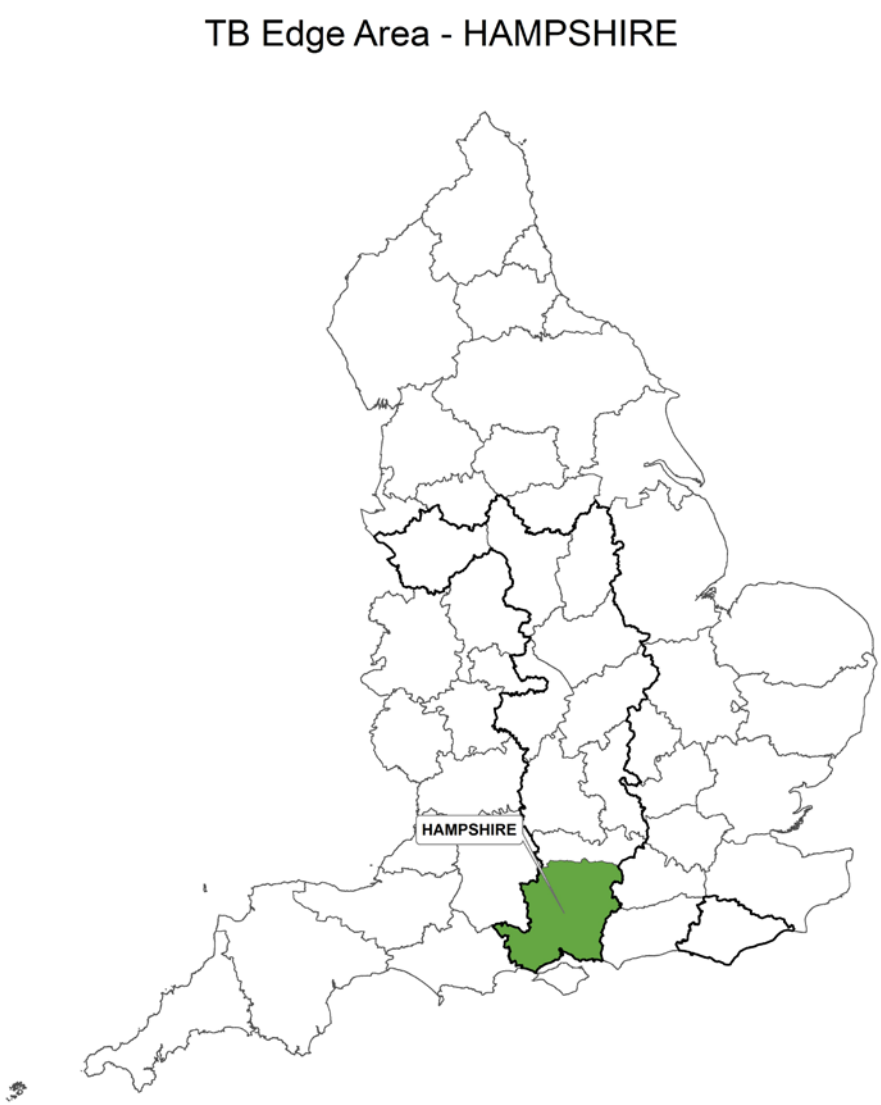
Animal & Plant Health Agency

Year-end descriptive epidemiology report:

Bovine TB in the Edge Area of England

County: Hampshire

Year-end report for: 2019



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Executive summary

Reporting area

Hampshire is part of the Edge Area that was established in 2013. The following year, the bovine tuberculosis (TB) surveillance strategy for this area was incorporated into the Government's strategy to achieve Officially Tuberculosis Free (OTF) status for England by 2038. The Edge Area has an overall moderate but recently rising incidence of infected herds with substantial variability from county to county. This end of year report describes bovine TB in Hampshire.

Local cattle industry

There were minimal changes to the cattle herd numbers, type and structure in Hampshire in 2019. The majority of herds are small, with 60% of herds having 1-50 cattle. There are no markets in Hampshire, and there is one medium-sized abattoir. There is frequent summer grazing on common land in the New Forest.

New incidents of TB

The total annual number of new incidents (40) was similar to 2018 (42). The ratio of Officially Bovine Tuberculosis Free Status Withdrawn (OTF-W) to Officially Bovine Tuberculosis Free Status Suspended (OTF-S) has markedly increased from 45% (13 out of 29) in 2018 to 74% (17 out of 23) in 2019.

Suspected sources and risk pathways for TB infection

Cattle movements still account for the single highest percentage of most likely attributable sources (26% of weighted source pathways) with 43% of weighted source pathways classed as unknown and the remainder being assessed as residual infection, wildlife sources and contiguous spread.

Details of the methodology used to calculate the weighted contribution of the different suspected sources of *M. bovid* infection for all new incidents can be found in the main body of the report and in the Explanatory Supplement to the 2019 bovine TB epidemiology reports.

Disclosing tests

Over 50% of incidents were disclosed at Whole Herd Surveillance Testing (WHT). Incidents were also disclosed by six month post-incident testing, pre-movement testing, radial testing and slaughterhouse surveillance.

Reactor numbers

A total of 197 reactors were disclosed in Hampshire in 2019, of which 129 (46%) were detected by the skin test and 68 (34%) by the interferon gamma (IFN-γ) test. This is a large reduction on 2018 when a total of 328 reactors were disclosed, of which 177 were skin test reactors (54%) and 151 were IFN-γ test positives (46%). The average number of reactors per incident was 1.8 in 2019 as opposed to 2.9 in 2018.

Risks to the reporting area

Risks to Hampshire continue to be movement of undetected infected cattle from the HRA, movements within the county of conservation graziers' cattle and the possibility of establishment of new areas of TB infected wildlife in central Hampshire.

Risks posed by the reporting area

There is a risk of undetected spread of the endemic infection in wildlife towards the Low Risk Area (LRA) as the low cattle population density to the east of the county means there are less cattle to act as sentinels of wildlife infection.

Forward look

Herd incidence in Hampshire has levelled off, which gives some hope for the future course of the epidemic, but this is tempered by possible establishment of new areas of TB infected wildlife. A substantial proportion, but not all of the county has a crude herd OTF-W incidence of <2% (the target for the Edge Area by 2019) as TB infection is regionalised within the county.

Introduction

This report describes the level of bovine tuberculosis in cattle herds in Hampshire in 2019. Bovine TB is caused by the bacterium *Mycobacterium bovis* (*M. bovis*), and will subsequently be referred to as TB. This report explores the frequency and geographical distribution of TB in cattle herds. It examines what is likely to be driving TB in Hampshire, and the risks the disease in this county may pose to neighbouring cattle. Although other sources may refer to TB 'breakdown(s)', this report will use the term 'incident(s)' throughout. This report is intended for individuals involved in the control of TB, both in the local area and nationally. This includes, but is not limited to: farmers, veterinarians, policy makers and the scientific community.

In 2014 the Government published its Strategy to achieve Officially TB Free (OTF) status for England by 2038. A key action was to recognise the different levels of TB in different parts of the country and to vary the approach to control accordingly. To this end three management areas were established (refer to Appendix 1). Hampshire forms part of the Edge Area. Overall, the Edge Area has a moderate but recently rising incidence of infected herds with substantial variability from county to county. Control efforts are seeking to slow down and reverse geographic spread, and to reduce the incidence rate. The aim is to obtain OTF status for the Edge Area as soon as possible.

Changes to the Edge Area in 2018

On 1 January 2018 the Edge Area boundary was expanded westwards to absorb the former High Risk Area (HRA) parts of the five previously split counties. Cheshire, Derbyshire, Warwickshire, Oxfordshire and East Sussex all moved fully into the Edge Area. Furthermore, the routine TB testing frequency of herds in the counties in the west of the Edge Area adjoining the HRA (or parts thereof) was increased from annual to six-monthly. The respective descriptive TB epidemiology reports for those five counties of the Edge Area will focus on the whole county and key differences between the old and new parts will be highlighted where relevant.

The changes of January 2018 to the Edge Area boundary did not affect the county of Hampshire. However, at that time Defra introduced radial skin testing of herds located within a 3km radius of a new OTF-W incident to enhance the cattle TB surveillance regime in parts of Hampshire and all the other parts of the Edge Area that remained on annual testing.

At the same time, herds in the north-west part of Hampshire moved to six-monthly surveillance testing. However since May 2019, cattle herds that meet certain criteria are eligible for annual surveillance testing (earned recognition). These criteria are either: 1) the herd has been in existence for at least six years and has not had a TB incident in that six year period or 2) the herd is registered to a bovine TB health scheme accredited under the Cattle Health Certification Standards (CHeCS) at level one or above.

Cattle industry

Herd types

There were a total of 743 cattle herds in Hampshire which represents a small decrease from 2018 (780). Around 60% of herds have between 1-50 cattle (Figure 1) and these would mostly be beef suckler herds or small beef fattening premises. Feeding and husbandry practices vary greatly within the county depending on herd type, herd size and soil type. Winter housing takes place on most premises from October to April.

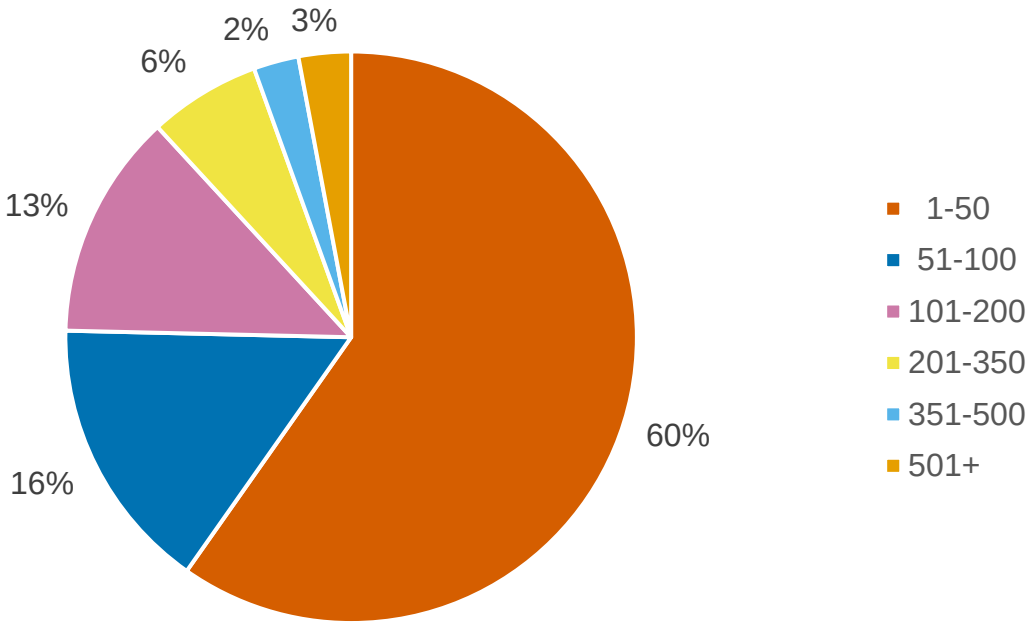

Figure 1: Proportion of cattle holdings by herd size in Hampshire in 2019 (n=743).

Markets and abattoirs

There are no livestock markets in Hampshire, which means that to purchase or sell stock, farmers have to rely on markets in neighbouring counties or online auctions. The markets predominantly used are in the HRA. Therefore, there is a flow of cattle, especially for fattening, from the HRA into Hampshire. There is one medium-sized abattoir in Hampshire at Farnborough.

Common land

Summer grazing on temporary grazing is not uncommon and cattle are present on the common land of the New Forest all year round.

Descriptive epidemiology of TB

Temporal TB Trends

Three measures are used to explore the level of TB in this report.

