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Understanding the dog population in the Republic of Ireland: insight from existing data sources?

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Abstract

Background: Reliable information about national pet dog populations is an important contributor to informed decision-making, both by governments and national dog welfare organisations. In some countries, there is an improved understanding of aspects of the national pet dog population, but as yet limited published information is available in Ireland. The current study reviews the utility of existing data to inform our understanding of recent changes to the pet dog population in Ireland, including both biological and organisational processes.

Results: Based on national data on dog licencing and microchipping registration, pet dog numbers have remained relatively stable in recent years (ie prior to the COVID-19 pandemic). Since 2015, there has been a substantial decrease in the number of dogs managed through dog control centres. Although the completeness of the data are likely variable, there appears to be substantial, and increasing, number of dogs moving from Ireland to other countries, including UK, Sweden, Italy, Germany and Singapore. We also note an increase (albeit much smaller) in the number of dogs being moved into Ireland.

Conclusions: This study highlights the challenges faced when using existing national data to gain insights into the dog population of Ireland. The linking of existing national databases (individual dog identification, dog licencing, dog control statistics) has the potential to improve both the representativeness and accuracy of information about the Irish pet dog population. In the next phases of our work, we will focus on the work of dog welfare organisations, given both the increased role played by these organisations and the substantial public funding that has been committed in this sector.

Keywords: Pet dogs, Dog population, Ireland, Existing databases, National policy

Background

Information about national pet dog populations is an important contributor to informed decision-making, both by governments and national dog welfare organisations. For governments, this information can assist

both to monitor existing policies (including compliance with existing legislative instruments) [1, 2] and to inform ongoing policy development [3]. It is also important to the work of national dog welfare organisations, with their primary focus on advocacy, action and education [4, 5]. The effectiveness of their work will be maximised if informed by a range of relevant information, such as an ongoing assessment of trends in dog health and welfare indicators [6], a clear understanding of key points of national concern (such as puppy farms and the illegal

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transportation of dogs, including puppies) [4], and of an ongoing assessment of the impact of advocacy activities.

In a number of countries, considerable efforts are being made to progressively build a robust evidence base in support of an improved understanding of aspects of national pet dog populations.

In Sweden, research has been undertaken over many years with the Agria pet insurance database to investigate mortality and morbidity in the insured dog population. These studies focused on a claims database from a large insurance company. These data are reasonably representative of the national population [7, 8] and covered (during 2016) approximately 38% of the national dog population [9]. Over the years, analysis primarily focused on health-related research questions and included mammary tumours (incidence, prognosis) [10], kidney disease [11] and cruciate ligament rupture [9]. Studies on mortality and survival have also been conducted [12] and the benefits and limitations of using insurance data for companion animal research have been considered in some detail [13].

In Italy, there has been a particular research focus on legislative compliance, noting that it is local authorities that oversee the obligatory requirement for registration and identification of dogs. In a recent study, Carvelli et al. [14] reported that 75.3% of dogs were correctly registered and identified, with these animals more likely to be purebred, neutered, living in urban areas and visiting a veterinarian frequently. This study recommended several strategies to encourage registration, including promoting responsible dog ownership among the general population, engaging with private veterinarians and dog breeders, establishing an effective monitoring system by competent authorities and introducing incentives to enhance dog registrations and fines for owners who do not comply.

In the UK, work has been undertaken by a number of different organisations and research groups, seeking a comprehensive understanding of the national pet dog population. Four broad study approaches have been adopted. Firstly, there are several ongoing studies that utilise existing veterinary practice data. An initiative of the Royal Veterinary College, the Veterinary Companion Animal Surveillance System (VetCompass™ [15]) is investigating a range of health problems in companion animals based on the capture and analysis of data from more than 1800 primary veterinary practices and referral centres in the UK. These analyses form an evidence basis, captured in an extensive portfolio of scientific publications over the last 10 years, across a broad range of health disorders (general, systems-based) [16, 17], prescribing practices [18] and disease surveillance [19]. This approach has since been extended to several countries,

