Animal &
Plant Health
Agency

Livestock Demographic Data Group:
Poultry population report

Livestock population density maps for GB 2020 using winter 2019 data

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APHA is an Executive Agency of the Department for Environment, Food and Rural Affairs and also works on behalf of the Scottish Government, Welsh Government and Food Standards Agency to safeguard animal and plant health for the benefit of people, the environment and the economy.

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Who are these reports for?

These reports are suitable for use in animal health and welfare policy work which requires an estimate of the distribution and size of the poultry population at GB level. This type of population level information is often required to assess the economic or social impact of particular animal health policies, for contingency and resource planning, or to provide evidence to trading partners. There are important assumptions and uncertainties with these estimates which the user needs to take into consideration and can be found with the Quality Statement.

Who did this work?

The Livestock Demographic Data Groups (LDDGs) were formed in January 2014 and are made up of APHA representatives from data, epidemiology, species expert and GIS groups. The work was initiated and completed between October 2019 and December 2019.

What do the data show about the population?

The maps (Figures 1 and 2) show either the density of animals, with a small map to show how this compares with the density of holdings, or vice versa. The data extract is interpreted as a snapshot of the poultry population in October 2019. These map styles have then been reproduced, and applied to the separated species of Poultry in Figures 3 – 10; namely chickens, ducks and geese (species combined), gamebirds (multiple species combined) and turkeys. The methodology for the extraction of species-level data is described below. The GB poultry population density map and the GB poultry holding density map correspond with the Avian Expert Group's current opinion of the geographical distribution of the industry. The significant concerns over data quality discussed below, limit the application of the maps and tables. Our current understanding of the inaccuracy in the data restricts the interpretation to an indication of likely relative density.

How accurate are the data?

The Great Britain Poultry Register (GBPR) (now incorporated within the Sam database) contains registration information of locations and animal numbers of poultry holdings in Great Britain. Assessment of the GBPR data quality during a survey identified a significant percentage of holding records were ineligible for use in a study on avian influenza, which can be considered a proxy for percentage of inaccurate records. Eligibility varied between species, with some species, including ducks, below 12% holdings eligible, while other species were up to 71% eligible (lowest eligibility was game ducks with 8%, highest was

turkey fatteners with 67%. On average 30% were eligible, 278 out of 948 sent out). The causes of this inaccuracy are discussed in the quality statement (Annex 1).

There is some concern regarding the number of unregistered poultry holdings. Registration with the GBPR is mandatory for holdings with greater or equal to 50 birds. Foot patrol investigations during notifiable outbreaks of highly pathogenic avian influenza has shown good representation of these larger holdings in kept databases. However, it has also shown the underrepresentation of holdings keeping less than 50 birds. These are generally referred to as backyard poultry however some of these holdings may have some associated commercial activity. For further information please refer to the Data Quality Statement in Annex 1.

What do the data not show?

The data and maps presented here do not show the seasonal variations the population undergoes across the year, instead these data represent the maximum capacity of the holdings. For the first time information is broken down to individual species level for chickens, turkeys, ducks, geese, gamebirds. This dataset does not include details of wild birds or birds in zoological collections.

There is significant uncertainty in the accuracy of the information displayed. Limitations in the dataset are discussed in the supporting quality statement (Annex 1). The creation of maps from incomplete data results in a high risk of incomplete and or misleading information being portrayed. Similarly population and holding density maps are classified to different scales and units and due care must be taken regarding their interpretation.

How were the maps produced?

The maps have been created using the kernel density function in *ArcGIS* software. This tool distributes population information over a defined radius, creating a smooth density surface. Two key parameters that require adjustment are the *search radius distance* and the size of the *output surface grid*. Discussion at the LDDG meetings informed these criteria, and their selection is recognised as a subjective process[1]. A search radius of 20km was deemed sufficient to enable distinction between categories and a 1km grid square was used for the density surfaces themselves. The classification bins were limited to six, to aide in cross referencing areas of the map to the key. Comparison between the maps was optimised by assigning similar parameters between the species. However, further refinement of the parameters for each species dataset could represent the information more accurately.

[1] Pfieffer, D. Spatial Analysis in Epidemiology, 2008. p47.

