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## The impact of applied ethologists and the International Society for Applied Ethology in improving animal welfare

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### Abstract

In the 35 years since the International Society for Applied Ethology (ISAE) was founded, much of the scientific research done by applied ethologists has been concerned with understanding and improving animal welfare. There have been significant advances in conditions for farm and laboratory animals, but the overall rate of progress in animal welfare seems inadequate relative to the severity of suffering and huge numbers of animals affected. Advances in animal welfare are most likely to occur when benefits are also conferred upon other public concerns, when there are economic advantages associated with these changes, and when networks exist to facilitate transfer of information and to coordinate activities through commercial and legislative sectors. Animal welfare science and animal ethics have required time to develop as academic disciplines, and applied ethologists have been at the forefront of the development of animal welfare science, responding to demands for fundamental and applied research particularly into subjective experiences of animals. Animal welfare scientists, including applied ethologists, must collaborate with others involved in the decision making process to identify gaps in knowledge that impede progress in animal welfare and to develop practical applications such as welfare assessment techniques that facilitate improvements on farms and in laboratories. One goal of the ISAE is to provide expertise on animal behaviour, and individual members of the Society advise policy makers, retailers, commodity groups, and others about animal welfare issues. The ISAE has considerable opportunity to increase its influence on animal welfare issues because of its expanding

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and diverse membership, comprising 729 scientists from 11 geographical regions worldwide in 2003. The Society should strive to develop its own materials to raise awareness about applied ethology and animal welfare science, and make the pool of regionally available expertise more accessible to interested parties. Where particular animal welfare issues are debated, it may be possible to develop scientific reports with more internationally diverse perspectives. Animal welfare is likely to remain a principal focus of members of the ISAE.

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*Keywords:* Animal welfare; Applied ethology; International Society for Applied Ethology

## 1. Introduction

In the 35 years since the Society for Veterinary Ethology (SVE), now the International Society for Applied Ethology (ISAE) was founded, research done by applied ethologists is increasingly concerned with understanding and improving animal welfare. A survey of *Applied Animal Behaviour Science* over the past decade reveals a general increase in the number of published papers that list “welfare” among the subject keywords, comprising 2% of the 91 papers published in 1992 and 14% of the 117 papers published in 2002 (Fig. 1). Actions to improve conditions for farm animals by some supermarkets and restaurant chains, and for farm and laboratory animals by some governments and multinational organizations, are encouraging and worthy of support. Notwithstanding these developments, the overall rate of change in the care of farm and laboratory animals has been extremely slow in spite of the accumulation of a great deal of scientific evidence revealing shortcomings in existing conditions. For example, the Brambell Committee established in the UK to investigate the welfare of intensively farmed animals during the 1960s recognized that laying hens housed in commercial battery cages cannot meet their basic needs to stretch, wing-flap and perch (Command Paper 2836, 1965). In 1980, the European Commission started the Farm Animal Welfare Programme as part of the Coordinated Programme for Agricultural Research and it supported six research contracts in poultry welfare. In 1988 the European Union (EU) passed legislation providing minimum standards for protecting the welfare of laying hens housed in battery cages which was amended in 2001 to phase out battery cages by 2012 (Table 1).

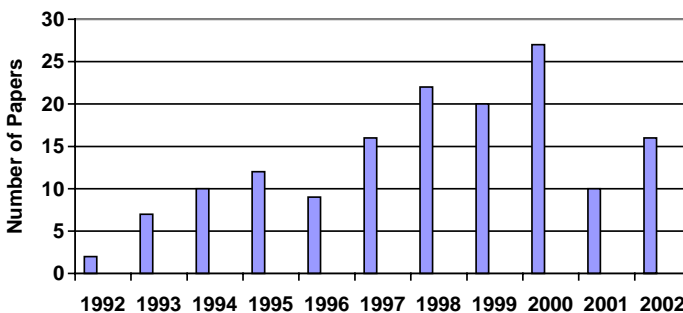


Fig. 1. Numbers of welfare-related papers published in *Applied Animal Behaviour Science* from 1992 to 2002.