including Australia [20, 21]. The University of Liverpool in partnership with the British Small Animal Veterinary Association has established the Small Animal Veterinary Surveillance Network (SAVSNET [22]), which harnesses electronic data on the population of dog owners that visit small animal veterinary practices. SAVSNET seeks to harvest electronic health and environmental data for rapid and actionable research and surveillance, with a current focus on identifying and reporting adverse drug reactions, understanding the needs of dogs as they age, and investigating vaccine hesitancy and strategies to improve vaccine uptake in companion animals [23]. Secondly, Dogs Trust is currently utilising data from multiple existing databases to gain a greater understanding of the spatial density and distribution, demographics and regional trends in size of the UK pet dog population. The study is motivated by key welfare concerns, including the large-scale breeding and sale of puppies from unsuitable environments with regards to health and behavioural development (e.g., puppy farms), and the illegal international transportation of puppies with associated welfare and disease transmission risks (i.e., puppy smuggling) [4]. It relies on the linking, or matching, of data across datasets from a variety of sources, including animal welfare centres, microchipping organisations, pet insurance, local councils, and veterinary practices. Thirdly, several longitudinal cohort studies are underway, seeking a clearer understanding of associations of canine genetics and environment with a range of health and behavioural outcomes [4, 6, 24]. These studies include the Dogslife project, which is following Labrador Retrievers registered with the Kennel Club in the UK [6, 24, 25], and the Generation Pup study, which is focusing on pure- and mixed-breed puppies [4, 26, 27]. Finally, a longitudinal nationwide survey (the Animal Wellbeing (PAW) Project) has been published annually by the People's Dispensary for Sick Animals' (PDSA) since 2011, providing an overview of trends and priorities in companion animal welfare in the UK [28]. The 2021 PAW report considers the impact of the COVID-19 pandemic on pets, highlighting concerns relating to pet acquisition, behavioural problems and unscrupulous breeding [29]. Over several reports, PDSA also highlighted obesity in pet dogs and breeding for exaggerated conformation (including brachycephaly) as ongoing welfare concerns. The report highlights the value of pre-purchase consultations to prospective dog owners to address several key issues identified by veterinarians, including 'welfare at breeding establishments (e.g. puppy farms)' and 'poor choice of breed for owner lifestyle' [29].

To date, there has been little information available in the peer-reviewed literature on the pet dog population in the Republic of Ireland (subsequently referred to as

Ireland, or Irish when used as an adjective). With respect to population demographics, an estimated 35.6% of Irish households owned one or more pet dogs in 2007, with 47.3% of them neutered [30, 31]. At that time, more pet dog owning households were found per square kilometre in cities and in the east of the country than in rural areas and in the west. Dog ownership was associated with location, house type, household social class, household composition, the presence of children in the household, and the presence of a cat. In a recent study relating to community-dwelling adults aged 50 years and over, dog ownership was highest among adults aged 50–64 (51%) and lowest among adults aged 75 and over (25%) [32]. Further, the proportion of rural dwellers (49%) owning a dog was almost twice that of Dublin dwellers (26%).

Several recent studies have considered aspects of Irish legislation and controls relating to pet dogs. In a review of records generated by the Cork County Council dog control service during 2007 [2], almost three quarters of official dog control duties related to dogs that were unwanted and/or were not under the control of the owner. The most frequent reasons for a service request included collecting a stray dog from a person's property, an owned dog being out of control in a public place, and bite incidents or reports of aggressive behaviour. In a review of hospital records-based dog bite injuries in Ireland, Ó Súilleabháin [33] raised concern about use of breed-specific legislation, as currently applied in Statutory Instrument (SI) No. 442/1998 (the Control of Dogs Regulation 1998) [34]. Recently, Keogh et al. found low levels of awareness among the general public (both dog owners and non-dog owners) that key responsibilities of dog owners are prescribed under Irish law. These included the responsibilities of dog identification, prevention of dog straying, abandonment and tail docking and the safeguarding of a dog's health [1].

In recent years, particularly in the popular press, there have been numerous reports of change in the Irish dog population. There has been an increased role for dog welfare organisations [35], including for the direct surrendering of dogs. A drop in the number of stray dogs euthanised each year has been reported [36]. Further change has been reported in association with the COVID-19 pandemic, including an initial surge in dog ownership [37], followed more recently by the surrendering of unwanted dogs to animal welfare organisations [38] and dog control centres [39], in part as a consequence of behaviour-related problems [37]. As yet, these changes have not been reflected in the Irish scientific literature.

A multi-study research programme is currently underway in Ireland to broaden the evidence base on the national pet dog population. This research will inform a review of the current *ex gratia* funding model for animal

welfare organisations and the underlying public policy objectives is outlined in the national Department of Agriculture, Food and the Marine (DAFM) Animal Welfare Strategy, 2021–2025 [40].

The current study reviews the usefulness of existing data sources to inform our understanding of recent changes to the pet dog population in Ireland, including those relating to biological (demographics, flows, trends) and organisational (the roles of different organisations, regulatory and non-regulatory impacts, drivers of supply and demand) processes. Further, we present a proposal to improve both the representativeness and accuracy of information about the Irish pet dog population.