Figure 1: Poultry population density

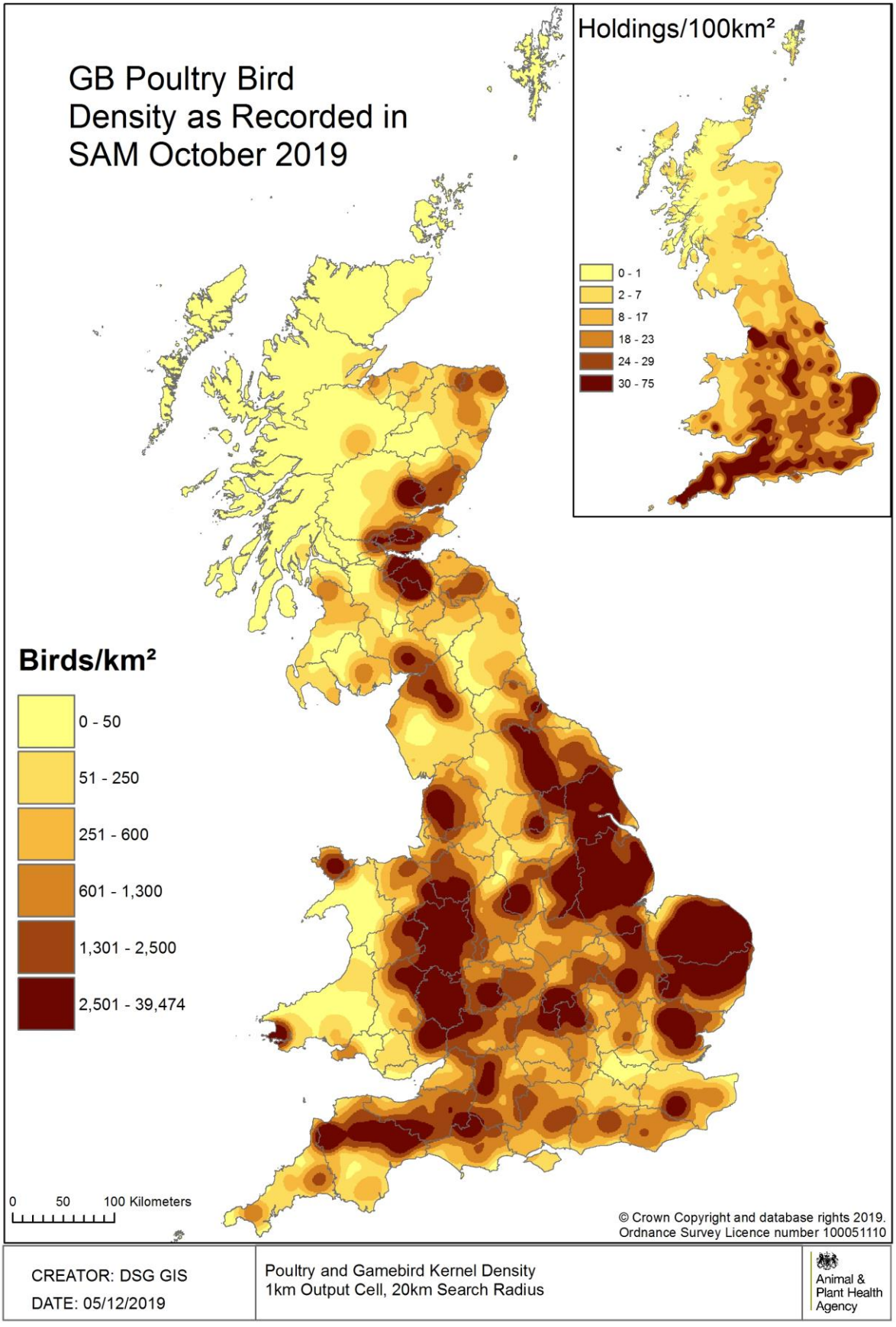


Figure 2: Poultry holding density

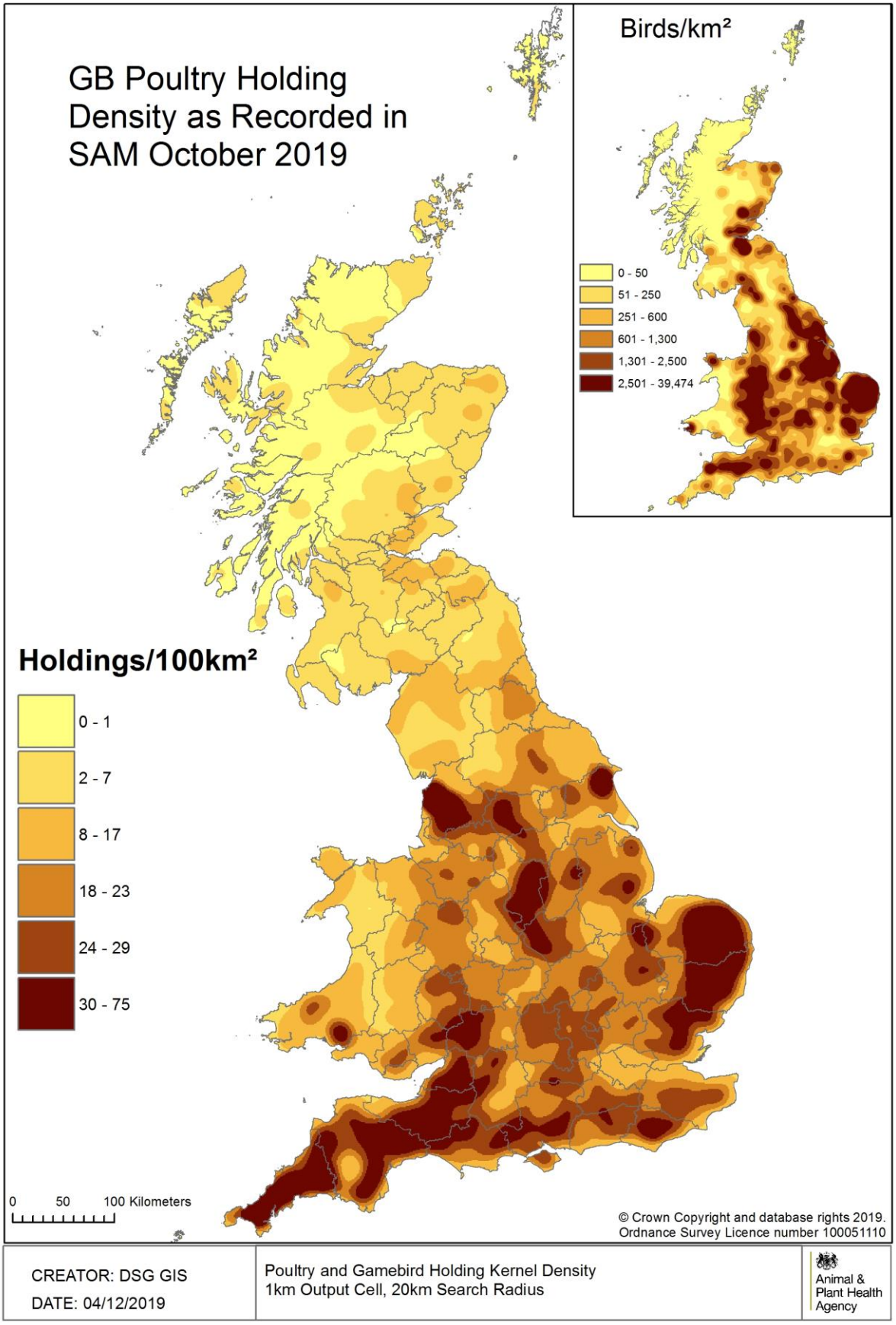


Figure 3: Chicken population density

