



Animal &
Plant Health
Agency

Livestock Demographic Data
Group:

Poultry population report

Livestock population density maps
for GB, using July 2022 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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Data year	July 2022

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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 (LDDG) were formed in January 2014. These are made up of APHA representatives from data systems, epidemiology, species expert and GIS work groups. The work was initiated and completed between August 2022 and October 2022.

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 July 2022. 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) represents the statutory systematic record of the location, species, usual number of birds and seasonal variations, for holdings with more than 50 birds 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, from turkey fatteners with 21% ineligible to geese at 62%, with an overall average of 46% ineligible due to reasons around inaccurate data (no birds or less than the number specified, moved

away/no longer in business or wrong class of birds) The causes of this inaccuracy are discussed in the quality statement ([Annex 1](#)).

There is also some concern regarding the number of unregistered poultry holdings. Registration under the GBPR is only 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 confirmed the underrepresentation of holdings keeping less than 50 birds. These are generally referred to as smallholding 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](#). There is awareness of these issues across England and the devolved governments of Wales and Scotland and a public consultation regarding changes to poultry registration opened on the 7th March 2023 and closes on the 31st May 2023 which looks to address these concerns ([Consultation on proposed registration requirements for all bird keepers in Great Britain - Defra - Citizen Space](#)).

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 usual capacity of the holdings. For the reports produced in 2020 ([Livestock population density maps for GB 2020 using winter 2019 data \(defra.gov.uk\)](#)) and 2021 ([Poultry population report \(defra.gov.uk\)](#)) 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 displayed with different data classes and units in their respective legends 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 process¹. 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

¹ Pfeiffer, D. Spatial Analysis in Epidemiology, 2008. p47.

to six, to aid 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.

Table 1: Number of poultry holdings and number of birds by country in GB, based on July 2022 records, comparing with 2021 records. The number of poultry holdings and total number of poultry per county, grouped per country, is provided in [Annex 2](#).

Country	Holdings			Usual Stock Numbers		
	July 2021	July 2022	% Change	July 2021	July 2022	% Change
ENGLAND	34,609	44,166	27.6%	232,958,750	260,046,229	11.6%
SCOTLAND	2,651	3,132	18.1%	24,162,001	25,514,385	5.6%
WALES	3,000	3,558	18.6%	15,325,747	19,020,809	24.1%
GB TOTAL	40,260	50,856	26.3%	272,446,498	304,581,423	11.8%

The reported total number of poultry in GB was just over 304.5 million, which was significantly up from the figure of 272.4 million poultry from 2021 records (Table 1). The reported total number of holdings has also increased from just over 40,000 in 2021 to just over 50,000 in this current report based on 2021 records (Table 2). This however is subject to the data quality issues addressed above, poultry numbers are dependent on poultry registration which may be affected by the presence of notifiable diseases in poultry. Notifiable disease investigations may force registration updates implying change or addition in poultry numbers that in reality were always present. In the event of notifiable avian disease occurrence, there is a statutory requirement to undertake a census and identify all poultry and captive bird keepers within a Protection Zone it is likely that a number of unregistered holdings, particularly smallholding premises, will be registered by APHA as a result. This would likely increase the number of registered holdings whilst having a limited impact on the true number of animals.

