



Animal &
Plant Health
Agency

**Livestock Demographic Data
Group:
Poultry population report
Livestock population density maps
for GB, using July 2021 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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Correction Notice

This report has been reissued due to an error with the density of holdings in Tables 1 & 2 and [Annex 2](#). This error has been corrected in this issue. The report for year 2022 has also been reissued (<http://apha.defra.gov.uk/documents/surveillance/diseases/lddg-pop-report-avian2022.pdf>) Distribution Maps were not affected by this error.

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 October 2021 and January 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 2021. 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 commercial ducks at 57%, 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 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 usual capacity of the holdings. Since the previous report ([Livestock population density maps for GB 2020 using winter 2019 data \(defra.gov.uk\)](#)) 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 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 2021 records. The number of poultry holdings and total number of poultry per county, grouped per country, is provided in [Annex 2](#). Yellow highlighted numbers are updated following this reissue.

Country	Holdings	Usual Stock Numbers
ENGLAND	34,609	272,918,954
SCOTLAND	2,651	31,009,097
WALES	3,000	18,385,539
GB TOTAL	40,260	322,313,590

Table 2: Number of poultry holdings and number of birds by country in GB, based on July 2020 records. Yellow highlighted numbers are updated following this reissue.

Country	Holdings	Usual Stock Numbers
ENGLAND	32,683	285,190,939
SCOTLAND	2,426	30,903,340
WALES	2,837	17,748,003
GB TOTAL	37,946	333,842,282

The reported total number of poultry in GB was just over 322.3 million, which was slightly down from the figure of 333.8 million poultry from 2020 records (Tables 1&2). The reported total number of holdings has however increased from just under 38,000 in 2020 to just over 40,000 in this current report based on 2021 records (Tables 1&2).