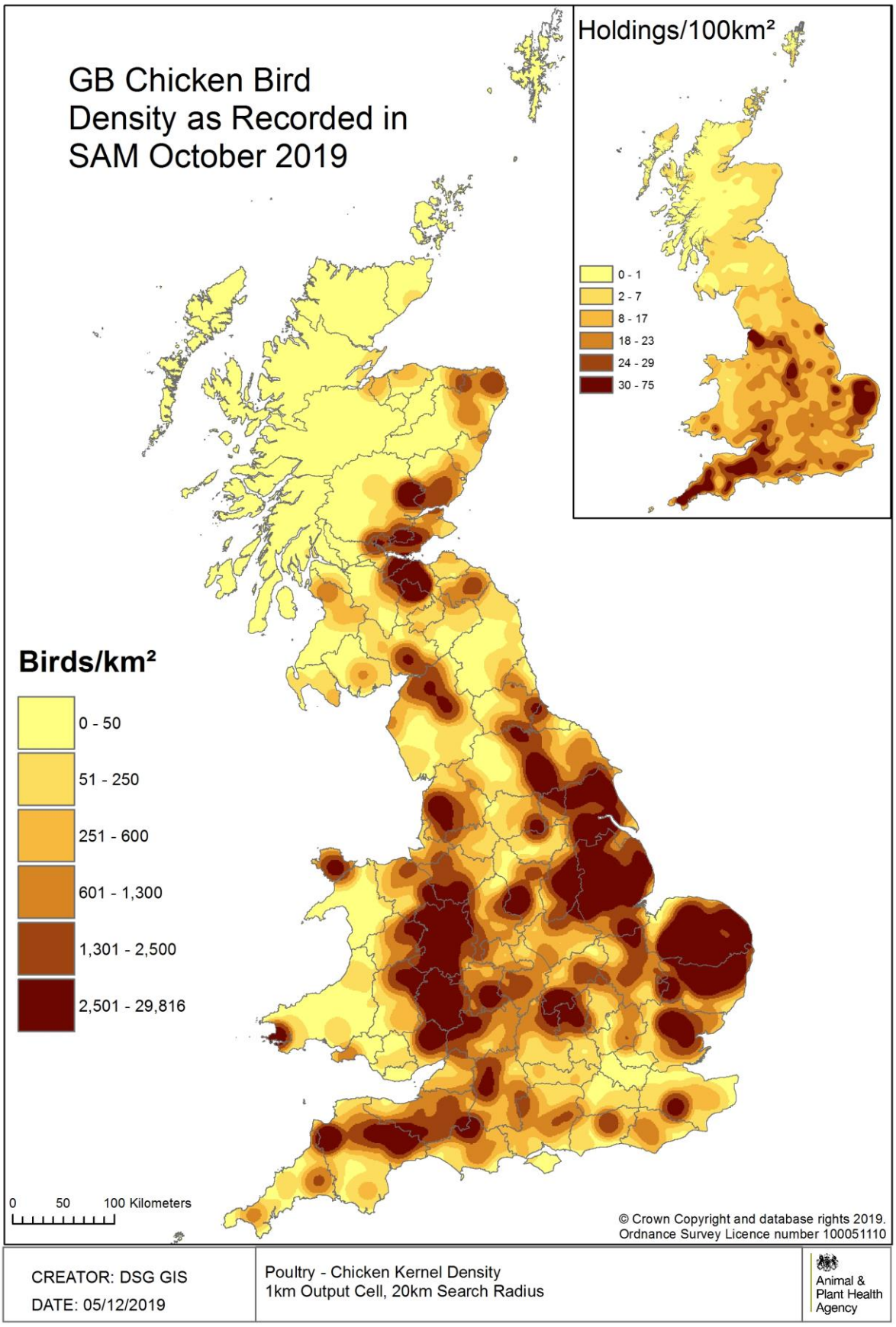


Figure 4: Chicken holding density

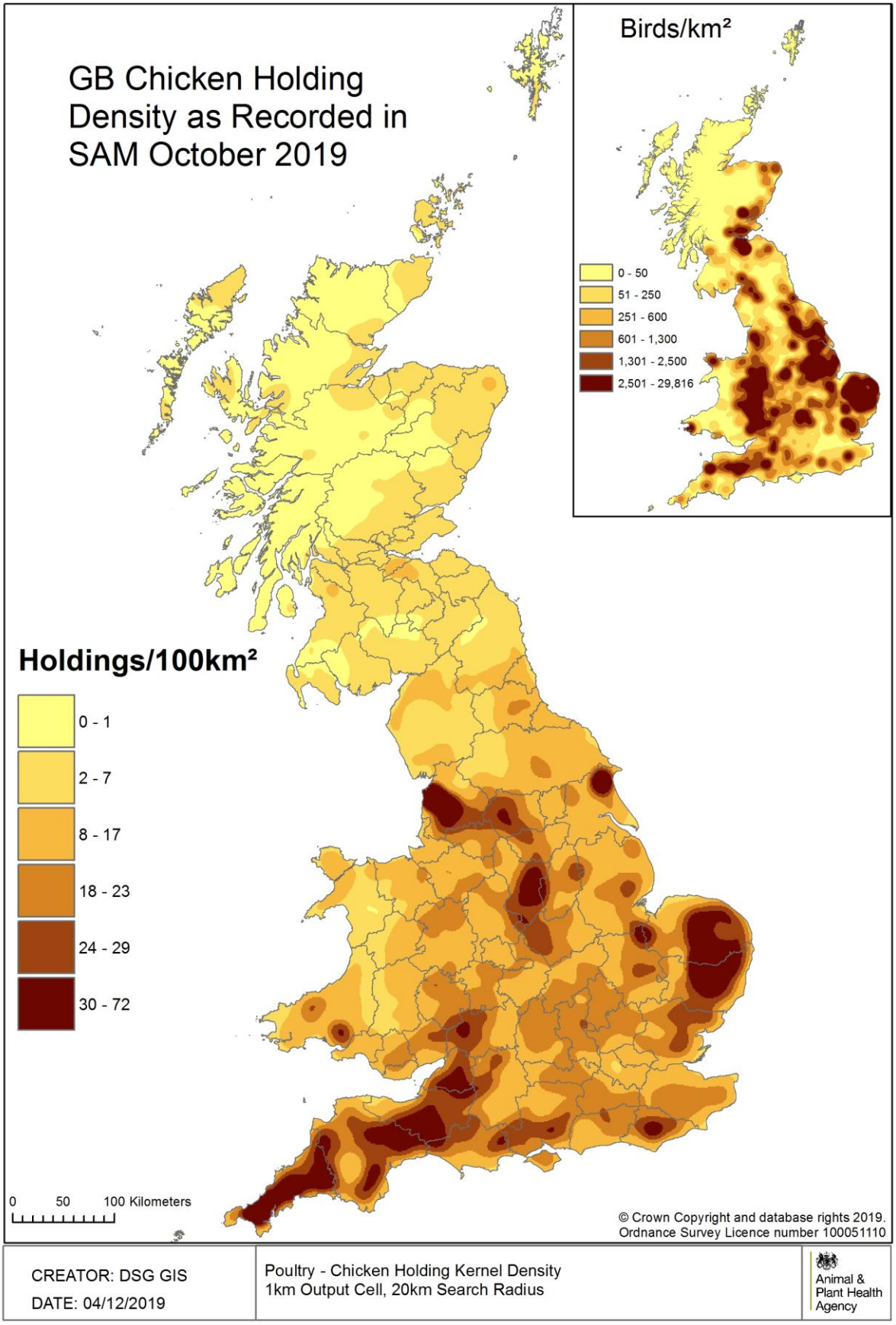


Figure 5: Duck and Goose population density

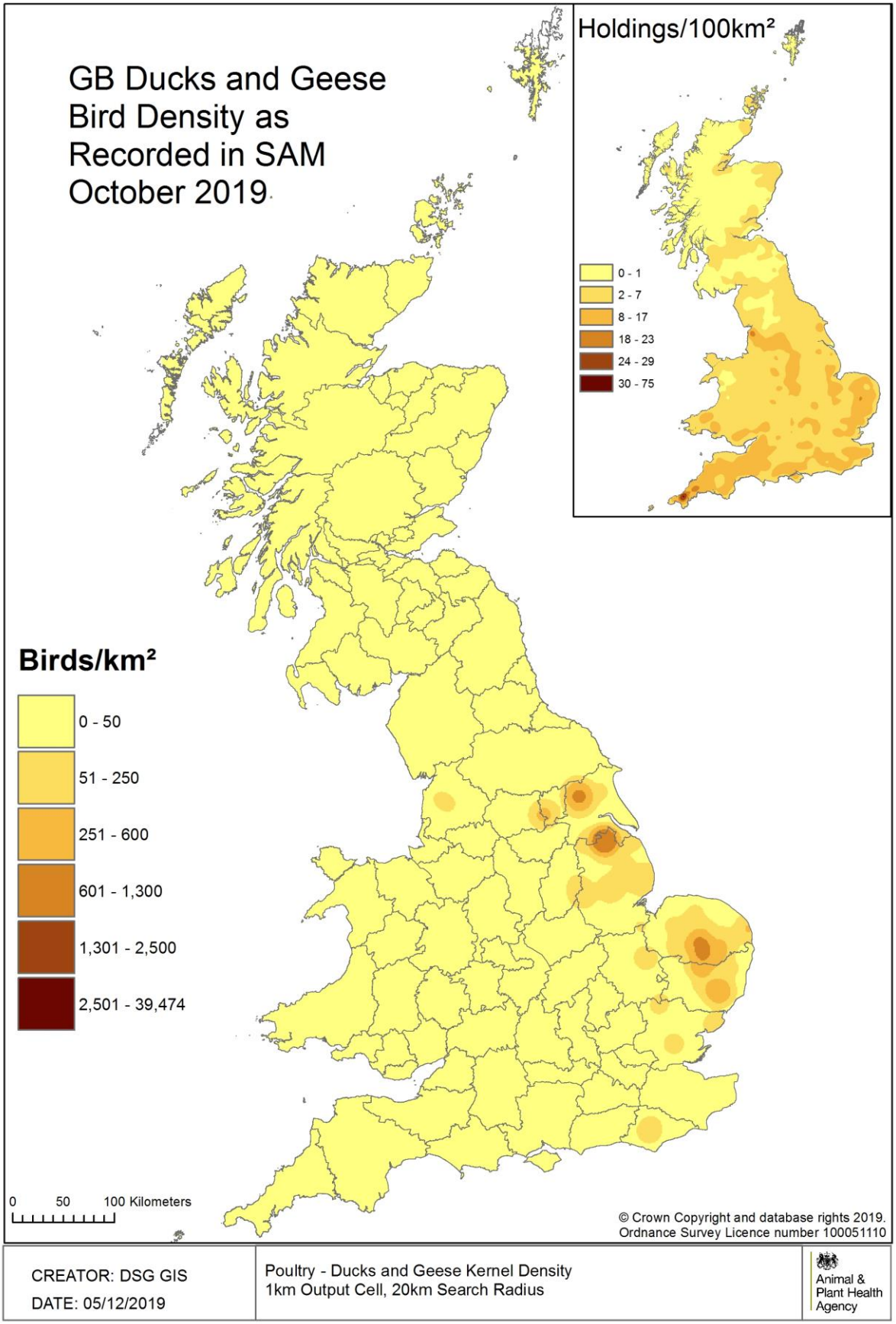