This is the first output of this multi-study research programme. In the next phases of our work, we will focus on the work of dog welfare organisations, given both the increased role played by these organisations and the substantial public funding that has been committed in this sector.

Methods

Definitions

Dog control centres operate under The Control of Dogs Act 1986 [41]. Under this Act, each local authority is required to 'establish and maintain one or more shelters for dogs seized, accepted or detained under any of the provisions of this Act and may, with the consent of the Minister, enter into arrangements with any person for the provision and maintenance of such shelters and for the exercise by such person of the functions of the local authority under this Act in respect of the acceptance, detention, disposal and destruction of stray and unwanted dogs.' The national Department of Rural and Community Development (DRCD) is the relevant government department, which has responsibility for policy and legislation regarding dog control and dog breeding establishments.

Dog welfare organisations are voluntary organisations. National animal welfare policy is overseen by DAFM [40], and funding from DAFM Animal Welfare Grants is available to registered animal welfare organisations to assist in delivery of animal care and animal welfare services [42].

Background activities

Several activities were conducted to inform later aspects of the work:

- a. Legislation relevant to dog controls in Ireland were described.
- b. A conceptual diagram of the Irish dog population was created to represent the various sub-populations of dogs (pets, commercial etc.), locations and organisations which house them (dog control centres, dog

welfare organisations) and the movement of dogs between these groupings as well as into and out of Ireland. The diagram was informed by the expert opinion of co-authors.

- c. The location of dog welfare organisations that were supported financially by DAFM in 2020 and of the dog control centres was mapped using ArcView (version 3.2). In Ireland, the location of each business and private premises may be derived from the Eircode (the Irish postcode system [43]), which is unique to each premises. Past funding support from DAFM to animal welfare organisations was determined based on publicly available data, for December 2016 [44], December 2017 [45], December 2018 [46], December 2019 [47] and December 2020 [48].

The Irish pet dog population

The following sources of data were used to gain an understanding of dog population numbers in Ireland:

- *Dog licencing.* These data are collated by AnPost which gives access to each local authority within the DRCD. These data, covering the periods 2000–2020, are publicly available [49], as is licence pricing information [50].
- *Dog microchip and identification.* Microchip and identification data are collected by four commercial companies: Animark [51], Fido [52], the Irish Kennel Club [53], and Microdog ID Ltd. [54]. Each company is registered in compliance with conditions set down in the Microchipping of Dogs Regulations 2015 (S.I. No. 63/2015) [55].
- *Population estimates* for Ireland from the European pet food industry (Fediaf) Facts & Figures [56]. However, the method used to estimate the Irish dog population is not available.
- *Dog control centres.* Annual statistics relevant to dog control centres in Ireland are collated by each individual local authority within the DRCD [49].

Approaches were also made to Veterinary Ireland (the representative body for veterinary surgeons in Ireland) and several pet insurance companies, but no data relating to dog numbers were made available.

Although private dog sales data are not regularly collected, a proportion of these sales will be advertised online on public listings. Therefore, a pilot study was undertaken during a 6-month period (01 September 2021 to 28 February 2022) of dog sales advertised on Irish websites to determine the potential utility of these data to provide insights into population numbers and dynamics. We restricted the pilot study to two websites for dog

sales [57, 58], these being those ranked highest by Google for “dog sales Ireland” on 02 December 2021. We judged that it was both legal and ethical to web-scrape these sites, noting that these data are online and publicly available, the data were to be used for research purposes only, and web-scraping was not prohibited on either site in the stated terms and conditions or based on the robots exclusion standard. No personal information on the sellers was collected. During this 6-month period, advertisements were downloaded on an ongoing basis. For each advertisement, information was collected on the data published, price, breed, date of birth, current age, number of dogs for sale, number of females/males, microchip number, colour, temperament, location, whether the dog was registered with the Irish Kennel Club (IKC), whether the dog was de-wormed, vaccinated or neutered, whether the seller was registered with DAFM, and the maximum number of breeding bitches owned. Advertisements were cleaned using R software (rvest and httr packages). There was expected duplication in the dataset, with the potential for sellers to relist the same advertisements, to create new advertisements for the same dogs, or to create an advertisement for another website. There was an increase month by month as more advertisements were captured and the likelihood of recording the duplicates increased. Duplicate advertisements were identified based on identical microchip numbers and birth dates, and only the first instance of any advertisement was retained. Descriptive analyses were conducted to determine the number of listings (each month, by sex and age), the percentage of dogs de-wormed, vaccinated, neutered and IKC registered, the range in prices, the breed, and the distribution of sellers by maximum number of breeding bitches.