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

GB Poultry Bird Density as Recorded in SAM July 2021

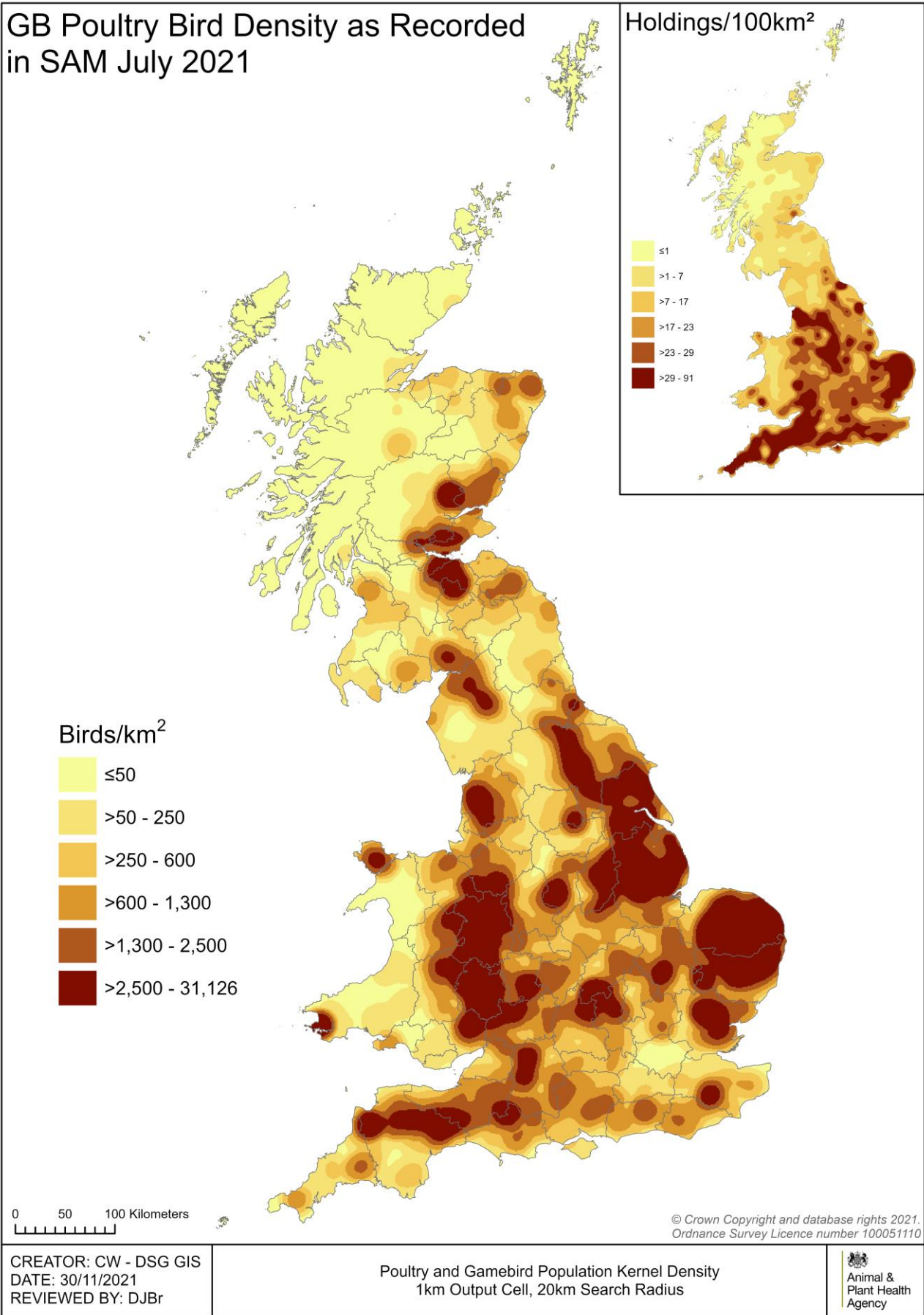


Figure 1: Poultry population density in GB based on July 2021 records

GB Poultry Holding Density as Recorded in SAM July 2021

