

Resource Review:

Model Conditions For Pet Vending Licensing, 2013. Chartered Institute for Environmental Health, 32pp.

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Introduction

According to the best available data, over 65 million pet (or companion) animals are maintained in the UK (PFMA, 2014). Although this figure includes large species, for example horses, the majority are household or garden animals. The approximate composition of this 'pet' population includes: 100,000 insects (which likely more broadly implies a variety of invertebrates); 40-45 million ornamental fish; 100,000 frogs and toads; 300,000 tortoises and turtles; 400,000 lizards; 400,000 snakes; >2 million domestic fowl and caged birds; >2 million small mammals; 9 million dogs; and 8 million cats (PFMA, 2014). Several thousand species are thought to be involved.

Many of these animals are supplied by locally licensed pet vending establishments, although unlicensed and unlawful selling frequently occurs via the Internet, pet markets and other sources (Warwick et al., 2011; Toland et al., 2012). Concern is growing internationally regarding the pet industry, perhaps at present notably with regard to the exotic animal sector. Issues include species and ecological conservation threats (Bush et al., 2014); animal to human ('zoonotic') and agricultural animal disease (Akhtar, 2012); and the introduction of invasive alien species (Shine et al., 2010). Key amongst concerns is animal welfare at all points in the trade and keeping chain, again notably regarding exotic or 'wild' animals. For example, whilst many problems affect domesticated dogs and cats, such as overpopulation and incidents of cruelty, these groups commonly experience relatively free human 'life-sharing' associations, which are well supported by local veterinary care. For example, dogs and cats manifest strong affiliative traits (Price, 1984), which are regularly accommodated in the home where these animals enjoy low levels of restriction, and largely voluntarily participate in human day-to-day activities (Udell and Wynne, 2008).

By comparison many exotic animals commonly lack affiliative traits (Price, 1984) and are typically confined to highly restrictive and artificial environments, with genuine impartial and expert guidance being considerably less available. The consequences of these issues are highly relevant, for example, most dogs achieve natural potential longevity (Mitchell, 1999) whereas most reptiles do not (Toland et al., 2012). Indeed, Toland et al. (2012) found that in UK homes, 75% of reptiles die prematurely in their first year. Relatedly, a recent study of a major global exotic pet supplier found cumulative mortality rates during 6 weeks for invertebrates, amphibians, reptiles and mammals, to be 72%, which industry experts deemed to be normal and acceptable (Ashley et al., 2014). Husbandry in the domestic environment, as well as differing coping mechanisms of animals, likely impact on life-quality and outcome, and the conditions animals experience in commerce directly impact health, welfare and future survival (Ashley et al., 2014).

Seeking to safeguard the welfare of animals at pet vendors is therefore vital and warrants, wherever possible, both dedicated and meaningful guidance. The 'Model Conditions For

Pet Vending Licensing' (MCPVL, 2013) were conceived for this reason. The purpose of this review is to critically examine this new guidance and discuss its key strengths and weaknesses.

Methodology

For our review we obtained the published MCPVL document as well as pre-publication drafts, which were subsequently circulated for consultation via a working party of professional biologists, veterinarians, medics and others who were requested to examine the materials, and comment on issues within their area of qualified expertise, as well as to offer any general observations. All consultants were also established publishers of science-based husbandry information, and familiar with formal review protocols and standards. None of the consultants possessed any vested interest in the publication of the document or the trading of pet animals.

Enquiries with the publisher of the guidance identified historical and current contributors along with their affiliations, which allowed for clarifications regarding parties with vested interests as well as any relevant credentials. During approximately 20 months, the comments of the independent consultants were collated and redistributed within the working party in order to verify views and develop a consensus.

Discussion

The 'Model Conditions For Pet Vending Licensing' (MCPVL, 2013) constitutes guidance criteria intended to raise and standardise the quality of management for animals sold as pets through licensed establishments in the UK. The Chartered Institute of Environmental Health (CIEH) is the publisher of the guidance. The CIEH's remit includes providing information, evidence and policy advice to local and national government.

Guidance on a range of animals, including exotics, aimed at helping local authority pet shop inspectors deal with the growing issue of an expanding range of animal species being sold in pet shops is warranted, and therefore the MCPVL are essentially timely. The format of the MCPVL is typical of that for other CIEH literature and throughout the 32-page document follows didactic instruction (headed 'Condition') and advisory information (headed 'Guidance') for each management point.

