s) should be free adequately to react to hunger/thirst.	Appetitive and successful foraging behaviour Normal activity pattern Adequate or appropriate body condition	Unsuccessful foraging behaviour Lethargy Inappropriate body condition
The animal(s) should be free adequately to react to climate conditions.	Seeking and finding shelter Appropriate fur condition Appropriate modulation of body condition during seasons	Not finding shelter Bad fur condition Body condition worse than can be expected in relation to season
The animal(s) should be free adequately to react to physical injury or disease.	Seeking and finding rest and shelter Functional immune system [e.g. appropriate wound healing; lack of scouring]	Inability to seek and find shelter Infection/inappropriate would healing; obvious signs of repeated scouring
The animal(s) should be free to express its full non-social behavioural repertoire.	Adequate behavioural responses to non-social circumstances/challenges [covering both avoidance and approach behaviours]	Persistent behavioural inhibition, lethargy, context-inadequate behaviour
The animal(s) should be free adequately to respond to social interactions.	Adequate behavioural responses to social interactions [covering both socio-positive and socio-negative behaviours]	Persistently being bullied (in social species); social isolation
The animal(s) should be free to experience the full spectrum of emotional states and respond to those states adequately.	Executing anxiety-related behaviour and stress-responses as well as play-or other pleasure-related behaviour in appropriate context	Inadequate emotional responses [lethargy, hyperreactivity]; absence of adequate emotional responses

7.5 The ethical dimension of welfare

Assessment of the actual welfare status of an individual animal (or group of animals, see Ohl and Putman, 2013a) offers simply that: an assessment of welfare status. Whether or not that status constitutes a welfare ***issue*** (and may warrant some level of intervention/mitigation, section 8) is inevitably more of a value judgement or ethical decision.

It is important at this juncture to recognise that assessment of what may or may not constitute a welfare issue is not simply dependent on objective biological evaluation of welfare status *per se* but also must take into account ethical dimensions and societal views. Therefore, it has been recommended that government policy on animal welfare and animal health should pay attention to the fundamental moral assumptions that underlie many animal-related problems [RDA, 2010].

To help structure such evaluation a number of frameworks have been developed (see Beekman *et al.,* 2006; Mepham *et al.,* 2006; RDA, 2010) that may help to make explicit, structure and analyse moral issues in policy. Such assessments should be public, transparent and based on the most recent scientific knowledge as well as broadly shared public moral views. Ideally, these public views should be derived from a full ethical assessment, which is to say, the result of a reflective process that incorporates intuitive judgements, knowledge and moral principles.

The application of such assessment models is not restricted to analysing practical questions of the morally 'right' action, but more aims at allowing for better structured and more explicit discussions on fundamental questions related to the moral good.

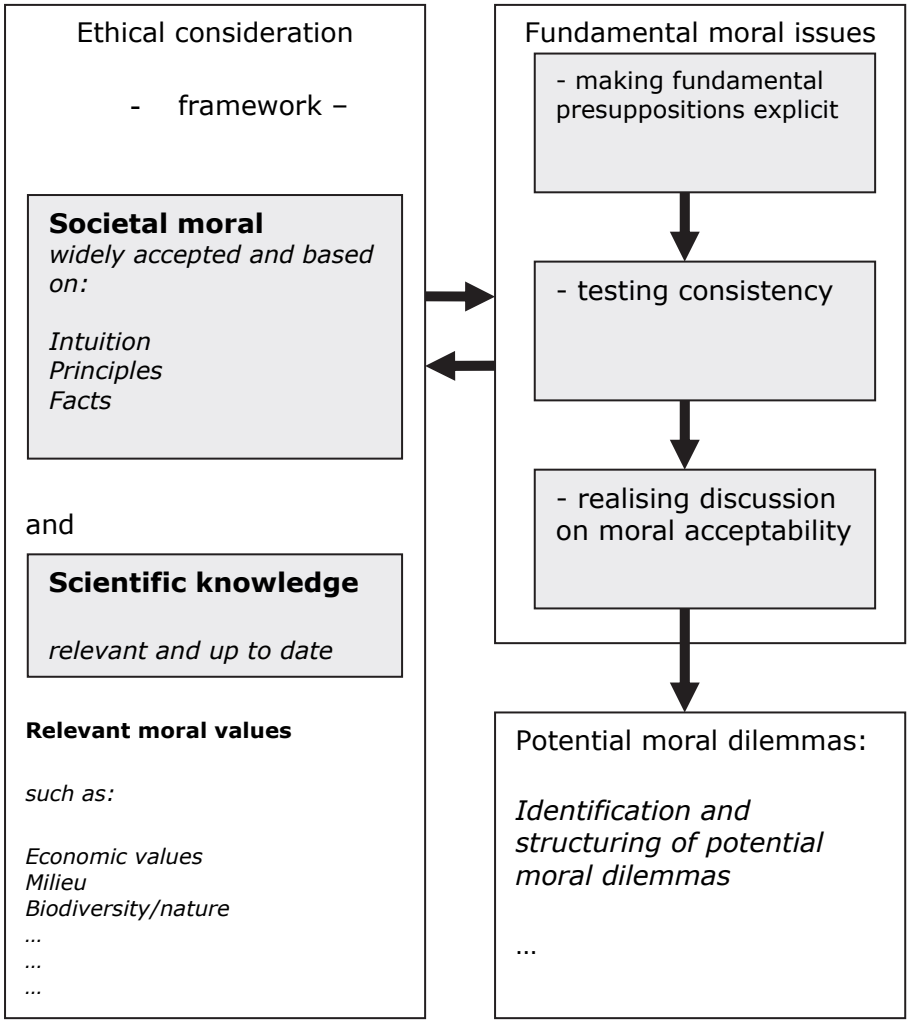
As one example: the assessment model proposed by the RDA (2010) consists of two parts (see Figure 1). The left column of the framework is focused on the applied value assessments, such as the question whether the killing of a group of animals during an outbreak of animal disease is justified. The right column addresses broader and more fundamental questions related to a specific question, such as moral ideals on animal disease prevention. Commonly ethical issues only tend to become explicit in a policy context if there is a clear need to deal with a specific problem, e.g. whether or not to shoot potentially suffering wild animals. The moral questions that underlie such a specific problem often remain unaddressed. The aim of the right column is to explicate these more fundamental questions in a way that is beneficial in addressing the current dilemma, but also in drafting future policy.

The model or framework builds on the idea of ethics as a reflection process in which one strives for an equilibrium of a number of moral elements, including intuitive judgments, facts, principles and moral ideals (cf. Rawls, 1972; Van der Burg & Van Willigenburg, 1998).

The model starts with the intuitive judgements, i.e. the first impressions people may gain in a specific case. Intuitive answers often come to the fore in discussions about animals. In the search for a reflective equilibrium these intuitions are considered to be a moral marker. They usually indicate that there is a moral problem or a question at stake. Still, such intuitions are only a start of an ethical reflection: A first reaction can be valuable, but people may also be mistaken due to lack of knowledge or the lack of acknowledging others´ interests. Therefore, morally relevant facts and ethical principles play a key role in the ethical consideration. The principles and relevant facts are employed in critical reflection upon intuitive judgements. This requires a critical reflection of the similarities and differences between first impressions, principles and facts. If it turns out that there are inconsistencies, one has to evaluate underlying causes and examine which parts are in need of modification. Once coherence is achieved between the intuitive judgements, the principles and the facts, a reflective equilibrium has been reached.