1. The number of new herd incidents that were disclosed in each year.

2. The annual herd incidence rate, reported as the number of new incidents per 100 herd-years at risk (100 HYR). This is the number of new TB incidents detected in the year, divided by the time those herds were at risk of contracting TB. The 100 HYR incidence rate is used in this report as it accounts for different intervals between herd tests that other incidence measures do not (such as new TB incidents per number of herds or tests).

3. The annual end of year herd prevalence. This is the number of herds under restriction due to a TB incident, divided by the number of active herds at the same point in time. Prevalence provides a snap shot of the burden of TB on the local cattle industry.

All three measures include Officially Tuberculosis Free Status Withdrawn (OTF-W) incidents, and Officially Tuberculosis Free Status Suspended (OTF-S) incidents. OTF-W incidents are those in which at least one animal was identified with typical lesions of TB at post mortem (PM) inspection, and/or positive for *M. bovis* on culture from tissue samples. OTF-S incidents are those with one or more reactors to the Single Intradermal Comparative Cervical Tuberculin (SICCT) skin test, but without full confirmation of *M. bovis* infection by PM inspection or bacterial culture. TB incidents in non-grazing AFUs are not included in the prevalence and incidence calculations in this report due to the limited epidemiological impact of these cases. Furthermore, herds restricted because of an overdue test rather than a TB incident are also excluded from calculations. Measures of incidence and prevalence in this report may be lower than those reported in the official TB statistics.

The total number of new incidents in 2019 (40) was marginally lower than in 2018 (42), but of greater concern was the increasing number of OTF-W herds which has returned to the level seen in 2016 (Figure 2).

The annual herd incidence rate for all incidents (OTF-S and OTF-W) was 5.7 (incidents per 100 herd-years at risk). This has continued the rising trend reported over the last two years and takes it marginally above the previous highest level in 2016 (Figure 3). The denominator for this incidence rate measure (herd-years at risk) is sensitive to changes in testing intervals within an area. This should be borne in mind when considering incidence rate trends in some parts of the Edge Area that moved from annual to six-monthly testing in 2018. A detailed description of the methodology used to calculate incidence per 100 HYR is available in the Explanatory Supplement for 2019 (https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2019).

Incidence measured as the proportion of annual incidents per 100 unrestricted herds (5.3) suggests a more even trend over the last ten years with 2019 being approximately the same as reported in 2010.

Herd prevalence levels have dropped marginally from their peak in 2018, but there continues to be an upward trend in prevalence from 2010 as can be seen in Figure 4.

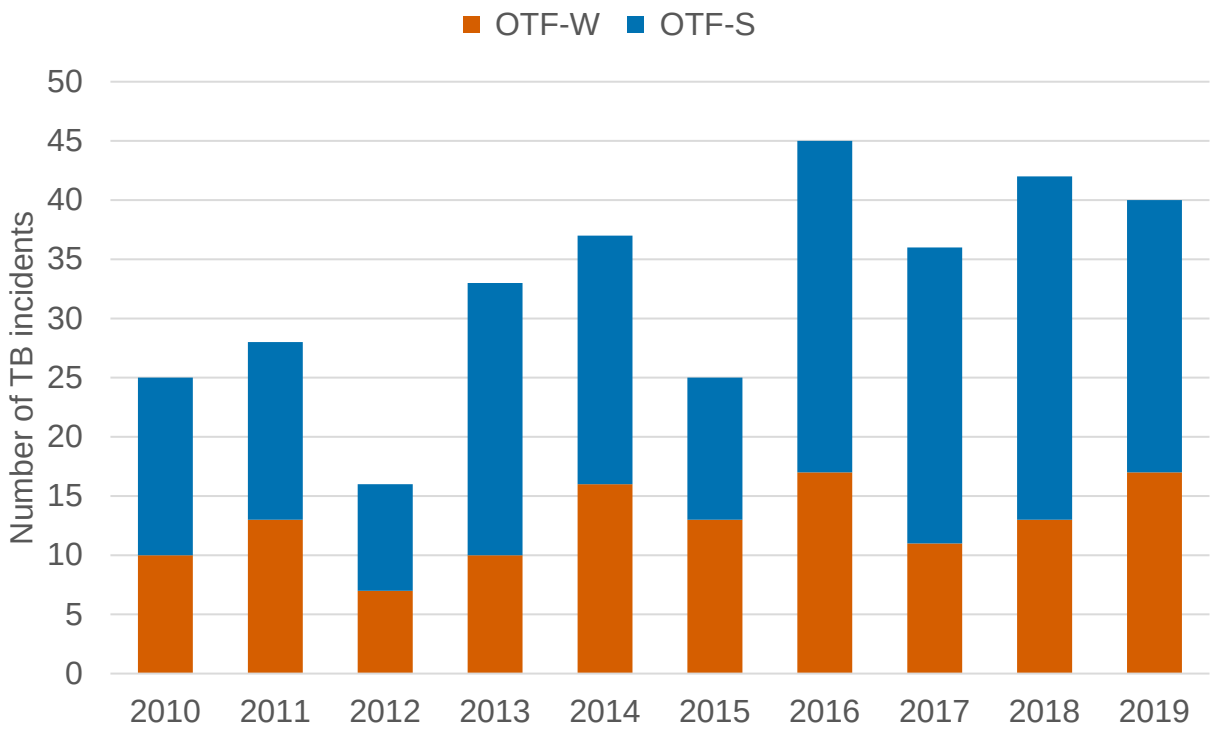

Figure 2: Annual number of new TB incidents in Hampshire, 2010 to 2019.

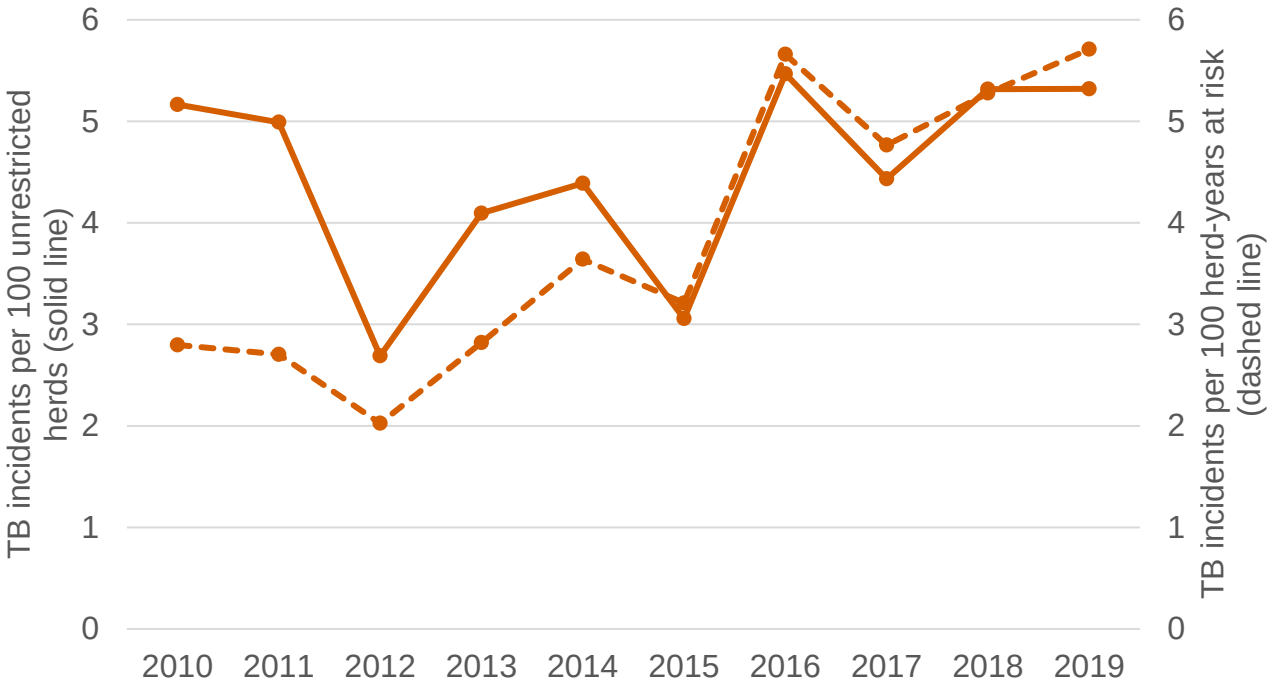

Figure 3: Annual herd incidence rate (per 100 herd-years at risk and per 100 unrestricted herds) for all new incidents (OTF-W and OTF-S) in Hampshire, 2010 to 2019.

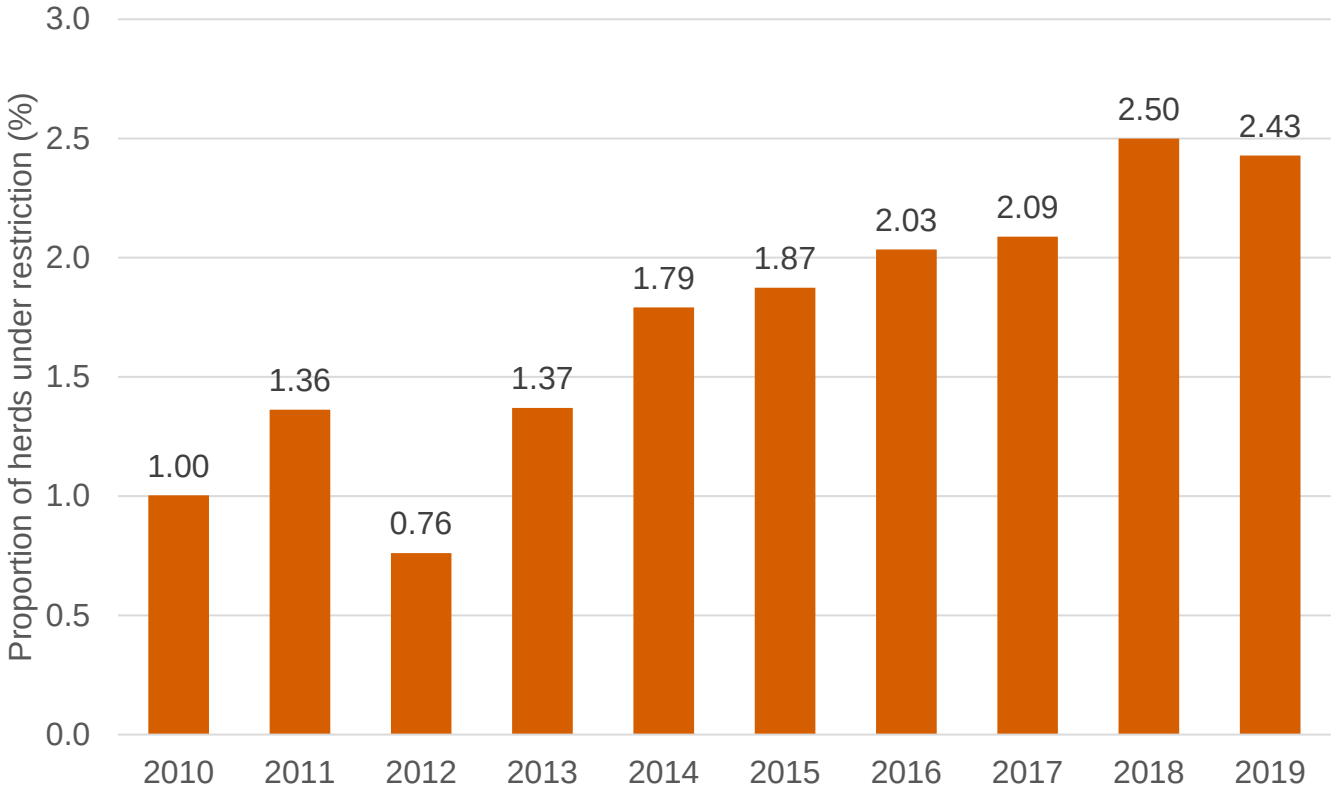

Figure 4: Annual end of year TB herd prevalence in Hampshire, 2010 to 2019.