General observations

Leaving aside the array of grammatical, typographical and formatting errors in the text and tables, the document has no discernible coherent theme of its own to unify the disparate and frequently unscientific husbandry principles it recommends for different animals. These deficiencies are particularly, but not exclusively, apparent in relation to birds, reptiles and amphibians, and fishes. The absence of important basic information is negatively compounded by some highly questionable or misleading content, including biological and husbandry guidance that is inconsistent with good animal welfare, exam-

ples of which we set out later.

The problems with this document commence early and endure throughout. For example, the front cover depicts a hamster resting on a plain wooden cage furnishing, whilst the text itself states that wood should not be used in hamster cages. Given that the guidance is intended to offer 'model' standards, then the reader likely presumes that the main image would be exemplary, and thus the messaging is confused at the outset.

Elsewhere the guidance states: "*Pet care leaflets or other similar written instructions suitable for the species (or group of species) in question should be made available to customers free of charge at the time of purchase...*". Relatedly, it also states: "*Staff members must be able to provide suitable advice to purchasers and answer questions as required by them (the purchaser).*" Education is a vital component of animal care as well as helping purchasers to make informed decisions on whether to acquire an animal. However, in our view, the document's emphasis on pet trade-led information is both naïve and potentially harmful.

The document cites the 'five welfare needs' as enshrined in law under the Animal Welfare Act 2006, namely: 'Its need for a suitable environment'; 'Its need for a suitable diet'; 'Its need to be able to exhibit normal behaviour patterns'; 'Any need to be housed with, or apart from, other animals'; and 'Its need to be protected from pain, suffering, injury and disease'. However, as we will indicate, some guidance provided in the document would, in our view, run contrary to providing for these needs.

Protecting animals from fire outbreaks at pet shops is a legal provision of the Pet Animals Act 1951. Nevertheless, despite this very important requirement one can argue that fire risks are also proportionately increased where exotic animals are sold due to the typical presence of complex and multi-unit electrical heating, lighting and filtration devices. Where fishes are concerned, the guidance presumes that no efforts will actually be made to save these animals anyway, which many will view as irresponsible, irrespective of laws that govern the welfare of all vertebrates.

The fundamental principle of this document states: "*Animals must at all times be kept in accommodation designed to prevent escape and an environment suitable to their species and condition with respect to behavioural needs, situation, size, temperature, ventilation, and cleanliness. All accommodation must avoid drafts and overexposure to direct sunlight and must be kept in good repair.*" This principle is derived from a key provision of the Pet Animals Act 1951 and Animal Welfare Act 2006. As a legal requirement and 'Condition' in the document, this fundamental principle is immutable and non-negotiable. However, little if any of the guidance in this document would actually meet, for example, the genuine behavioural and spatial needs of animals – many species simply would not be capable of flying, jumping, running, burrowing and so on as they would naturally. That said, this major deficiency is not the sole fault of the MCPVL publication, but also a systematic failure of the Pet Animals Act from which it takes its lead.

Specific sections

We found certain contributions, for example for 'Dogs' and 'Cats', to be relatively well prepared, and whilst possessing greater potential, normal publishing format limitations for CIEH documents may have constrained fuller development of these basic yet promising sections. The higher quality of the dog and cat sections may reflect the range of supporting contributors to the guidance who were able to draw on a wide range of resources to develop these sections.

In contrast we found certain contributions, for example 'Other small mammals', 'Birds', 'Reptiles and amphibians' and 'Fish', to be relatively-to-very poor, with the failures of these contributions being attributable to both low quality and deeply minimalist information rather than to potential publishing limitations. Unlike the sections for dogs and cats, the other sections aim to represent many different animal species that can be found in high street pet shops. In our view, not only has addressing this species diversity been too challenging for the current MCPVL format, but also a significant amount of the material for the birds, reptiles, amphibians and fish sections has been produced by parties with trade vested interests rather than by impartial and objective contributors.