The assessment model introduced here is not a decision making tool that functions as a one size fits all approach for practical ethical dilemmas. Thus, it should be clear that such an ethical framework is drafted rather in order to identify the relevant ethical questions and identify potential moral dilemmas than to yield straight forward management or political solutions (see also Ohl & van der Staay, 2012).

Figure 1 – Ethical Framework:
The left column of the framework is focused on value assessments, such as the question whether the killing of a group of animals during an outbreak of animal disease is justified. The right column addresses broader and more fundamental questions related to a specific question, e.g. whether or not to shoot potentially suffering wild animals. The aim of the right column is to explicate these more fundamental questions in a way that is beneficial in addressing the current dilemma, but also in drafting future policy.



8. DUTY OF CARE FOR WILDLIFE SPECIES

8.1 Is our responsibility context dependent?

Much of the literature (and many of the principles) established thus far have been developed for animals which are closely managed by humans such as production farm animals, companion animals or laboratory animals. Before considering how we may assess and respond to the welfare status of wildlife it is important to question to what extent our responsibility may be in some sense context dependent (see also Ohl and Putman, 2013d).

There has been much debate in the more philosophical literature about human responsibilities to animals and about the moral value of animal life. A significant part of this literature recognizes animals as having moral status: that is, to be an entity (a being) towards which we can have moral duties (Warren, 1997), acknowledging that animals that fall under our responsibility are also part of our moral circle, and whether these animals flourish is also our concern. In the past, perhaps, many philosophers, following a Kantian approach, presumed that such moral status derived as a consequence of their relationship with humans, as an extension of human-centred morality, but a significant number of ethicists now concede that animals have some moral value that is independent of their use by humans.

According to Regan (1983), animals are, like humans, subjects-of-a-life. They have subjective experiences, can experience the quality of their lives, and enter into and maintain relationships with others. Taylor (1986) argues that all organisms have 'inherent worth' because, as 'teleological centres of life', they have a good of their own, while Rollin (2011) ascribes an intrinsic value to animals because "what happens to an entity matters to it even if it does not matter to anyone or anything else. Because it is capable of valuing what happens to it, either in a positive or negative way, such valuing is inherent in it."

In effect, although the basis for the belief may differ, many western philosophies now accept that all animals have moral status and that in consequence, and without exception, they merit moral consideration. This broad acknowledgement of animals as having moral status, however, appears not to result in one broadly shared view on how we should treat them. This is clearly reflected in current legislative provisions for consideration of animals' welfare which are in general largely context-dependent, such that there may be a clear legal distinction between responsibilities towards farm animals, lab animals, companion animals, closely managed wildlife, and truly wild animals experiencing little management input (see for example review by Vapnek and Chapman, 2010).

Partly as a reflection of that legal distinction, some authors (as, for example, Swart, 2005 and Swart & Keulartz, 2011) suggest a similar distinction in relation to context (kept and non-kept), in terms of our responsibilities for animals and the way those responsibilities might be discharged. If we wish to try to claim for a wider duty of care, we may argue that at least within a European context, all animals (whatever their status as kept or non-kept) are to some degree influenced by human activity – whether to a greater or lesser extent, and whether deliberate or incidental. Closely managed animals in whatever context (farm animals, laboratory animals, companion animals) have their whole environment controlled by human agency; but even for free-ranging or apparently wild animals, their habitat and movement patterns are affected by human land-use and land-management and many populations are directly controlled by culling.

Thus even in terms of those philosophical traditions which base responsibilities for animals on their relationship with humans, some duty of care might be expected. In practice however such separate 'justification' is unnecessary if we accept the moral premise above that all

animals without exception have some inherent or intrinsic value we have a moral responsibility to care about their welfare.

Some commentators argue that consideration should be extended only to those animal species known to be 'sentient' (that is capable of experiencing pleasure and pain, capable of self-awareness - e.g. Rawls, 1972; Singer, 1989). However such argument becomes increasingly sterile and potentially dangerous since science has an imperfect knowledge of what taxa are indeed 'sentient' in this sense – and the list is growing all the time and in practice, for most of the wildlife species with which SNH may find themselves concerned such distinction is perhaps an unnecessary refinement.

8.2 Responsibility for action?

In effect, although the basis for the belief may differ (Appleby and Sandoe, 2002 and Swart & Keulartz, 2011 offer comprehensive reviews), most modern philosophers accept that all animals have some "inherent value", or at least that humans have a wide-ranging moral duty towards them and this is articulated in the draft SNH Position Paper on Welfare which acknowledges a responsibility to consider the welfare of wildlife animals. What *does* appear to differ is the perceived degree of obligation (or requirement) to take action in different contexts.

Swart and Keulartz (2011) link this responsibility to context in presuming that responsibility to address some compromise of welfare status is higher in animals more closely managed by man (or free-ranging animals more heavily impacted upon by human activities), because we are more closely responsible for providing all resources for more closely-managed (farm or companion) animals, which thus have less freedom and have fewer opportunities to respond 'naturally'.

They also suggest we should acknowledge a greater responsibility for wildlife species where humans are demonstrably responsible through their actions either for the compromise to welfare status in the first place and/or for the restricted opportunities available to those wildlife animals to perform appropriate adaptive behaviour (perhaps because of human impacts in restricting habitat diversity).

We ourselves would argue (Ohl and Putman, 2013d) that this negates the initial construct of an equal moral duty to all animals, which is universal and independent of the context of the human-animal relationship. We would however suggest that, even within that subset of cases where we may feel it appropriate to intervene,[5] the obligation to take action may be constrained by the actual practicalities of intervention and the availability of (realistic) mitigation measures to effect a change in welfare status.

If there are no practical mitigation options possible, then almost by definition, this must lessen the obligation to take action. However simple this last constraint may appear, it opens an additional debate about avoidable versus unavoidable suffering and further, whether our duty of care should be restricted to the prohibition of 'avoidable' suffering or should include the enhancement of positive welfare status.

8.3 Differing dichtomies in relation to animal suffering

In this context, suffering should be interpreted in a broader sense than defined in section 6.5 and, after Dawkins (1990, 2008) we here presume that suffering can result from experiencing a wide range of unpleasant emotional states such as fear, boredom, pain, and

[5] that is, as above, in those situations where the animal has insufficient opportunities to adapt by appropriate changes of its own behaviour

hunger. While short-term exposure to such negative states/ emotions is accepted as a necessary part of any mechanism triggering appropriate adaptive behaviour, if an animal continues to be exposed to such states over a prolonged period, then it is clear that the situation exceeds the individuals' adaptive capacities and thus does constitute a welfare issue.

As a principal framework, we would suggest that philosophical considerations explored so far would suggest that any suffering of animals that is technically avoidable should be considered (morally) unacceptable. However, there may be constraints on intervention that are posed purely by practicalities of intervention or mitigation.

Thus effective intervention in the lives of free-ranging or wild animals may simply not be feasible; in a farm context, if livestock animals are kept outdoors (which may itself be warranted in terms of promoting positive welfare) in other respects, they may be exposed to extreme weather that may cause transient suffering. Sudden changes of weather are neither predictable nor controllable and occasional suffering is *unavoidable* when animals are kept outdoors.