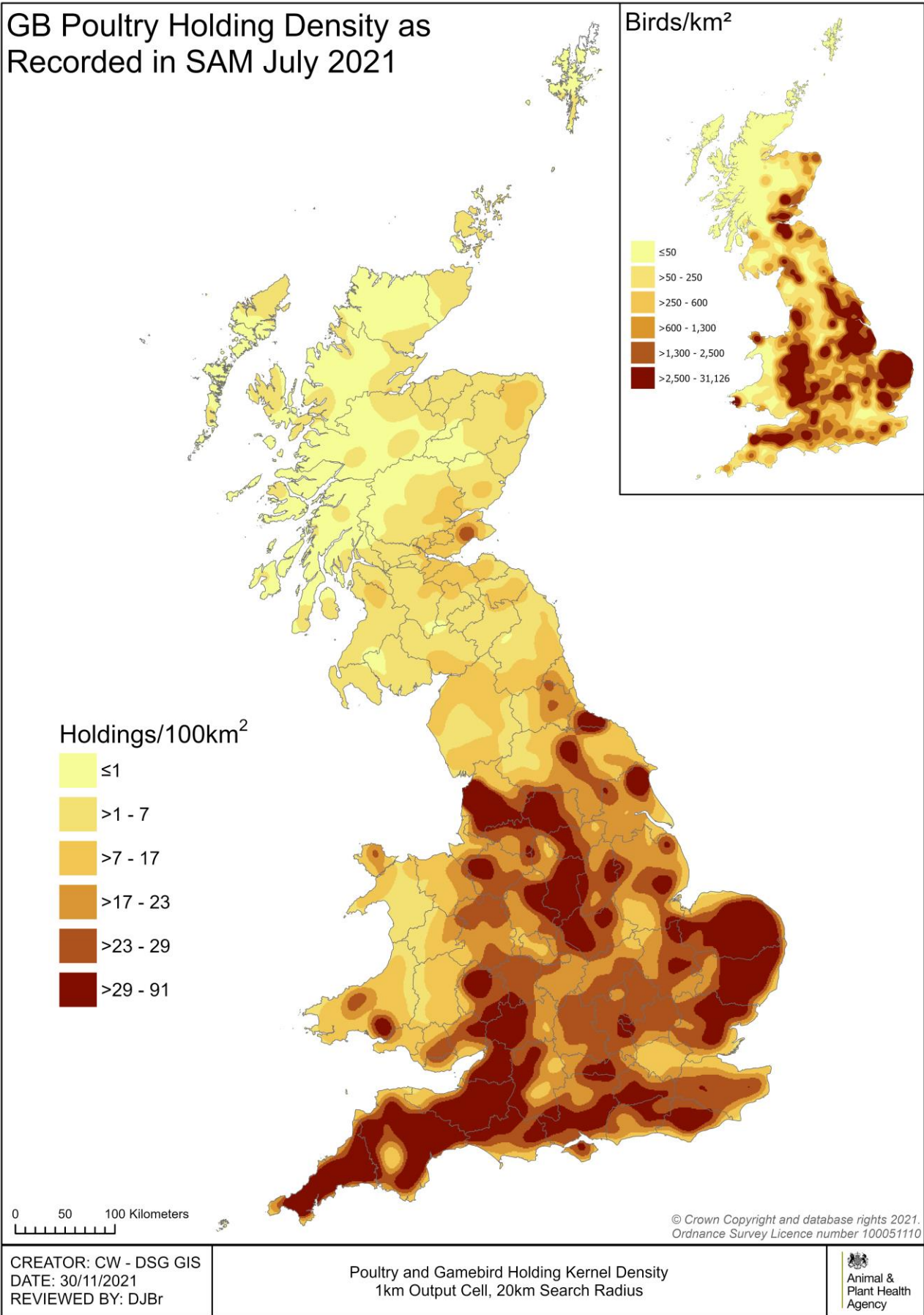


Figure 2: Poultry holding density in GB based on July 2021 records

GB Chicken Bird Density as Recorded in SAM July 2021

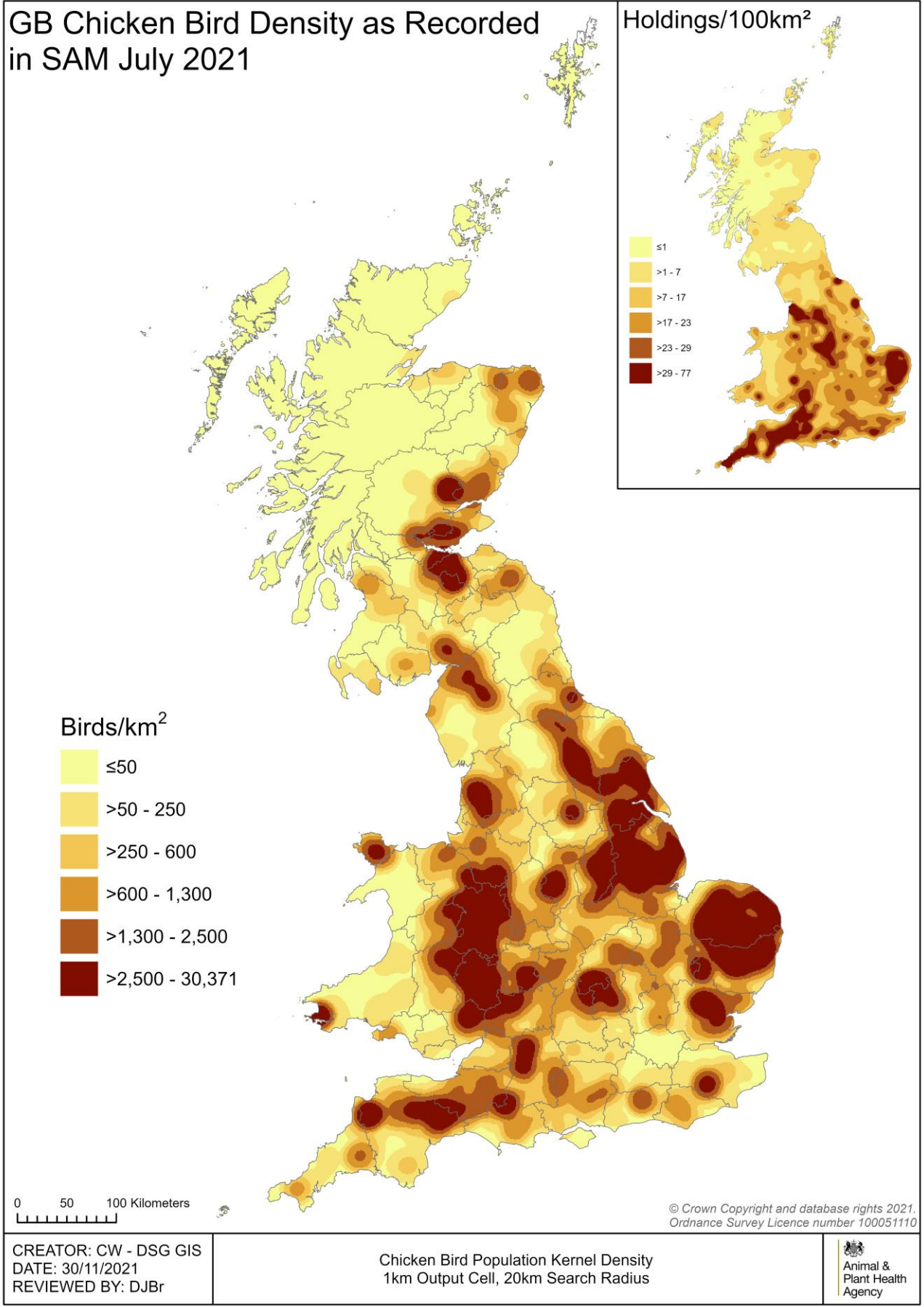


Figure 3: Chicken population density in GB based on July 2021 records