Geographical distribution of TB incidents

As shown in Figure 5, Hampshire's herd incidence (incidents per 100 herd-years at risk) at 5.7 is well below the average herd incidence level for all Edge Area counties (9.8) and is a third of that of neighbouring Edge Area county Berkshire (16.4). It is significantly lower than the herd incidence in the HRA counties of Wiltshire and Dorset (21.7 and 13.7, respectively), which border Hampshire to the west.

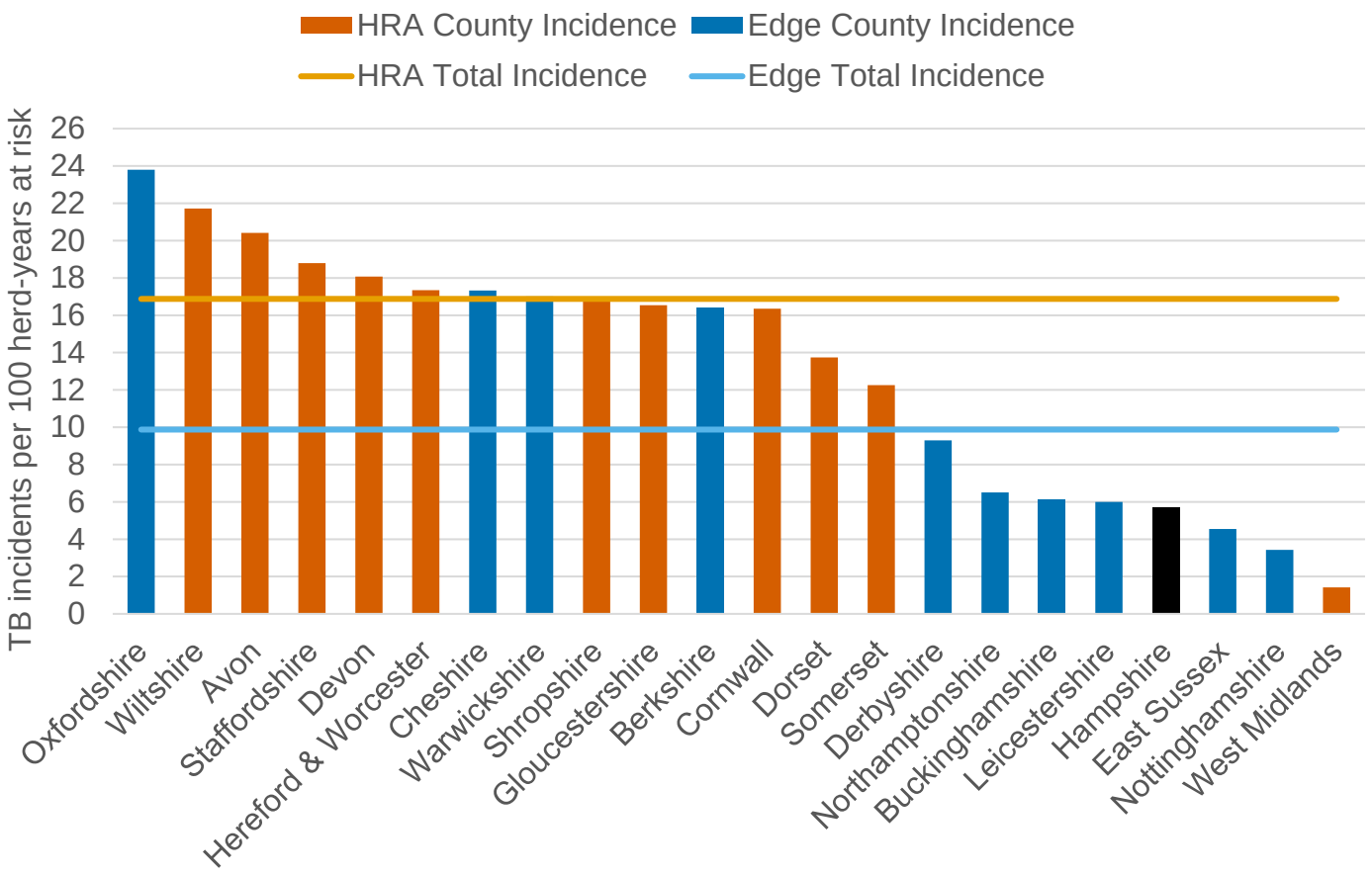

Figure 5: Incidence rate (per 100 herd-years at risk) for all new incidents (OTF-W and OTF-S) in 2019, by HRA and Edge Area County.

There is little association between the distribution of incidents and cattle population density (Figure 6). There are more incidents in the less densely populated north-west of the county than the central southern band of higher cattle density. This region is close to the counties of Berkshire (Edge Area) and Wiltshire (HRA), which both have markedly higher levels of incidence than Hampshire (Figure 5). Holding density in Hampshire mirrors the cattle density in geographical distribution.

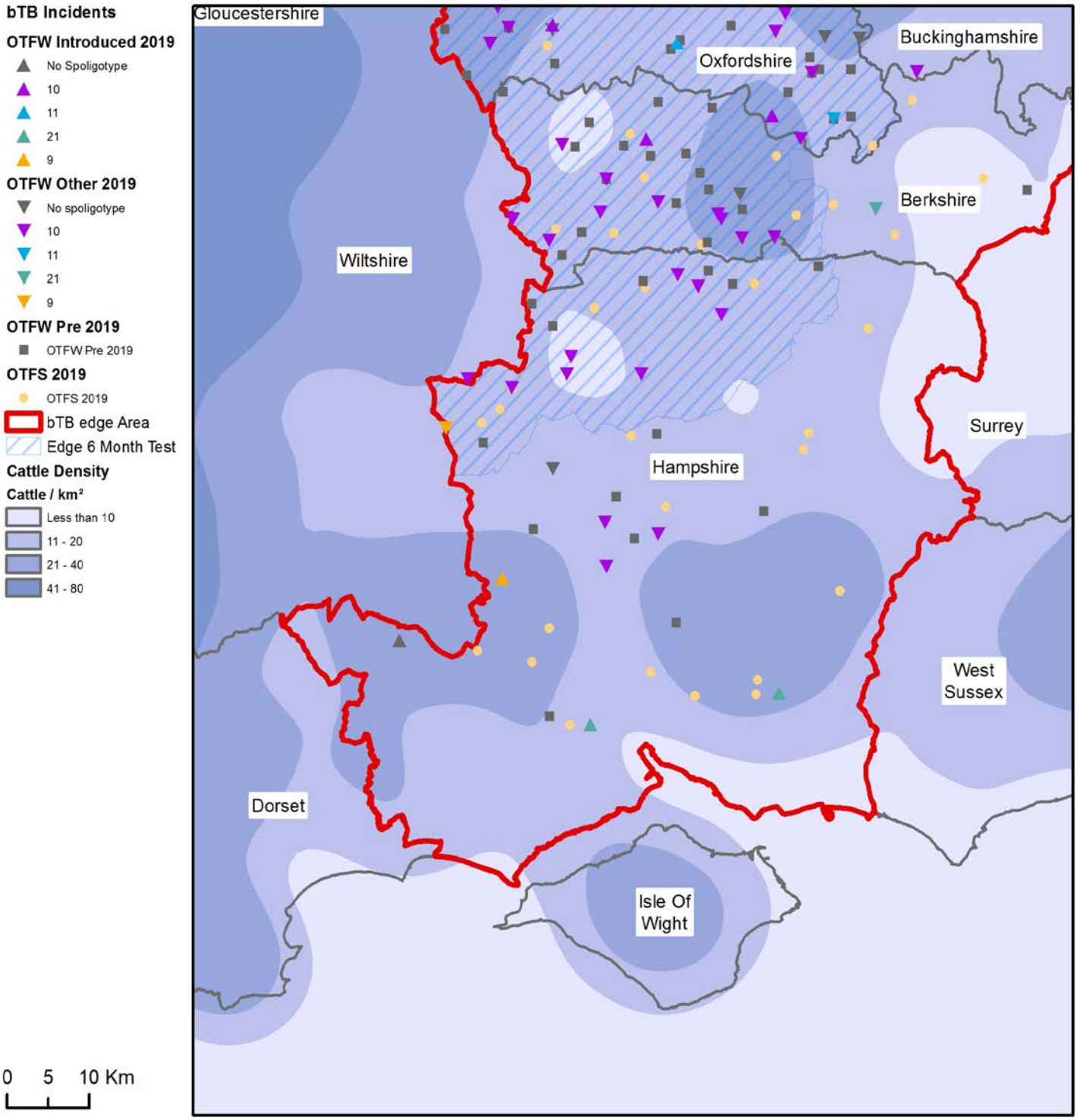

Figure 6: Geographical distribution of all new TB incidents (OTF-W and OTF-S) in 2019 and OTF-W incidents that began before 2019 and were still ongoing at the beginning of 2019 overlaid on a cattle density map. To note, 'OTF-W Introduced 2019' refers to OTF-W incidents in which introduction of infection through cattle movements was the most likely source identified.

Since the last report covering 2018, there has been an increase in the number of OTF-W incidents in the endemic area in the northwest quadrant of the county. These were all confirmed as spoligotype

10 as would be expected with the establishment in this area of *M. bovis* genotypes 10:a and 10:u over time.

A small cluster of incidents may be developing in the centre of the county to the west and south of Winchester. This group of four incidents comprised two 10:a incidents in closely located dairy herds, one disclosed in 2018 and one in 2019, and two 10:u incidents identified in 2019.

Using Whole Genome Sequencing (WGS) analyses, the *M. bovis* isolates of 10:u from the two new incidents in 2019 were found to be very closely related genetically. The herds are separated by a motorway that prevents any chance of nose-to-nose contact. However wildlife can travel through underpasses. This indicates possible wildlife involvement as no common cattle sources were found and there were no other possible cattle interactions reported.

The seeding of infection into this Winchester cluster area could be related to the movement of conservation grazing cattle from north Hampshire where genotype10:u is prevalent.

There was also an incident in 2018 that involved conservation grazing at multiple sites around the county. These incidents increase the risk of long distance spread within the county and generated a large number of 3km radial zones which required additional testing of herds.

There were three OTF-W incidents attributed to movement of cattle in the south of the county. Two were traced to cattle purchases from the HRA, confirmed by genotypes which matched farm or area of origin. The third involved movement of a whole herd from the HRA to Hampshire. This herd had suffered an OTF-W TB incident within the three years prior to moving to Hampshire with the same genotype (9:f) in 2019 as previously disclosed.

Figure 7 shows incidents that were attributed to a most likely wildlife source (with a 75% certainty) and suggests areas of endemicity. It shows only four incidents in the hatched six-monthly surveillance testing endemic area that fulfilled this criteria in 2018/2019. Three were spoligotype 10 as would be expected. The herd with spoligotype 9 borders an area of Wiltshire where spoligotype 9 is endemic. WGS confirmed close genetic relationship for the spoligotype 9 isolate with incidents locally in Wiltshire.

This relatively low number of incidents suggesting endemicity for spoligotype 10, may be caused by the difficulty of differentiating between wildlife infection and residual infection where there has been a previous incident with the same spoligotype. Both risk pathways are therefore recorded with equal weighting but as result, the wildlife transmission pathway does not reach the 75% threshold required to be recorded as endemic. Consequently, endemicity is probably under-recorded in this map.