GB Poultry Bird Density as Recorded in SAM July 2022

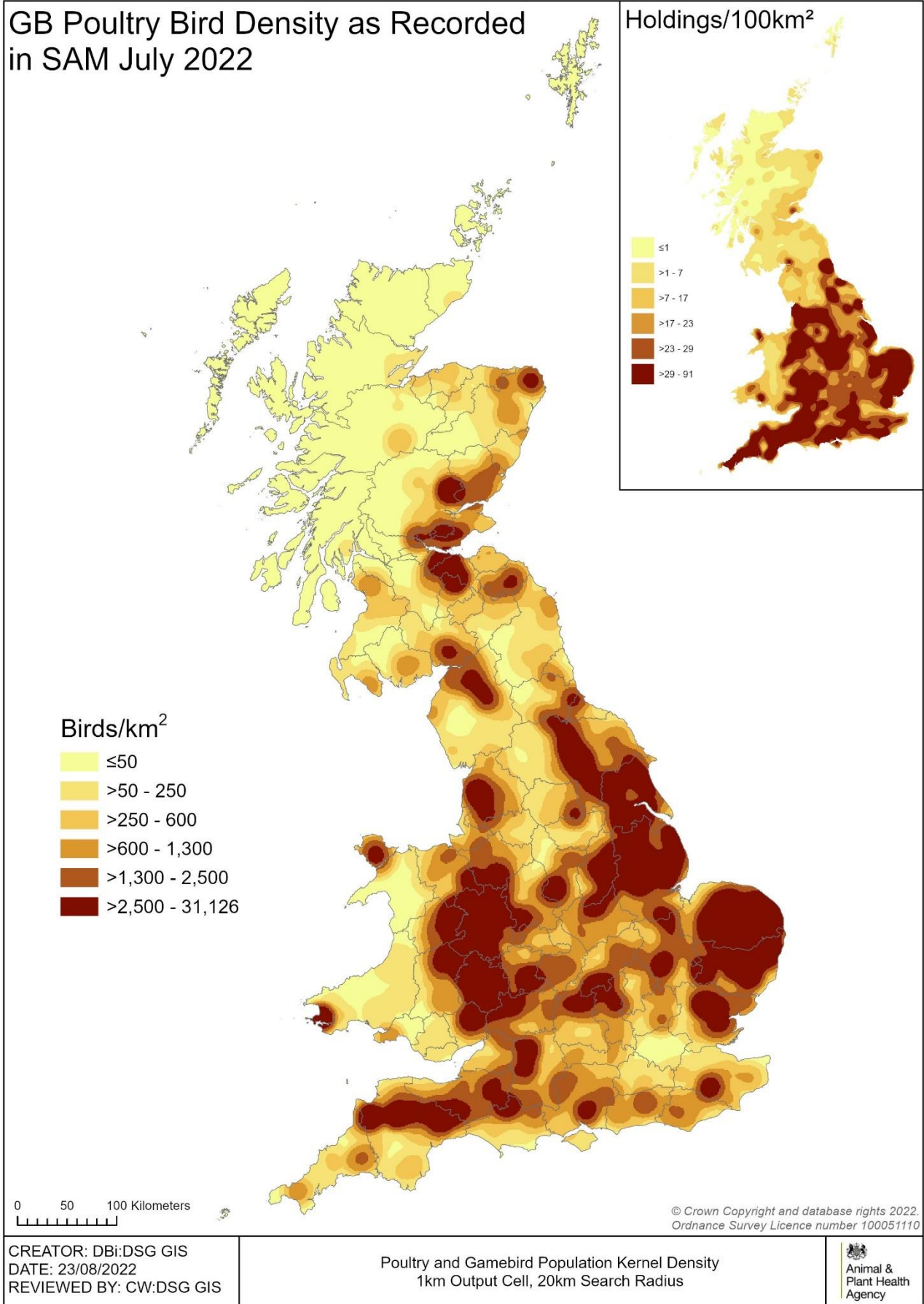


Figure 1: Poultry population density in GB based on July 2022 records

GB Poultry Holding Density as Recorded in SAM July 2022

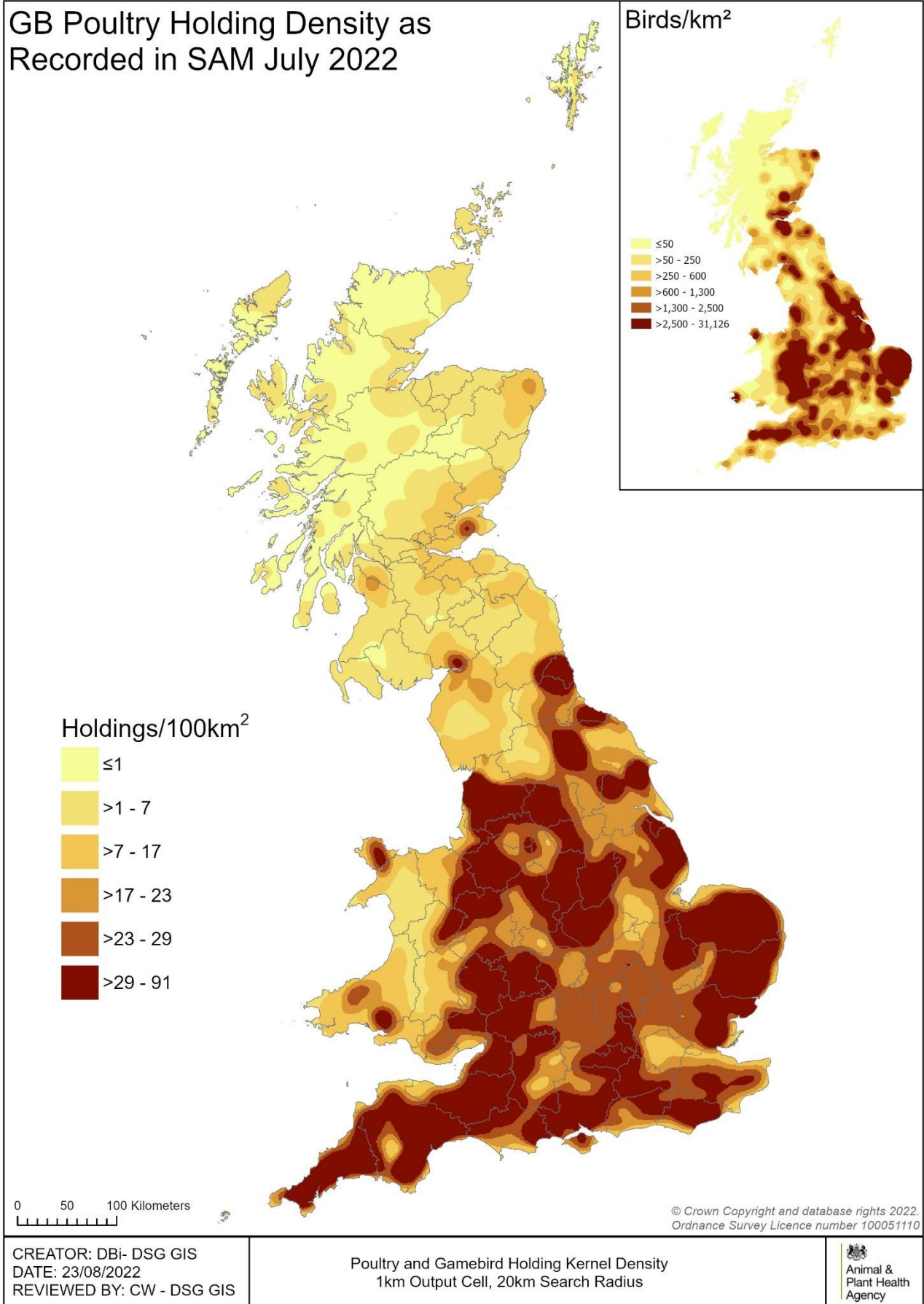


Figure 2: Poultry holding density in GB based on July 2022 records

GB Chicken Bird Density as Recorded in SAM July 2022

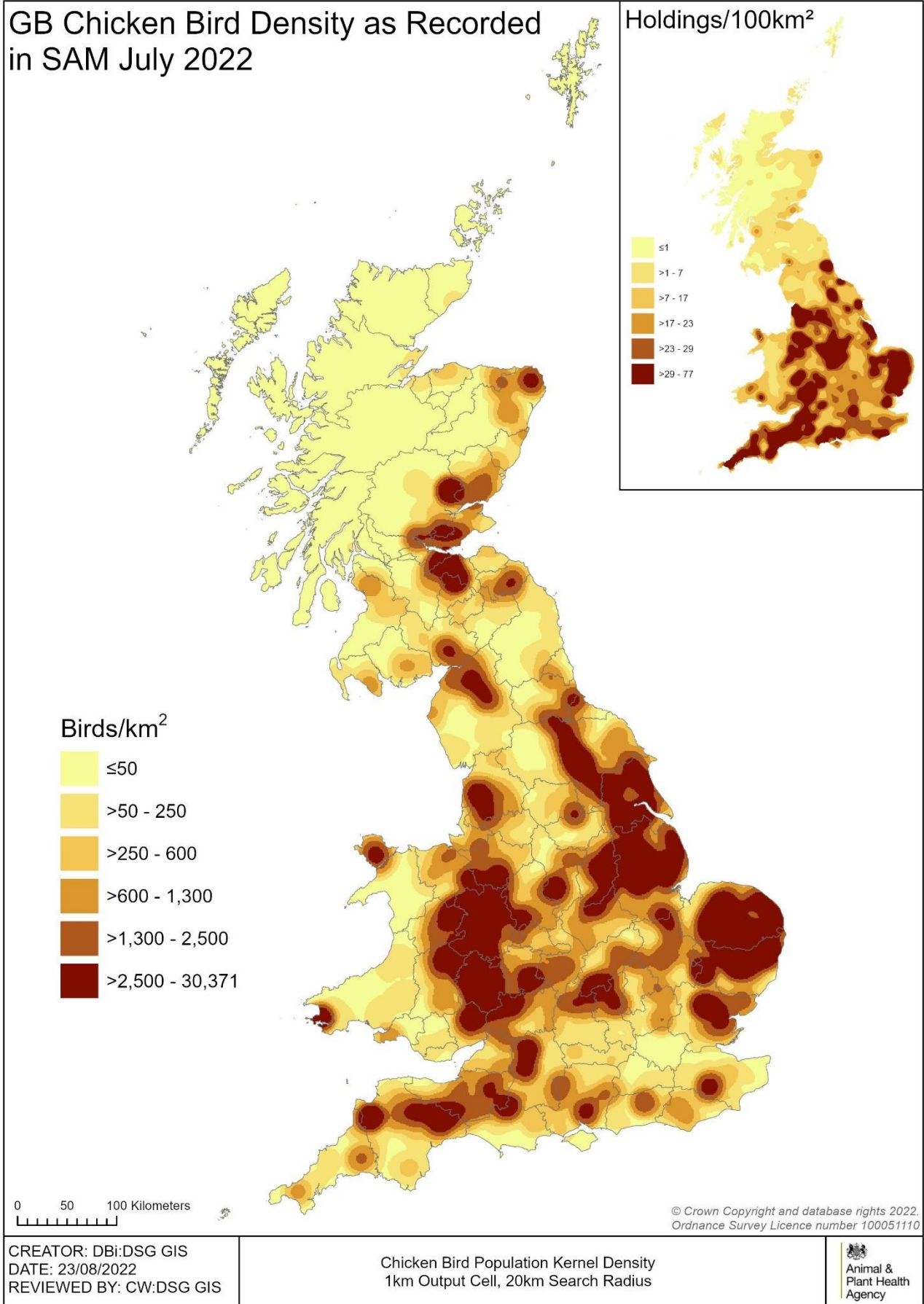


Figure 3: Chicken population density in GB based on July 2022 records

GB Chicken Bird Holding Density as Recorded in SAM July 2022

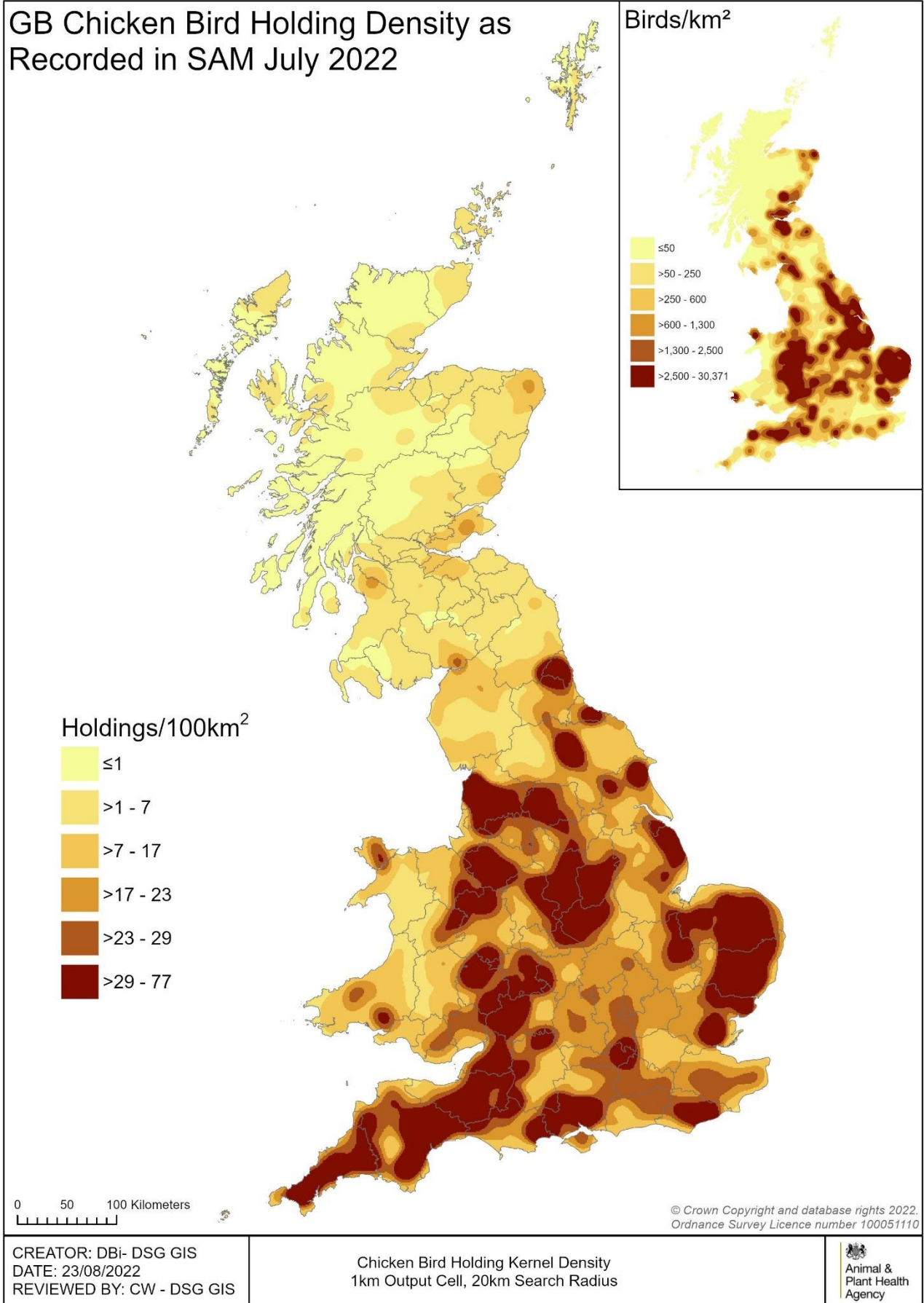


Figure 4: Chicken holding density in GB based on July 2022 records

GB Ducks and Geese Bird Density as Recorded in SAM July 2022