The movement of dogs to and from Ireland

A range of data were used to gain an understanding of the dynamics of the dog population in Ireland:

- *Pet passports.* The EU system of passports for pets allows cats, dogs and ferrets to travel between EU Member States and some other countries that are part of the scheme [59]. Therefore, when leaving or entering Ireland, all dogs must have an individual pet passport regardless of whether the reason for travel is commercial or not (eg. for pet movement). Pet passports are issued by DAFM to private veterinary practitioners PVPs and dog welfare organisations who subsequently issue them to pet dog owners [60]. The pet passport database, maintained by DAFM, records the annual number of pet passports issued to PVPs and dog welfare organisations, but provides no information on the number that were subsequently issued

to pet dog owners. The DAFM database was interrogated as part of this study.

- Some official and commercial data are available on the incoming and outgoing movement of dogs.

- *Data from the European Commission.* Trade Control and Expert System (TRACES) is the online platform of the European Commission to facilitate sanitary and phytosanitary certification of animals, animal products, food, feed and plants, for importation into the EU, for intra-EU trade and for export out of the EU [61]. These data are limited to movements where certification is required (i.e., commercial non-pet movements). The TRACES database was interrogated as part of this study.

- *Data from commercial enterprises.* Airline and ferry companies were contacted, seeking data on incoming dog movements, and the reported data is as notified to DAFM. Outgoing dog movement data were not available.

Data analysis

Using R software version 4.0.3, simple graphs were constructed for all measures to aid in the assessment of trends.

A qualitative review of data quality

A qualitative review of each of the data sources used in this study was undertaken, including a description of the context in which these data are collected and an assessment of data quality, including characteristics of the information, representativeness of the national dog population, accuracy of the information (whether the values stored for an object are the correct value) and suggestions to address concerns raised.

Results

Relevant legislation

There is a range of legislation relevant to the control of dogs in Ireland:

- *The Control of Dogs Act 1986* [41] requires dog owners to purchase a licence for all dogs older than 4 months of age (or once the puppy is removed from its dam or foster mother, if younger). The licence applicant must be older than 16 years old, and pet owners may purchase either an annual dog licence (€20) or a lifetime dog licence (€140). Kennel owners with multiple dogs (unspecified numbers) are required to purchase a general dog licence direct from their local authority (€400). During the online purchase of a dog licence, although there is an oppor-

tunity to enter microchip details, registration can proceed without this information.

- *Statutory Instrument (S.I.) No. 442/1998 Control of Dogs Regulation 1998* [34] places restrictions on certain breeds of dogs, relating to leashing, muzzling and identification of ownership.
- *The Dog Breeding Establishments Act 2010* [62] regulates dog breeding establishments and anyone keeping 6 or more intact bitches.
- *S.I. No. 602/2014 Pet Passport (No. 2) Regulations 2014* [60] implements Regulation (EU) No. 576/2013 [63] on the rules applicable to the non-commercial movement of a pet dog, cat or ferret, which accompanies its owner during his or her movement. Where the pet animal is being moved for the purposes of sale or change of ownership, the animal must meet the EU animal health requirements applicable to trade in or imports into the Union of animals of the species concerned ('commercial movement').
- *S.I. No. 63/2015 Microchipping of Dogs Regulations 2015* [55] requires all dogs to be microchipped by 12 weeks of age, or sooner if moved from place of birth. The microchip must comply with ISO Standard 11,784 and be legible with devices compatible with ISO Standard 11,785. The dog identification database must include details of the unique identification, owner, identity of person performing the microchipping and the death of dog. In addition, the database operator must be a full member of EuroPetNet [64].
- *S.I. No. 681/2019 Animal Health and Welfare (Sale or Supply of Pet Animals) Regulations 2019* [65] regulates the sale or supply of pet animals, including the requirement that all advertisements of sale must include a dog's microchip number. Under this S.I., a pet animal is defined as an animal kept, or intended to be kept, by a person as a pastime or hobby, for companionship and/or for ornamental purposes, and does not include a farm animal. The legislation is applicable to sellers/suppliers of 6 or more pet animals in a calendar year, including animal homing organisations and commercial entities, but not to farm animals, establishments covered under the Dog Breeding Establishments Act 2010 [62], or facilities run by, or on behalf of, local authorities.