GB Chicken Holding Density as Recorded in SAM July 2021

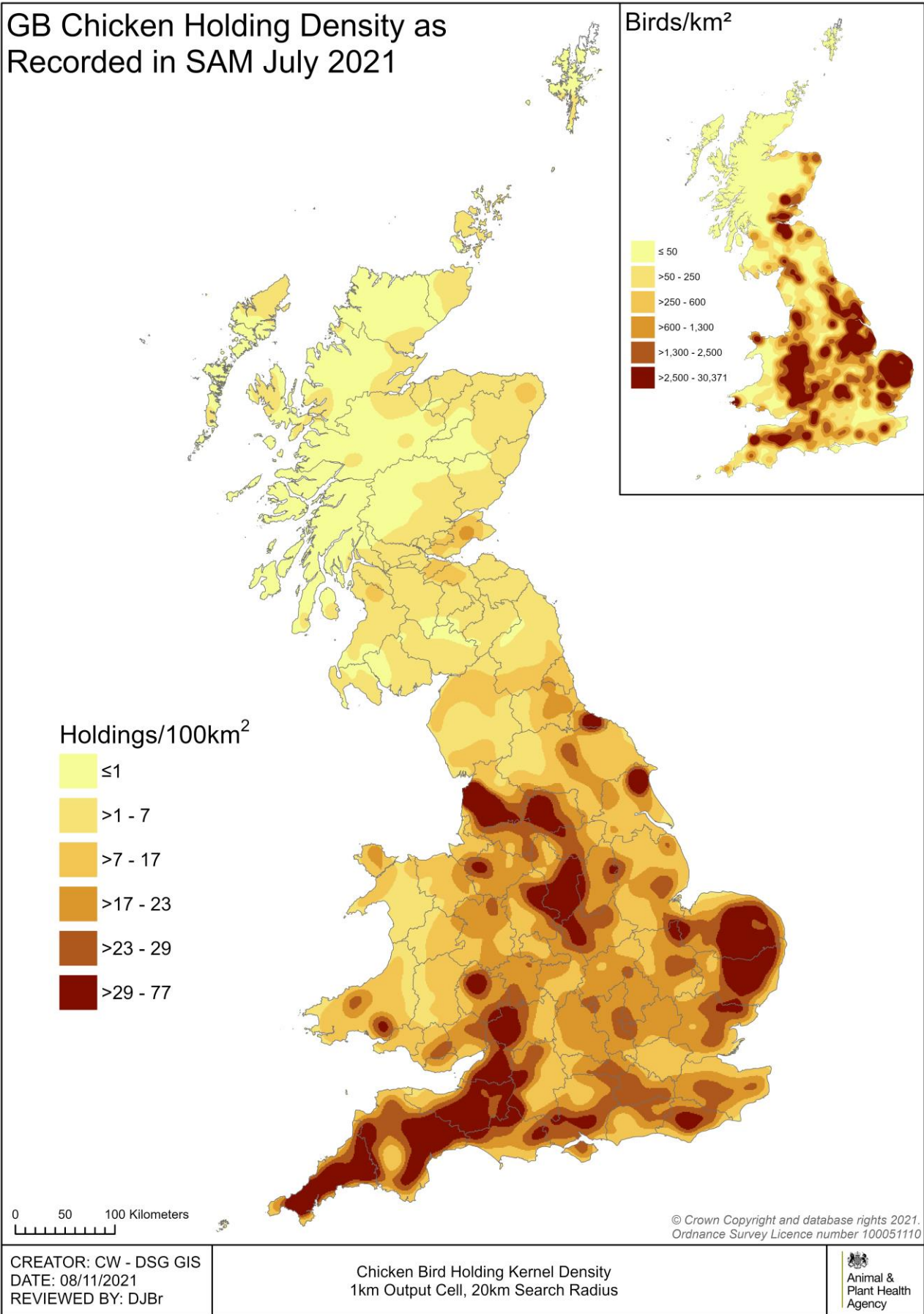


Figure 4: Chicken holding density in GB based on July 2021 records

GB Ducks and Geese Bird Density as Recorded in SAM July 2021