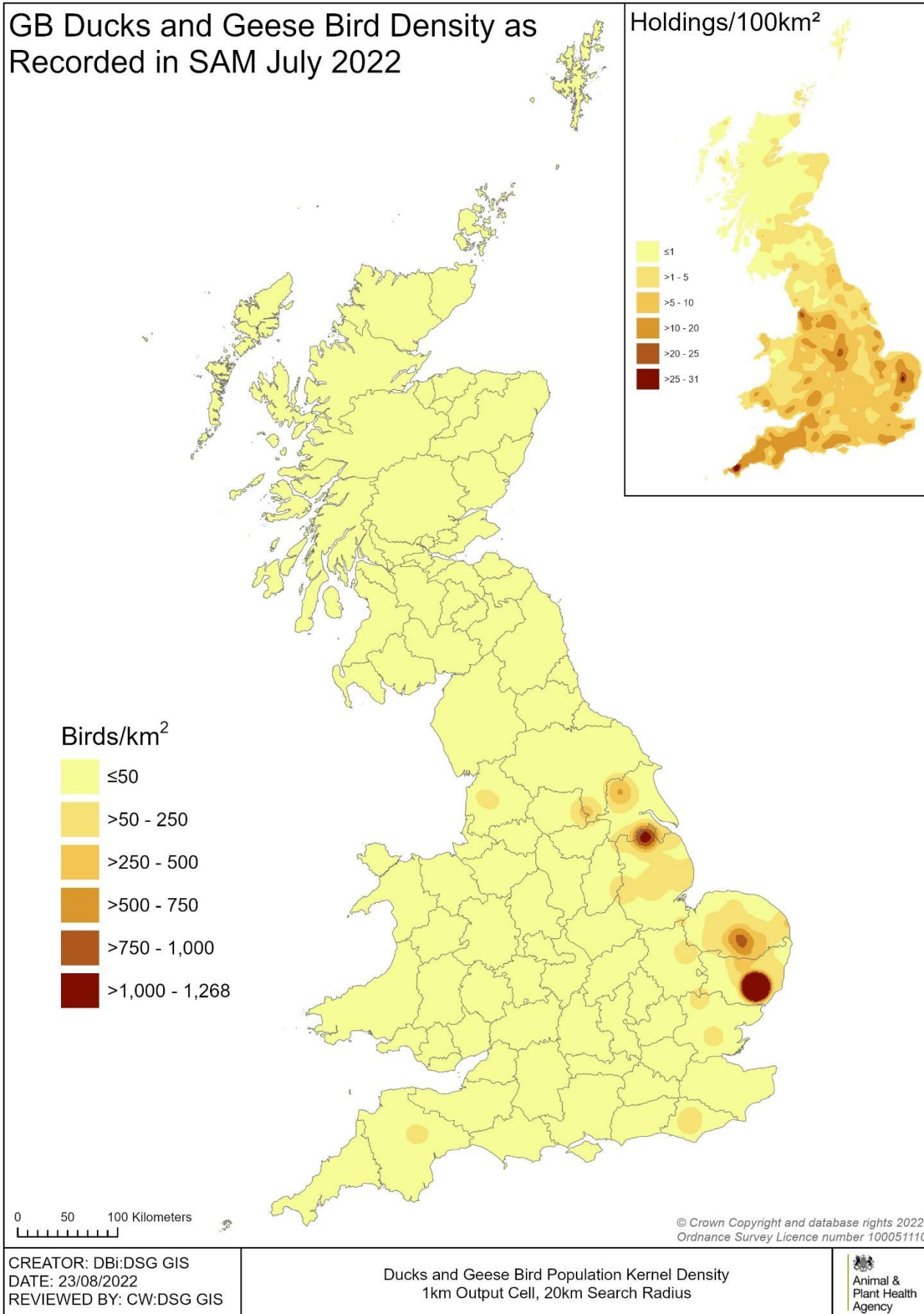


Figure 5: Duck and Goose population density in GB based on July 2022 records

GB Ducks and Geese Bird Holding Density as Recorded in SAM July 2022

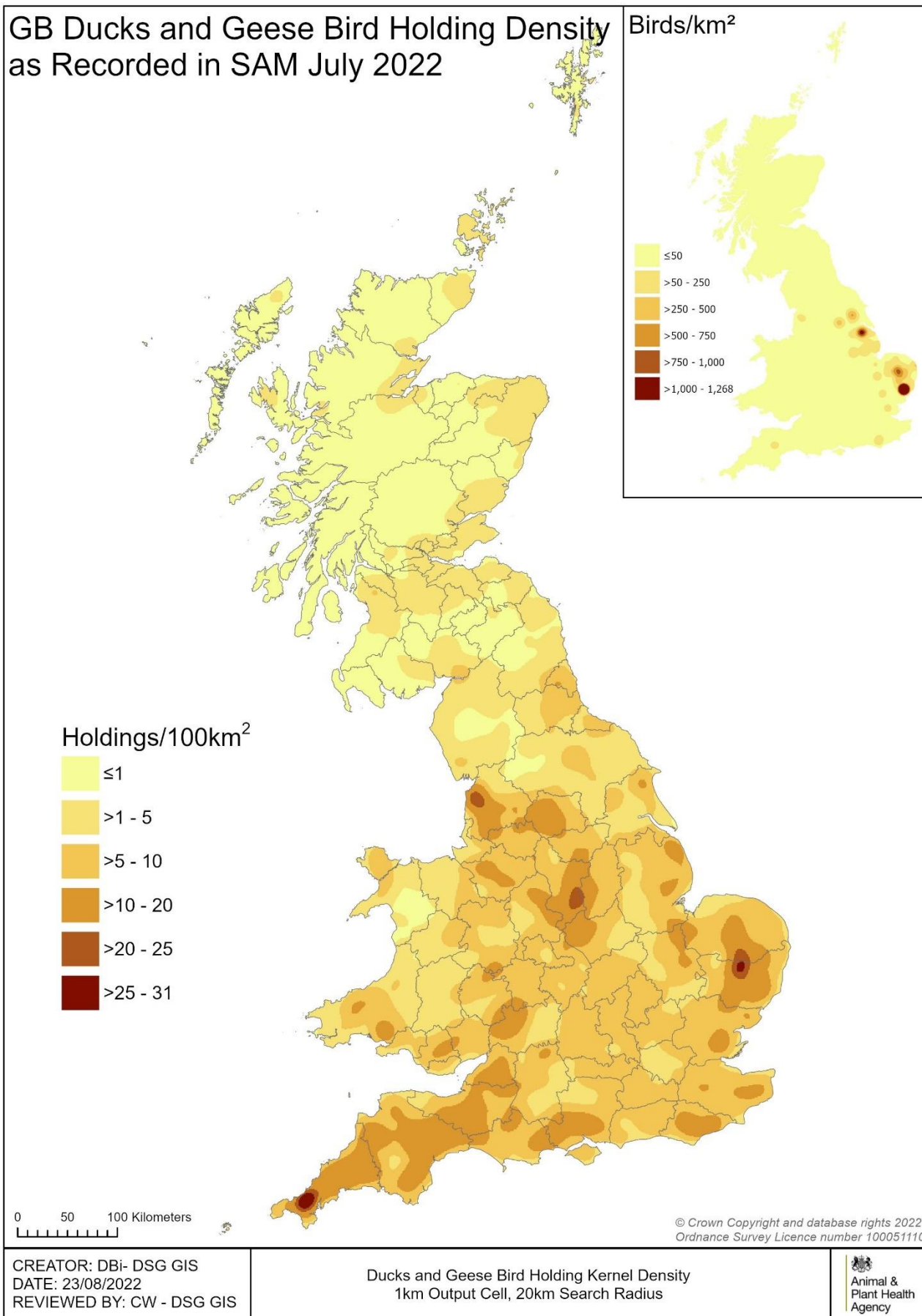


Figure 6: Duck and Goose holding density in GB based on July 2022 records

GB Gamebird Density as Recorded in SAM July 2022

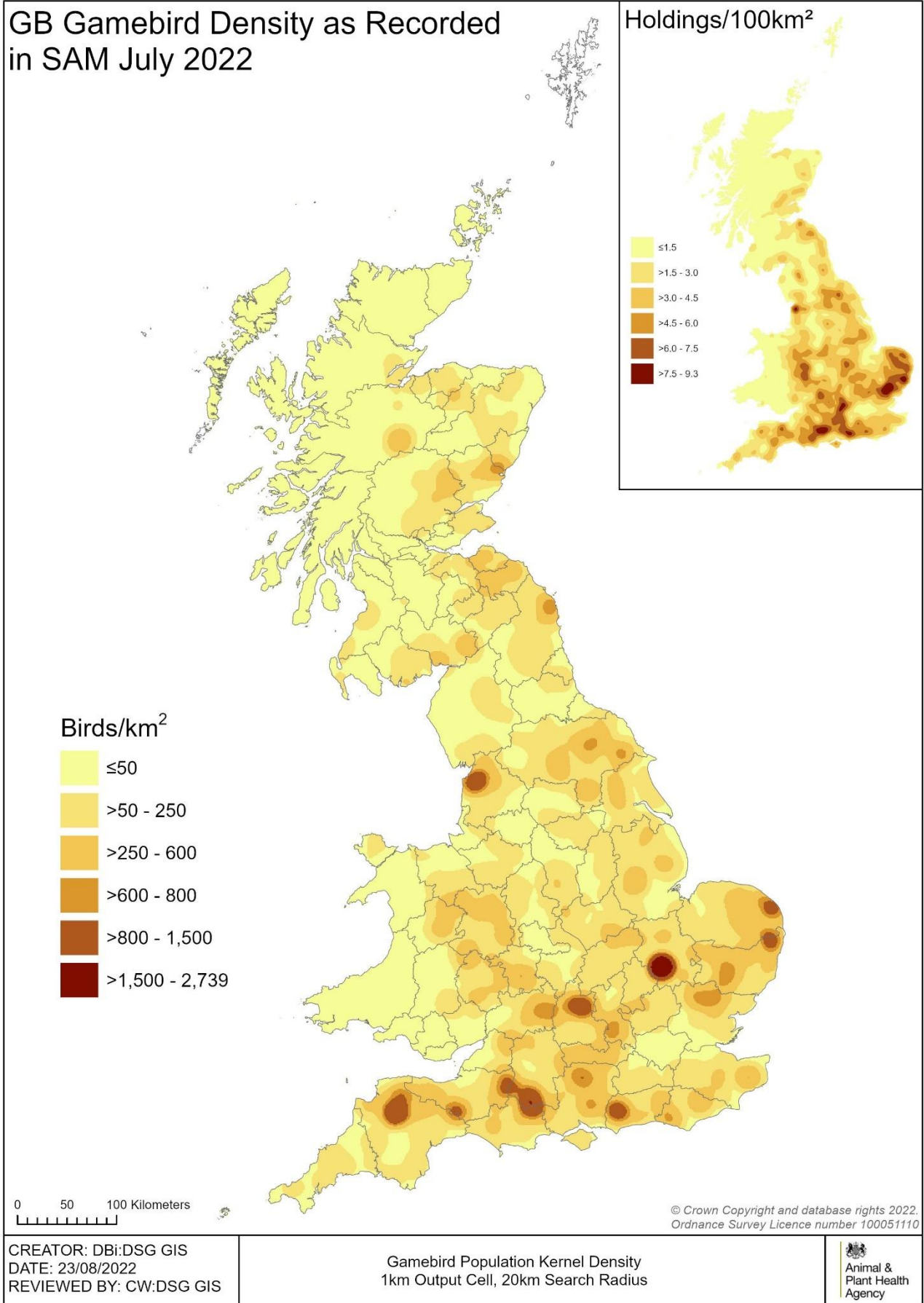


Figure 7: Gamebird population density in GB based on July 2022 records

GB Gamebird Holding Density as Recorded in SAM July 2022

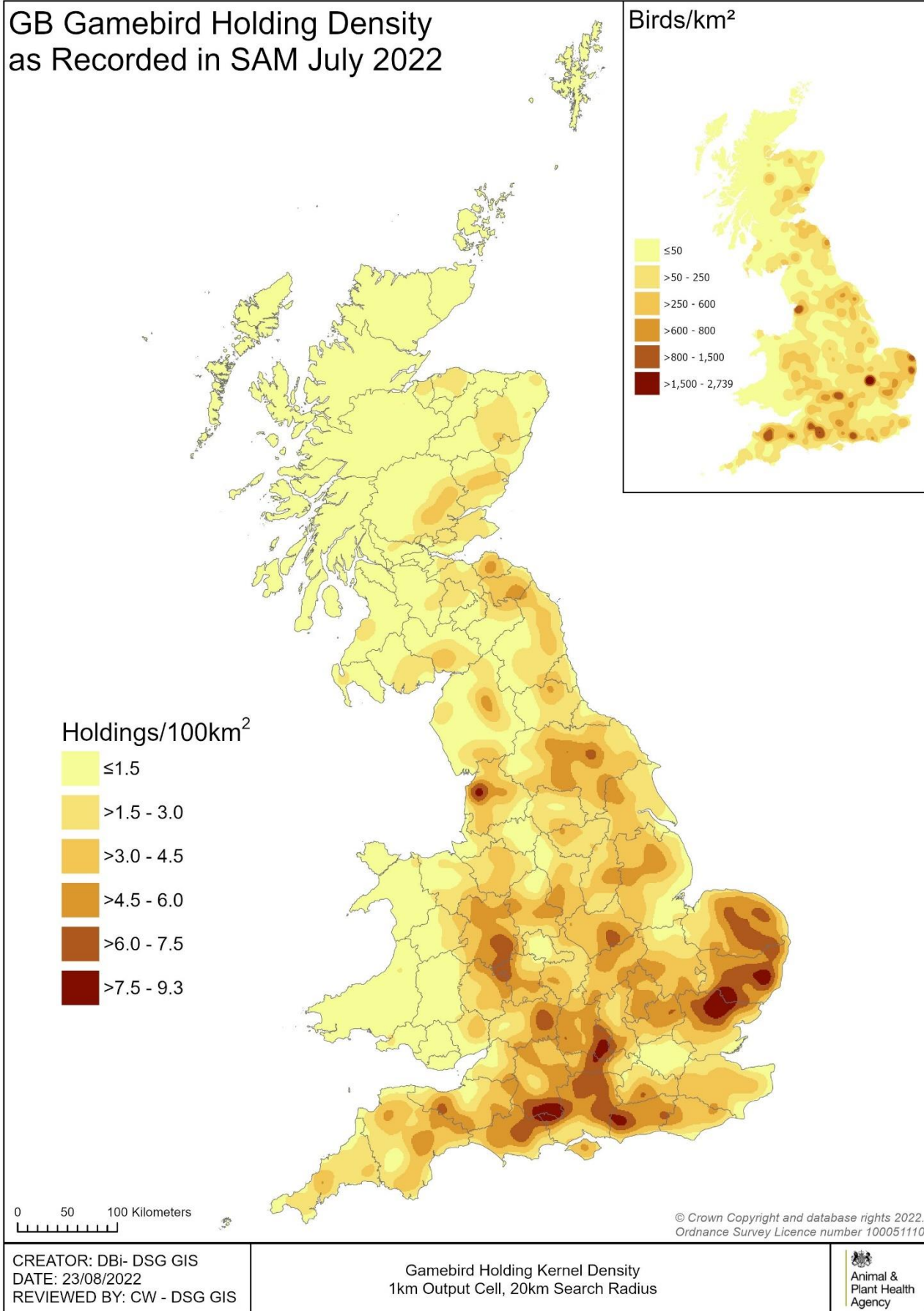


Figure 8: Gamebird holding density in GB based on July 2022 records

GB Turkey Bird Density as Recorded in SAM July 2022

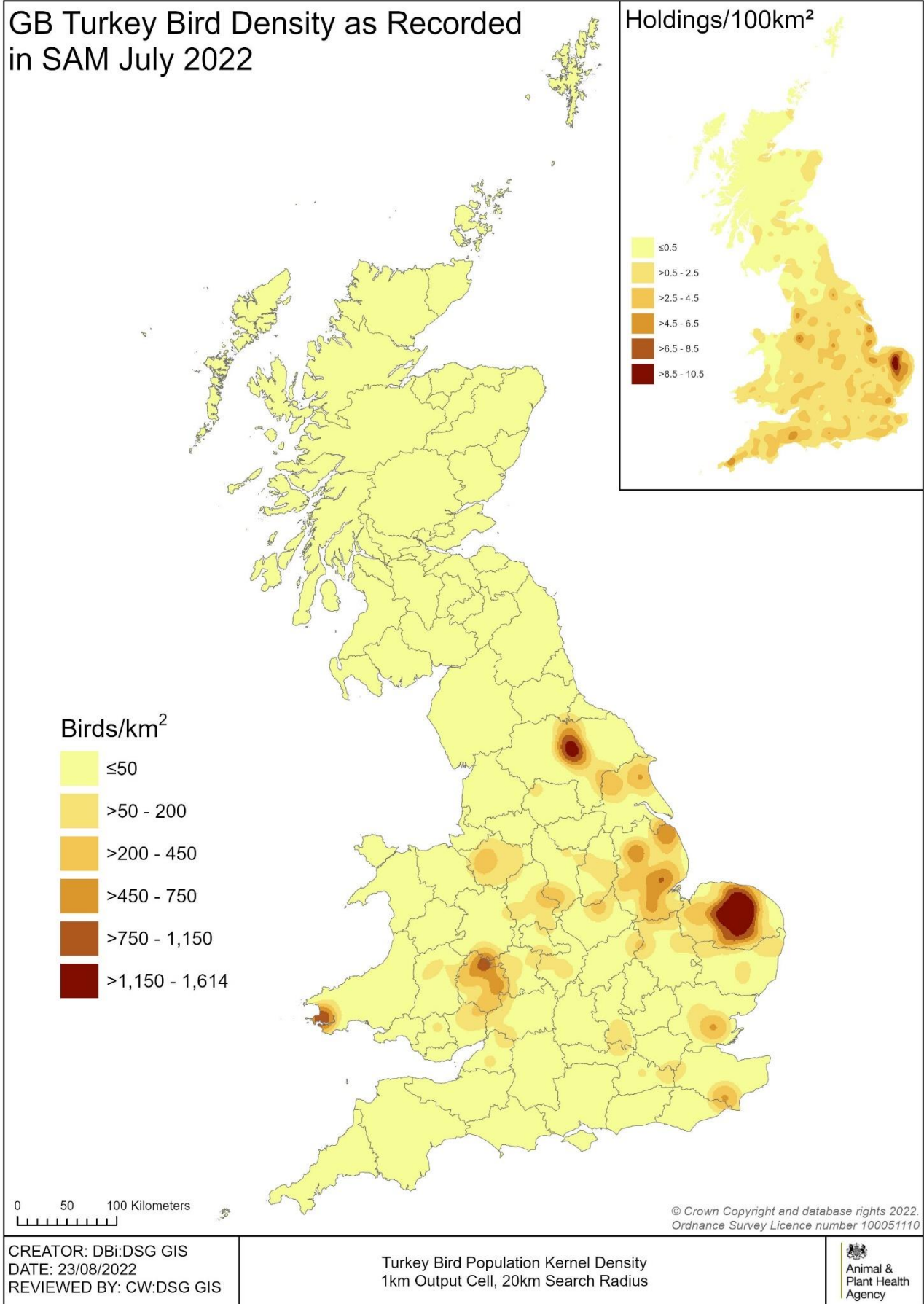