Conceptual diagram

A conceptual diagram of the dog population in Ireland, and of the movement of dogs into and out of Ireland, is presented in Fig. 1. The diagram highlights the movement of dogs from and to other EU Member States and Third Countries (including the UK). Within Ireland, there is a flow of dogs between different subpopulations

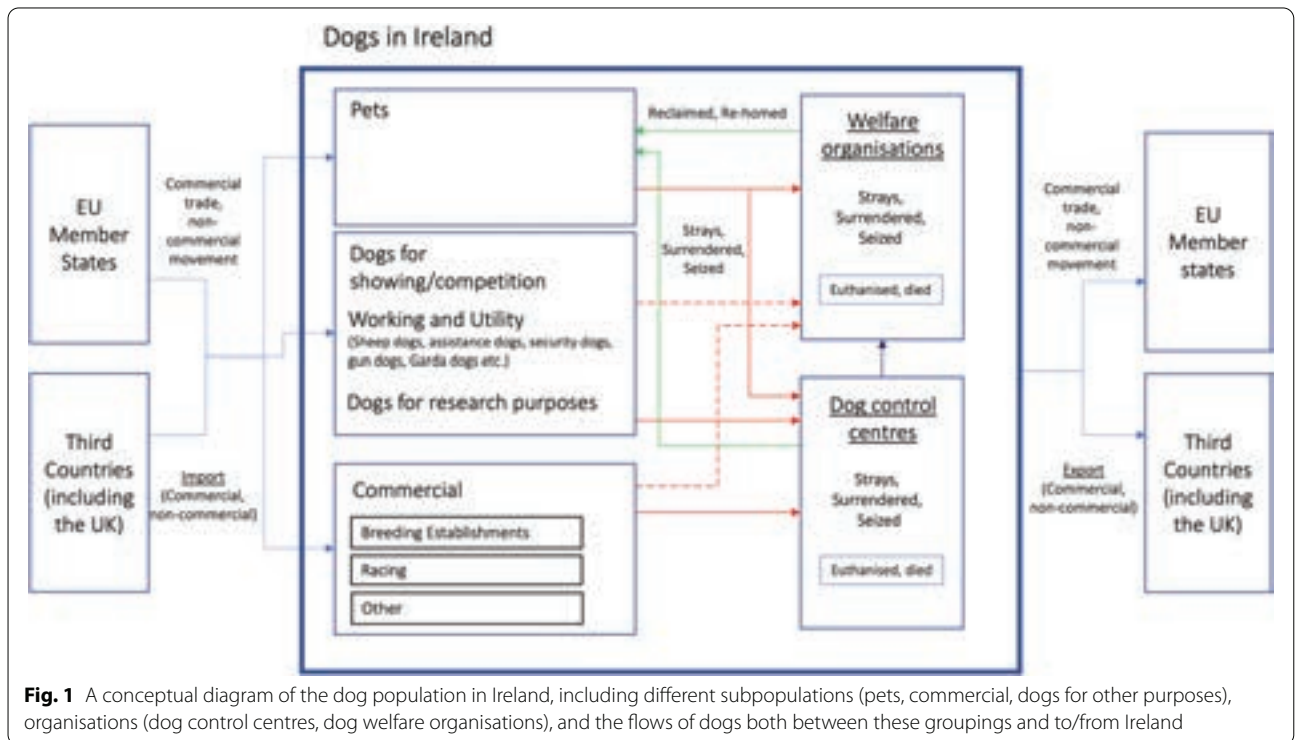


Fig. 1 A conceptual diagram of the dog population in Ireland, including different subpopulations (pets, commercial, dogs for other purposes), organisations (dog control centres, dog welfare organisations), and the flows of dogs both between these groupings and to/from Ireland

(pets, commercial, dogs for other purposes) and different organisations, including dog control centres and dog welfare organisations.

Animal welfare organisations and dog control centres

Dog control centres and dog welfare organisations are located throughout Ireland (Fig. 2). There are currently 27 dog control centres. During 2016 to 2020, DAFM provided €13.9 million to animal welfare organisations, as presented in Table 1. In 2020, 101 animal welfare organisations received funding, including 72 dog welfare organisations.

The Irish pet dog population

Dog licences

The number of dog licences issued in Ireland during 2000–2020 is presented in Fig. 3 (also in Table S1 in the Supplementary material). Note the drop off in licences issues from 2011 to 2012, and in 2020. There was an upward trend in dog licences issued, increasing by 31.2% (49,424) over the 20-year period since 2000. The majority of this increase was prior to 2007.

Microchipping

The number of dog microchips issued in Ireland by Animark, Fido and Microdog ID from 2015 to 2020 and by the IKC from 2017 to 2020 is presented in Fig. 4 (also in Table S2 in the Supplementary material). There

was a very substantial uptake of microchipping in 2016 (noting the legal requirement for mandatory microchipping in Ireland from 01 June 2015 [55]), although the number has been relatively stable since. The mean number of microchips since 2017 is 87,787 per year.