Table 1

Selection of principle legislation protecting animals in the European Community ([http://www.europa.eu.int/comm/food/fs/aw/aw\\_references\\_en.html](http://www.europa.eu.int/comm/food/fs/aw/aw_references_en.html))

Year	Legislation
1974	Council Directive 74/577/EEC: Requires stunning of animals before slaughter
1978	Council Decision 78/923/EEC: Approves the European Convention for the protection of animals kept for farming purposes. Provides general rules for the protection of all species of animals kept for food, wool, skin, fibre, fur or other farming purposes based on the Farm Animal Welfare Council's "Five Freedoms". Amended in 1998 to include fish, amphibians and reptiles
1986	Council Directive 86/609/EEC: Protecting animals used for experimental and other scientific purposes
1988	Council Directive 88/146/EEC: Prohibits certain substances having hormonal action for use in livestock farming Council Decision 88/306/EEC: Approves the convention for the protection of animals for slaughter Council Directive 88/166/EEC: Providing minimum standards for protecting the welfare of laying hens housed in battery cages. Amended in 1999 and 2002
1990	Council Regulation (EEC) 1907/1990: Providing marketing standards for eggs
1991	Council Directive 91/628/EEC: Protecting animals during transport. Amended in 1995, 1997 and 2001 Council Directive 91/629/EEC: Providing minimum standards for the protection of calves. Amended in 1997 Council Directive 91/630/EEC: Providing minimum standards for the protection of pigs. Amended in 2001
1993	Council Decision 93/119/EC: Protecting animals at the time of slaughter or killing
1997	Treaty of Amsterdam: Grants animals special consideration under the law as "sentient beings"
1999	Council Directive 1999/22/EC: Protecting animals kept in zoos

Nevertheless, during 2001 approximately 91% of the 305 million laying hens raised in the EU were kept in battery cages (Eurogroup for Animal Welfare and Royal Society for the Protection of Animals, 2001), and despite a few exceptions such as Switzerland, methods of commercial egg production are similar throughout the world with each hen receiving less space than what is provided on a sheet of legal-sized note paper (Table 2).

Why is the rate of progress so slow? One would imagine that improvements to housing and husbandry standards based on rigorous scientific studies that have been published in peer-reviewed journals would be driven forward quickly by public opinion. However, certain other mechanisms such as entrenched traditions, political manoeuvring and economic restraints, as well as the slow rate of change of society's ethical environment, tend to impede this progress. In addition, decision-making is often challenging because different classes of evidence may point in different directions. For example, maintaining a high level of hygiene may conflict with allowing behavioural freedom.

At the 35th International Congress of the ISAE (Davis, CA, 2001), approximately 100 ISAE members shared their thoughts and experiences as participants of a roundtable discussion about the impact of applied ethology in improving animal welfare. The objectives of this paper are to summarize the opinions of the ISAE members that participated in the discussion about reasons for the slow rate of progress in the adoption of changes designed

Table 2  
Space requirements for adult laying hens in different countries

Country	Minimum space per hen	Comments
Australia and New Zealand	450 cm <sup>2</sup> for established cage systems; 550 cm <sup>2</sup> for new cage systems	As of 2013, all cages must provide 550 cm <sup>2</sup> per hen
Canada	432 cm <sup>2</sup> for hens weighing 1.7 kg; 483 cm <sup>2</sup> for hens weighing 1.9 kg	Recommended codes of practice for the care and handling of pullets, layers and spent fowl (2003). Not legally binding in most provinces
European Union	450 cm <sup>2</sup> from 1986; 550 cm <sup>2</sup> from 2003; 750 cm <sup>2</sup> from 2012	Conventional battery cages that lack nests and perches will be banned from 2012
Switzerland	1430 cm <sup>2</sup> for barn eggs <sup>a</sup>	Cages are banned in Switzerland since 1981, 70% of hens are in barn systems and 30% free-range
United States	348 cm <sup>2</sup> was the industry average in 2001 <sup>b</sup> ; 465 cm <sup>2</sup> for producers supplying McDonalds Corp.	The main commodity group that represents the US egg industry, United Egg Producers, advises its members to increase minimum space requirements to 432–555 cm <sup>2</sup> by 2010. There are no legally binding standards for hens in the US

<sup>a</sup> Eurogroup for Animal Welfare and Royal Society for the Protection of Animals, 2001.