Figure 9: Turkey population density in GB based on July 2022 records

GB Turkey Bird Holding Density as Recorded in SAM July 2022

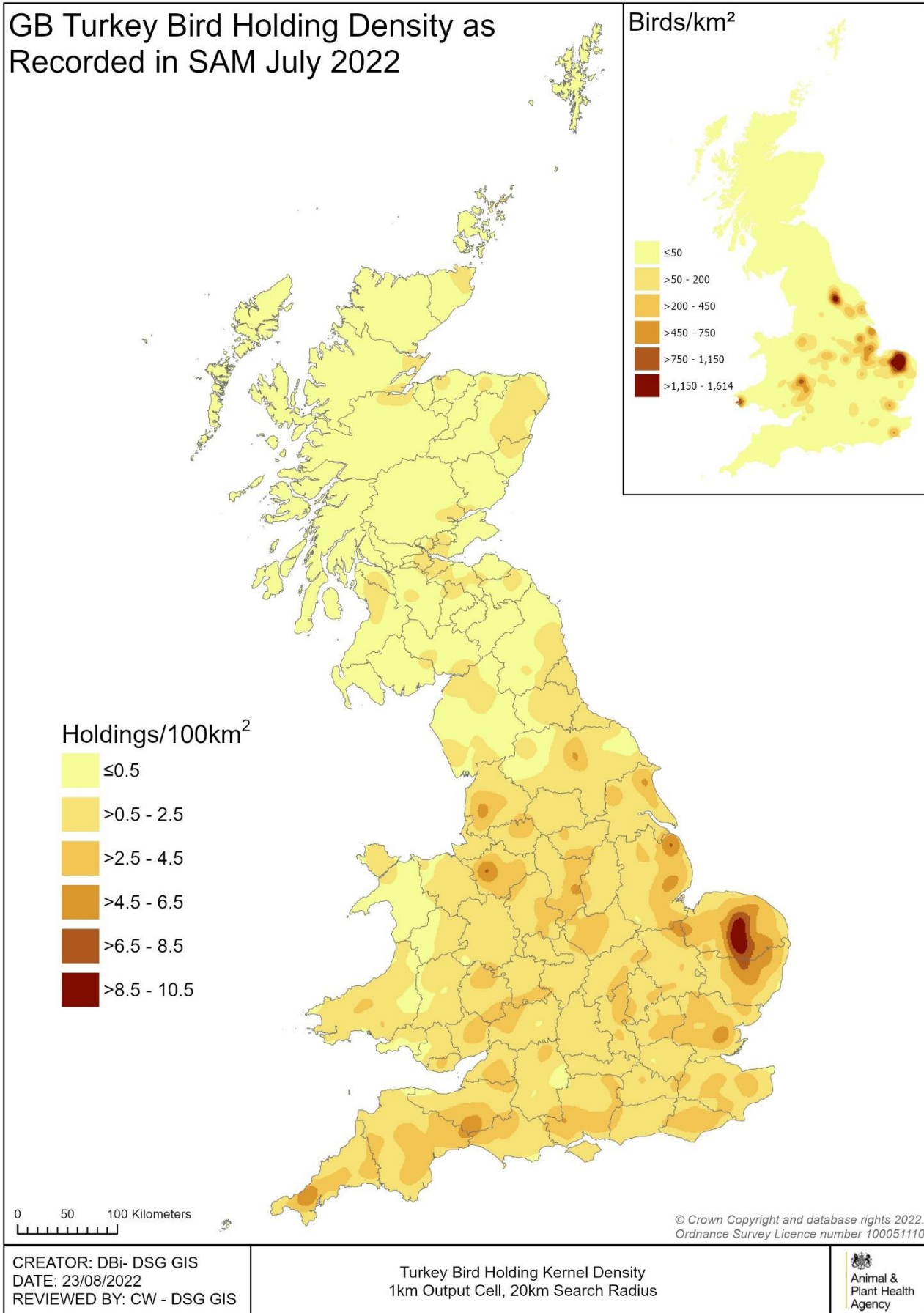


Figure 10: Turkey holding density in GB based on July 2022 records

Acknowledgements

The LDDGs are grateful to Defra, Welsh Government, Scottish Government, and APHA Weybridge Data System Group (DSG) staff who handled the Great Britain Poultry Register data (now incorporated within the Sam database) and for their assistance in producing this report.

References

Charpentier, A., & Gallic, E. (2016). Kernel density estimation based on Ripley's correction. *Geoinformatica*, 20(1), 95–116. <https://doi.org/10.1007/s10707-015-0232-z>