Other constraints may be posed by human convenience or other human interest: for example, efficiency of animal production in an agricultural context. We suggest that *necessary* suffering in this context should be understood as that required to achieve some anthropocentric objective (e.g. animal experimentation, food production or pest control) or animal-centred goal (for example in veterinary practice). In such cases, there may be mitigation options which are not implemented for reasons of efficiency or economics. Here, any suffering resulting from non-intervention may be considered avoidable (in theory) but *necessary* (because of distinct subjective/**individual** human interests). For further exploration of this axis, see Ohl and Putman 2013d.

Cutting across these dimensions of necessary or unavoidable suffering, we must recognise that even science-based, operational definitions of animal welfare and suffering will necessarily be influenced by societal mores. Thus, in addition to determining whether considering an animal's suffering may be avoidable vs. unavoidable, or as necessary *vs.* unnecessary, it is appropriate also to evaluate along a third axis, based upon what is considered by a wider society to be [morally] *acceptable* or *unacceptable* (RDA, 2012).

Of course, moral frames differ markedly between cultures, thus differ between societies as well as showing a range of 'attitudes' even within one given society. Our assessment of what is acceptable must thus be framed within a proper understanding of what the majority of members of our own contemporary society believe and accept, although this implies an additional responsibility to inform and educate that wider society so that reactions are not simply based on untutored and un-reflected intuitions (see e.g. Ohl and van der Staay, 2012; Meijboom and Ohl, 2012).

8.4 To intervene or not to intervene?

Following this line of reasoning, the obligation to take action **in response to a perception of suffering**, or in an attempt in general to promote more positive welfare of an individual or population, is constrained by what may be considered necessary or acceptable suffering, or by the actual practicalities of intervention and the availability of (realistic) mitigation measures to effect a change in welfare status.

If we accept the more dynamic concept of what constitutes welfare presented above (section 4.2) such that a welfare issue arises only when an animal or a group of animals have insufficient opportunity (freedom) to respond appropriately to a potential welfare 'challenge' through adaptation by changes in its own behaviour, it implies that biologically, we have an

obligation to take action to address potential welfare problems only in those situations where the animal cannot adapt appropriately by changes of its own behaviour (sufficient to bring about appropriate environmental adjustments required to restore its positive welfare status).

Yet, from our deliberations here, we must recognise that even within such a 'subset' of cases, if there are no practical mitigation options possible, then almost by definition, this must lessen the obligation to take action. Thus the obligation to intervene (in any context, wild or closely managed) depends primarily on whether or not there are practical (and economically feasible) options available for intervention (**whether or not such intervention is in the interests of avoidance of suffering or positive, proactive enhancement of general welfare status**).

One final consideration here however might be an assessment of the unintended consequences of any proposed intervention. Thus as a refinement of the responsibility for intervention we might add recognition that we should intervene only in those cases where we can be certain that our intervention will not result in greater harm (to the individual or individuals it is sought to assist and/or to other animals in the wider environment - see for example Donaldson and Kymlicka, 2011, Sozmen, 2012).

We may summarise much of this "thought-process", in debate over whether or not a given situation of perceived animal suffering demands some intervention (and thus our human responsibility for action in a given situation), in the decision-making scheme presented in Figure 2.

Not all management interventions of course are undertaken to address some perceived welfare issue; yet even when proposed towards some unrelated management objective, such interventions may still have welfare implications which should be considered, whether at the level of the individual or group/population (Ohl and Putman, 2013b) Therefore, when a guiding principle of management is to safeguard or enhance welfare the welfare implications should be considered in relation to any proposed change in management practice, irrespective of objective.

We may summarise much of the "thought-process", in debate over whether or not a given intervention may result in unacceptable animal suffering in the decision-making scheme presented in Figure 3.

Figure 2 – modified from RDA 2012

When an animal or a group of animals have sufficient opportunity to respond appropriately to a potential welfare 'challenge' through adaptation by changes in its own behaviour, there should clearly be seen to be no requirement to intervene. We have an obligation to take action to address potential welfare problems only in those situations where the animal cannot adapt appropriately by changes of its own behaviour (sufficient to bring about appropriate environmental adjustments required not only to avoid suffering, but to restore its positive welfare status) - or perhaps in immediate operational terms if we are uncertain whether or not the animal has that capacity.

The obligation to intervene (in any context, whether the animals concerned are wild or closely managed) further depends on whether or not there are practical (and economically feasible) options available for intervention. Beyond this, constraints may be posed by anthropocentric aims or human objectives, and here, any suffering resulting from non-intervention may be adjudged avoidable (in theory) but necessary (because of distinct subjective/individual human interests). Finally, whatever may be determined necessary or unavoidable by the actual manager or agent himself/herself, such judgement is inevitably

subjective and possibly subject to self-interest. Thus any decision must be further evaluated within the context of what is considered by a wider society to be (morally) *acceptable* or *unacceptable.*