<sup>b</sup> Armstrong and Pajor, 2001.

to improve the welfare of farm and laboratory animals, opportunities and challenges facing applied ethologists in relation to animal welfare, and possible roles for the ISAE and its members in the future implementation of welfare improvements.

## 2. Why has progress in improving animal welfare been so slow?

For perspective, it is important to recognize the substantial progress that has been made in animal welfare. As a social movement, animal protection was significantly influenced in the 19th century by the Darwinian theory of evolution that recognized humans as part of the animal kingdom. This discovery also sparked interest by biologists in emotions and cognitive abilities of animals (Sparks, 1982). At this time concerns for animals were closely linked with concerns for children and contributed to an evolving social ethic demanding moral accountability for mistreatment of humans on the grounds of race, religion or age (Unti, 2002). Although public concern for animals waned following World War One, interest was rekindled during the 1950s with increased pet ownership and the emergence of humane organizations that focused attention on animal suffering in biomedical research and in the meat industry (Unti and Rowan, 2001). In the US, lobbying by these organizations resulted in the Humane Slaughter Act (1958) protecting meat animals, and the Animal Welfare Act (1966) protecting animals used in research. During the 1960s and 1970s, there was a burgeoning of academic discourse by philosophers and scientists about animal use issues

and about quality of life for animals raised for food production and for experimentation. In particular, animal cognition and consciousness regained its importance as a topic for scientific scrutiny (Griffin, 1976), stimulating methodology to “ask” animals about their subjective experiences through sign language by psychologists such as Roger Fouts, and through operant tasks by ethologists, such as Marian Dawkins and Ian Duncan. Furthermore, animal welfare concerns were popularised by the media and by cultural avenues of visual arts, literature, television and music. In particular, Ruth Harrison’s book *Animal Machines* (1964) raised awareness about husbandry conditions in commercial farming operations, and Peter Singer’s *Animal Liberation* (1974) popularised debates about animal ethics.

Policy makers are incorporating aspects of animal welfare into domestic laws and international agreements, particularly in Europe (Table 1). Animal welfare issues are also being debated through legal channels, most famously in the McDonalds Corporation vs. Steel Case (English High Court of Justice, Queen’s Bench Division, 19 June 1997), dubbed the “McLibel Case” by the media, in which Justice Bell’s 800-page judgment explored whether the Plaintiffs (McDonalds Corporation) were culpably responsible for cruel practices in the rearing and slaughter of animals used to produce their food products (for review, see Frasci et al., 2000, pp. 233–258). In 1999, the Harvard Law School announced the first course in animal law in the US. The most significant legal development for animal protection is likely the Protocol on animal welfare, agreed upon by member states of the European Union as part of the Amsterdam Treaty (1997), which categorizes animals as “sentient beings” and confers special consideration for them under European Law. Animal welfare is also receiving scrutiny as a global issue within the World Trade Organization (WTO) and the World Organisation for Animal Health (OIE). Outside policy and legal frameworks, animal welfare increasingly has become a consumer issue, with mainstream multinational companies marketing cruelty-free cosmetic products and developing animal welfare standards for food animal production.

Despite these improvements, the severity of suffering and huge numbers of animals affected in food animal production and animal experimentation pose serious moral concerns, and consequently, the ISAE members participating in the roundtable discussion expressed that the overall rate of progress often seems frustratingly inadequate. For example, an examination of current global animal stocks provides a daunting example of the relatively small numbers of animals benefiting from the animal protection regulations that have been successfully lobbied for in the European Union in comparison to the numbers of livestock raised in the majority of regions where animals receive little if any consideration under the law (Fig. 2). Even in countries with progressive animal protection legislation, practices that are known to be painful, such as tail docking, castration and beak trimming, are usually permitted to be performed without anaesthesia or analgesia although there may be limitations on ages when these procedures may be performed. The main challenge for improving conditions for animals is how animal welfare competes with other issues for public attention and resources. In the case of farm animals, welfare issues are weighed against concerns about pricing, food safety, product quality, and how farming practices impact on the environment and on rural communities. Economics seems to be the main factor impeding progress; in most cases, improvements to welfare result in increased costs of production. In those cases in which improvements to welfare are accompanied by some production benefit, such as