For example, for reptiles and amphibians the guidance states: "*Most reptiles and amphibians are not social and may, therefore, be kept individually.*" Whilst asocial traits may imply individual accommodation can be appropriate, the reader may deduce that social species (of which there are many) are therefore appropriately or even necessarily maintained in groups. Such a deduction could, and frequently does, in pet shops lead to aggressive territorial, reproductive combative and other events and results in serious injuries among conspecifics. Again for reptiles and amphibians (and curiously not for other animals) the document states: "*Communal enclosures should not be stocked as to appear overcrowded, common sense should be observed.*" Animals 'appearing' overcrowded is neither a specific nor useful gauge and, as means of assessment, far more rational and safer guidance principles have already been published. A useful way of interpreting overcrowding for any observer is to apply the 'crypto-overcrowding' principle (Warwick et al., 2013a), which determines that unless all animals can utilise all provisions (water, food, space, furnishing etc) at any one time, then such conditions should be considered overcrowded.

In nature, reptiles (including those common in the pet trade) occupy expansive home ranges that are frequently between hundreds of square metres and hundreds of hectares (e.g. Carter, 1997; Moler, 1985; Speake, 1993; Thompson et al, 1999), which caging cannot supplement (Warwick, 2004; Burghardt, 2013). Accordingly, spatial provisions for these (and other animals) should be as generous as possible (Warwick, 2004, Warwick et al. 2013a).

The section regarding spatial provisions for lizards recommends a principle of a minimum of three times the full length of a lizard to calculate the acceptable length of an enclosure. Because the 'full length' of a lizard should include its tail then this would be 'fair' under some pet shop environment conditions, because it would, for example, suggest a minimum cage size of 2.5m for many medium-sized lizards that are available. However, for very small lizards, for example, those with full lengths of 10 to 15 cm, this guidance is strongly contraindicated because small lizards typically have demanding spatial needs due to their frequently high activity levels and insectivorous nature that necessitate range requirements comparable to larger lizards (Warwick, 2004; Warwick et al., 2013a). Nevertheless, the evidential foundation for the recommendation is absent and in such absence a rational basis for the guidance is unclear or invalid.

With regards to spatial provisions for snakes, the guidance recommends the principle of two-thirds the body length of a snake to calculate the acceptable length of an enclosure. This recommendation means that no snake can fully extend its body. There is no evidential foundation for the recommendation and no rational basis to it. However, there exists longstanding evidence and opinion regarding postural-positional orientation behaviour in snakes and their apparent requirement to fully

extend their bodies at will – a behaviour related to general locomotion (Greene, 2000) and also thought to relate to achieving comfort and easing of physical discomfort (Warwick, 2004; Warwick et al., 2013a). Accordingly, best evidence determines that snakes should be provided with environments that (as a minimum) allow them to fully extend their bodies to maintain essential comfort and health, and thus the MCPVL guidance is unscientific and deficient.

Varga (2004) suggested similar spatial provisions for snakes to those of the MCVPL – ie cage lengths of three-quarters of snake body length. However, that guidance derives from historically common practices reported in Bernard (1996) rather than scientific observation, and predates both current animal welfare legislation and modern biobehavioural studies involving the biological needs of snakes. The MCPVL guidance, therefore, recommends even smaller dimensions than the outdated literature, marking a retrograde move.

The 'Other small mammals' (that is, the so-called 'small furies') section is based on information recycled from non-authoritative materials and appears to have no logical foundation. It is of note that the tabulated guidance fails to cater for a wide and diverse range of commonly found and potential pet species, for example, sugar glider, skunk, meerkat, coatimundi and raccoon (Ashley et al, 2014; Schrickel et al, 2008). Important guidance on enrichment and spatial needs is notably absent. For example, the range of activity for many small mammals includes the natural behavioural requirement to burrow (Augustsson, 2004; Ewer, 2010; Johnson, 2002; LariviÈre and Messier, 2002). Many species are known to be highly active. Environments therefore need to be complex, with correspondingly accommodating enclosure length, breadth, height and substrate. The guidance, for example, states that gerbils can be kept in a group of up to 4 individuals, in a space of 25cm (l) x 27cm (w) x 30cm (h). At ground level the resultant environment would be insufficient for provision of a feeding station large enough for 4 animals, at least 2 water stations, a latrine area, enrichment, and a safe retreat or hide. Given that essential substrate for burrowing would significantly decrease available cage height, occupants would be left with insufficient space to jump – i.e. the 30cm (h) provision is inevitably reduced by the depth of the substrate. The minimum height requirements would therefore deny both the natural behaviour of jumping and the natural behaviour of burrowing.