Figure 6: Duck and Goose holding density

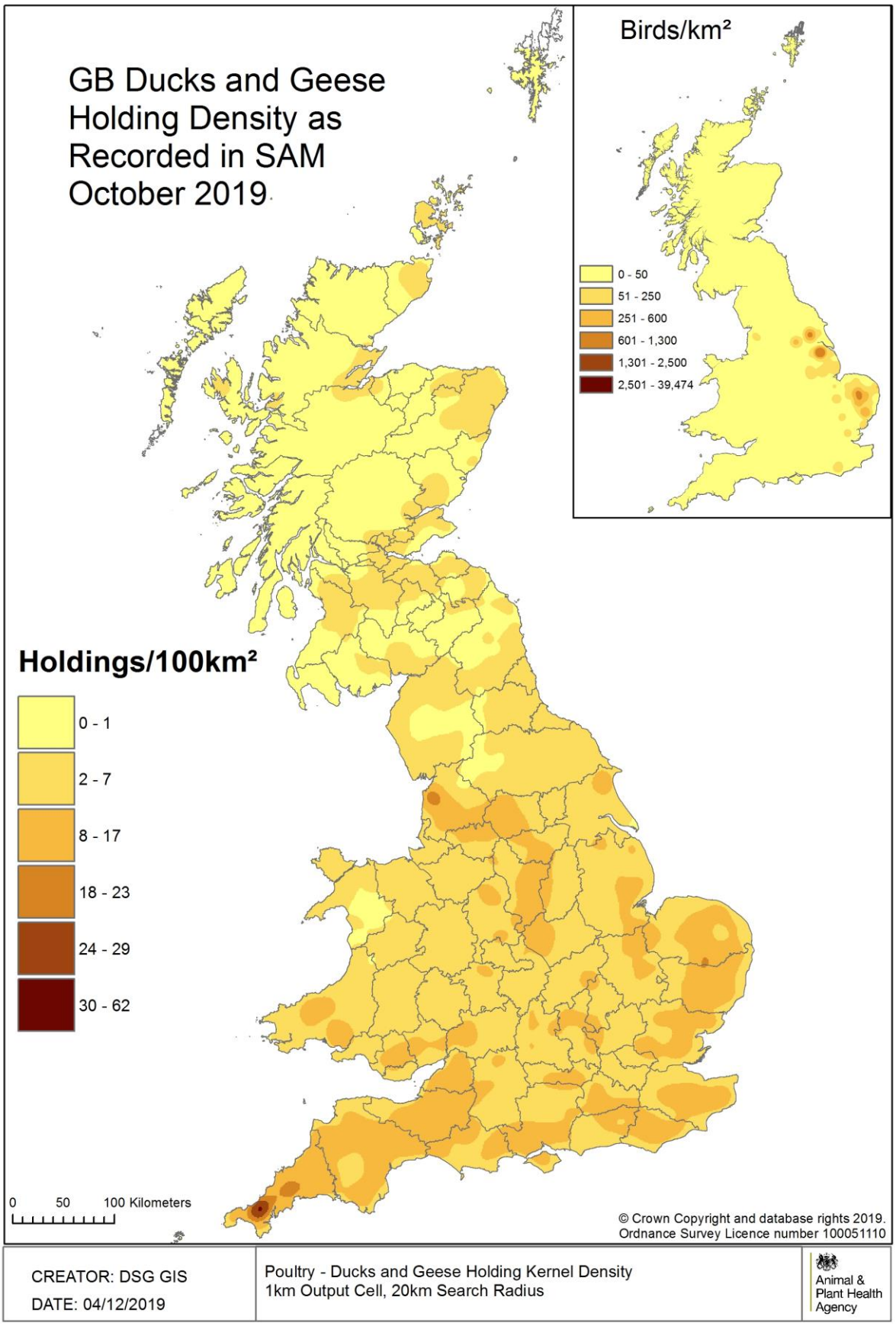


Figure 7: Gamebird population density

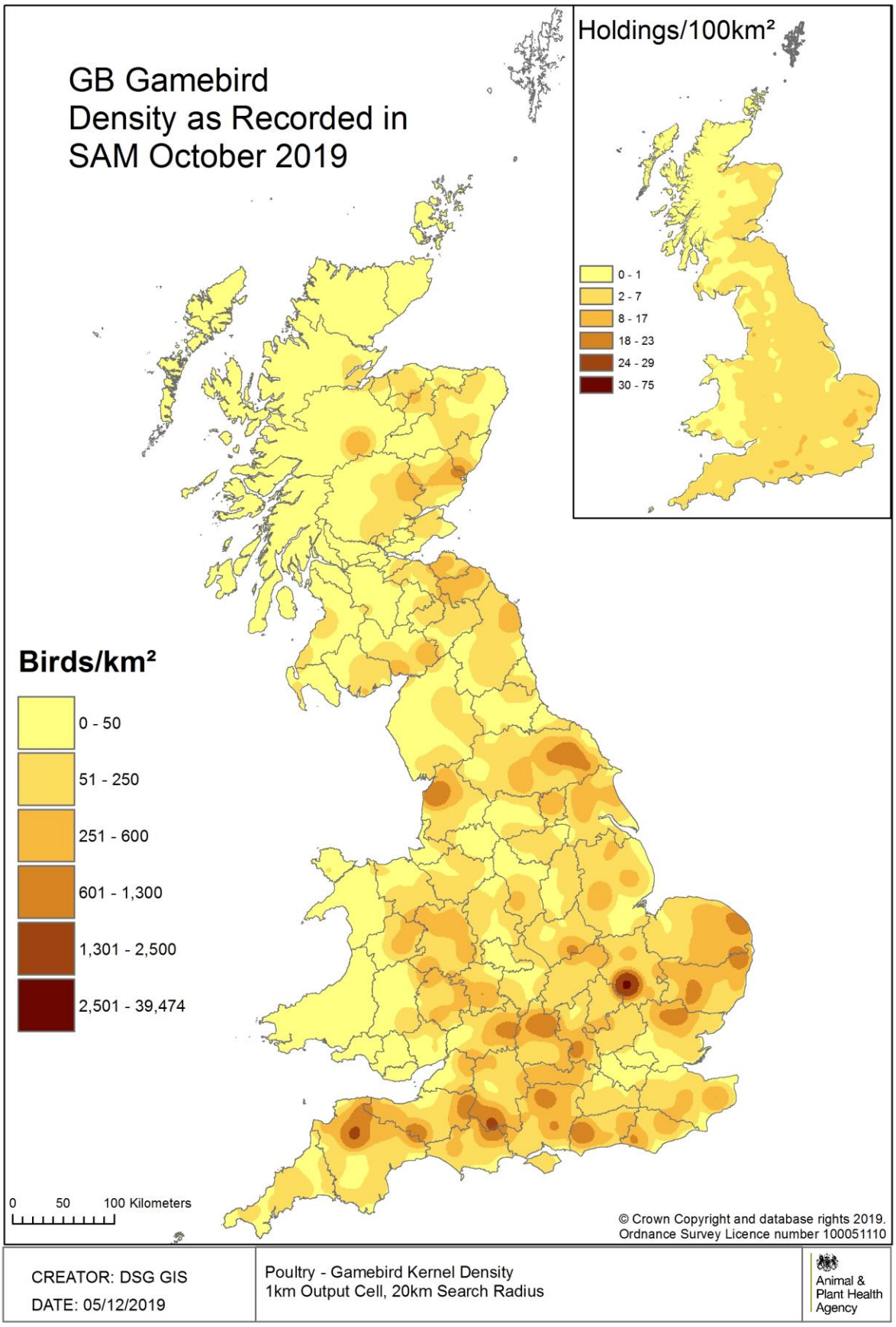


Figure 8: Gamebird holding density