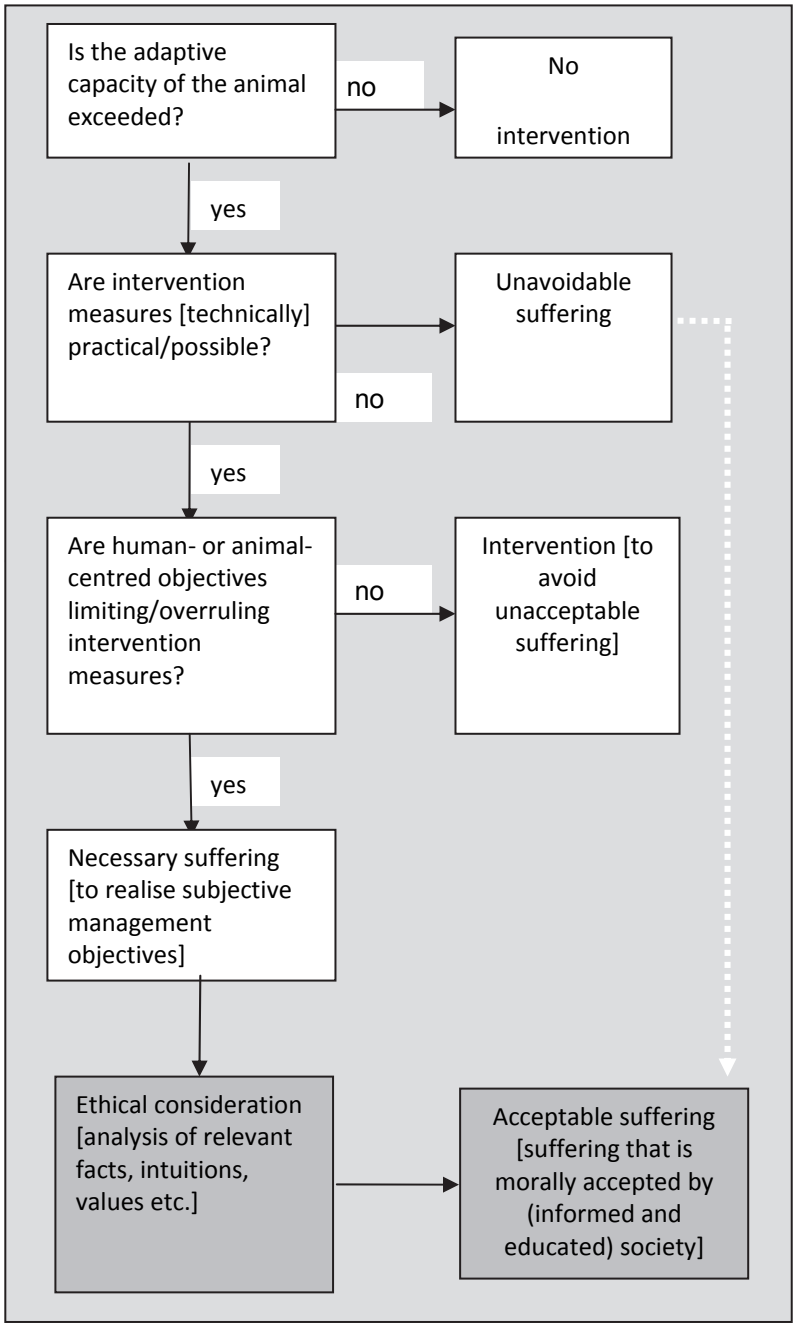
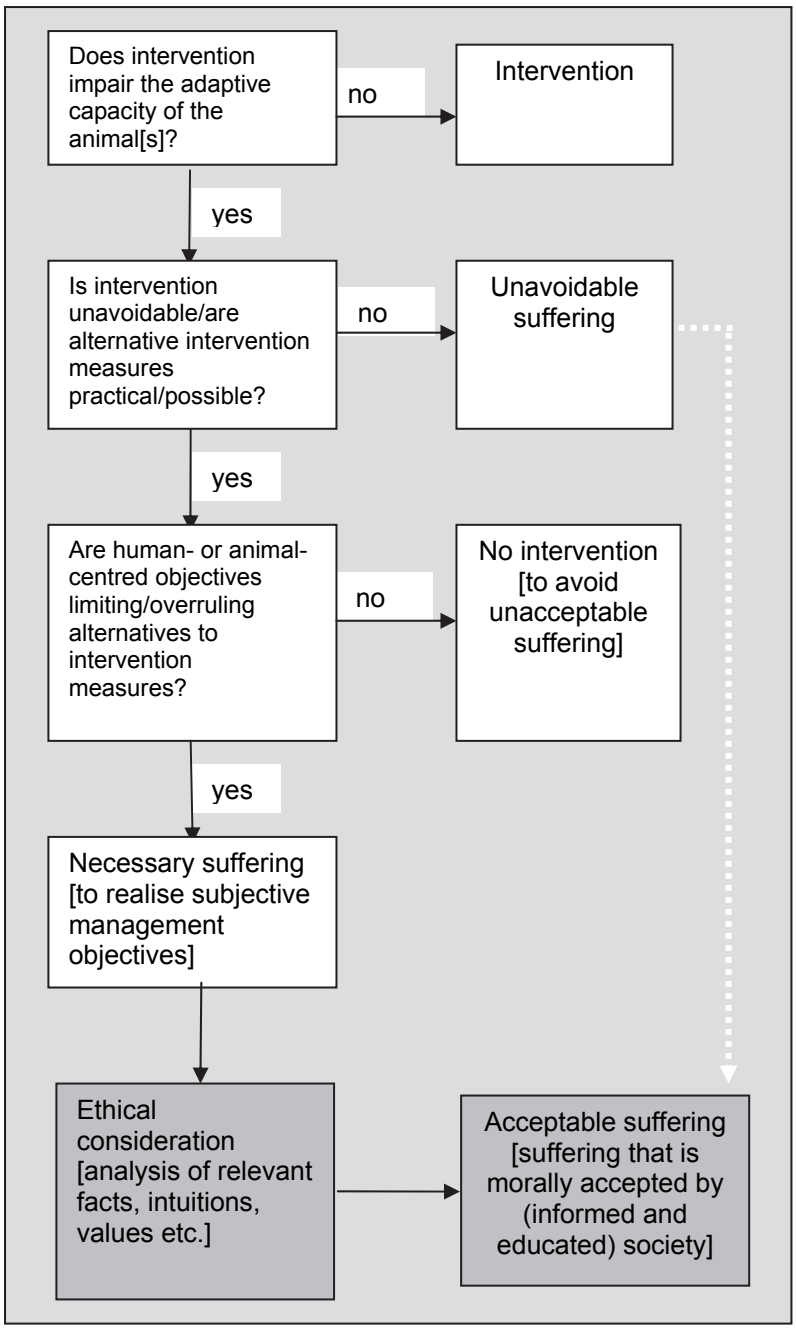


Figure 3

Preferably, any management intervention should only be undertaken if it can be ensured that it does not result in an animal or a group of animals having insufficient opportunity to respond appropriately to a potential welfare 'challenge' through adaptation by changes in its own behaviour. An intervention will cause welfare problems only in those situations where the animal *as a result of that intervention* cannot adapt appropriately by changes of its own behaviour (sufficient to bring about appropriate environmental adjustments required not only

to avoid suffering, but to restore its positive welfare status) - or perhaps in immediate operational terms if we are uncertain whether or not the intervention has such an effect. We may modify Figure 2 as below to offer a decision-framework for assessment of the acceptability of any management intervention or change in management practice which may be proposed towards whatever objective.



Finally - as well as discussing whether or not one should intervene at all in any given situation, we may also discuss what might be the appropriate form of intervention in cases where we do feel it is our responsibility to do so. While we disagree with Swart (2005) and Swart and Keulartz 2011)'s contention that duty of care is itself dependent on context, Swart (2005) argues convincingly that the *form* of that intervention (if intervention is justified at all) might indeed be more dependent on context - such that for wild animals, welfare is more

likely to be affected by 'non-specific care', focused on maintaining and developing the natural environment of the wild animal so that it can lead a natural life. As the counterpart of non-specific care, Swart suggests 'specific care' for animals kept by humans, including domesticated animals. These animals are entrusted to our care or are placed in human environments, and are therefore much more dependent on us for their welfare and needs.

Although the two different types of care exclude each other to a certain extent, they do not rule each other out completely, since there may be good reason to provide specific care when an individual wild animal happens to find itself in acute distress (Swart, 2005; Swart and Keulartz, 2011).

While we would decouple this construct from an initial contention that the responsibility for care is in the first place dependent on context, this suggestion that the form of intervention must be more closely related to circumstances seems entirely appropriate. Swart's deliberations also 'fit' nicely with the concept of what managers of wildlife populations might concern themselves with in relation to proactive measures aimed at for improving the welfare status of wild animals through general environmental enhancement, rather than a simple focus on reducing suffering caused by culling or other population control measures (e.g. Cockram *et al.,* 2011).

8.5 Context-dependecy of Duty of Care: a reprise:

In review of the above, we would suggest, after Ohl and Putman (2013d), that

- the moral duty of care is absolute and independent of context
- the requirement to intervene should be based on biological assessment of whether or not sufficient opportunities exist for the animal or animals to respond appropriately to a potential compromise of welfare status through appropriate and adaptive changes in its own behaviour (sufficient to bring about appropriate environmental adjustments required not only to avoid suffering, but to restore its positive welfare status) the requirement for intervention in such cases is further constrained by the physical possibility/impossibility of any effective mitigation (avoidable versus unavoidable suffering)
- intervention is further constrained by considerations of human interest in the animals concerned (thus necessary versus unnecessary suffering)
- there is in addition a moral dimension in co-determining the scale of required intervention in relation to societal norms of what may be acceptable versus unacceptable suffering.