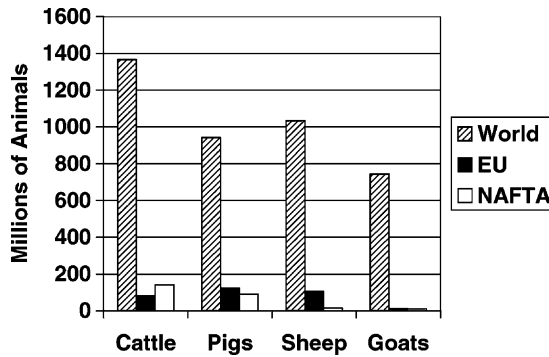


Fig. 2. Food and Agriculture Association of the United Nations statistical data for numbers of live animals raised worldwide and in select geographic regions during 2002 (FAO Statistical Database, 2002).

when welfare-friendly handling during transportation and pre-slaughter management results in improved meat quality, the industry has adopted change very quickly. In the case of laboratory animals, cost has also been a factor impeding change, as well as resistance to change on hygienic grounds and due to experimental traditions. There obviously needs to be more research into the economics of improved welfare including investigations into the value that the general public places on welfare-friendly products. Similarly, to address concerns about animal health and public safety, more research is needed to determine the degree to which hygiene is compromised in welfare-friendly environments for farm and laboratory animals.

A second factor identified by roundtable participants that affects the rate of progress in improving animal welfare is the effective transfer of information between the academic community and industry, policy makers and the general public. Animal welfare legislation has evolved slowly and is difficult to enforce in all countries. However, it may be useful to consider examples where scientific information has been swiftly disseminated and acted upon. Adoption of knowledge about biotechnology is rapidly applied, such as the popularity of reproductive technologies of embryo transfer by the dairy cattle and equine industries and the relatively rapid development of novel pharmaceuticals, presumably because potential economic benefits produce keen interest and coordination by the various sectors within commercial and legislative networks. Similarly, a beef animal identification system was promptly developed and instituted when demanded by the Canadian government to address threats to its export markets based on food safety concerns. It appears that a rate-limiting step in improving welfare may be the timeliness and effectiveness of communication and collaboration with individuals responsible for the intermediary phases of equipment design, staffing, product marketing, and so on. This highlights one advantage of vertically integrated companies, which also have the ability to absorb costs and risks associated with phasing in welfare improvements. For example, McDonalds Corporation was able to institute more humane handling at slaughter for livestock and improved husbandry standards for laying hens within short timeframes partly because of the relationships between this large and well-established company and its limited number of suppliers. Achieving commitment to animal welfare by all sectors of animal users will likely require

economic interventions to ensure fair distribution of associated costs and benefits even when consumers have shown willingness to pay premiums for higher standards (FAWC, 2001), an issue currently being debated by countries in the World Trade Organization (WTO, 2002).

Another potentially more serious reason for the non-adoption of welfare improvements is that the scientific evidence that has been presented has often been regarded with some scepticism by both the animal industries and the legislative bodies responsible for regulating animal production. For example, the question of whether laying hens suffer as a result of forced moulting, during which hens are deprived of food for periods of up to 14 or even 21 days, has been debated by scientists and veterinarians during legislative hearings in the US, during animal cruelty investigations, and within scientific publications (see Webster, 2000 and response by Duncan and Mench, 2000). Similarly, scientific evidence is presented to both support and refute the welfare aspects of veal crates and sow stalls. Although the same scientific evidence was reviewed on the topic housing gestating sows in stalls or crates that fail to provide sufficient space to turn around, stretch, groom and lie recumbent, policy makers in Australia and in the European Union reached opposing conclusions with stalls being phased out in the European Union, but being permitted in Australia. This confusion has not been helped in the past by disagreements amongst scientists over the facts, and by some published research of dubious scientific merit that was probably inevitable in the development of a young scientific discipline. However, the quality of research in animal welfare science is increasingly recognized with prestigious journals such as *Nature* and *Science* taking interest in topics such as motivation (Mason et al., 2001) and animal consciousness (Kendrick and Baldwin, 1987; Dawkins and Woodington, 2000; Kendrick et al., 2001). In the future, animal welfare scientists must strive for high standards of science and publish results in top quality journals. If we do this, the merits of our research cannot be dismissed and new findings will stimulate examination of entrenched positions by scientists from all schools of thought.