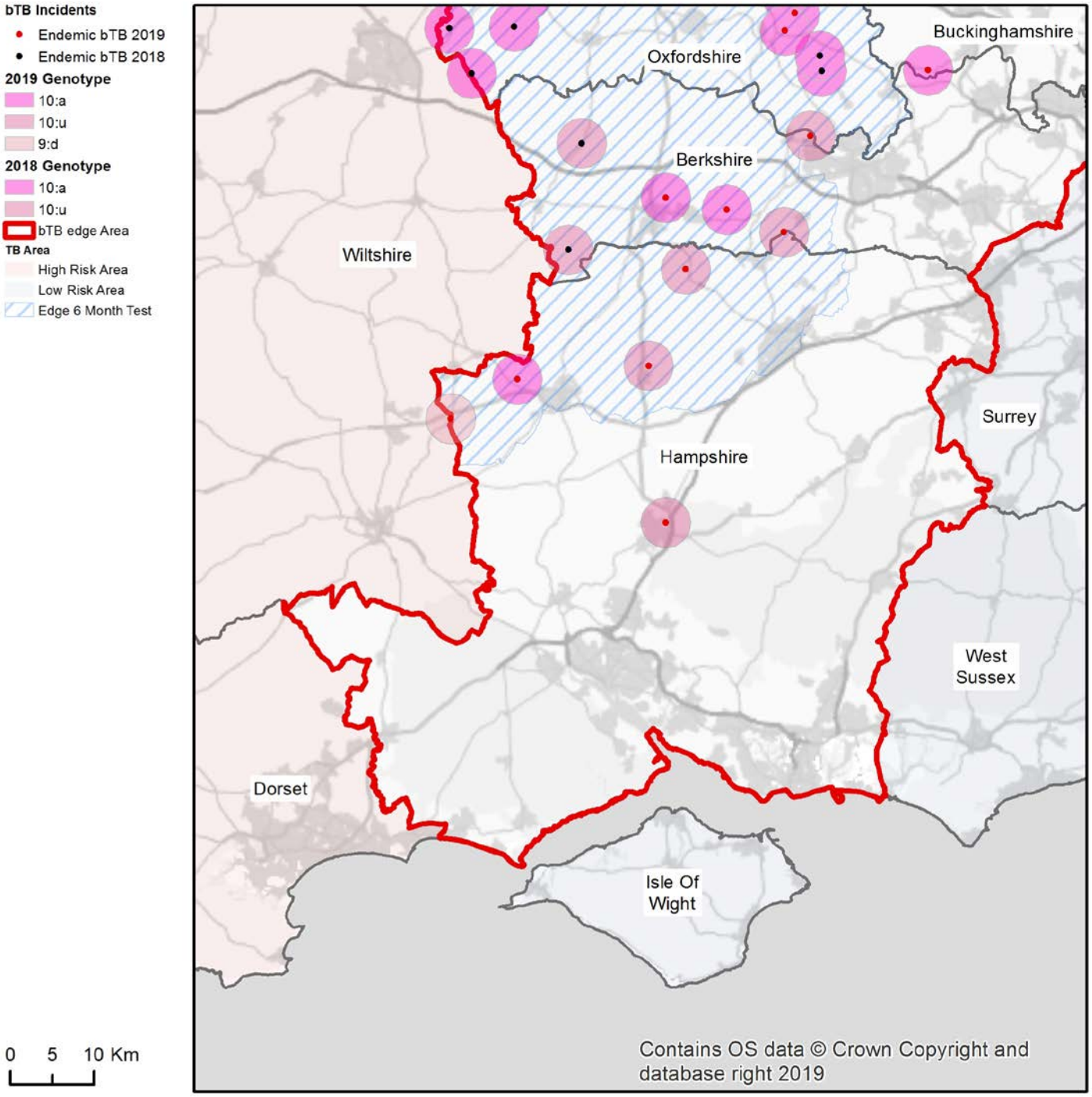

Figure 7: Genotypes of *M. bovis* detected in Hampshire in 2018 and 2019 where a wildlife source was attributed with a 75% certainty or above, as an indication of *endemic* infection within local wildlife populations (OTF-W incidents only).

Considering the OTF-S incidents, cattle movements were again assessed as being the most likely source in the south of the county but not to a 75% threshold of certainty because of a lack of *M. bovis* genetic information. There were also three cases where residual infection was the presumed source, shown with the blue triangles in Figure 8.

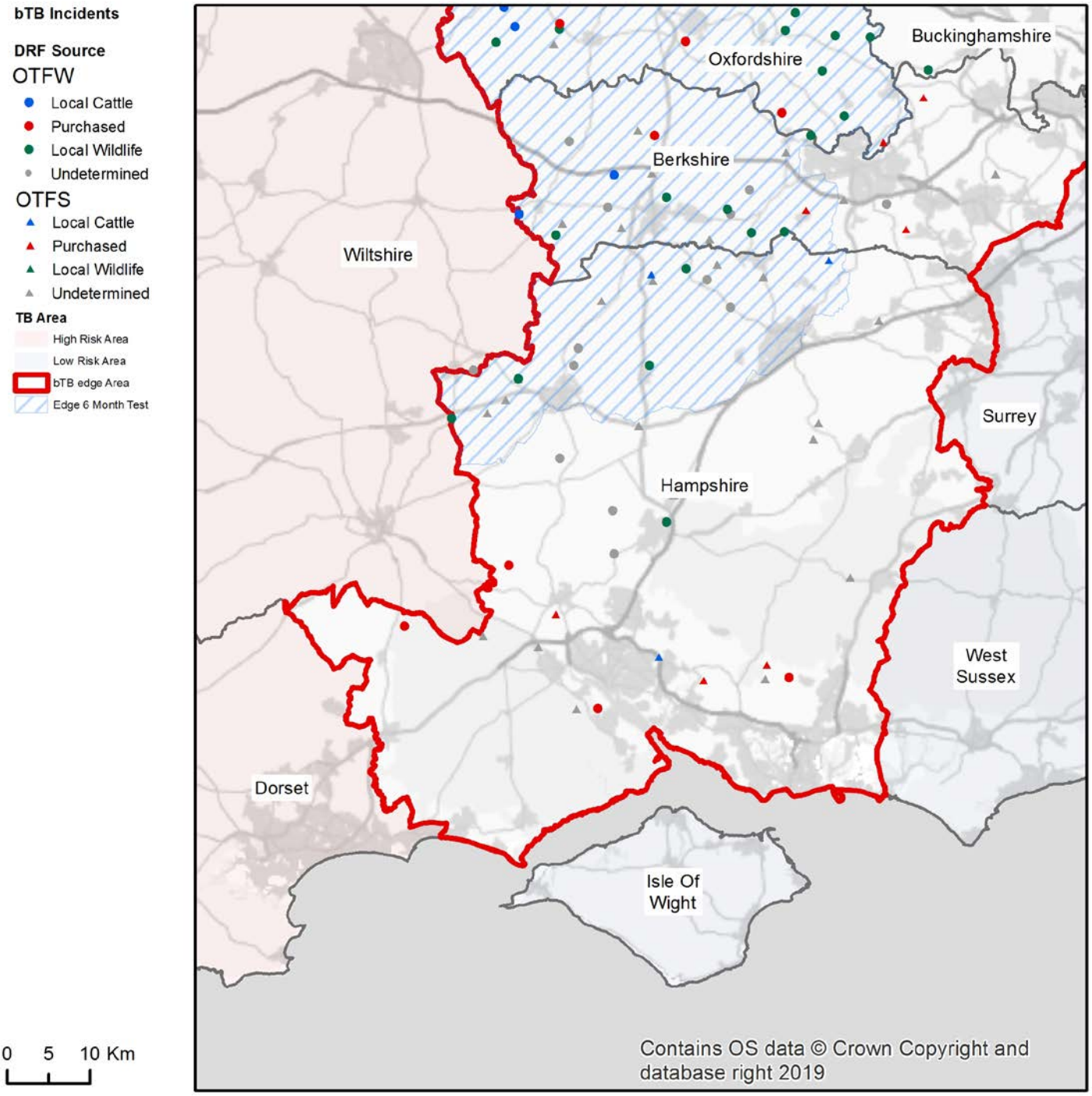

Figure 8: Map of the source of infection pathway recorded with the highest level of certainty for all TB incidents (OTF-W and OTF-S) in Hampshire, and its adjoining Edge Area counties, which started in 2019.

Other characteristics of TB incidents

Incidents by herd types

There was a fairly even distribution of incidents between beef suckler, beef fattener and dairy herds (Figure 9). It also shows that the largest herds (501+) were more likely to become OTF-W (four out of five). However, of all larger herds (201+), OTF-S incidents outnumber OTF-W by a considerable margin (11 out of 17).

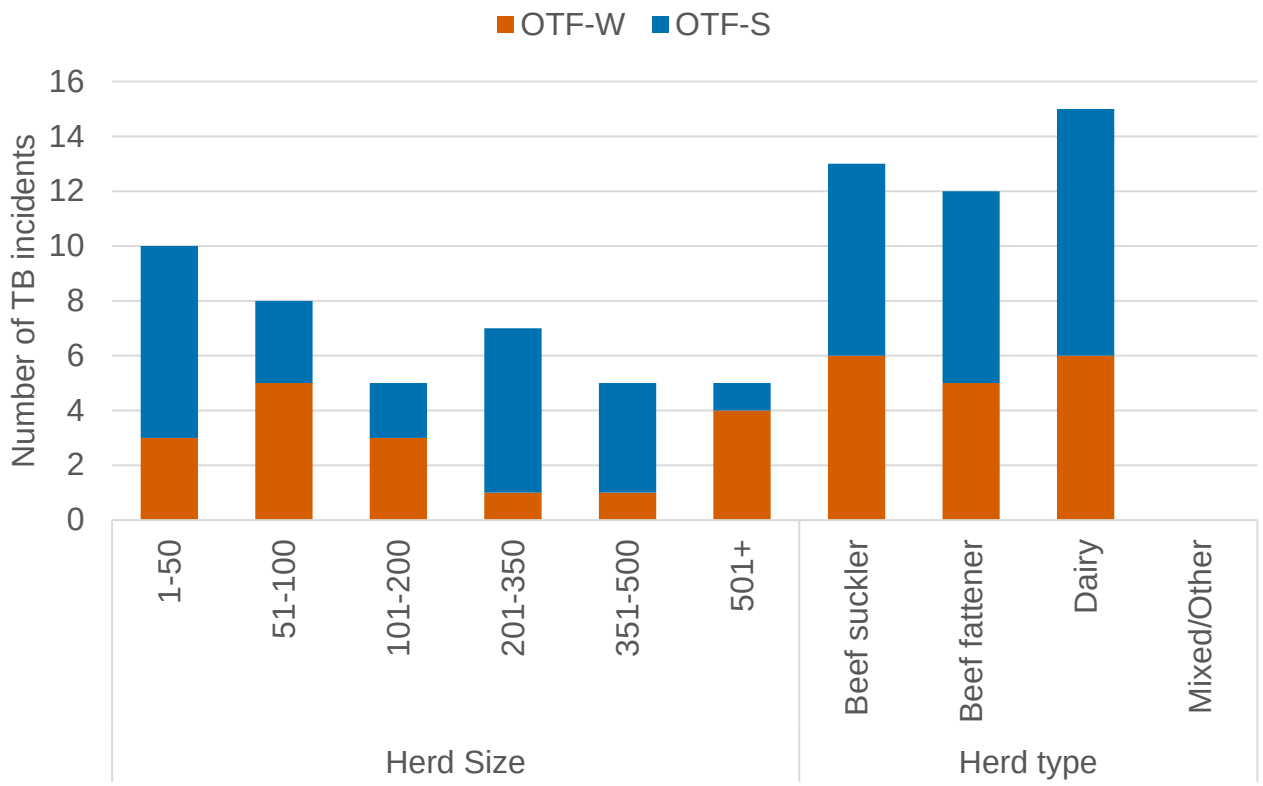

Figure 9: Number of new TB incidents (OTF-W and OTF-S) in Hampshire in 2019, by cattle herd size and type.