European pet food industry (Fediaf) population estimates

During 2010–20 (except 2011, 2013 and 2015), Fediaf estimates were available of the number of dogs in Ireland, and the percentage of households owning at least one dog. These estimates included 425,000 dogs and 26% households owning at least one dog in 2010, 430,000 and 20% in 2012, 416,000 and 20% in 2014, 430,000 and 22% in 2016, 450,000 and 34% in 2017, 450,000 and 34% in 2018, 455,000 and 35% in 2019, and 455,000 and 25% in 2020. The Fediaf population estimates follow an upward trend, with an increase of 39,000 dogs (9.4%) from 2014 to 2020. The same period saw a similar increase in dog licence registrations of 16,496 (8.6%) (Fig. 5).

There is no visual relationship between the number of dog licences and microchip registrations per year (Fig. 5). The dog licences are, for the most part, individual licences that need to renewed annually whereas the microchip registrations are once-off.

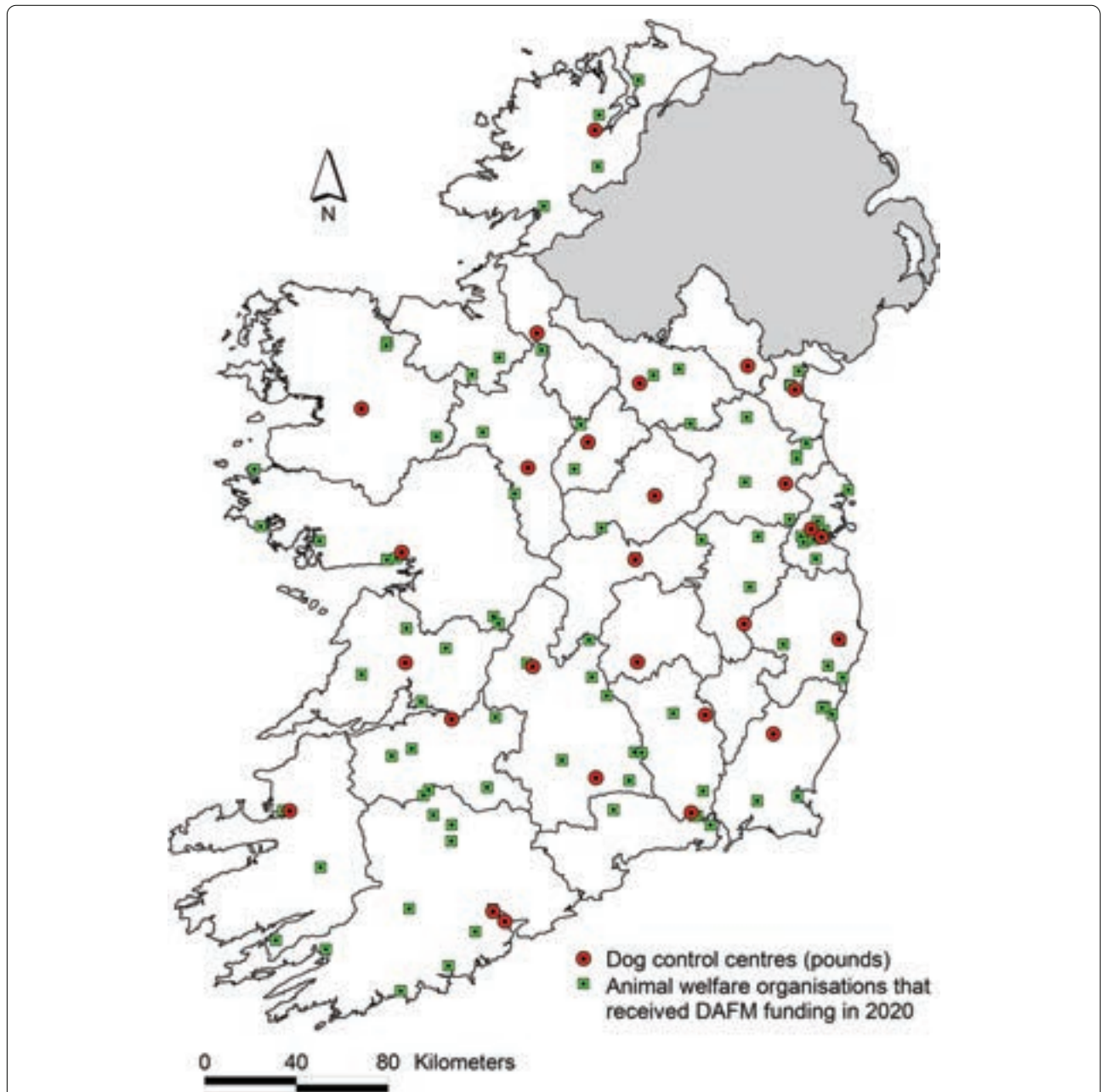


Fig. 2 The location of 27 dog control centres and 72 funded dog welfare organisations in Ireland. The 72 dog welfare organisations each received funding in 2020 under the DAFM Animal Welfare Grants to registered animal welfare organisations to assist in delivery of animal care and animal welfare services