Pfeiffer, D. U., Robinson, T. P., Stevenson, M., Stevens, K. B., Rogers, D. J., & Clements, A. C. A. (2008). *Spatial Analysis in Epidemiology* (1st ed.). Oxford University Press.

Annex 1: Data quality statement for poultry (Sept-22)

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 in July 2022. 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	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

coverage, content and detail]	type. A metadata document is available with more detailed information from APHA Data Systems Group.
<p>Timeliness</p> <p>[the degree to which data represent reality from the required time point]</p>	<p>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 Customer Service Centre (CSC) for incorporation into Sam.</p> <p>When do data become available? Data are available on request from the Management Information and Data Architecture Services (MIDAS) team in Worcester.</p> <p>Were the data updated often? The onus under statute is on keepers to update significant changes, within 30 days. Prior to 2013 keepers could update their own data and GBPR personnel performed data-maintenance. Since its incorporation into Sam, data can no longer be directly updated by the owner and additionally has restricted ongoing data maintenance. Keepers are encouraged to contact Cardiff CSC, to update incorrect or incomplete data. Surveys relying on Sam demographic data such as the EU Avian Influenza Survey provide feedback on data inaccuracies to Cardiff CSC for amendment.</p>
<p>Accuracy and precision</p> <p>[extent of data error and bias and how well data portrays reality]</p>	<p>How were the data collected? Data are entered by the Cardiff CSC 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</p> <p>Sample & collection size: The dataset lists 53627 records. Of 53627 premises, 1748 have 0 stock recorded and these were removed from the data mapped. 39332 premises have between 1 and 49 birds (all species).</p> <p>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: 46% of the 2022 avian influenza poultry survey (to date), which equated to only 20% (179 eligible out of 870 sent so far) of premises contacted were theoretically eligible for sampling (some were ineligible for practical reasons such as seasonal variation in access to</p>