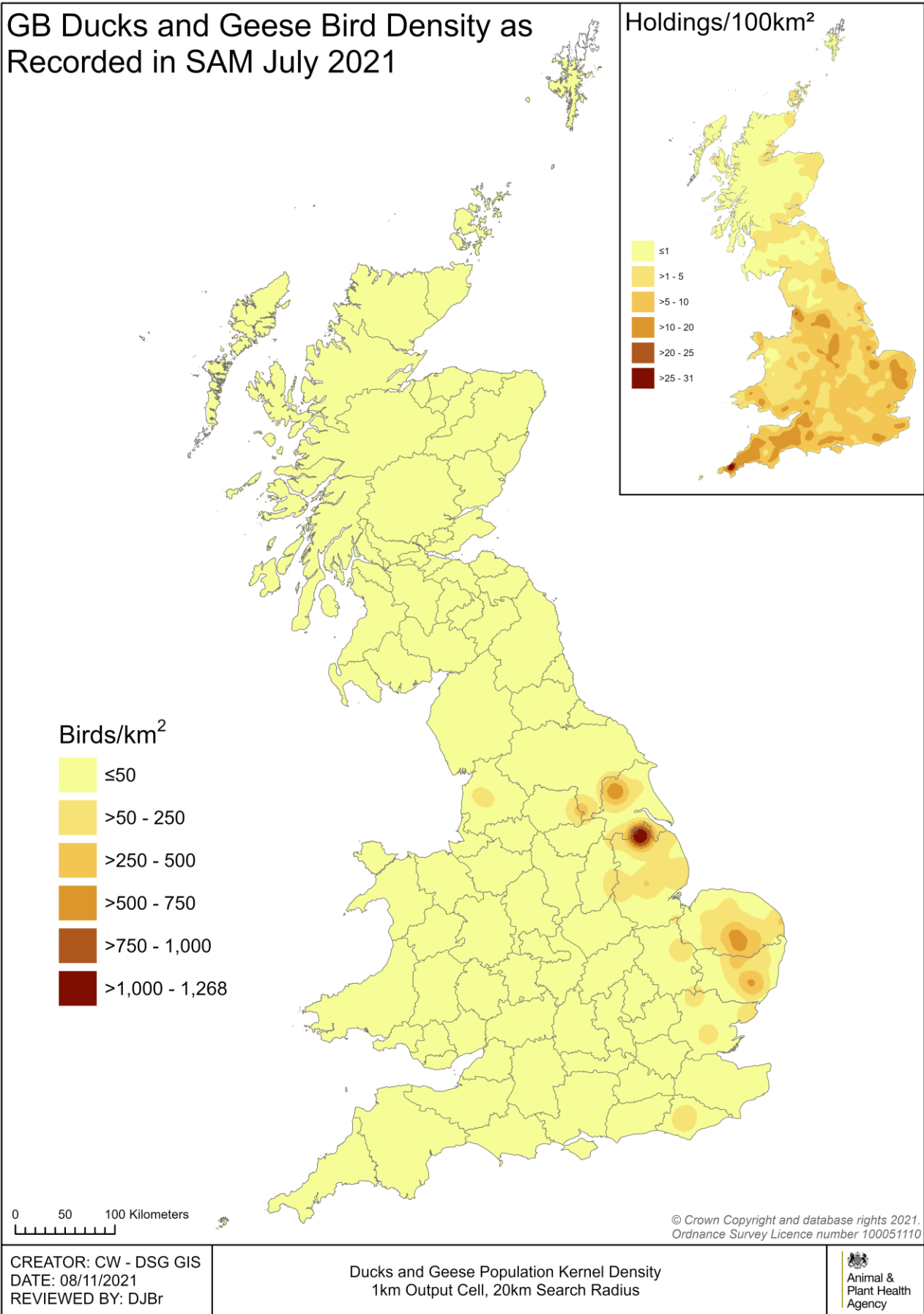


Figure 5: Duck and Goose population density in GB based on July 2021 records

GB Ducks and Geese Holding Density as Recorded in SAM July 2021

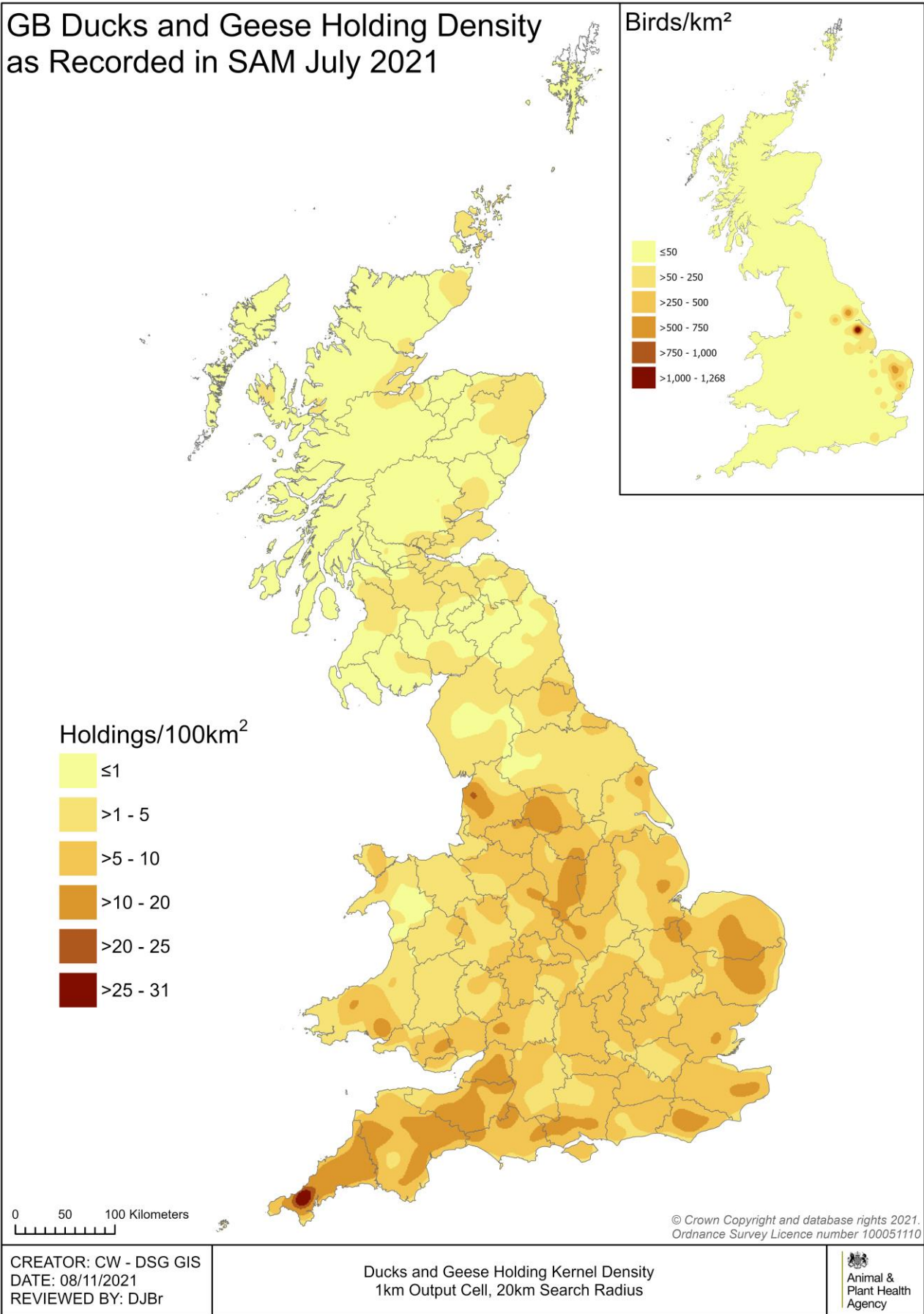
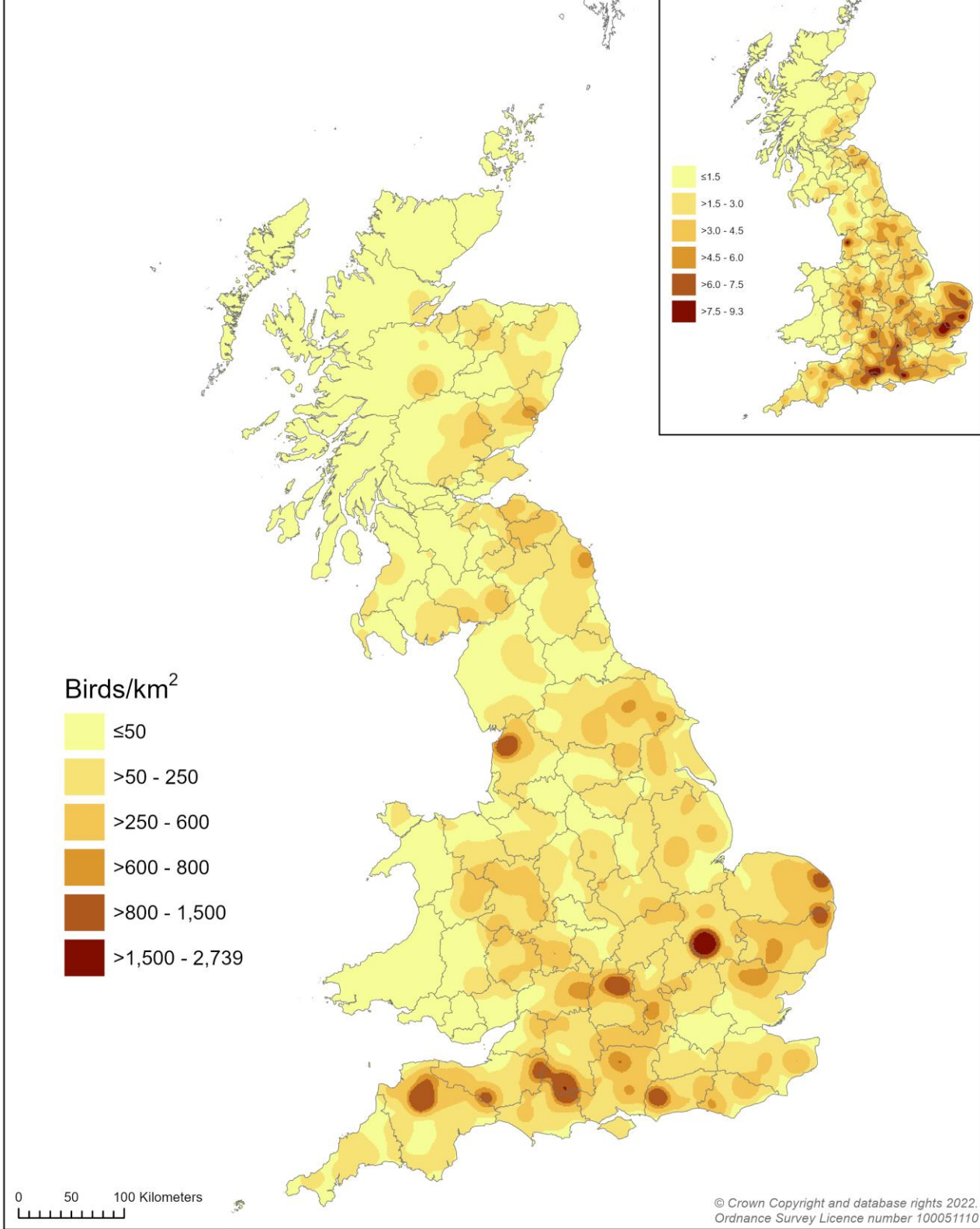