Some guidance may also result in animal husbandry conditions that could contravene UK law, for example, the guidance on the caging of birds. Under UK legislation Section 8 of the Wildlife and Countryside Act 1981 (as amended) states: "*If any person keeps or confines any bird whatever in any cage or other receptacle which is not sufficient in height, length or breadth to permit the bird to stretch its wings freely, he shall be guilty of an offence.*" This provision in law is widely interpreted to include a bird stretching its wings in any physical dimension. Although the MCPVL acknowledges that "...cage size must be adequate to allow birds to open their wings fully in all directions..." the tabulated guidance on cage dimensions for many species of frequently kept bird is both contradictory and appears to contravene legal requirements.

Recommended stocking densities for birds are set out according to bird length rather than wingspan. When wing measurements for pet birds are taken into account (e.g. Forshaw, 1989; del Hoyo et al, 1997; Hilty et al, 2003; Juniper and Parr 1998), the MCPVL guidance for at least 10 species of cockatoo and at least 8 species of macaw, would not allow these animals to spread their wings in these cages, thus contravening the very minimal provisions as set out in the Wildlife &

Countryside Act. Notwithstanding that the keeping of even a single bird under MCPVL standards might contravene the law, the guidance further suggests stocking several birds in the same conditions as a single bird. The guidance offers no recommendation for cage height, which may lead readers to undervalue this important consideration. Where more than two birds of larger parrot species are to be housed together, the MCPVL recommend that these are displayed in aviaries or flights. However, it is questionable whether the recommended aviary size would allow even one individual of a larger species to stretch its wings in all directions.

The MCPVL guidance states "...perches must be positioned so that birds do not defecate on each other." Accordingly, based on the recommended stocking density of four birds per cage, and assuming that cages permit birds to perch at only one level, then the stated minimum cage sizes would offer insufficient space for many of the smaller parrot species to stretch their wings freely. For example, in a minimum legal cage size where a parrot is capable of fully stretching its wings in all three dimensions (albeit only just capable), it would seem highly improbable that the bird could achieve this when the space must be shared with co-occupants, let alone should more than one bird wish to extend their wings simultaneously. The MCPVL guidance also states that "*some species will need adequate space to fly*", which is clearly not an option for birds that can barely stretch their wings.

The inclusion of a table relating to enclosure sizes and stocking densities without further clarification is in itself unhelpful and does not account for issues such as potential co-occupant aggression when adult birds are housed together or the need for young birds to be housed with conspecifics for the purposes of socialisation. Important guidance on cage positioning for birds is also absent – for example basic advice should mention that cages are to be placed high off the ground and should not be exposed on all sides.

The 'Fish' section is overly brief and impractical for guidance. It recognises that there are approximately 4000 species of fish available in the pet trade but offers scant guidance on their management for health and welfare. There is no advice on stocking density for aquaria. There is no discussion on providing natural environments for shoaling species or solitary species. There is no guidance on provision of environments for rapidly growing species. There is sensible guidance on water quality parameters that should be the mainstay of fish management but no detail on heating, lighting and environmental enrichment.

One glaring conflict in guidance, however, devalues the entire section on water quality. The guidance for marine fish dissolved oxygen levels states a minimum of 4.0mg/l as a conditional requirement. Subsequently, under the guidance section, the document states that: "*The recommended level is 5.5mg/l so extra care is needed to ensure that levels do not routinely fall below this.*" As fish keeping represents the largest sector of pet keeping and pet vending, as well as having the largest diversity of species traded, it is disappointing that the subject amounts to only 4 sections of the conditions and guidance, with those sections largely devoted to water quality testing. Consequently, there is a dearth of information on conditions and guidance for specific issues of accommodation, health, welfare, feeding and enrichment.