Incidents by month of disclosure

Month of disclosure shows a dip in the months of June and July (Figure 10). This is partly explained by farmers preferring to conduct testing when cattle are housed due to easier management. The number of herds tested in June and July was 140 as opposed to 250 herds tested in the months of January and February.

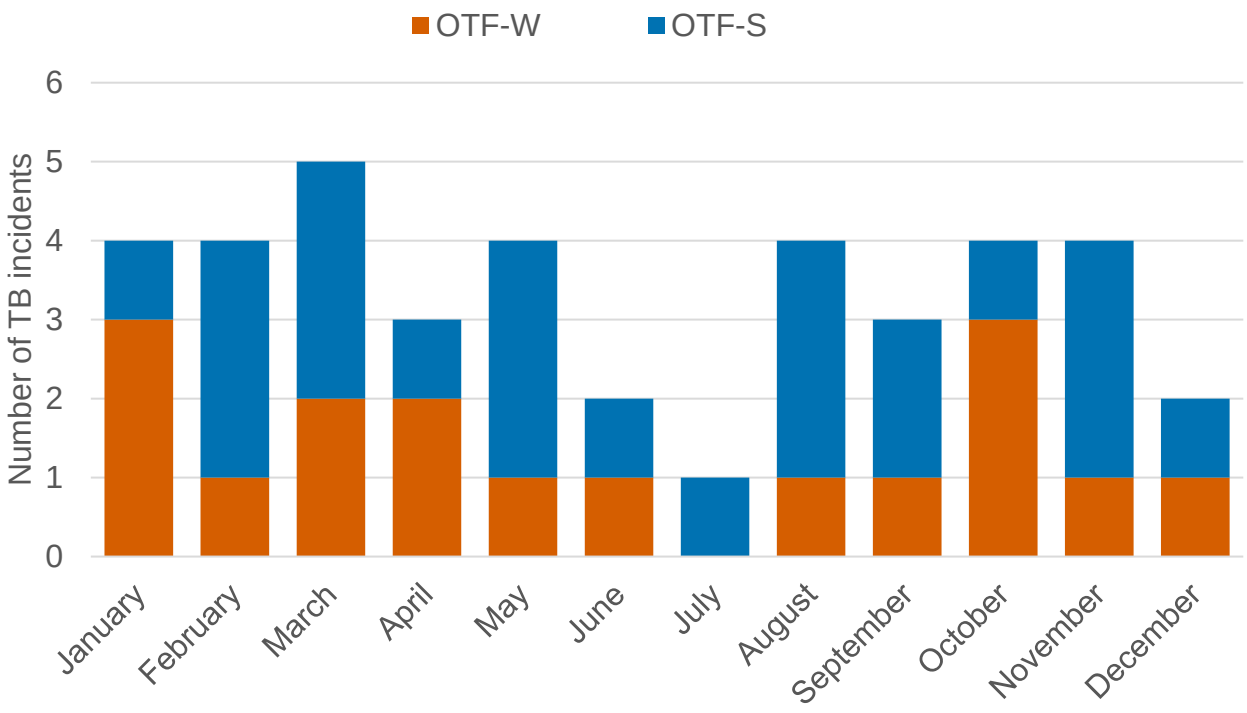

Figure 10: Number of new TB incidents (OTF-W and OTF-S) in Hampshire in 2019, by month of disclosure.

Genotypes of *M. bovis* isolated

The genotypes of *M. bovis* confirmed in Hampshire help to illustrate that genotypes 10:a and 10:u are endemic (Figure 11). These two genotypes constitute 73% of the total. The single 9:d incident could also be from infected wildlife because the herd spans the Hampshire/Wiltshire border where 9:d is endemic. Both genotype 21:a and the single 9:f isolations were confirmed to have originated from movement of cattle into the county.

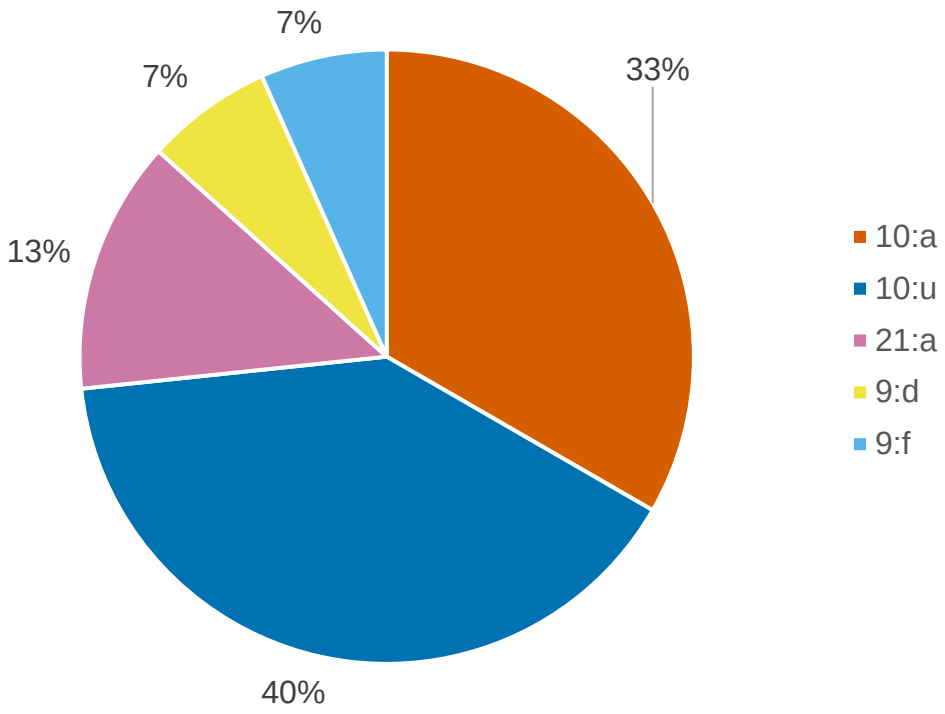

Figure 11: Genotypes of *M. bovis* identified in herds with OTF-W incidents in Hampshire in 2019 (n=15).

Duration of incidents

As can be seen in Figure 12, the majority of incidents were cleared within the 151-240 days or 241-550 days categories. Those in the time interval 151-240 days were likely to have passed either the minimum of two or three short interval tests before movement restrictions were lifted. This suggests that infection was cleared swiftly from over half the incidents in the county. One incident that resolved in 2019 had been under movement restrictions for longer than 551 days (persistently infected). This was an organic suckler herd that had an unusual genotype which had previously been found in central Wiltshire.

The mean length of OTF-W incident was 268 days and the median 225 days. This compares with OTF-S mean length of 217 days and a median of 193. These figures illustrate that incidents where TB lesions are detected at post-mortem examination and/or *M. bovis* is cultured from tissue samples, take longer to resolve than those without detectable lesions.

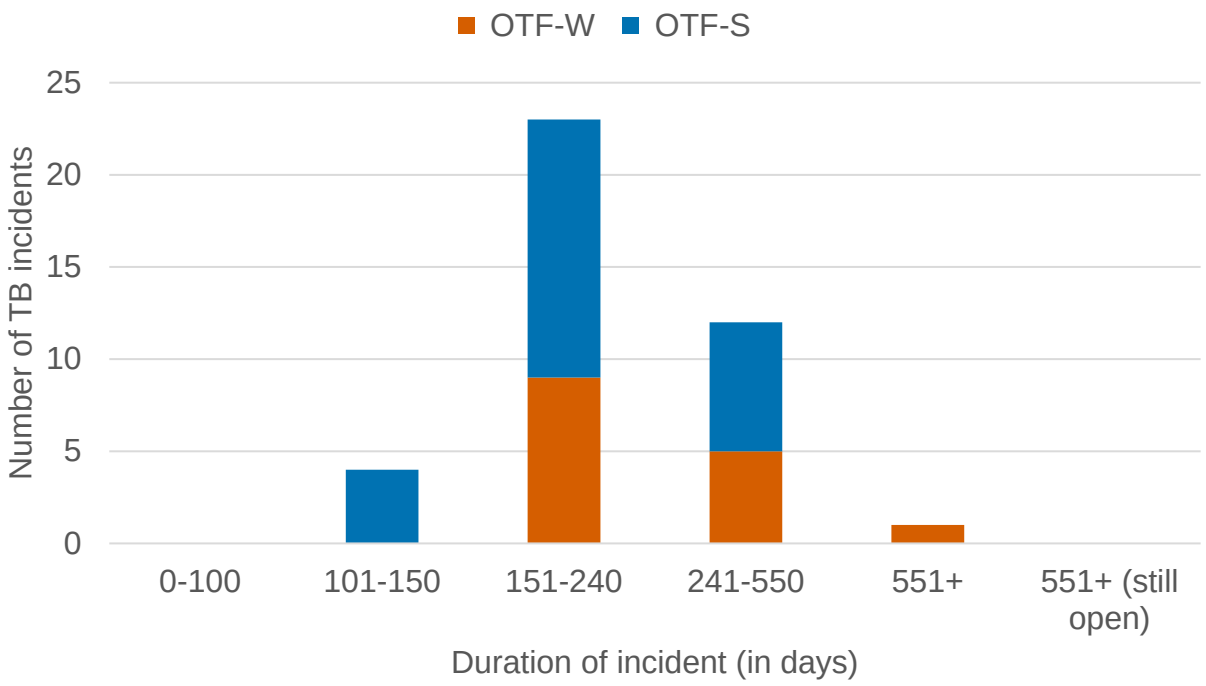

Figure 12: Duration of all TB incidents (OTF-W and OTF-S) that ended in 2019, and the number of persistent TB incidents (551+ days) that were unresolved at the end of 2019 in Hampshire. Note that Approved Finishing Units (AFUs) have been excluded.

Suspected sources, risk pathways and key drivers for TB infection

It can be challenging to retrospectively establish the route of infection for a TB incident herd. The Animal and Plant Health Agency (APHA) aims to complete an epidemiological assessment for all TB incidents in the Edge Area (both OTF-W and OTF-S). This includes a thorough on-farm investigation and scrutiny of routinely collected data; such as cattle movement records, and the results of molecular analyses where available.

During the assessment up to three risk pathways of infection are selected for each herd. Each risk pathway is given a score that reflects the likelihood of that pathway bringing TB into the herd. The score assigned has been updated this year to reflect developing understanding of how likelihood is being assessed in practice. It is recorded as either definite (score 8), most likely (score 6), likely (score 4) or possible (score 1). The source(s) for each incident are weighted by the certainty ascribed. Any combination of definite, most likely, likely or possible sources can contribute towards the overall picture for possible routes of introduction in to a herd. If the overall score for a herd is less than six, then the score is made up to six using the ‘Other/Unknown Source’ option. Buffering up to six in this way helps to reflect the uncertainty in assessments where only ‘likely’ or ‘possible’ sources are identified.

The weight of infection outputs in Appendix 4 are produced by combining the data from multiple herds and providing the proportion of pathways in which each source was identified, weighted by certainty that each source caused the introduction of TB. The outputs do not show the proportion of

herds where each pathway was identified (this is skewed by the certainty calculation). Genotyping of *M. bovis* isolates can be a powerful tool in identifying a likely source of infection, however genotypes are not determined for OTF-S herds. The inclusion of OTF-S herds in these calculations increase the uncertainty in the outputs. As a result, the relative proportions of each risk pathway is very approximate and only broad generalisations should be made from these data. A more detailed description of this methodology is provided in the Explanatory Supplement for 2019 (https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2019).