Figure 6: Duck and Goose holding density in GB based on July 2021 records

GB Gamebird Density as Recorded in SAM July 2021



CREATOR: CW - DSG GIS
DATE: 28/01/2022
REVIEWED BY: DJBr

Gamebird Population Kernel Density
1km Output Cell, 20km Search Radius



Figure 7: Gamebird population density in GB based on July 2021 records

GB Gamebird Holding Density as Recorded in SAM July 2021

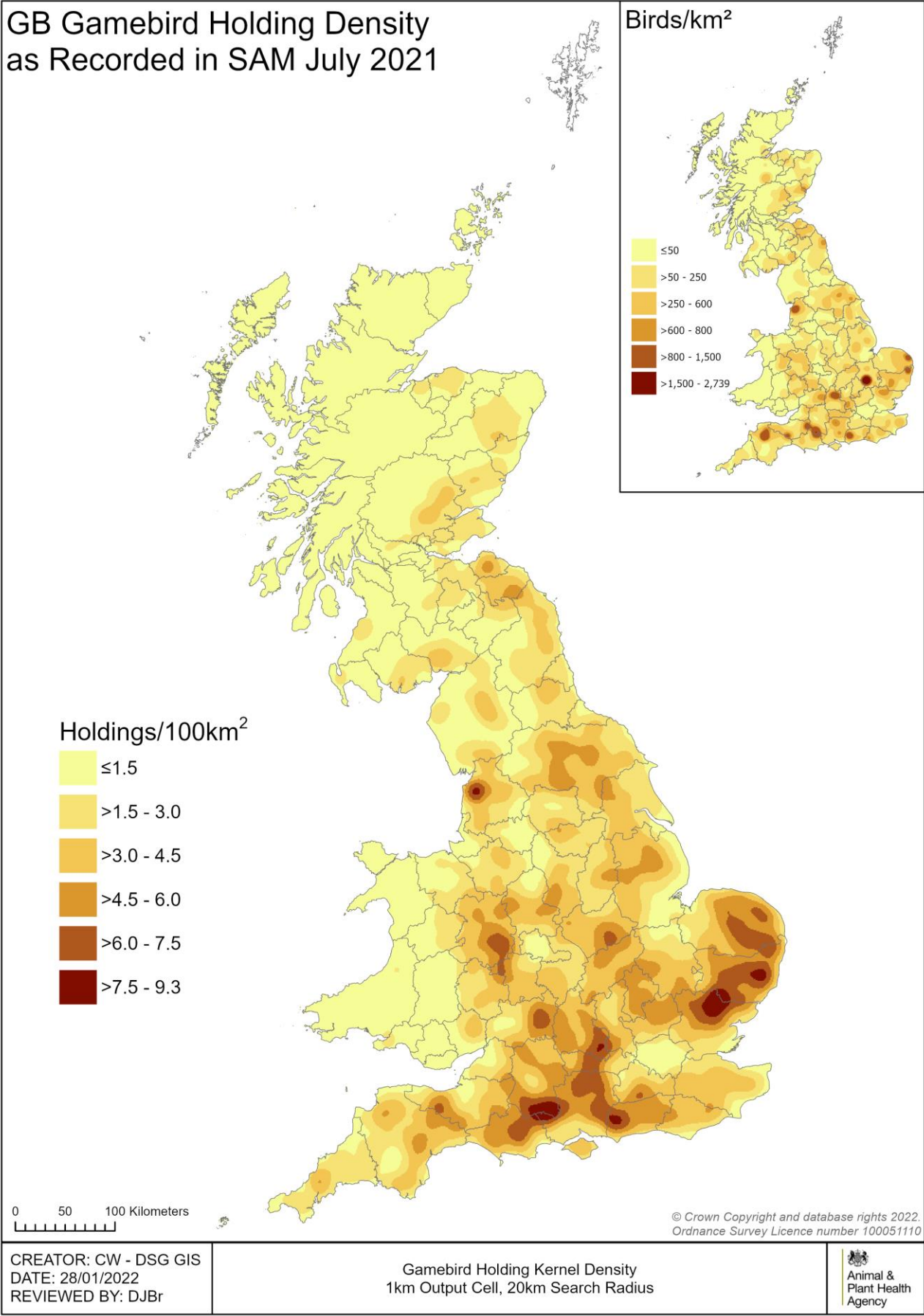


Figure 8: Gamebird holding density in GB based on July 2021 records

GB Turkey Bird Density as Recorded in SAM July 2021

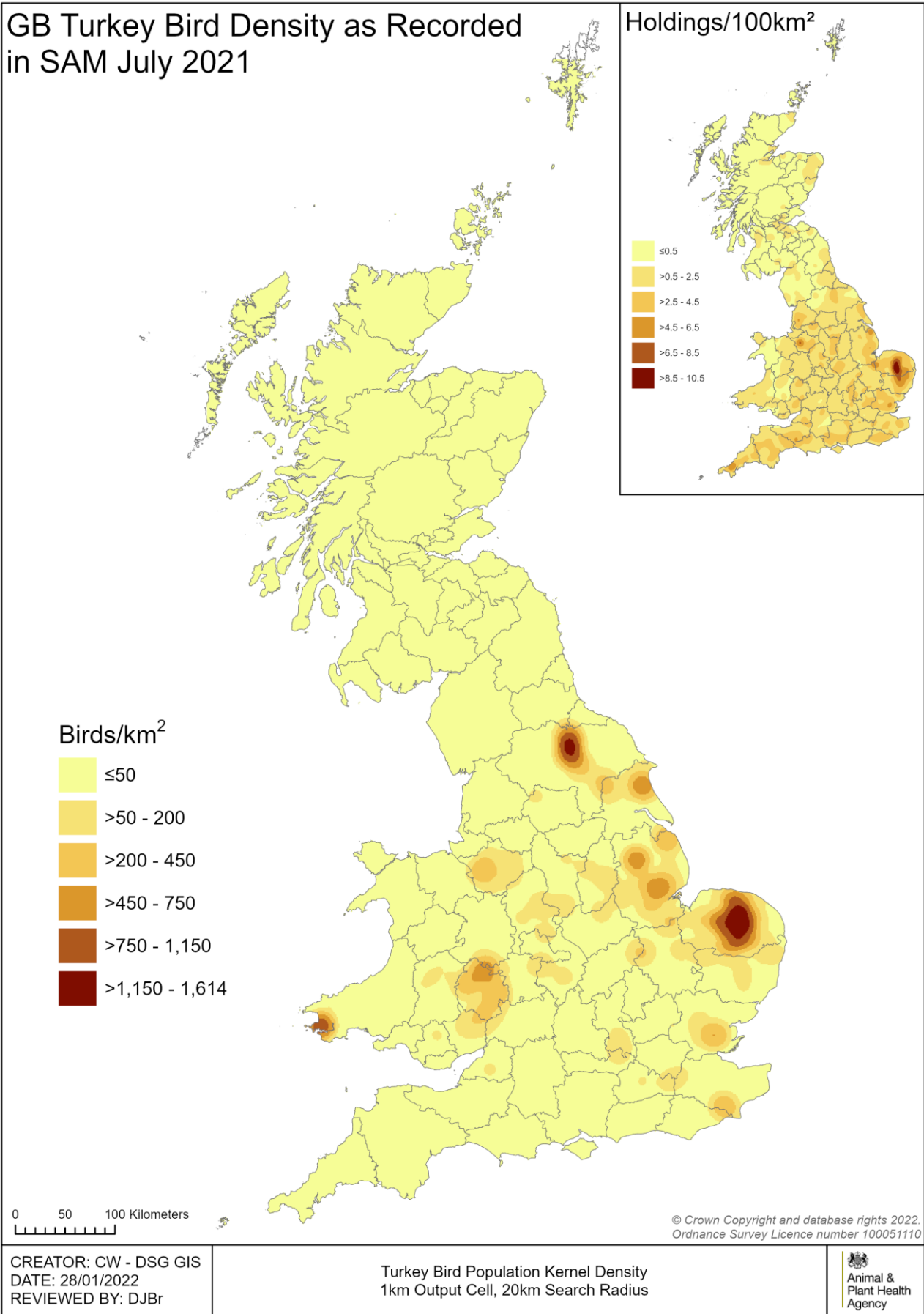