Dog control centres

Annual statistics relevant to dog control centres in Ireland during 2004–2020 are presented in Fig. 6 (also in Table S3 in the [Supplementary material](#)). There have been decreasing trends in both the incoming and outgoing movement of dogs from dog control centres over the last 15 years. In any given year, the number of dogs moving into these centres (surrendered, collected

or seized) roughly equals those leaving (reclaimed, rehomed, euthanised, died or transferred). From a peak of incoming: outgoing movements of 25,332:25,364 in 2005, these have decreased to the most recent figures of 5310:5371 in 2020 (that is, a 78.4% decrease in incoming movements and a 78.1% decrease in outgoing movements during 2005 to 2020). There is a small peak in intake from 2011 to 2012 which aligns with the

Table 1 Grants provided to animal welfare organisations by the Department of Agriculture, Food and the Marine from 2016 to 2020

Funding date	Number of animal welfare organisations that received animal welfare grants				Total value of grants provided to animal welfare organisations
	Handling dogs only	Handling dogs and other species	Handling other species only	Total	
December 2016	11	65	61	137	€2,460,500
December 2017	14	57	40	111	€2,560,000
December 2018	12	62	34	108	€2,751,000
December 2019	8	57	41	106	€2,906,000
December 2020	7	65	29	101	€3,200,000
Total					€13,877,500



Fig. 3 The number of dog licences issued in Ireland during 2000–2020, by type of licence. These data were collated by the Department of Rural and Community Development and are available at <https://www.gov.ie/en/collection/879d4c-dog-control-statistics/>

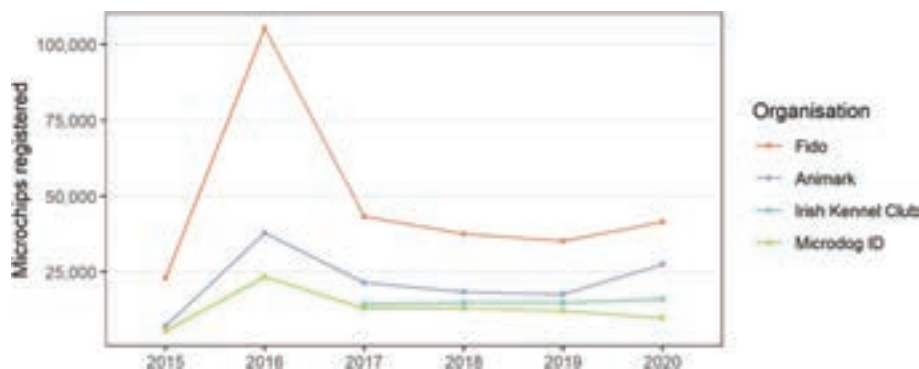


Fig. 4 The number of dog microchips registered in Ireland by Animark, Fido and Microdog ID from 2015 to 2020 and by the Irish Kennel Club from 2015 to 2020

decrease in licence registrations that was observed in Fig. 3.

Online private dog sales

During a six-month period (01 September 2021 to 28 February 2022), there were 5201 unique advertisements representing 14,732 dogs (a mean of 2.8 dogs per advertisement, median 2, maximum 14). A mean of 28.7

(median 27) advertisements were added each day, with a maximum of 78 added on 24 September 2021.

Of the 14,732 dogs advertised, the median age was 69 days and there were 8815 (55%) males. More than 92% ($n = 13,602$) of dogs advertised were less than 4 months old at the time of the listing. Based on the information presented, 99.2% ($n = 14,620$) of dogs were de-wormed, 99.1% ($n = 14,598$) were vaccinated, 1.2% ($n = 183$) were

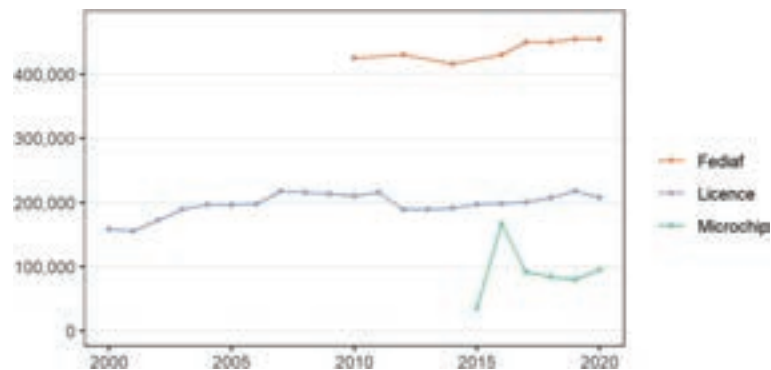


Fig. 5 The total number of dog licences issued and microchips registered per year in Ireland, during 2000–2020 (where available). The population estimates for the domestic dog population in Ireland from the European pet food industry (Fedaf) are also presented