Key drivers of infection

The key drivers of the TB epidemic within the Hampshire in 2019 are as follows:

- Purchasing stock from HRA markets is an issue, despite pre-movement testing.
- Internal cattle movements within Hampshire from the endemic six-monthly testing area to the annual testing area. In both 2018 and 2019 there were OTF-W incidents in conservation grazing herds whose grazing areas were widely dispersed across the county.
- Possible endemic TB infection in wildlife in northwest Hampshire leading to infection, including some cases of re-infection, of cattle herds.

Sources of infection and risk pathways

Movement of infected cattle and direct or indirect contact with local infected badgers were the two key infection sources accounting for over half of the weighted source pathways attributed for all incidents, as shown in Figure 13a and Figure 13b. The weighted source pathways of infection for all new incidents in 2019 is described in Appendix 4. In OTF-W herds nearly 70% of pathways were attributed to cattle movement and wildlife combined. Due to the updated approach to the analysis of risk pathways and updated operational instructions for completion of DRF risk pathways in 2019, it is difficult to compare these figures to 2018 data.

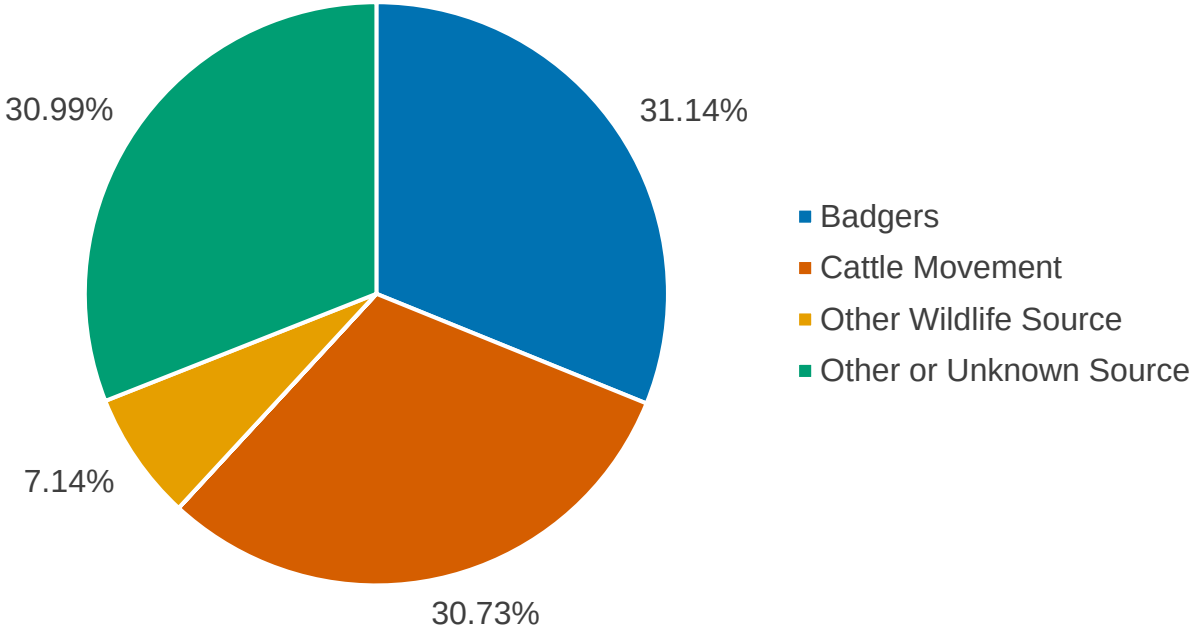

Figure 13a: Summary of the weighted source of infection pathways attributed for OTF-W incidents in Hampshire that started in 2019, that had a completed DRF (16).

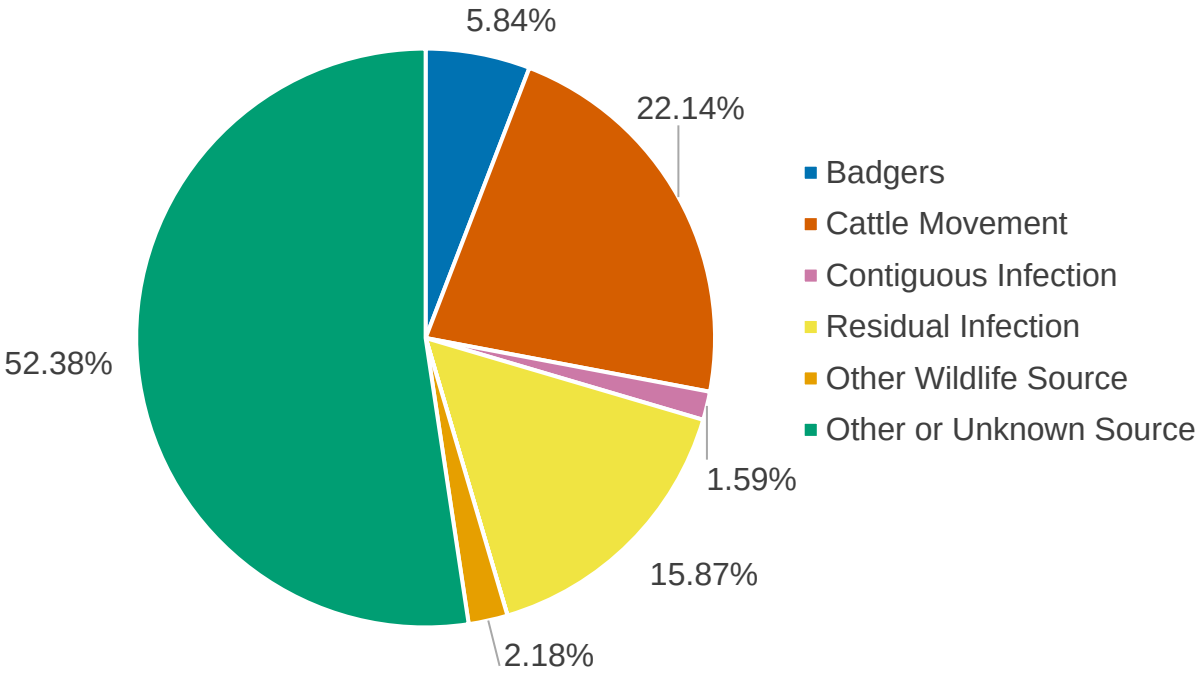

Figure 13b: Summary of the weighted source of infection pathways attributed for all OTF-S incidents in Hampshire that started in 2019, that had a completed DRF (21).

There are two interesting points to take from Figure 14. Infected wildlife was not considered as the highest risk pathway for the incidents in fattener herds. This was explained by either a tracing connection found as the source or because of less likelihood of wildlife contact when fattening cattle are permanently housed. For dairy herds, cattle movements were not considered as the highest risk pathway in any of the incidents. This probably relates to the fact that most dairy herds breed their own replacements and the sole movements on will be the occasional purchase of a bull. Reports suggested dairy herd managers who need to buy bulls are selecting bulls from low risk areas and low risk herds whenever possible.

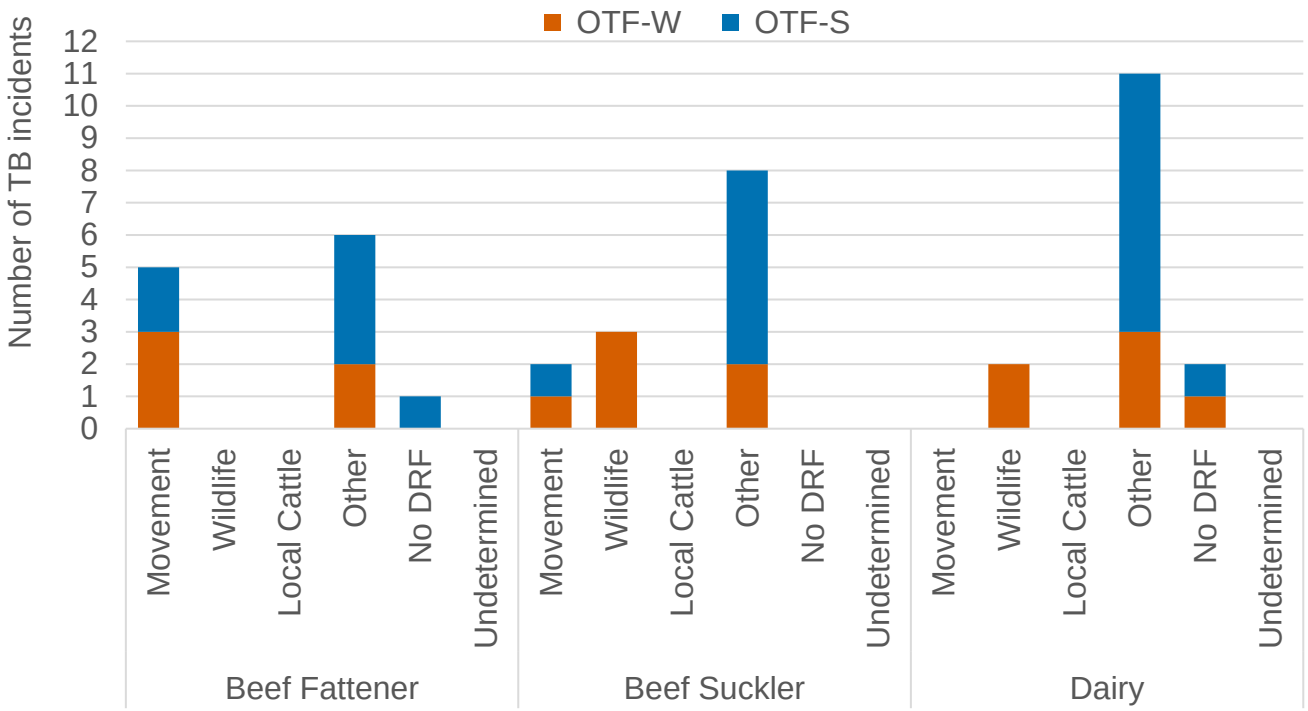

Figure 14: Source of infection recorded with the highest level of certainty for all TB incidents (both OTF-W and OTF-S) in Hampshire in 2019, by herd type. Note that the categories ‘movement’, ‘wildlife’, and ‘local cattle’ are comprised of incidents where these were the most likely single source of infection recorded. Incidents where the most likely single source was stated as ‘unknown’ were assigned to the category ‘undetermined’. ‘Other’ includes incidents where there was equal weighting between the most likely sources of infection as well as other pathways not categorised elsewhere.

TB in other species

There is no statutory routine TB surveillance of non-bovine species, apart from post mortem examination (PME) of suspected clinical cases reported to APHA and post mortem meat inspection of animals (e.g. sheep, goats, pigs) slaughtered for human consumption.

M. bovis was confirmed in a wild fallow deer in the parish of Longparish in 2019. The deer was culled in north-west Hampshire. The genotype was confirmed as 10:a which was also found in three cattle herds within 10km. This is of concern as wild fallow deer are known to roam large distances, rather than live within a small defined territory, increasing the opportunity for wildlife spread.

Detection of incidents

Figure 15 illustrates the various methods by which incidents are first detected. It is noticeable that all methods contributed to detecting OTF-W incidents. As expected whole herd testing (WHT) contributed the highest percentage but slaughterhouse surveillance (SLH), pre-movement testing (PRMT), radial testing (RAD) and six month post incident testing (6M) also played a part in detecting infection at an earlier stage. This early detection may well have reduced spread within infected herds and hence numbers of reactors and length of incidents.