Public health

Human health guidance in the MCPVL document is extremely minimal and of low instructional value, for example, it states: "*Staff and customers should wash hands after handling specimens, and any equipment used should also be disinfected.*"

Customers handling animals prior to purchase should be supervised and offered facilities to wash their hands afterwards." Another brief and nonspecific sentence reads: *"Staff should be aware of zoonotic transmission"*. Essentially, the document contains no proportionate human health guidance, given that zoonoses are a significant and sometimes major public health threat, and despite the fact that the CIEH published separately one of the most comprehensive reviews of exotic pet related human disease along with extensive health preservation guidance for both pet shop staff and pet keepers (Warwick et al., 2012). Furthermore, the document's reference to zoonoses (diseases that are transmissible between animals and humans) states that: *"Zoonoses, or zoonotic disease are infectious diseases transmissible between humans and other animals; many thousands of zoonotic disease have been identified"*. However, although this is a very important issue, the information is misleading because approximately 200 zoonoses are known to affect humans and not "many thousands" (WHO, 2014).

Absence of essential information

Certain essential information that we feel should have been included in the document is notably absent. For example, primates are excluded, which is peculiar given that primates are still sold in pet shops, albeit rarely, and current interest in private keeping of primates is under detailed (including Parliamentary) scrutiny in the UK. In addition, invertebrates are excluded despite a wide variety of these animals being available both for pets and as food animals, and the growing evidence that these animals require consideration regarding their welfare (Crook, 2013; Horvath et al., 2013). Further, regardless of whether or not invertebrates might receive legal protection, consideration of their welfare needs is also relevant not only because some of these animals are sold as pets, but also because where they are sold as food items, their physical condition may reflect nutritional quality as prey items. Relatedly, these authors also consider that the way pet shop managers maintain 'disposable' animals, such as food invertebrates, directly reflects a generalised approach to all animals in their care. Finally, many invertebrate species sold present potentially toxic threats, thus their exclusion from the guidance evades important advice regarding risk factors.

Currently, there are no inspection models or tools to aid competent authorities in their assessment of pet vending establishments. Lastly, there is no guidance on the suitability or unsuitability of selling or keeping certain types of animal as pets, even though at least three models are available (Schuppli & Fraser, 2000; Koene, 2012; Warwick et al., 2013b). These tools are important provisions intended to enable both private individuals and professionals, such as animal managers and enforcement officials, to make informed decisions about the level of challenge associated with caring for any animal.

At the outset, the publication claims to provide: *"...a living document which will be revised from time to time to take into account new knowledge of animal physiology and behaviour as well as advances and development in standards of animal welfare."*

However, in its current form the document does not actually attain (nor indeed closely approach or incorporate) modern understanding of the biological needs of animals and their husbandry in captivity. Accordingly, a 'living document' that fails to meet even basic modern standards infers little prospect of it keeping pace with meaningful 'advances' in animal care.

Potential for miseducation

The modern world is abundant with largely informal guidance

on diverse animal husbandry. A considerable volume of such information substantially or wholly lacks any credible evidence-base and, to date, has played a significant role in the resultant harm to countless animals, and increasingly also their keepers and the environment. In essence, this abundance of information, with its historical lack of a scientific basis, carries with it a dearth of value. Therefore, when guidance is being offered by organisations with relevant formal responsibility, the uptake of this information is both presumed reliable and likely to be followed.

The shortfalls of the MCPVL guidance harbour serious implications with the potential to affect animal welfare on a very large scale because this poor information can be guaranteed to reach an understandably 'welcoming' target audience (British local government agencies). However, many institutions abroad may also grasp at what is apparently helpful material that ultimately does not serve its purpose. Most alarming, is that this information, although unsound, is less likely to be questioned, and even result in reinforced poor management practices. Millions of animals of thousands of species and types that transit pet sellers are likely to be affected by the possible adoption of the MCPVL, and as already indicated, harm in any one part of a chain probably involves subsequent adverse impacts, that may continue into the home and beyond.

Conclusion

We regard the premises for the MCPVL to be important and timely, and the CIEH itself provides an appropriate and 'natural' medium in the UK for the dissemination of the guidance. It may, however, be noteworthy that of the approximately 20 organisations, and scientific and veterinary experts who worked to develop the guidance, 10 withdrew from the project. The MCPVL document is a lateral, and in some cases retrograde, rather than progressive move in pet animal husbandry that blurs weak standards rather than improves them. The guidance is arguably an example of what occurs when consultations go wrong, science is ignored, and soft options are adopted. Whilst strong reviewer cautions have resulted in a considerable amount of very poor material being deleted since prepublication drafts (most notably regarding the reptile and amphibian, and public health sections), in our view the MCPVL remains unfit for purpose. That said, the document has certainly been improved by the extensive deletions. However, improving material by expunging much of its substance must be considered a guarded compliment.