We believe that a construct cuts across the rather artificial distinctions we have formerly, traditionally, used between kept and non-kept animals (it obviates the need for such artificial and arbitrary distinctions) and replaces these with a more robust and functional construct applicable in more general terms.

In effect, the whole neatly defines a recognition of welfare issues (in all contexts) as lack of opportunity to respond appropriately to environmental challenges, and offers a simple concept of appropriate solutions in terms of providing the opportunities to enable the animal(s) to react appropriately to such challenge. It provides a recognition that we (humans) have an obligation to take action only if an animal is (for whatever reason) unable to respond appropriately and effectively through its own adaptive behaviour; a recognition that obligations are further constrained by actual practicalities of what is possible in terms of mitigation.

9. LEGISLATION PROVISION

It is apparent that in some countries some general responsibility for animal welfare is defined by statute as a legal obligation. As far as we are aware the Netherlands is the only country in Europe which actually imposes a legal obligation on all citizens “to take responsibility and provide the necessary care for animals that need help” (whether wild or managed/kept).[6]

In other countries any legal responsibility is generally limited to the prohibition of actions likely to **cause** suffering (or actually calculated to cause suffering), rather than imposition of a more general responsibility for welfare - and as noted, primary legal responsibilities are enshrined in context-specific legislation dealing explicitly with farm animals, laboratory animals etc.

However, as already noted, much of this legislation is very explicitly context-related and thus stipulates requirements for housing and maintenance of the avoidance of farm animals in intensive management designed to minimise perceived suffering, provisions for the transport of farm animals, management of laboratory animals etc. Provisions relating to wildlife and game animals in particular tend to be contained within more specific game laws.

In the UK, Wildlife and other more ‘generic’ laws are generally of this more ‘negative’ nature, and, as above, tend to be framed more specifically to **prohibit** actions considered likely to cause suffering (or actually calculated to cause suffering), rather to impose some more general responsibility for welfare. Thus, under the Wildlife and Countryside Act, it is illegal deliberately to disturb the lairs or nesting places of (specified) wildlife species and the Act contains a few specific provisions and for prohibition of certain methods of capture/ killing (e.g. leg-hold traps, etc.), though the express purpose is conservation.

The Animal Welfare Act 2006 (England and Wales) supersedes and absorbs the old 1911 Cruelty to Animals Act. Deliberately causing an animal to suffer - the old cruelty offence - applies only to a "protected animal" - defined in Section 2 of the Act as " under the control of man, on a permanent or temporary basis". Thus, hedgehogs being used as footballs, squirrels nailed to trees, etc. have been deemed "temporarily under the control of man" as they have no power to escape, whereas shooting a wild animal, or chasing it with dogs, is not covered, because the animal can escape.

The other element of the new Act - duty of care - is under Section 9. This is more the equivalent of the position in the Netherlands under the Dutch Animal Health and Welfare Act. As before, the requirement again only applies to animals a person is "responsible for".

The equivalent Act in Scotland (The Animal Health and Welfare (Scotland) Act 2006, applies explicitly to domestic animals and wild animals are not covered under the Act, while the complementary Wild Mammals (Protection) Act 2006, mirrors the provisions of the Animal Welfare Act in England and Wales by prohibiting actions calculatedly deliberately or recklessly to cause any animal to suffer, while “under the control of man”

Because as above, any legal responsibility for welfare is more generally limited to prohibition of actions considered likely to **cause** suffering (or actually calculated to cause suffering), rather than imposition of a more general responsibility for welfare, thus in most European countries any provisions in relation to welfare of game animals in particular, tend to be included in more specific game laws.

Provision for welfare under such Game Laws is commonly indirect rather than direct (that is to say, the legal constraint is through the imposition of particular seasons, or through the

[6] [Dutch Animal Health and Welfare Act (GWWD) (1992) paragraph 36 subsection 3].

restriction of firearms which may be used, the prohibition of traps, snares, stupefying baits etc.). For the most part such laws are national; in some instances they may have regional (or provincial) variants.

Actual responsibility for welfare is rarely defined in these more specific laws. It is apparent that since in almost all cases, specific prescription is made in terms of what is permitted and what is not in relation to firearms, ammunition, shot distance, permitted seasons etc., the State is by and large assuming responsibility by making such prescription, suggesting that as long as the practitioner obeys the law he or she is exonerated from further legal responsibility.

It is clear however that that is over-simplistic (and merely represents the 'strict' legal position), since in many countries any prospective hunter must by law become a member of some national or provincial Hunting Association and many of these Associations have their own (more formal or less formal) Codes of Practice. There may therefore be a second 'tier' of constraint on actions impacting on welfare, but while such voluntary codes of practice might appear to impose some level of responsibility on the practitioner, they do not of course comprise a **legal** obligation or imply a legal responsibility.

In a similar way we may note that in many European countries (see for example Putman 2011), game management is structured through the (mandatory) definition of specific Game Management Districts, within which day to day management may be devolved to the landowner(s) or other leaseholder (commonly a local Hunting Association). Here (while provision of an annual Management Plan is still commonly a legal requirement), actual day to day management responsibility is effectively devolved. To what extent that implies an explicit devolution of responsibility for welfare to that leaseholder is less clear!

In some instances, 'allocation' of hunting rights within a given GMD imposes on the 'leaseholder' other significant responsibilities. Thus in many cases such 'leaseholder' is considered responsible to keeping deer populations in balance with the habitat and ensuring that impacts to natural heritage, agriculture or forestry are kept to acceptable levels. Further, in a remarkable number of countries (e.g. Belgium, Austria, Germany, Czech Republic, Baltic countries, Poland, Hungary, Romania, Slovakia, Slovenia, Croatia) the 'leaseholder' is fully responsible for paying compensation for damage caused by deer (or other game ungulates) within the GMD for which they have the management 'title'. Once again this implies significant 'devolution' of management responsibility from the State or Provincial authority, but does not necessarily impose specific responsibility for welfare.

As at paragraph above **the position would appear to be that minimal welfare requirements are prescribed by laws which prohibit specific practices or provide minimum constraints; some additional consideration for welfare and humane management practice may be supplied by voluntary codes of practice prescribed by Hunters Associations in some countries.** But actual responsibility is rarely defined.

10. ADDRESSING WELFARE ISSUES AND IMPROVING INDIVIDUAL WELFARE STATUS IN WILDLIFE SPECIES

10.1 Background to assessment of welfare status in individual wild deer

How can we assess what may be our responsibilities for wildlife welfare against such a framework? In exploring the options available for mitigation of negative impacts and/or active enhancement of positive welfare, we will again focus as a worked example on wild deer and more specifically, upland red deer. Humans impact on deer populations in a variety of ways: indirectly in terms of encroachment on habitat by industrial and residential developments, alteration of habitat by agriculture or forestry, habitat fragmentation with roads and railways, disturbance of movement patterns and freedom of movement by the erection of fences and so on. We also have a more direct impact through active management of deer populations through culling (or potentially, in imposition of other direct management practices such as capture for translocation, immuno-contraception etc.) What are the welfare issues we might recognise for wild deer, and raised by our deer management practices?