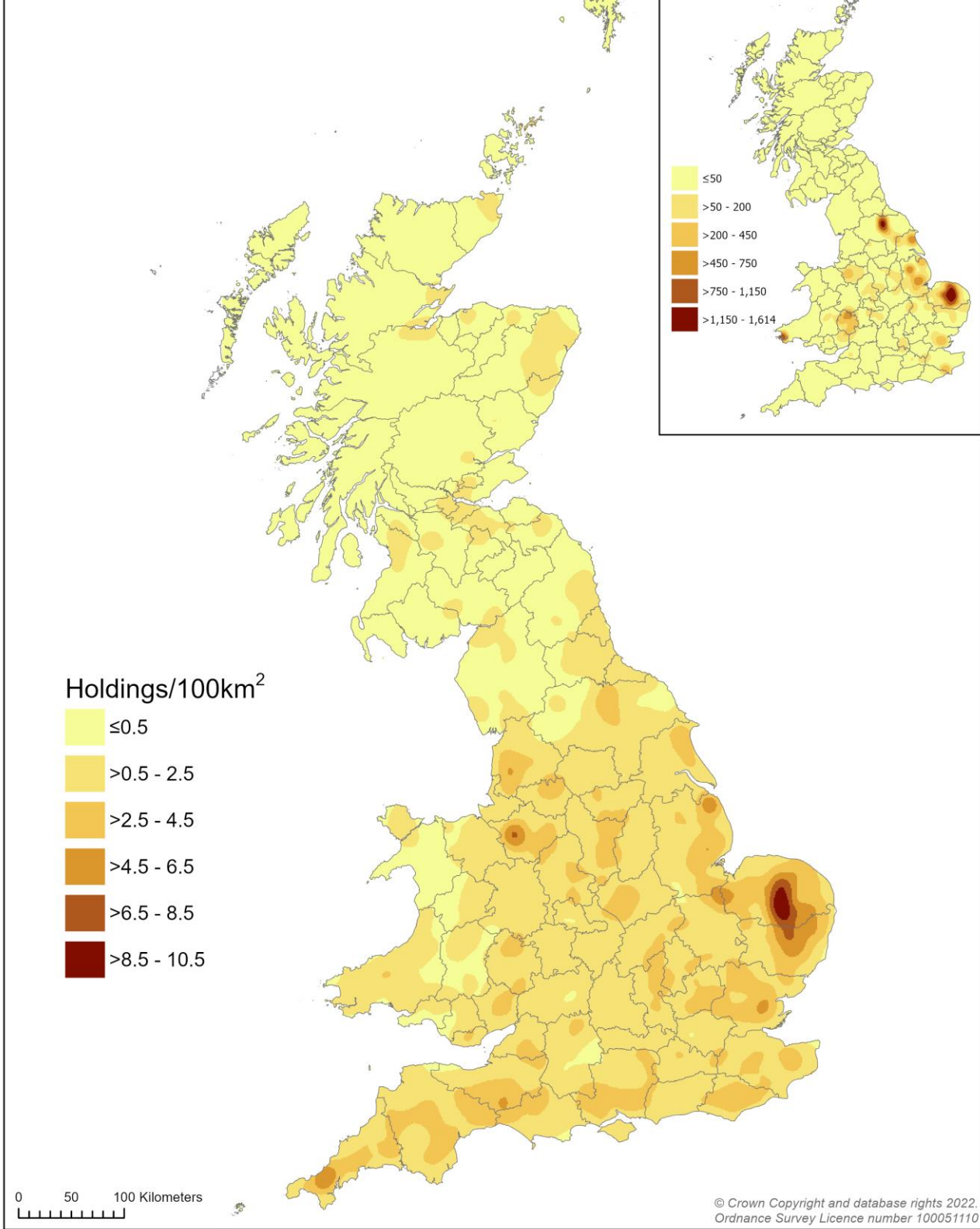


Figure 9: Turkey population density in GB based on July 2021 records

GB Turkey Holding Density as Recorded in SAM July 2021



CREATOR: CW - DSG GIS
DATE: 28/01/2022
REVIEWED BY: DJBr

Turkey Bird Holding Kernel Density
1km Output Cell, 20km Search Radius



Figure 10: Turkey holding density in GB based on July 2021 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 (Nov-21)

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 2021. 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,	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.