References

- Animal Welfare Act (2006) <http://www.legislation.gov.uk/ukpga/2006/45/contents>
- Akhtar, A. (2012) *Animals and public health*. Palgrave MacMillan: London, England
- Ashley, S., Brown, S., Ledford, J., Martin, J., Nash, A.E., Terry, A., Tristan, T. & Warwick, C. (2014) Morbidity and mortality of invertebrates, amphibians, reptiles and mammals at a major exotic companion animal wholesaler. *Journal of Applied Animal Welfare Science* 17:1-14 DOI:10.1080/10888705.2014.918511
- Augustsson, H. (2004) *Ethoexperimental Studies of Behaviour in Wild and Laboratory Mice: Risk Assessment, Emotional Reactivity and Animal Welfare*. Doctoral thesis Swedish University of Agricultural Sciences, Tryck, Uppsala, Sweden, pp62.
- Barnard, S.M. (1996) *Reptile Keepers Handbook*. Kreiger, Malabar, FL.
- Burghardt, G.M. (2013) Environmental enrichment and cognitive complexity in reptiles and amphibians: Concepts, review, and implications for captive populations. *Applied Animal Behaviour Science*,

- 147:286–298
- Bush, E.R., Baker, S.E. & MacDonald, D.W. (2014) Global trade in exotic pets 2006–2012. *Conservation Biology* 28(3):663–676 DOI: [10.1111/cobi.12240](https://doi.org/10.1111/cobi.12240)
- CAWC, (2013) Opinion on Communicating the Duty of Care. Companion Animal Welfare Council, Cambridge, pp 21.
- Carter, S.L. (1997) Movements, home range, and habitat preference assessment of bog turtles (*Clemmys muhlenbergii*) in southwestern Virginia. Thesis submitted to the faculty of the Virginia polytechnic institute and state university in partial fulfillment of the requirements for the degree of master of science in fisheries and wildlife sciences approved, June 1997, pp 88.
- Crook, R.A. (2013). The welfare of invertebrate animals in research: can science's next generation improve their lot? *Journal of Postdoctoral Research*, 1;2:1-20.
- del Hoyo, J., A. Elliot, J. Sargatal. (1997). *Handbook of the Birds of the World: Volume 4: Sandgrouse to Cuckoos*. Barcelona: Lynx Edicions.
- Ewer, R.F. (2010) The Behaviour of the Meerkat, *Suricata suricatta* *Ethology*, 20:570–607.
- Forshaw, J. (1989) Guides to Parrots of the World. Lansdowne Editions. Melbourne.
- Juniper, T. and Parr, M. (1998) *Parrots: A Guide to Parrots of the World*. Pica Press, Sussex
- Greene, H.W. (2000) *Snakes: The Evolution of Mystery in Nature*. University of California press, pp365.
- Hilty, S.L. (2003) *Birds of Venezuela*. Princeton University Press. New Jersey. p327
- Horvath, K., Angeletti, D., Nascetti, G. and Carere, C. (2013) Invertebrate welfare: an overlooked issue. *Ann Ist Super Sanità*, 49:1;9-17. DOI: [10.4415/ANN_13_01_04](https://doi.org/10.4415/ANN_13_01_04)
- Johnson, D.H. (2002) Coatimundi, Kinkajou, and Raccoon Care. World Small Animal Veterinary Association. <http://www.vin.com/proceedings/Proceedings.plx?CID=WSAVA2002&Category=&PID=12298&O=Generic>
- Koene, P. (2012) Keeping of exotic animals: are all animal species suitable for companion animals. Import & keeping of exotic animals in Europe: Existing concerns and risks-Current challenges to meeting challenges. Federation of Veterinarians Europe, Belgium 4–5 October 2012
- Larivière, S and Messier, F. (2002) Denning ecology of the striped skunk in the Canadian prairies: implications for waterfowl nest predation. *Journal of Applied Ecology*, 25(2):207–213.
- MCPVL (2013) Model Conditions For Pet Vending Licensing. Chartered Institute for Environmental Health, 32pp
- Mitchell, A.R. (1999) Longevity of British breeds of dog and its relationships with sex, size, cardiovascular variables and disease. *Veterinary Record* 27:625–629