The Deer Commission for Scotland (now a part of Scottish Natural Heritage) is on record as asserting that if we can assure a minimum level of competence amongst stalkers that this will in itself ensure proper attention to welfare. We would argue here that competence of the stalker (and legal support through, for example, the imposition of appropriate close seasons) can only be effective in minimising actual suffering of individuals and cannot actively promote positive welfare of individuals or populations (except as above, insofar as culling may establish the population number at levels in balance with available resources). More active promotion of positive welfare status, beyond this, must be seen as a separate responsibility which has little to do with stalker competence as currently conceived.

In a review for the (then) Deer Commission for Scotland in 2008, Putman considered as potential issues for upland red deer:

i) winter die-off
ii) need for (or alternatively problems resulting from) of supplementary feeding
iii) need for winter shelter
iv) the problem of wounding
v) the problem of orphaned calves.
vi) problems associated with extensive fencing, fragmenting range and disrupting traditional movement patterns (particularly when such fencing prevents animals from reaching low ground shelter over winter)
vii) welfare issues (and public safety issues) of deer involvement in road traffic accidents.

The problem of wounding is an old chestnut and is somewhat intractable in the sense that it is hard to get good objective data on wounding rates (but see Urquhart and McKendrick, 2003; Cockram *et al.*, 2011). Even work focusing on time to death inevitably imposes an arbitrary period which is subjectively deemed as acceptable and it is virtually impossible to account for animals which are wounded but subsequently escape.

Orphaning of dependent calves is considered in detail by Putman (2008) and also by Apollonio *et al.* (2011). In essence, juveniles may be both nutritionally and socially-dependent on the mother (reliant on her milk production but also reliant on her to gain familiarity with a home range, familiarity with other members of the social group, to learn appropriate social responses, etc. It is well-established, for example, that female red deer calves 'acquire' some of their dominance status within the group as a consequence of the status of the mother: e.g. Clutton-Brock *et al.*, 1982).

However it is extremely difficult to determine precisely when these periods of dependency 'expire' as it were. The period of lactation of breeding females, for example, is not a good

indicator for nutritional dependency of the calf, since commonly dams are lactating to Christmas and beyond – and while, yes, the calf will opportunistically take advantage of this extra bonus, it is fully-weaned and in no way nutritionally dependent on this added luxury. Such suckling, however, even without the intake of milk, may remain part of the bonding associated with social dependency and we really have no idea how long the period of learning from the mother might continue (see for example Holand *et al.*, 2012).

It is probable that it may extend at least until birth of the subsequent cohort of offspring when the earlier juveniles are 'displaced' – but clearly it would be inappropriate to extend close seasons this long, or we would have no open window for culling females at all. Thus we must accept this un-quantified 'loss' (social dependency of the calf) as 'unavoidable suffering' if indeed we endorse any culling of female deer at all.

But in truth all such discussion is largely semantic; no welfare issues arising in culling of females with dependent juveniles **so long as the juvenile accompanies the mother and the stalker ensures that any such dependent offspring are shot before the mother.** Although it is acknowledged that this is not practical in all cases, on welfare grounds alone, it should at least be the preferred approach wherever possible.

Direct control (killing of individuals, control of the population) clearly cannot in itself be designed to promote welfare (although arguably maintenance of population numbers below levels where resources would become significantly limiting does contribute to the improved welfare of surviving members of that same population).

However, there may be potential in other areas of management – in management of the resource itself - to establish practices which in themselves may promote opportunities for adaptive behaviour (e.g. diversification of natural food resources to provide adequate quality and quantity of natural forages during the year; provision of adequate shelter so that animals at least have opportunities to seek shelter in adverse weather; maintenance of movement corridors between different parts of the range, between winter and summer ranges or for dispersal of juveniles – ensuring that any new fencing proposals do not obstruct such freedom of movement, etc.).

Responsibilities and actions here may thus be proactive. In addition however there is presumed some need to ensure that other management practices (not necessarily explicitly directed at deer in any direct way) do not have negative impacts, and that general management practices which may impact upon deer populations and their welfare (such as fencing, felling of forestry, enclosure of parts of existing deer range, etc.) are subject to some form of explicit risk assessment and proper consideration whether alternative options are available which will reduce or avoid negative impacts on welfare.

Only in such cases may we decide whether acceptable alternatives may be available, or whether no such options exist and we may judge the potential loss of welfare to the deer population as necessary or at least unavoidable suffering (see section 8.3).

While these considerations are expanded here specifically in relation to deer, similar considerations might be extended to consider measures appropriate to minimise negative impacts and promote positive welfare for other wildlife species.

10.2 Actual assessment of welfare status in individual wild deer

How may we try to translate such theoretical constructs into what measures might be practically available for field use to determine the condition of a population of wild animals? Here once more we explore what measures might be available by considering how we might try to assess the condition of a population of wild red deer in an upland environment.

Clearly if we truly believe that an individual animal's welfare status is defined in terms of its own self-perception of its well-being, then we must rely in major part on behavioural cues to advise us of whether or not that individual (or others in its group) are showing behaviours which are directed towards altering/improving their current status - and whether or not those behavioural responses are likely to be successful (thus whether amelioration of welfare status is within the animal's own adaptive capacity).

While this may be practicable for individuals or groups which we may study over prolonged periods of time, such an approach is clearly not likely to be feasible in application where encounters with individuals or groups are typically occasional, fleeting and at a considerable distance. Here inevitably assessments will be biased in favour of physical condition scores or rather coarse behavioural assessments.

Putman (2005) summarised the behavioural indicators of poor condition/negative welfare status used by experienced stalkers as:

Signs of being bullied within the herd, particularly within a group of animals of similar general age, are generally considered an indication of an animal which might be sick or otherwise in poor condition. Animals which are drawn apart from the rest of the group were likewise viewed with suspicion.

Lethargy was another behavioural indicator noted as characteristic of animals which were potentially in poor condition, although this may be confounded with effects of age.

"Failure to shake regularly when wet, being the first to lie down after running, lagging behind the group on a prolonged run, or sometimes those animals which take risks lying in vulnerable places or out feeding early or in risky locations are sometimes doing so because they are in poor condition and have to take risks to survive" (from Putman 2005).

Lethargy then might be opposed by active and/or appetitive behaviour as indicating a positive welfare status. Age-related changes in the amount or intensity of activity however should be taken into account.

Many stalkers attempt to cull selectively animals with broken-mouths (animals which have started to lose teeth) on the presumption that these will be unable to feed as effectively and will thus (even if it is at some point in the future) deteriorate in condition, particularly where environmental conditions are harsh. As with most behavioural cues, such selection presumes a period of observation, and use of a telescope.

Being injured in some way or ill always represents a negative state of welfare. However, if we assume that animals should have the freedom adequately to react to being injured or ill, positive indicators of such freedom may include a temporal reduction in 'normal', active behaviour and, instead, seeking rest and inactivity. During some period of observation signs of recovery then are to be interpreted as positive indicators.

As noted however, much assessment of welfare in the field will be based more directly on observations of physical condition. Many use the classic visual condition score of Riney (1955, 1960), a 5-point condition score for assessment of (physical) condition of wild deer (specifically red deer) which has subsequently been modified and used by others for assessing condition of other free-ranging ungulates (e.g. ponies: Gill, 1987; Burton, 1992). Riney's condition index is based on assessment, by relation to established standards, of the amount of flesh covering ribs and rump. In effect, as with the Body Condition Scores used in assessment of condition of domestic livestock (from which it was derived) it offers simply a method for formalising a subjective assessment of the depth of subcutaneous fat (e.g. Zulu *et al.,* 2001; Broring *et al.,* 2003).