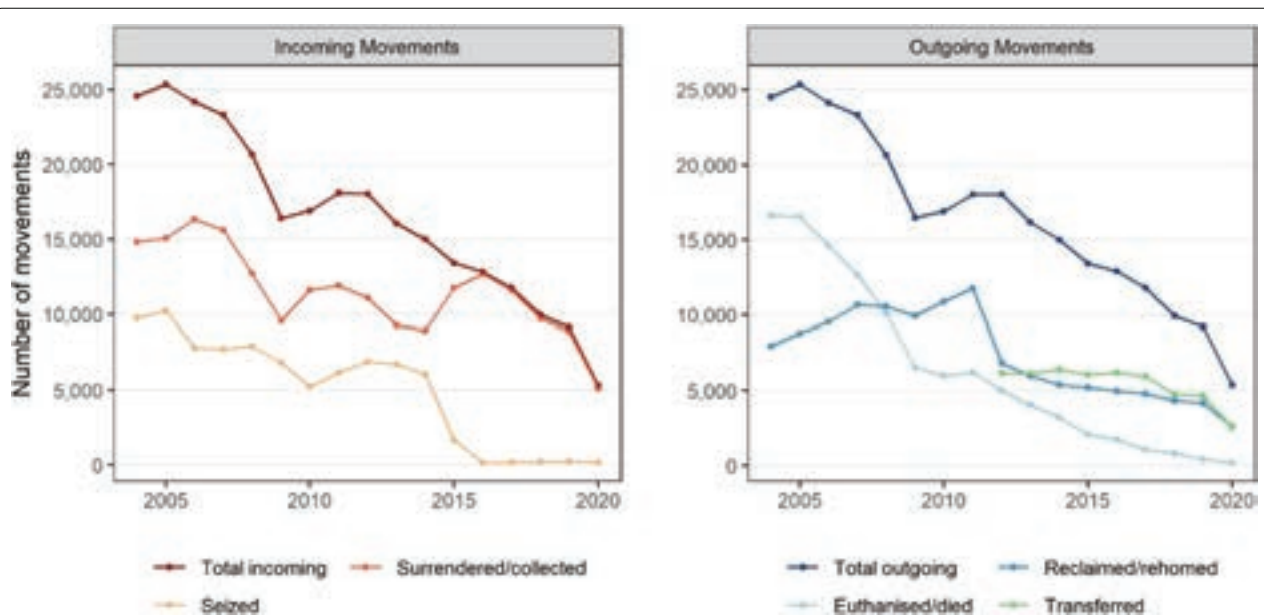


Fig. 6 Incoming and outgoing movements from dog control centres in Ireland from 2004 to 2020. These data were collated by the Department of Rural and Community Development and are available at <https://www.gov.ie/en/collection/879d4c-dog-control-statistics/>

neutered, and 27.6% ($n = 4061$) were IKC registered. The advertised mean sale price of dogs was €830 (median €750, maximum €6500), and the most frequent breeds were Poodle crosses (449 advertisements, including Doodles (164), Cockapoos (183) and Cavapoos (102)), Labrador Retrievers (375), German Shepherds (293), Golden Retrievers (258), Jack Russell Terriers (208), Cocker Spaniels (203) and Collies (202).

There were 69 identified breeders that provided a registration number for a dog breeding establishment. These 69 breeders were associated with 381 advertisements, being 7.3% (381/5201) of all advertisements. The top 3 sellers had 44, 21 and 18 listings, and were seeking to sell

210, 47 and 52 dogs, respectively. Among the sellers who specified the number of maximum breeding bitches on their premises, there were 3 sellers with a maximum of 1–10 breeding bitches, 34 with 11–12, 12 with 21–30, 3 with 31–40, 1 with 41–50, 3 with 51–50, 11 with 61–100, 1 with 101–180 and 1 with 181–300.

**The movement of dogs to and from Ireland
Pet passports issued**

The number of pet passports issued by DAFM to PVPs and dog welfare organisations in Ireland during 2014–20 is presented in Table 2. There was a 15.7% decrease in passports issued by DAFM between 2017 and 2020.