Similarly, appropriate action to improve animal welfare requires integration of knowledge from multiple disciplines, particularly animal ethics which, like animal welfare science, has required time to evolve. David Fraser provides an excellent review of the importance of this integration in his D.G.M. Wood-Gush Memorial Lecture entitled "Animal ethics and animal welfare science: bridging the two cultures" (Fraser, 1999). While farmers have tended to define an animal's welfare according to its biological function, the general public takes a more interdisciplinary approach, defining welfare in terms of an animal's health, its natural history and its subjective experiences (Velde et al., 2002). Similar disagreements occur within the scientific community with veterinarians and animal scientists traditionally favouring indicators of biological function while applied ethologists are increasingly using indicators of subjective experiences. Recognition of these differences in ethical viewpoints is crucial if different types of scientific information are to be balanced to respond accurately to public concerns about animal welfare. For example, despite the challenges of designing practical scoring systems for farm and laboratory applications, assessments of animal welfare that include measurements of performance and health, but fail to address subjective experiences such as pain, fear and frustration, are unlikely to concord with the public's concepts of animal welfare.

### 3. What challenges and opportunities exist for applied ethologists in relation to animal welfare?

Applied ethologists have been at the forefront of the development of animal welfare science, using a “whole animal” approach to provide information that is most applicable to public concerns about quality of life of animals used for farming, laboratory and other purposes. At a fundamental level, applied ethologists have investigated the causation and development of behavioural systems thus providing some scientific basis for the notion of ‘behavioural needs’ (Hughes and Duncan, 1988; Cronin et al., 1984). Applied ethologists have also contributed to understanding the mechanisms of behaviour in relation to animal stress (Broom and Johnson, 1993; Moberg and Mench, 2000). At a more applied level, they have investigated the design of housing and equipment (Baxter et al., 1983) and management practices (Grandin, 1993) that better meet the needs of the animals. Most applied disciplines, such as nutrition, animal breeding, or veterinary medicine, draw from results of fundamental research to solve problems. However, one of the factors limiting progress in animal welfare science may be the lack of interest by classical ethologists in the behaviour of domestic species. Applied ethologists, particularly those working with farm animals and laboratory animals, are caught in a two-step process, needing to generate fundamental research on their species before using the results to develop solutions to behavioural problems (Dawkins, 1997). Applied ethologists are just beginning to explore subjective states of domestic animals under experimental conditions, and yet there are increasing demands for practical techniques to assess these states within animal welfare auditing schemes for use on farms and in laboratories.

Despite these contributions, policy makers and industry representatives sometimes argue that scientists, including applied ethologists, often address the “wrong questions” in their research. Development of regulations and husbandry standards requires exact specifications for enforcement, but this is information that scientists cannot deliver independently. For example, the amount of space animals require when they are housed in cages or pens depends on value-based judgments about what they are expected to do in that space. Applied ethologists can provide information about motivation to perform particular behavioural elements and about consequences of deprivation, but results occur in a continuum. Furthermore, welfare is determined at the individual level and there is variation in how individuals are affected by different practices. Decisions about acceptable levels of suffering and about the importance of suffering by vulnerable populations are value-based judgements. Consequently, although there is a general need for more research in animal welfare, there are situations in which demands for further scientific research are inappropriate or even harmful to the decision making process, because they may cause delays in decision making without adding useful knowledge. In these cases, it would be inappropriate to devote resources to further experiments. Webster (1998) points out that “Welfare scientists should decide when ‘enough is enough’. When we have sufficient knowledge to achieve real progress in addressing a practical welfare problem, that is the time to convert this research into action.” Rollin (2000) makes similar criticisms toward scientists researching antimicrobial growth promoters in animal agriculture and their effects on the development of drug-resistant bacterial pathogens. Hence, applied ethologists must continue to critically appraise research priorities, and when recommending that further studies are necessary to follow up existing

research results, care should be taken to be specific in identifying the nature and significance of these gaps in our knowledge.