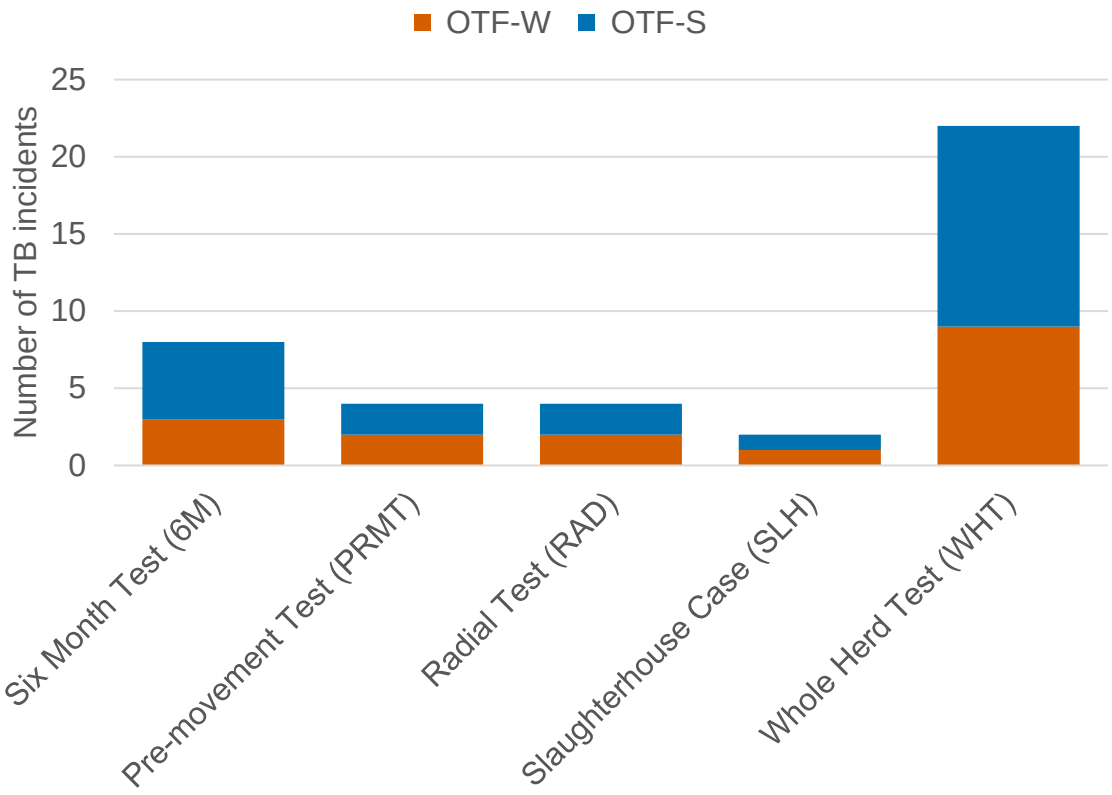

Figure 15: Number of TB incidents (OTF-W and OTF-S) in Hampshire in 2019, disclosed by different surveillance methods.

It is of interest that only four of the OTF-W herds had suffered a TB incident in the past three years (Figure 16). This is of concern as the 12 OTF-W incidents with no recent history of TB have either become infected through cattle movement or through wildlife interaction rather than through residual infection.

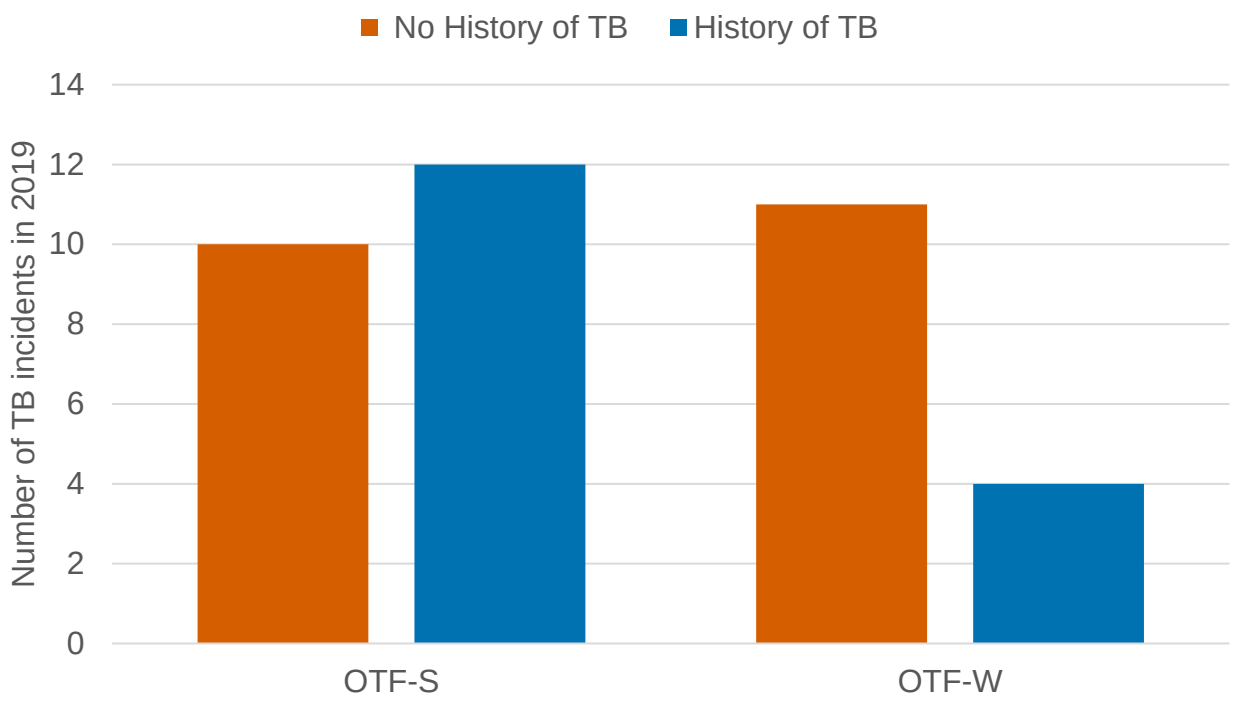

Figure 16: Number of TB incidents (OTF-W and OTF-S) in Hampshire in 2019 on holdings that have suffered an OTF-W incident in the previous three years, and holdings with no history of TB in the previous three years.

Skin test reactors removed and interferon gamma test positive animals removed

There were 197 cattle compulsorily slaughtered due to TB in Hampshire in 2019 (Figure 17). This was lower than in previous years and similar to levels in 2014 (210). Of those 197 cattle, 129 were skin test reactors and 68 were detected by IFN-γ testing. The average number of reactors identified and removed per incident was lower in 2019 at 1.8 compared to 2.9 in 2018 and 3.9 in 2017. These figures are encouraging after the increase in numbers in 2015, 2016 and 2018 shown in Figure 17. It means that farmers are not having to replace as many animals and there is a reduction in total compensation paid for removal of cattle.

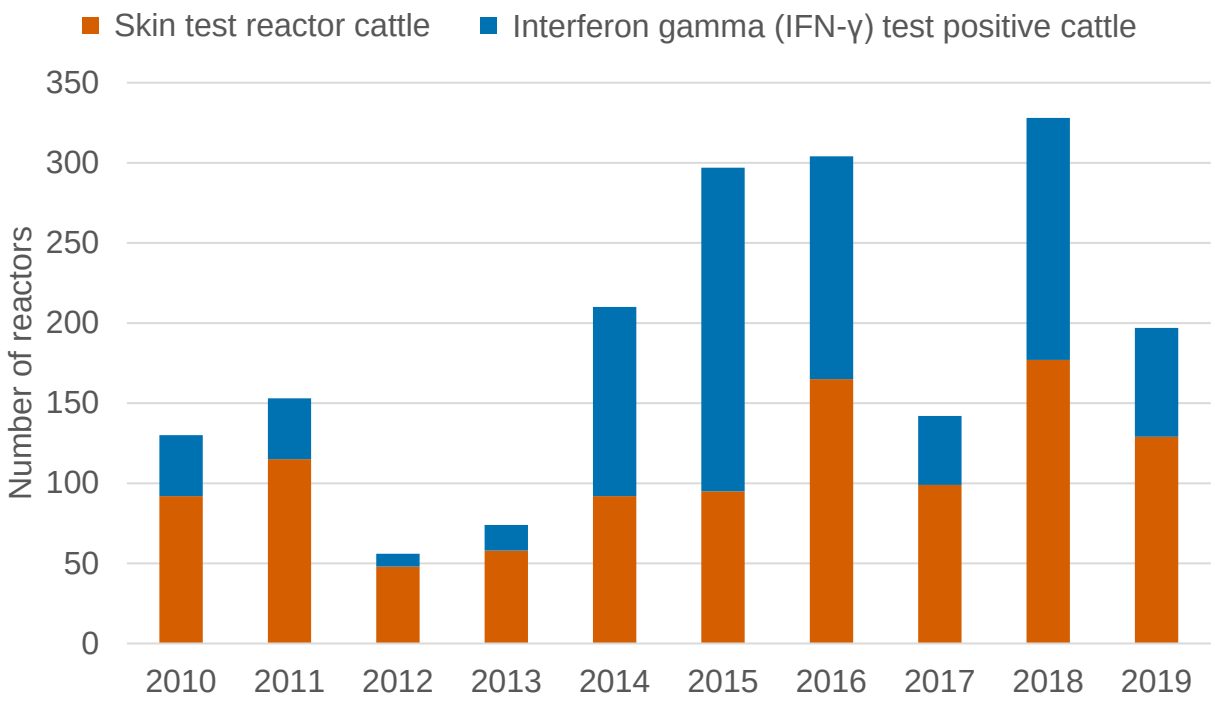

Figure 17: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons, in Hampshire, 2010 to 2019.

Summary of risks to Hampshire

Purchase of cattle from markets in the HRA for rearing in Hampshire poses the threat of introduction of infection including that of genotypes different from those already endemic in the county. This was shown by the two incidents where genotype 21:a was disclosed.

Movement of infected wildlife across the county border from Wiltshire and Dorset (HRA) has been a threat for many years. However, the epidemiological picture from cattle infections suggests that this may only have happened in the north western border with Wiltshire. In the south of the county the river Avon may be acting as a physical barrier to wildlife spread. This may help in attempts to keep infection from entering the New Forest.

The suspected endemic area does not appear to have spread further eastwards, but there are concerns that new separate endemic areas may be becoming established to the south and east of the current endemic area.

There is a risk of spread within the county where a number of dairy herds use ex-dairy farms to rear their heifers and these may be at some distance from the home premises. An example of this was an in-calf dairy heifer group becoming infected when they were pastured at a premises in the suspected endemic area some 32km from the home farm in southern Hampshire. Fortunately no movements had occurred back to the home farm before the incident was disclosed and the main herd has since tested clear.

Summary of risks from Hampshire to surrounding areas

Surrey (LRA) is separated from the Hampshire suspected endemic area by low cattle densities either side of the border and by conurbations such as Aldershot, Farnham and Farnborough. The low cattle density will mean that there are fewer cattle to act as sentinels to detect spread of wildlife infection. However, it also means that there will be less cattle to act as reservoirs of infection and lower numbers of cattle movements bringing infection closer to the LRA.

West Sussex (LRA) has a dense cattle area close to the county boundary, but currently the endemic area in Hampshire is still some 30km to the north-east. There are no specific natural or man-made barriers to wildlife movement towards West Sussex.

There is not a large trade in cattle from Hampshire to the Isle of Wight (LRA) as there is no market in Hampshire. Purchasers on the Isle of Wight are more likely to have bought stock from HRA markets. The lack of a market in Hampshire may therefore increase the likelihood of infected animals reaching the island.