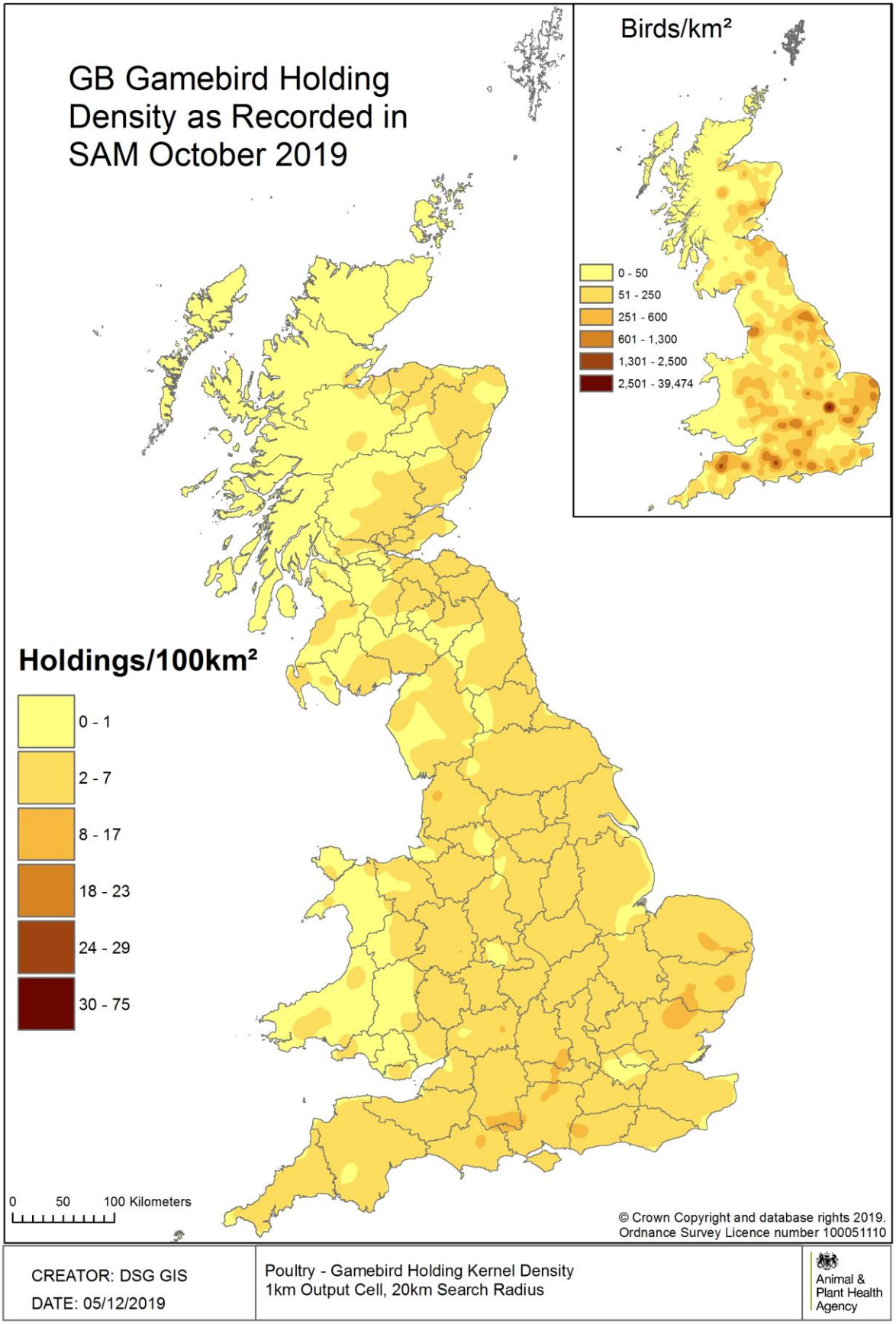


Figure 9: Turkey population density

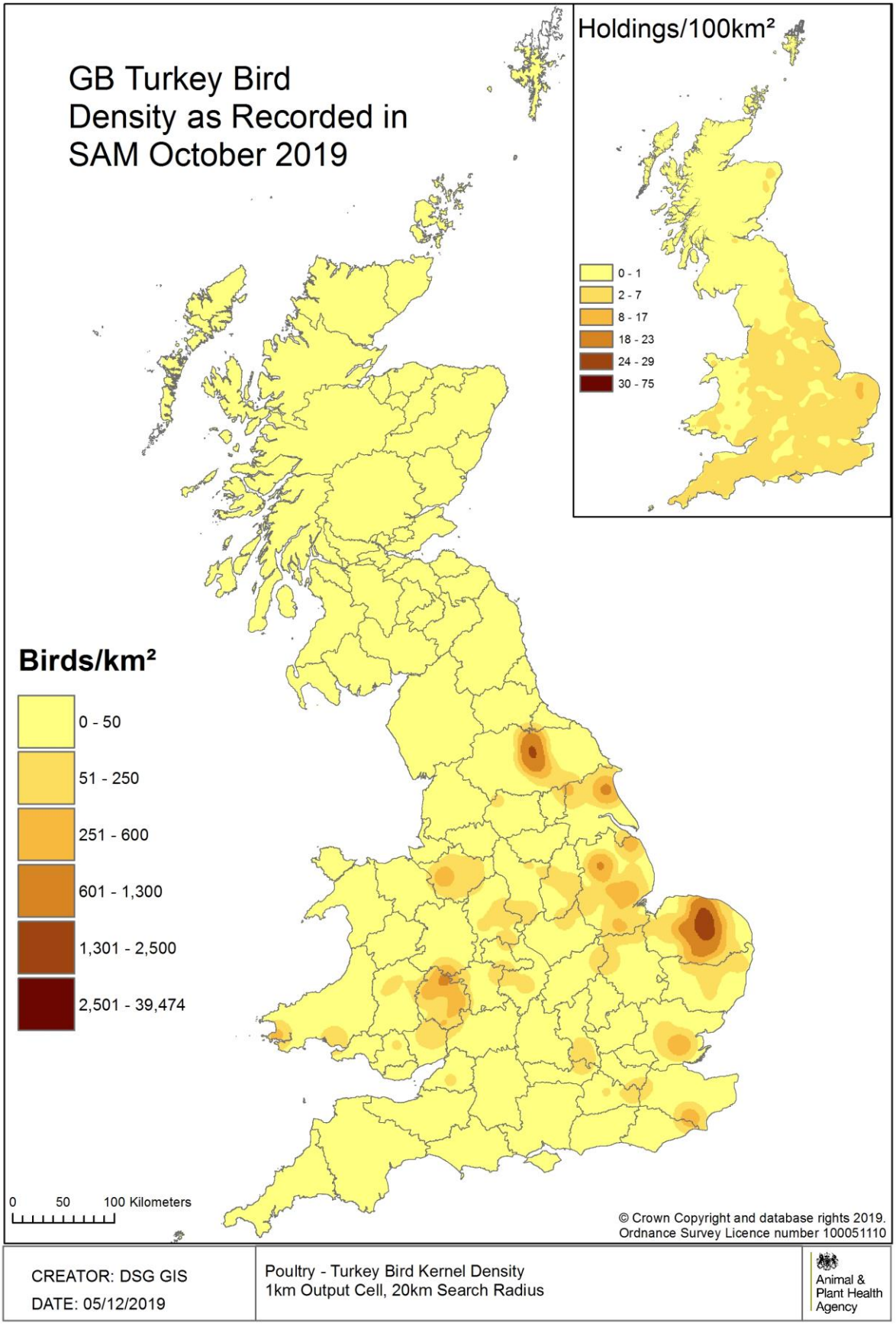
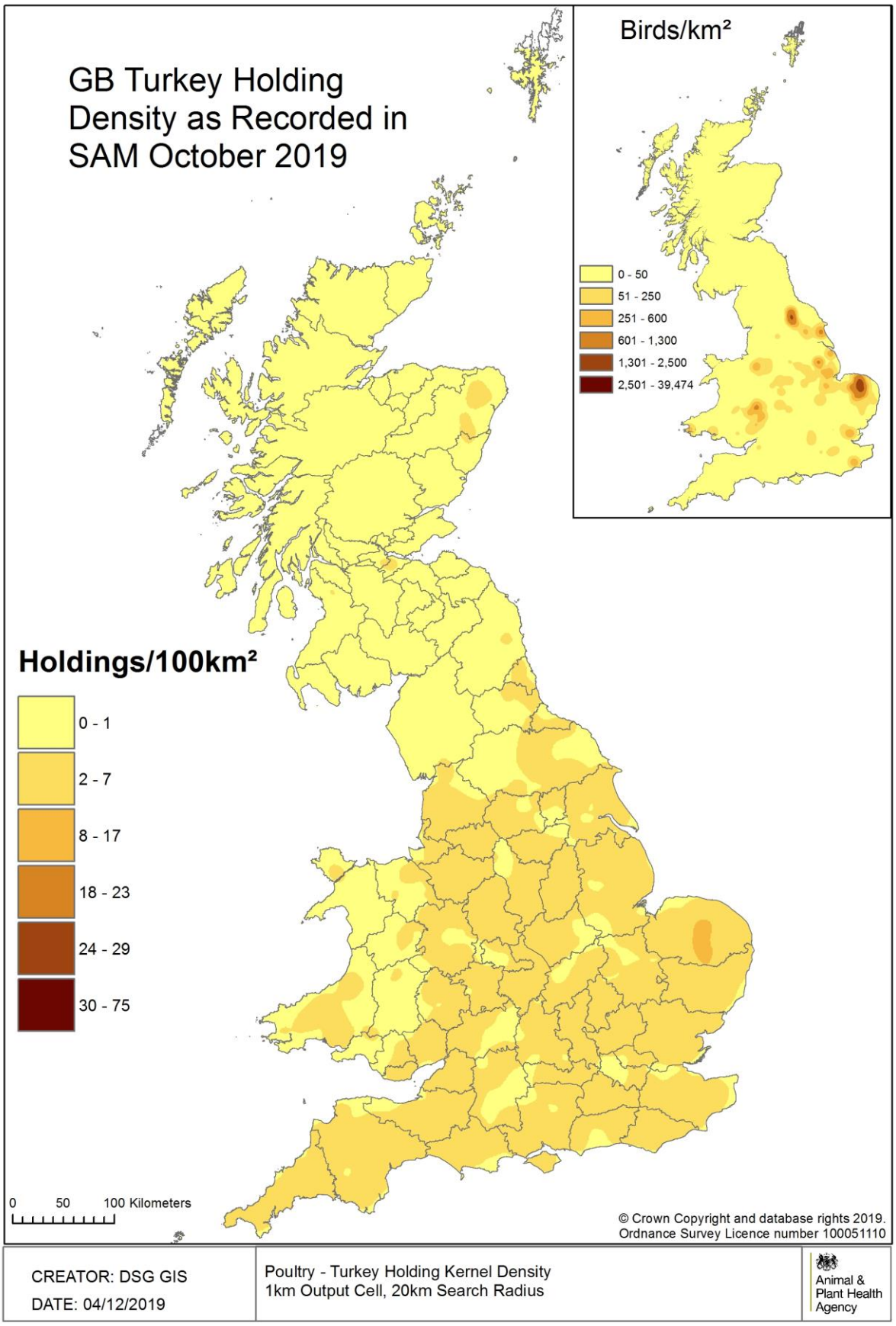


Figure 10: Turkey holding density



Annex 1: Data quality statement for poultry (Dec-19)

Introduction

This statement provides an overview of the quality of the data used to underpin the kernel density holding and livestock maps. This statement is written in the context of the data being used to provide an overview of the livestock demographics within Great Britain. The statement may not necessarily relate to data quality for other purposes.