One exciting development likely to facilitate progress in improving animal welfare is the interest in welfare assessment schemes by governments and industry for use as auditing tools on farms and in laboratories. Indexing systems to assess welfare are being explored in several countries for on-farm use, such as the Animal Needs Index (TGI) in Austria (Bartussek et al., 2000), and may be particularly effective as a decision support tool to communicate with farmers about animal welfare issues (Bonde et al., 2001). Attempts have been made to balance parameters within these models according to their ranked importance by “expert opinion” and by the public (for example, see Bracke et al., 2002). It may be possible to develop auditing schemes that provide some indirect information about feelings of pain and possibly fear, by scoring groups of animals for lameness (for example, see Garner et al., 2002), lesions and flightiness, using methods that are supported with laboratory studies examining the associated subjective states. Scoring methods would also be useful for assessing and selecting for behavioural traits by animal breeding companies, and could be used to assess prevalence of behavioural problems on farms and in laboratories.

Given the high level of public interest in animal welfare, animal welfare science should be given a higher priority for funding. The bulk of funds for welfare-related research are provided by government sources in most countries. Although animal protection organisations, retailers, industry groups, and policy makers all assert the importance of this scientific information, ISAE members participating in the roundtable discussion identified lack of financial resources as a serious impediment to the welfare research programs of most applied ethologists. With increasing reliance on industry funding by agricultural and veterinary colleges, and with requirements for matching industry grants by government-funded projects, funding for welfare-related research may be even more difficult to secure in the future. These developments encourage short-term projects with direct economic impacts and straightforward implementation, but may impede progress on fundamental issues of domestic animal behaviour and welfare. Some organisations, such as The Humane Society of the United States, the Universities Federation for Animal Welfare and the Royal Society for the Prevention of Cruelty to Animals provide limited funds for research projects addressing specific animal welfare concerns or for student assistance. Similarly, individual retailers have commissioned a few projects, but these funds have been extremely small. Clearly, applied ethologists will need to be creative and pro-active to capitalise on new funding sources. Integrating animal welfare studies into other well-funded projects such as food safety may be feasible, but a multidisciplinary approach cannot fully compensate for experiments specifically designed to answer questions crucial for fundamental welfare research. Research projects investigating welfare of animals with low economic value or controversial issues, such as animal consciousness, are also difficult to fund despite their resonance with societal concerns.

Success in obtaining funds for welfare projects by applied ethologists may improve as other scientists become more familiar with the discipline. At the present time roundtable discussants suggested that the peer-review system may present barriers for funding support and for publication of welfare-related research, since in countries where applied ethology is less established, evaluation is often performed by animal biologists who are unfamiliar with the methodology and background literature of our young discipline. Similarly, shortage of

referees trained in our discipline affects the quality of science in papers published, so that experiments which have small, poorly designed behavioural components may proceed to publication unchallenged, reinforcing bias against the scientific merit of applied ethology research and animal welfare science. It is critical that applied ethologists strive to present our work to a wide audience through publications, symposia, interdisciplinary research collaborations, and through curriculum development in veterinary and agricultural colleges.

#### **4. What is the role of the ISAE and its members in implementing welfare improvements?**

The ISAE is not an animal welfare advocacy organisation, and there is a wide range within its membership in terms of interest, involvement and research activity in animal welfare. However, in addition to being ethologists, many members are committed to the specific application of understanding and promoting animal welfare. Among the aims outlined in its constitution, the ISAE aspires “To provide a pool of expertise to government, industry and animal welfare organisations which deal with problems involving animal behaviour. To encourage, where possible and appropriate, assimilation of scientific knowledge so as to encourage its use in relation to practical problems concerning the way animals are kept and cared for.”<sup>1</sup> Furthermore, professional responsibility to behave ethically towards animals is addressed by the recent development of ethical guidelines for applied animal behaviour protocols (Sherwin et al., 2003), and an ethics sub-committee was formed to provide guidance to ISAE members on animal welfare issues relating to research.