Once again, experienced stalkers may utilise additional physical information. Prolonged examination may reveal if an animal is scouring, while staining of the hindquarters (combined with evidence of some emaciation; above) may indicate that this has been a chronic problem, or over a significant period. As with any other physical characteristics, care must be taken to ensure that observed changes in coat colour are not due to wet/ mud/ vegetation. Other obvious signs of disease include limping, coughing, or obvious emaciation.

For animals in a given age-category, it is also noted (Putman, 2005) that those in poorer condition tend to have a scruffier appearance to the coat, often due to an improper moult and retention into the new coat of some proportion of the old winter or summer pelage. Thus animals in poorer condition tended to have a harsher coat texture with a more 'staring', less glossy appearance. Poor (or late-born) calves may also retain signs of spotting in the coat. However, once again we must note that care must be taken in such assessment to take account of weather conditions and effect on coat and coat appearance. Coat colour and condition can also be varied by wet/mud /staining from vegetation etc.

While the above examples are based on observations in deer, it is clear that the principal idea can be extrapolated to any other species. Specification of readout parameters in relation to species-specific characteristics however are essential: social stability for example translates into different behavioural patterns within a herd of deer when compared to a pack of wolves. Therefore, any assessment of individual animal welfare can only be as good as our knowledge about the biology of the respective species.

11. ASSESSING BIOLOGICAL AND ETHICAL ASPECTS OF INDIVIDUAL WILDILFE WELFARE

In summarising the discussions above we conclude that assessments of animal welfare need primarily to answer the question of whether the adaptive capacity of the individual is being exceeded by prevailing environmental circumstances. In practice, we need to assess whether the individual:

- is free adequately to react to hunger/thirst, e.g. perform foraging behaviour and find appropriate food and water
- is free adequately to react to climate conditions, e.g. find shelter when needed
- is free adequately to react to physical injury or disease, e.g. find rest and shelter
- is provided with an environment allowing the animal to adapt to the demands of prevailing circumstances
- is free to express its full behavioural repertoire
- is free adequately to respond to social interactions
- is free to experience the full spectrum of emotional states and respond to those states adequately.

If any given "freedom" is absent or inaccessible (e.g. permanent absence of shelter or permanent food shortage), the animals' adaptive capacity is likely to be exceeded, which will translate in a long-term negative welfare state and, thus, suffering that may demand intervention. If such freedom is disrupted only temporarily (e.g. seasonal food shortage), the resulting short-term suffering of the animal is likely to lie within the animal's adaptive capacity and no intervention is demanded.

That determined status is, in itself neither morally good nor bad; it simply offers description of a given (biological) condition. Subsequent ethical analysis may decide that that determined status does constitute a *welfare problem* which needs to be addressed (the animal or animals are in a poor welfare state, or at least a state which might be improved upon); in which case we must explore what are the (welfare) advantages or disadvantages of different alternative possible interventions. We note however that such moral and often intuitive primary assessments may differ significantly between different observers and may also not accord with biological assessments.

A full assessment of individual wildlife welfare should comprise both a biological and an ethical assessment in order to result in sustainable wildlife welfare management. A series of worked Case Examples is included at the end of the companion report (Ohl and Putman 'Applying Wildlife Welfare Principles at the Population Level, 2013).

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ANNEX 1: GLOSSARY OF TERMS

It remains one of the problems of any new area of enquiry - and the welfare 'area' is no exception -that successive authors tend to adopt words from common parlance and give them quite technical meanings. In order, therefore, to avoid misunderstandings and potential misinterpretation, we felt it might be useful to offer a glossary of terms to make clear what is meant by each term, by us or by others, when used in this report.

Adaptive Capacity
We use the expression: adaptive capacity, to describe the set of innate (physical and mental) abilities with which an animal is able to respond and 'adapt' to its environmental situation and any challenges it may encounter. Many features of this adaptive capacity have been acquired by a species through evolution; others may be developed by individual animals as a result of its own lifetime experience. The species-specific abilities form a basis, which is refined and developed in each individual. The adaptive capacity of an individual is not static; it continues to develop throughout an animal's life; in addition at any one instant of time it is dependent on the individual's internal state as well as on changing environmental conditions.

In considering the welfare of individuals of more social species, where the environment also includes other members of its social group, it is necessary to re-evaluate the adaptive capacities of an individual as being related to the functioning of a social group as a whole.

The adaptive capacity of a group describes the set of (physical and mental) abilities with which a group of animals is naturally endowed. The species-specific abilities of each group-member form a basis, which is refined and developed in each individual as a functional part of the whole. As with that of the individual, the adaptive capacity of a group is not static; it is dependent on the interactive functioning of group members as well as on changing environmental conditions.

Adaptive response
Welfare is in large part a function of an animal's ability to respond appropriately and in some adaptive way to its environmental circumstances. Adaptive responses thus are characterised by behavioural or physiological responses that enable and individual (or group) to react appropriately to both positive and potentially harmful (negative) stimuli (e.g. approach a food resource or avoid a potential danger).

Appropriate adaptive response
There may be considerable variation between individuals in their adaptive capacities (their actual behavioural or physiological abilities to respond adaptively), or in the actual coping strategy adopted. Different coping strategies may relate to what some authors describe as different underlying 'personalities' of individual animals, where some may be more active and others more passive in response. As a result there may be quite substantial variation in the way different individuals may respond to the same stressor and the ways in which they may cope with environmental or social challenge - not simply in relation to differences in the adaptive repertoire available to different individuals, but also in relation to coping strategy adopted. While it may thus be 'appropriate' for an actively coping individual to respond more pro-actively or aggressive to a given challenge, avoidance of that same stimulus might be appropriate for a more passively coping individual.

Depending on internal (e.g. hormonal or developmental) and external changes (e.g. season) an individual may respond differently even to the same stimulus at different times. While such different responses may all be adaptive, a distinct response may be more appropriate at a given juncture depending on prevailing internal and/or external circumstances: for example foraging behaviour clearly is adaptive as such; still, during harsh weather conditions

it might be more appropriate to seek shelter and to inhibit foraging behaviour. Thus, any meaningful assessment of the adaptive value of behaviour can never be done in 'absolute' terms but only in relation to prevailing circumstances.

Welfare
Welfare describes an internal state of an individual, as experienced by that individual. This state of welfare is the result of interplay between the individual's own characteristics and the environmental conditions to which it is exposed and cannot be assumed to be the same for all individuals placed within a given environmental situation. Human determination of an animal's state of welfare is only as good as the observer's perception of the signals that the animal emits. A negative state of welfare is perceptible via reactions that are aimed at changing the existing situation. A neutral or positive state of welfare is perceptible via lack of any reaction or reactions aimed at keeping the existing situation as it is.

The welfare state of an individual represents a function of its adaptive functioning within prevailing environmental circumstances. For social animals, that environment includes other members of the social group or population; a separate assessment of welfare at the group or population level may thus be determined as the adaptive functioning of the group as a whole in response to a given welfare challenge. The adaptive functioning of a group then is the result of the characteristics of that group, as well as the environmental conditions to which the group is exposed.

At the individual level we assume that welfare is defined by the animals' ability and freedom to adapt to environmental conditions. But we recognise that individuals may show significant variation in their perception of a given status and their 'decision' about how to respond to that perceived status. Thus we may expect that even under identical environmental conditions, different individuals within a group or population may perceive or experience their welfare status differently.