Overview and purpose of the source data

The source data is from APHA's Sam database as at October 2019. The dataset holds information from registration of poultry holdings ≥50 birds. Premises with less than 50 birds are encouraged to register and so a proportion of these premises will be included within the Sam extract.

Category (+definition)	Quality description
Relevance of data [degree to which data meets user needs in terms of currency, geographical coverage, content and detail]	**Spatial coverage**: The data cover Great Britain **Temporal coverage**: Registrations have been recorded in the GBPR since 2008. The data are an extract from APHA's Sam data source which incorporated the GBPR data after it's decommissioning in April 2013. **Key data items available**: The dataset includes information on species, rearing method, industry sector and housing type. A metadata document is available with more detailed information from APHA Data Systems Group.
Timeliness [the degree to which data represent reality from the required time point]	**How often are data collected?** Data were captured continuously from submissions by poultry holding owners that were received by the GBPR team since the start of the register up to its point of decommission and then subsequently by Cardiff Specialist Service Centre (SSC) for incorporation into Sam. **When do data become available?** Data are available on request from the Management Information and Data Architecture Services (MIDAS) team in Worcester **Were the data updated often?** Prior to 2013 the Onus to update GBPR data was on the holding owner. Since its

	incorporation into Sam, data can no longer be directly updated by the owner and so now need to go via APHA staff who are encouraged to update incorrect or incomplete data when found, however there is no means whereby owners can regularly update their information. Surveys relying on Sam demographic data such as the EU Avian Influenza Survey provide feedback on data inaccuracies to Cardiff SSC for amendment.
Accuracy and precision [extent of data error and bias and how well data portrays reality]	**How were the data collected?** Data are entered by the Cardiff SSC from submissions of a registration form which is mandatory for holdings with ≥50 birds. However examination of the Sam extract shows that about 50% of registrations are for holdings with <50 birds **Sample & collection size:** The dataset lists 38,064 records. Of 38,064 premises, 720 have 0 stock recorded and these were removed from the data mapped. 18833 premises have between 1 and 49 birds (all species). **What steps have been taken to minimise processing errors?** We are unaware of any steps taken to minimise errors in the dataset. Work in other projects indicate that approximately half the premises in the GBPR do not contain the poultry types as listed e.g. only 33% of premises contacted for the avian influenza survey in 2018 were theoretically eligible for sampling (some were ineligible for practical reasons such as seasonal variation in access to birds). However, due to the large number of submissions, it is not possible to take steps to minimise these errors once entered into the database. **What are the non-reporting or non-response rates?** We do not have information on non-reporting or non-response rates for holdings in Sam. It remains a legal requirement for flocks of 50 or more birds to be registered; this requirement has been promoted through industry sectors, and the registration forms (for keepers of both more than 50, and fewer than 50 birds) were updated in January 2019. **Are any parts of the population unaccounted for in the data collection?** Holdings with <50 birds are not required to register with Sam hence this “backyard” population is not fully accounted for and information held almost certainly only represents a snapshot of the backyard population.

Comparability [how well these data can be compared with data taken from the same dataset and with similar data from other sources]	**Within dataset comparability:** The format and data analysis methods are similar between years. **Other dataset comparability: How does the data stored compare to data stored in other data sources?** The Agricultural survey only targets holdings of over 1000 birds and last ran a full census in 2010, though little work has been done by the LDDG to compare the GBPR with this dataset.
Coherence [degree to which data can be or have been merged with other data sources]	**How consistent are the data over time? If there are differences, what are they and what is their impact?** This has not been accurately assessed. More recent extracts indicate the presence of fewer holdings but it is unknown if this is representative of the population or an artefact due to inaccurate data. This might be clarified if there was a mechanism for owners to update their poultry numbers on a regular basis. **Have there been changes to the underlying data collection?** We are unaware of any changes in data capture methods but do not expect any changes to be significant or impact our use of the data. **Have any real world events impacted on the data since the previous release? How have these impacts on the data been managed?** The introduction of Sam has led to a switch in April 2013 to record data in Sam instead of GBPR. The requirement of holdings to register if they hold ≥50 birds has continued with Sam. **What other data sources in society report similar information? How do these data sources compare?** Aside from Sam and the Agricultural survey, the Egg Marketing Inspectorate (EMI) database may hold comparable information relating to laying flocks.
Interpretability [how well the data is understood and utilised appropriately]	**Is there a particular context that this data needs to be considered within?** See comments above. **What other information is available to help users better understand this data source?** Further information on data held in GBPR can be obtained from Cardiff SSC who now hold the GBPR data. The MIDAS Team in Worcester can be contacted to obtain an extract of this data.

	Are there any ambiguous or technical terms that may need further explanation? The UK poultry population is comprised of different poultry species and production types, as follows: • Chickens - breeder, layer and broiler flocks. • Turkeys - fattener (meat-type) and breeder flocks. • Ducks - breeder, meat and layer flocks. • Geese - breeder, meat and layer flocks. • Feathered game classified as poultry - breeders and rearer flocks of pheasants, partridges and ducks reared for shooting. • Other minor poultry species including: guinea fowl, quail, pigeons reared for meat, ostriches, emus, rheas. Wild birds and birds in zoo collections are not included within the scope of this document; feathered gamebirds are considered 'wild' once released.
Accessibility [availability of relevant information and access to the data in a convenient and suitable manner]	**What data are shared and with whom?** Data must be aggregated to at least a county level before publishing so individual farms cannot be identified (e.g. by CPH or postcode). Also estimates based on less than five holdings should not be used as this would breach confidentiality. A confidentiality agreement is required for data that is not publically available. Sam data can be obtained from APHA Cardiff SSC. APHA Weybridge Data Systems Group has a copy of the final extract. **Contact details for data source queries:** customerregistration@apha.gov.uk Animal and Plant Health Agency (APHA) Cardiff Specialist Service Centre Poultry Data Team Government Buildings 66 Ty Glas Road Llanishen Cardiff CF14 5ZB Agricultural Survey England: Farming-statistics@defra.gov.uk Agricultural Survey Wales: Stats.agric@wales.gov.uk Agricultural Survey Scotland: agric.stats@scotland.gov.uk