<p>geographical coverage, content and detail]</p>	<p>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.</p>
<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 42,479 records. Of 42,479 premises, 687 have 0 stock recorded and these were removed from the data mapped. 20573 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 2021 avian influenza poultry survey, which equated to only 20% (192 eligible out</p>

	<p>of 937 sent) of premises contacted were theoretically eligible for sampling (some were ineligible for practical reasons such as seasonal variation in access to 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 “backyard” population is not fully accounted for, and information held almost certainly only represents a snapshot of the backyard population.</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</p>

	<p>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 two large HPAI outbreaks, one in winter 2020/21 as well as the ongoing winter 2021/22. Although the report recognises their 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?</p> <p>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. <p>Wild birds and birds in zoo collections are not included within the scope of this document; feathered gamebirds are considered 'wild' once released.</p>

<p>Accessibility</p> <p>[availability of relevant information and access to the data in a convenient and suitable manner]</p>	<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. Some 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 Government Buildings 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>
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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. **Yellow highlighted numbers are updated following this reissue.**

Country	County	Holdings	Usual Stock Numbers
ENGLAND	AVON	531	1,123,216
	BEDFORDSHIRE	313	1,325,571
	BERKSHIRE	303	763,821
	BUCKINGHAMSHIRE	457	2,843,809
	CAMBRIDGESHIRE	815	4,863,137
	CHESHIRE	631	4,536,713
	CLEVELAND	285	718,864
	CORNWALL	1,816	1,835,832
	CUMBRIA	624	5,201,811

	DERBYSHIRE	986	4,555,897
	DEVONSHIRE	2,220	11,735,637
	DORSET	867	2,461,906
	DURHAM	373	1,850,026
	EAST SUSSEX	545	1,526,837
	ESSEX	1,090	7,535,116
	GLOUCESTERSHIRE	835	5,268,532
	GREATER LONDON	227	37,288
	GREATER MANCHESTER	325	632,195
	HAMPSHIRE	1,147	4,066,960
	HEREFORDSHIRE	602	26,300,100
	HERTFORDSHIRE	403	1,237,339
	HUMBERSIDE	897	14,845,834
	ISLE OF WIGHT	170	79,808
	ISLES OF SCILLY	22	2,419
	KENT	942	2,922,084
	LANCASHIRE	1,166	5,995,124
	LEICESTERSHIRE	757	2,580,809
	LINCOLNSHIRE	1,349	25,891,867
	MERSEYSIDE	119	583,177
	NORFOLK	2,225	30,418,824
	NORTH YORKSHIRE	1,388	13,576,959
	NORTHAMPTONSHIRE	546	6,177,458
	NORTHUMBERLAND	352	1,144,954
	NOTTINGHAMSHIRE	547	7,491,265
	OXFORDSHIRE	677	3,137,150
	SHROPSHIRE	784	23,345,615
	SOMERSET	1,150	7,403,874
	SOUTH YORKSHIRE	380	359,078
	STAFFORDSHIRE	688	3,179,549
	SUFFOLK	1,407	17,351,701
	SURREY	487	296,436
	TYNE & WEAR	126	44,374
	WARWICKSHIRE	391	2,049,038
	WEST MIDLANDS	168	548,933
	WEST SUSSEX	511	1,943,858
	WEST YORKSHIRE	652	2,010,889
	WILTSHIRE	862	5,698,674
	WORCESTERSHIRE	451	3,418,596
SCOTLAND	ABERDEENSHIRE	260	2,538,955
	ANGUS	108	2,342,782
	ARGYLL	78	72,823
	AYRSHIRE	144	1,085,691

	BANFFSHIRE	63	612,833
	BERWICKSHIRE	104	1,901,089
	BUTE	12	3,528
	CAITHNESS	58	58,351
	CLACKMANNANSHIRE	18	1,076,494
	DUNBARTONSHIRE	14	1,632
	DUMFRIESSHIRE	135	2,184,138
	EAST LoTHIAN	65	445,738
	FIFE	229	2,460,258
	INVERNESS-SHIRE	149	381,897
	KINCARDINESHIRE	57	875,587
	KINROSS	23	1,100,700
	KIRKCUDBRIGHT	82	742,868
	LANARKSHIRE	102	371,731
	MIDLoTHIAN & EDINBURGH	80	2,828,746
	MORAY	52	318,970
	NAIRN	20	90,452
	ORKNEY	88	6,891
	PEEBLES	51	3,283,681
	PERTH	188	3,540,517
	RENFREW	29	5,985
	ROSS & CROMARTY	158	174,586
	ROXBURGH	60	339,857
	SELKIRK	19	297,269
	SHETLAND	22	1,540
	STIRLING	51	54,436
	SUTHERLAND	43	19,111
	WEST LoTHIAN	41	1,477,564
	WIGTOWNSHIRE	48	312,397
WALES	CLWYD	351	2,864,692
	DYFED	890	2,928,779
	GWENT	336	2,809,721
	GWYNEDD	426	2,127,595
	MID GLAMORGAN	217	116,660
	POWYS	535	7,007,016
	SOUTH GLAMORGAN	106	56,562
	WEST GLAMORGAN	139	474,514