Welfare status
The term welfare status as used in this report refers to the factual, biological status of an animal or group of animals. As such it describes a biological status that may be bad, good or neutral, but is *per se*, neither morally bad, nor good. In our terminology, a welfare **problem** occurs if the adaptive capacities of an individual or group is being exceeded.

Whether or not the welfare status of an individual or group of individuals constitutes a welfare **issue**, implies a value judgement by an observer or by society. Throughout, we try to distinguish clearly between the biological status of an animal should be disentangled and that moral dimension that is brought in by a human observer who interprets and values any apparent animal welfare problem.

Positive welfare
Positive [or good] welfare describes the state in which an individual has the freedom adequately to react to the demands of the prevailing environmental circumstances, resulting in a state that the animal itself perceives as positive. With, in addition, a growing emphasis on the importance of positive experiences, good animal welfare is not ensured by the mere absence of negative states but requires the presence of positive affective states. At the group level, positive [or good] state of adaptive functioning describes the state in which a group has the freedom adequately to react to the demands of the prevailing environmental circumstances, resulting in a state that all individuals of that group perceive as optimum or at least satisficing.

Negative welfare
Welfare status is compromised (welfare status is negative or bad) when an animal or a group of animals have insufficient opportunity (freedom) to respond appropriately to a

potential welfare 'challenge' through adaptation by changes in its own behaviour (where environmental challenges exceed the adaptive capacity of the animal or the opportunities available are inadequate to permit the animal effectively to express the appropriate adaptive responses). Negative welfare, thus, describes a state that the animal itself perceives as negative but that still lies within the animals' adaptive capacity.

The adaptive functioning of a group is compromised ('welfare status' is negative or bad) when a group of animals have insufficient opportunity (freedom) to respond appropriately to a potential 'challenge' through adaptation by changes in behaviour (where environmental challenges exceed the adaptive capacity of the group as a whole or the opportunities available are inadequate to permit the group effectively to express the appropriate adaptive responses). Negative 'welfare' at the group level, thus, describes a state in which distinct individuals still may perceive their own state as positive but that does not allow for adaptive functioning of the group as a whole. In such a situation, it can be expected that the number of group members experiencing 'negative welfare' or 'suffering' will progressively increase over time.

Suffering
Suffering describes the negative emotional experience resulting from being exposed to a persisting or extreme negative state of welfare. Short-termed, negative welfare states such as suffering from hunger and fear serve as triggers for the animal to adapt its behaviour. They therefore serve a function. A brief state of negative welfare may fall within an animal's adaptive capacity, and would not necessarily require intervention. If an individual lacks the ability or the opportunity appropriately to react to suffering (for example, by escaping from a frightening situation), a challenge is created that may exceed the adaptive capacity of the individual. In such a case, the situation is one of suffering for which intervention is required.

Unavoidable suffering
There may be constraints on intervention that are posed purely by practicalities of intervention or mitigation. Thus effective intervention in the lives of free-ranging or wild animals may simply not be feasible; in a farm context, if livestock animals are kept outdoors (which may itself be warranted in terms of promoting positive welfare in other respects), they may be exposed to extreme weather that may cause transient suffering. Sudden changes of weather are neither predictable nor controllable and occasional suffering is *unavoidable* when animals are kept outdoors.

Necessary suffering
Other constraints may be posed by anthropocentric aims or human convenience, for example, efficiency of animal production in an agricultural context. In such cases, there may be mitigation options which are not implemented for reasons of efficiency or economics. Here, any suffering resulting from non-intervention may be considered avoidable (in theory) but *necessary* (because of distinct subjective/**individual** human interests).

Acceptable suffering
The more fundamental question, i.e. whether a distinct human interest and, thus, whether necessary suffering may be *morally acceptable*, still needs to be answered. Yet this returns us to our third axis of what is or is not acceptable to society as a whole, since there may in practice be a distinction
between what a producer or manager deems necessary or unavoidable and what society as a whole considers acceptable. Final decisions must therefore be couched within what is the ethical view of contemporary society. As above, what is acceptable or unacceptable to society is inevitably a value judgement or ethical decision.

Welfare issue

A welfare issue arises when a welfare status is perceived as a moral problem by an outside observer who considers that the welfare status is unacceptable and needs to be addressed (the animal or animals are in a poor welfare state, or at least a state which might be improved upon).

Self-perception [of an animal]
In effect the 'decision' by any individual animal to accept its current status or to engage in behaviour designed to bring about some change of status must in part be determined by an assessment of physiological condition (hunger, thirst etc.) but also by an assessment of a sense of 'well-being'. Most commentators now agree that welfare is in large part a function of an individual animal's own perception of its internal status. While 'perception' thus does describe some cognitive processing of internal information, it does not necessarily imply a process of conscious reflection. Rather, self-perception in animals should be understood as a process of relating internal information to external stimuli.

Emotional state
It is clear that emotions play an important role in this assessment and in the performance of adaptive behaviours. There is a growing literature to suggest that much of the function of emotion or emotional status may indeed be to provide a convenient proximate surrogate to reinforce behaviours which are (or were) in some way adaptive, to make performance of these appropriate behaviours in some sense pleasurable or rewarding and thus promote their expression in appropriate circumstances.

When therefore we, or other authors, refer to an animal's emotional reaction to a given situation, we refer quite explicitly to those physiological and behavioural mechanisms which enable that individual to assess its internal and external situation and trigger appropriate adaptive responses.

Maximising versus Satisficing
It is perhaps self-evident that if some animal is perceived by the observer to be in a negative welfare status, but has opportunities (correct behavioural repertoire, appropriate environmental conditions) to improve its status, yet fails to take that action, then it may simply perceive its own status as satisfactory.

It seems probable that not all individuals necessarily seek to maximise welfare status at any given point, and that 'adequate' may at times be enough. "Satisficing" is an alternative to maximisation for cases where there are potentially many possible alternative options which cannot effectively be fully-evaluated. A decision maker who gives up the idea of obtaining an optimal solution but obtains the optimum he can compute under given time or resource constraints is said to satisfice. In this approach one sets lower bounds for the various objectives that, if attained, will be "good enough" and then seeks a solution that will exceed these bounds. The satisficer's philosophy is that in real-world problems there are often too many uncertainties and conflicts in values for there to be a realistic probability of being sure of obtaining a maximisation and thus that it is far more sensible to set out to do "well enough" (but better than has been done previously).

It is of note here that the welfare status of the **group** may be optimised while the (apparent) welfare states of its (satisficing) individual members may vary over a considerable range.

Stress
In general, physiological approaches have focused on the concept of measuring levels of stress experienced by individuals based on the belief that if stress increases, welfare decreases. However, there are a number of problems with such an approach. Short term stress responses are an inevitable part of the process triggering an adaptive response from the animal and thus may be functional in maintaining a longer-term positive welfare status. In

such analysis a more relevant measure might be evidence of chronic and ‘traumatic’ stress (that exceeds the individual’s adaptive capacity), something which is not trivial to differentiate by means of physiological measurements from acute stress.

Stressor

When we use the term stressor, we do not necessarily imply something which causes ‘stress’ that exceeds the individual’s adaptive capacity, but in effect denote any environmental or other force impinging on an individual animal or group; an environmental ‘challenge’ which has to be met.

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