- Moler, P.E. (1985) Home range and seasonal activity of the eastern indigo snake, *Drymarchon corais couperi*, in northern Florida. Final performance report, Study E-1-06, III-A-5. Florida Game and Fresh Water Fish Commission; Tallahassee, Florida.
- Pet Animals Act (1951) (amended 1983) <http://www.legislation.gov.uk/ukpga/Geo6/14-15/35>
- PFMA (2014) Pet Food Manufacturers Association Pet. Population Statistics
- Price, E.O. (1984) Behavioral aspects of animal domestication. *Quarterly Review of Biology* 59(1):1–32
- Schricker, B., Gebhardt-Henrich, S. and Steiger, A (2008) Housing situation of small animals in Swiss pet shops. *Schweiz Arch Tierheild*, 50(7):344–51.
- Schuppli, C.A. & Fraser, D. (2000) A Framework for Assessing the Suitability of Different Species as Companion Animals. *Animal Welfare* 9(4):359–372
- Shine, C., Kettunen, M., Genovesi, P., Essl, F., Gollasch, S., Rabitsch, W., & ten Brink, P. (2010) Assessment to support continued development of the EU Strategy to combat invasive alien species (Final report for the European Commission). Brussels, Belgium: Institute for European Environmental Policy
- Speake, D.W. (1993). Indigo snake recovery plan revision. Final report to the U.S. Fish and Wildlife Service; Jacksonville, Florida.
- Toland, E, Warwick, C., & Arena, P.C. (2012) The exotic pet trade: pet hate. *The Biologist* 59(3):14–18
- Thompson, G.G., DeBoer, M. and Pianka, E.R. (1999) Activity areas and daily movements of an arboreal monitor lizard, *Varanus tristis* (Squamata: Varanidae) during the breeding season. *Australian Journal of Ecology*, 24:117–122.
- Udell, M.A.R. and Wynne, C.D.L. (2008) A Review of Domestic Dogs' (*Canis Familiaris*) Human-Like Behaviors: Or Why Behavior Analysts Should Stop Worrying and Love Their Dogs. *Journal of Experimental Animal Behaviour*, 89(2): 247–261.
- Varga, M. (1996) Captive maintenance and welfare. In: Editors, Girling S. and Raiti P, *BSAVA Manual of Reptiles*, Second edition, p9, Gloucester, UK.
- Warwick, C. (2004) Psychological and behavioural principles and problems. In: C. Warwick, F.L. Frye, & J.B. Murphy (Eds.) *Health and Welfare of Captive Reptiles* pp 205–238 Chapman & Hall/Kluwer: London and New York
- Warwick, C., Arena, P.C., Lindley, S., Jessop, M., & Steedman, C. (2013a) Assessing reptile welfare using behavioural criteria. *In Practice* 35:123–131. <http://inpractice.bmj.com/content/35/3/123.full>
- Warwick, C., Arena, P.C., Steedman, C. & Jessop, M. (2012) A review of captive exotic animal-linked zoonoses. *Journal of Environmental Health Research* 12(1):9–24 <http://www.cieh.org/jehr/default.aspx?id=41594>
- Warwick, C., Lindley, S. & Steedman, C. (2011) How to handle pets: a guide to the complexities of enforcing animal welfare and disease control part 1. *Environmental Health News* 8:18–19 Chartered Institute for Environmental Health
- Warwick, C., Steedman, C., Jessop, M., Toland, E, & Lindley, S. (2013b) Assigning degrees of ease or difficulty for pet animal maintenance: the EMODE system concept. *Journal of Agriculture and Animal Ethics*, 27:87–101 DOI: [10.1007/s10806-013-9455-x](https://doi.org/10.1007/s10806-013-9455-x) <http://link.springer.com/content/pdf/10.1007%2Fs10806-013-9455-x.pdf>
- WHO (2014) Zoonoses and the Human-Animal-Ecosystems Interface. World Health Organisation <http://www.who.int/zoonoses/en/Wildlife> and Countryside Act (1981) <http://www.legislation.gov.uk/ukpga/1981/69>
- Wildlife and Countryside Act (1981) <http://www.legislation.gov.uk/ukpga/1981/69>