Unlike professional bodies, such as veterinary associations, the ISAE does not issue policy or position statements. There is strong support within the ISAE for the Society to maintain its role as a provider of information, and for advocacy organisations and others to conduct lobbying for animal welfare. For many years the ISAE has had observer status at the Council of Europe in the Standing Committee for Farm Animals (T-AP) and in the European Convention for the Protection of Laboratory Animals Used for Scientific and Other Purposes (ETS 123). These ISAE representatives participate as scientific experts, providing valuable information about behavioural needs of animals and the effects of housing and management on behaviour and welfare. Since they are considered as animal welfare specialists basing their advice on sound scientific evidence, the ISAE representatives have considerable impact, but of course are not directly involved in decision-making. After a European Convention has been ratified by member states, each state must enact national legislation to bring it into line with the Convention. Furthermore, activities of the Council of Europe influence policy outside Europe; representatives from non-member countries often attend discussions as observers and take ideas back to their own countries. As individuals, members of ISAE have also devoted energy, time and resources to provide expertise for retailers wishing to develop animal husbandry guidelines and auditing systems, for commodity groups wishing feedback about welfare issues and alternative husbandry systems, for research institutions reviewing animal care protocols and animal housing, and for pros-

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<sup>1</sup> According to the version of the ISAE Constitution adopted at the Annual General Meeting on 20 October 2000 in Florianopolis, Brazil.

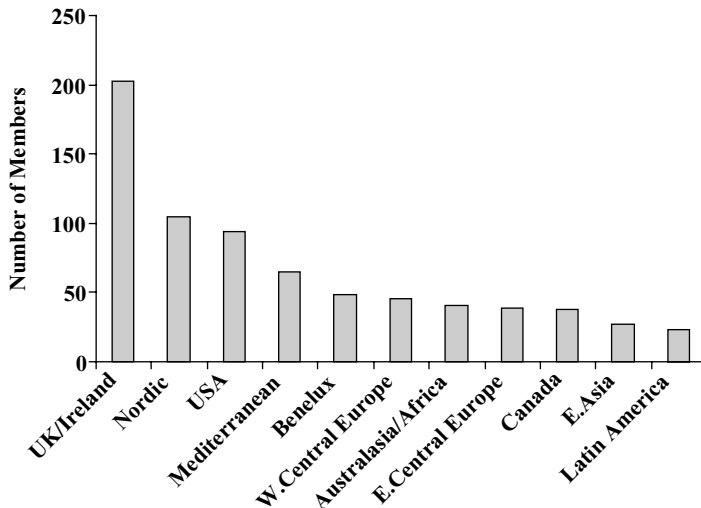


Fig. 3. Distribution of International Society for Applied Ethology membership in Spring 2003 ( $n = 729$  members).

ecutors requiring expert testimony in animal cruelty and similar investigations. Outside of academia, applied ethologists are increasingly hired by animal protection organisations, commodity groups and other organisations to provide expertise in animal welfare science.

Worldwide, the ISAE has considerable opportunity to increase its influence on animal welfare issues. Participation in the Society has grown significantly in recent years, with the latest figures reported in the ISAE's Spring 2003 Newsletter indicating a membership of 729, an increase of 63 members since 2002. The ISAE was founded as the UK-based Society for Veterinary Ethology, and approximately 28% of the current membership resides in the UK and Ireland, with the next largest regions being the Nordic region and the US (Fig. 3). As membership increases it also becomes more widely scattered throughout the globe, making the organisation of scientific meetings logistically and financially challenging. These obstacles have been partially addressed through regional and other meetings, as well as electronic networking through ISAEnet listserve and the applied ethology discussion group. In many countries, particularly in lesser-developed regions, the pool of applied ethologists available for consultation on welfare issues is small, posing both financial and logistical challenges. As the ISAE grows, it should strive to develop its own materials to raise awareness about applied ethology and animal welfare science, and make the pool of regionally available expertise more accessible to interested parties. Where particular animal welfare issues are debated, it may be possible for committees within the ISAE to raise funds to develop scientific reports with more internationally diverse perspectives.

In summary, applied ethologists have made significant contributions to the understanding of animal welfare and have been effective in providing expertise for application of their findings to farms and in laboratories. Opportunities exist for applied ethologists with expertise in animal welfare science, inside and outside of the traditional academic environment, to respond to needs for fundamental and applied research, for communication of welfare sci-

ence and for coordination of improvements in animal welfare together with policy makers, industry and the public. As an organization, the ISAE has a diverse membership that can facilitate exchange of information and ideas by members engaged in research and education in animal welfare science across a wide range of countries. There is every reason to believe that animal welfare will remain a principal focus of members of the ISAE.

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