	<p>birds, unable to contact or game birds already released). However, due to the large number of submissions, it is not possible to take steps to minimise these errors once entered into the database.</p> <p>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.</p> <p>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 “smallholding” population, is not fully accounted for, and information held almost certainly only represents a snapshot of the smallholding population. For the purposes of this report, all holdings with <50 birds are referred to as “smallholding” premises although the purposes and business objectives of these holdings may vary.</p>
<p>Comparability</p> <p>[how well these data can be compared with data taken from the same dataset and with similar data from other sources]</p>	<p>Within dataset comparability: The format and data analysis methods are similar between years.</p> <p>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.</p>
<p>Coherence</p> <p>[degree to which data can be or have been merged with other data sources]</p>	<p>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.</p> <p>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.</p>

	<p>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. It would be appropriate to mention the largest and longest winter 2021/22 HPAI outbreak which started on the 26th of October 2021 and is still ongoing, counting 143 confirmed infected premises as of 20/09/22. Although the report recognises their significant importance it is unlikely that the impact can be quantified on the population data.</p> <p>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.</p>
<p>Interpretability</p> <p>[how well the data is understood and utilised appropriately]</p>	<p>Is there a particular context that this data needs to be considered within? See comments above.</p> <p>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 CSC who now hold the GBPR data. The MIDAS Team in Worcester can be contacted to obtain an extract of this data.</p> <p>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:</p> <ul style="list-style-type: none"> • 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]	<p>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 publicly available. Sam data can be obtained from APHA Cardiff CSC. APHA Weybridge Data Systems Group has a copy of the final extract.</p> <p>Contact details for data source queries: customerregistration@apha.gov.uk Animal and Plant Health Agency (APHA) Cardiff Specialist Service Centre Poultry Data Team Cardiff Edge Business Park Longwood Drive Cardiff CF14 7YT</p> <p>Agricultural Survey England: Farming-statistics@defra.gov.uk Agricultural Survey Wales: Stats.agric@wales.gov.uk Agricultural Survey Scotland: agric.stats@scotland.gov.uk</p>

Annex 2: Number of poultry holdings and number of poultry per county

County totals for all poultry holdings and number of birds, based on July 2021 records. Data for counties with 6 or less holdings have been excluded from this table for data protection reasons.

Country	County	Holdings	Usual Stock Numbers
ENGLAND	AVON	570	1,111,481
	BEDFORDSHIRE	329	1,220,360
	BERKSHIRE	451	514,944
	BUCKINGHAMSHIRE	507	2,364,350
	CAMBRIDGESHIRE	944	3,283,505

	CHESHIRE	1,146	4,462,685
	CLEVELAND	298	693,853
	CORNWALL	1,833	1,651,818
	CUMBRIA	768	5,595,125
	DERBYSHIRE	1,402	3,525,100
	DEVONSHIRE	2,739	9,871,201
	DORSET	1,083	1,417,603
	DURHAM	520	1,896,030
	EAST SUSSEX	765	1,337,718
	ESSEX	1,418	6,814,402
	GLOUCESTERSHIRE	1,254	4,964,587
	GREATER LONDON	263	20,073
	GREATER MANCHESTER	417	596,839
	HAMPSHIRE	1,557	3,007,685
	HEREFORDSHIRE	952	28,617,776
	HERTFORDSHIRE	424	1,117,895
	HUMBERSIDE	1,144	14,755,424
	ISLE OF WIGHT	174	29,589
	ISLES OF SCILLY	23	2,125
	KENT	998	2,681,480
	LANCASHIRE	1,623	4,856,598
	LEICESTERSHIRE	1,041	3,490,120
	LINCOLNSHIRE	1,748	24,842,462
	MERSEYSIDE	142	570,738
	NORFOLK	2,521	31,936,062
	NORTH YORKSHIRE	1,820	13,696,348
	NORTHAMPTONSHIRE	564	3,328,471
	NORTHUMBERLAND	419	706,386
	NOTTINGHAMSHIRE	936	6,902,422
	OXFORDSHIRE	710	2,315,273
	SHROPSHIRE	1,042	22,352,165
	SOMERSET	1,324	6,360,405
	SOUTH YORKSHIRE	410	275,557
	STAFFORDSHIRE	862	3,779,440
	SUFFOLK	2,211	19,147,456
	SURREY	528	162,878
	TYNE & WEAR	583	50,968
	WARWICKSHIRE	568	2,289,274
	WEST MIDLANDS	185	389,146
	WEST SUSSEX	537	1,651,048
	WEST YORKSHIRE	702	1,682,076
	WILTSHIRE	1,019	4,511,718
	WORCESTERSHIRE	692	3,195,570
SCOTLAND	ABERDEENSHIRE	350	2,521,948

	ANGUS	163	1,892,336
	ARGYLL	79	51,547
	AYRSHIRE	196	843,786
	BANFFSHIRE	67	457,829
	BERWICKSHIRE	112	2,191,173
	BUTE	12	2,205
	CAITHNESS	58	45,413
	CLACKMANNANSHIRE	20	601,559
	DUMBARTONSHIRE	15	1,350
	DUMFRIESSHIRE	274	2,049,799
	EAST LoTHIAN	66	343,230
	FIFE	240	1,961,587
	INVERNESS-SHIRE	158	131,498
	KINCARDINESHIRE	65	657,467
	KINROSS	24	666,958
	KIRKCUDBRIGHT	90	557,080
	LANARKSHIRE	105	384,756
	MIDLoTHIAN & EDINBURGH	90	2,557,912
	MORAY	51	232,565
	NAIRN	20	82,922
	ORKNEY	99	5,077
	PEEBLES	53	3,104,206
	PERTH	194	1,455,670
	RENFREW	44	5,862
	ROSS & CROMARTY	166	120,426
	ROXBURGH	64	276,460
	SELKIRK	20	253,687
	SHETLAND	48	1,680
	STIRLING	54	34,397
	SUTHERLAND	45	8,987
	WEST LoTHIAN	40	1,467,478
	WIGTOWN	50	545,535
WALES	CLWYD	469	2,903,637
	DYFED	927	1,136,548
	GWENT	390	2,877,499
	GWYNEDD	515	1,909,965
	MID GLAMORGAN	227	93,377
	POWYS	780	9,585,785
	SOUTH GLAMORGAN	107	41,269
	WEST GLAMORGAN	143	472,729