Assessment of effectiveness of controls and forward look

Herd incidence in Hampshire has plateaued, which gives some hope for the future course of the epidemic. This is most likely associated with several factors such as the apparent low rate of spread of the suspected endemic area in the north-west, more cautious purchasing behaviour of beef fatteners, badger controls in areas of the adjacent HRA counties, and saturation effect for infection of farms in the endemic area. However, this is tempered by possible establishment of new endemic areas.

A substantial proportion of the county will have a crude OTF-W incidence of <2% because TB infection is regionalised within the county.

Appendices

Appendix 1: overview of risk and surveillance areas of England and Edge Area objectives and controls

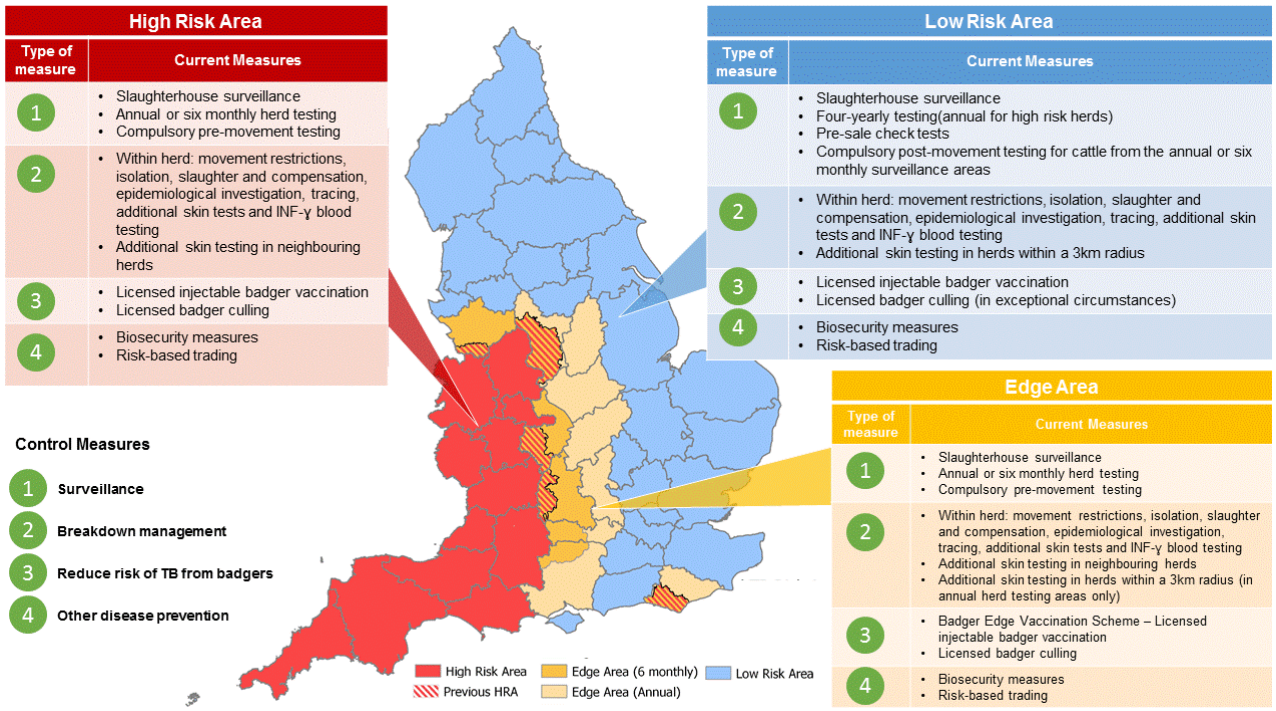

Figure A1: TB risk and surveillance areas of England effective since January 2018, as set out in the Government's Strategy for Achieving Officially Bovine Tuberculosis Free status for England. Map based on information published on www.tbhub.co.uk.

Policy objectives for the Edge Area

Short to medium term:

- slow down geographic spread
- maintain crude herd incidence of OTF-W incidents <2% overall by 2019
- begin to reduce the incidence rate

Longer term:

- reduce geographic spread of TB and push the Edge Area boundaries westward
- reduce OTF-W herd incidence to <1% by 2025
- attain OTF status (crude incidence of indigenous OTF-W herd incidents <0.1%) for the lowest incidence counties in the Edge Area

For more information about the governments approach to controlling TB, visit the strategy for achieving Officially Bovine Tuberculosis Free status for England, published in 2014 and independently reviewed in 2018, see:

https://www.gov.uk/government/publications/a-strategy-for-achieving-officially-bovine-tuberculosis-free-status-for-england

https://www.gov.uk/government/news/government-sets-out-next-phase-of-strategy-to-combat-bovine-tuberculosis

Key control measures

Surveillance:

- six monthly or annual routine herd testing
- additional targeted surveillance of cattle herds located within a 3km radius of new OTF-W incidents in annual testing sections of the Edge Area (radial testing)
- slaughterhouse (SLH) surveillance

Management of cases ('incidents'):

- increased sensitivity of incident herd testing:
- all incident herds must pass two consecutive short interval skin tests at severe interpretation to regain OTF status, irrespective of PM and bacteriological findings
- mandatory IFN-γ parallel testing of herds with OTF-W incidents
- enhanced management of herds with persistent incidents
- enhanced epidemiological investigation and data analysis
- information sharing - location of incident herds publicly available (using ibTB online (www.ibtb.co.uk) interactive mapping tool)
- restriction for life of all inconclusive reactors (IRs) that give a negative result on a re-test was introduced in November 2017. The only permitted movements of these animals are to slaughter or an Approved Finishing Unit

TB controls in the wildlife reservoir (badgers):

- licensed badger culling in high incidence sections of the Edge Area
- Government grants for licensed voluntary badger vaccination projects using injectable badger BCG (Badger Edge Vaccination Scheme - BEVS)

Other measures:

- compulsory pre-movement skin testing of cattle moved between herds
- promotion of herd biosecurity measures to reduce the risk of new incidents

Summary of enhanced TB control measures in Hampshire

Edge Area testing policy

- Eight incidents generated radial testing zones. Four incidents were disclosed at radial tests, two OTF-W and two OTF-S.
- One persistently infected herd resolved in 2019 without the need for supplementary testing.

Other testing measures

- The confirmed case of *M. bovis* in a wild fallow deer did not generate radial or contiguous testing as it was detected within the enhanced six-monthly surveillance testing area.
- The number of overdue TB tests was minimal because of actions taken by APHA with the assistance of Hampshire Trading Standards. Overdue testing therefore poses minimal risk to the county.

Other control measures

- The TB advisory Service (TBAS, www.tbas.org.uk/) continues to be active in giving bespoke biosecurity advice to farmers
- Quality assurance audits of TB testing by official veterinarians took place.
- Regional TB meetings have been held with farmers and their representatives in Hampshire.
- APHA has worked with Local Authorities regarding enforcement action for both overdue testing and illegal cattle movements which have occurred whilst a herd is under movement restrictions

Appendix 2: cattle industry in Hampshire

Table A2.1: Number of cattle premises by size band in each county at 1 January 2019. (RADAR data)

Size of Herds	Un*	1-50	51-100	101-200	201-350	351-500	501 +	Total Number of Herds	Mean Herd Size	Median Herd Size
Number of Herds	2	444	116	95	47	19	22	745	86	34

*The number of herds with an undetermined size.

Table A2.2: Number of animals (percentage of total animals) by breed purpose in each county at 1 January 2019.

Breed purpose	Beef	Dairy	Dual purpose	Unknown	Total
Number of Cattle	38,043 (59%)	22,862 (35%)	3505 (5%)	1 (<0.01%)	64,411

Appendix 3: summary of headline cattle TB statistics

Table A3.1: Herd-level summary statistics for TB in cattle in Hampshire between 2017 and 2019.

Herd-level statistics	2017	2018	2019
(a) Total number of cattle herds live on Sam at the end of the reporting period	910	880	906
(b) Total number of whole herd skin tests carried out at any time in the period	873	954	966
(c) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	761	750	713
(d) Total number of OTF cattle herds at the end of the report period (i.e. herds not under any type of Notice Prohibiting the Movement of Bovine Animals (TB02) restrictions)	880	841	857
(e) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period	891	858	884
(f) Total number of new TB incidents detected in cattle herds during the report period, (including all FUs)	36	42	40
• OTF-S	25	29	23
• OTF-W	11	13	17
(g) Of the OTF-W herd incidents:			
• How many can be considered the result of movement, purchase or contact from/with an existing incident based on current evidence?	7	6	4
• New OTF-W incidents triggered by skin test Reactors or 2xIRs at routine herd tests	7	0	9

Herd-level statistics	2017	2018	2019
• New OTF-W incidents triggered by skin test Reactors or 2xIRs at other TB test types (forward and back-tracings, contiguous, check tests, etc.)	5	2	7
• New OTF-W incidents first detected through routine slaughterhouse TB surveillance	0	0	1
(h) Number of new incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds			
• OTF-S	2	1	2
• OTF-W	2	0	0
(i) Number of OTF-W herds still open at the end of the period (including any ongoing OTF-W incidents that began in a previous reporting period, but not including non-grazing Approved Finishing Units)	7	8	10
(j) New confirmed (positive *M. bovis* culture) incidents in non-bovine species detected during the report period (indicate host species involved)	0	0	1 Fallow deer
(k) Number and type of finishing units active at end of the period:			
• Approved Finishing Units: Grazing	0	0	0
• Approved Finishing Units: Non Grazing	0	0	0
• Exempt Finishing Units: Grazing	0	0	0
• Exempt Finishing Units: Non Grazing	2	2	2

Table A3.2: Animal-level summary statistics for TB in cattle between 2017 and 2019.

Animal-level statistics (cattle)	2017	2018	2019
(a) Total number of cattle tested in the period (animal tests)	97,288	111,537	111,102
(b) Reactors detected in tests during the year:			
• Tuberculin skin test	99	177	129
• Additional IFN-γ blood test reactors (skin-test negative or IR animals)	43	151	68
(c) Reactors detected during year per incidents disclosed during year *	3.9	2.9	1.8
(d) Reactors per 1000 animal tests	1.5	2.9	1.8
(e) Additional animals slaughtered during the year for TB control reasons:			
• DCs, including any first-time IRs	3	18	18
• Private slaughters	2	3	15
(f) SLH cases (tuberculous carcases) reported by Food Standards Agency (FSA)	3	3	7
(g) SLH cases confirmed by culture of *M. bovis* **	1	0	3

* Note: reactors may be from incidents disclosed in earlier years, as any found through testing during the report year count here.
** Note: not all cases reported are submitted for culture analysis. All cases reported are from any period prior to or during restrictions.

Appendix 4: suspected sources of *M. bovis* infection for all of the new OTF-W and OTF-S incidents identified in the report period

Table A4.1: Suspected sources of *M. bovis* infection for all of the new OTF-W and OTF-S incidents identified in 2019.

Source of infection	Possible (1)	Likely (4)	Most likely (6)	Definite (8)	Weighted contribution
Badgers	15	4	2	0	16.8%
Cattle movements	20	1	4	3	25.9%
Contiguous	2	0	0	0	0.9%
Residual infection	8	2	1	0	9.0%
Domestic animals	0	0	0	0	0.0%
Non-specific reactor	0	0	0	0	0.0%
Fomites	0	0	0	0	0.0%
Other wildlife	10	0	0	0	4.3%
Other or unknown source	3	6	3	1	43.1%

Please note that each TB incident could have up to three potential pathways so totals may not equate to the number of actual incidents that have occurred. Details of the methodology used to calculate the weighted contribution of the different suspected sources of *M. bovis* infection for all new incidents can be found in the main body of the report and in the Explanatory Supplement for 2019 (https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2019).

Data Protection:
For information on how we handle personal data visit www.gov.uk and search Animal and Plant Health Agency Personal Information Charter.

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