# Microbiological quality of Australian beef & sheep meat
# Fourth national baseline study - 2011

- Brisbane
- Melbourne
- Rockhampton

# Agenda

1. Results of baseline 4
2. Comparison with other baselines
3. Comparison with other studies
4. General discussion

# Why Undertake Baselines?

1. Demonstrates the hygienic quality of Australian Meat Processing to Importing Countries
2. Data provides confidence in State and Federal regulatory systems
3. Position's the Australian industry in comparison to other countries with respect to the microbiological quality of meat products – Globally we can claim our meat products are at least equivalent to the best performing industries

# Baseline history

**Baseline 1: 1993-94**

Carcases and frozen trim

Export/domestic (QA) comparisons

**Baseline 2: 1998**

Carcases and frozen trim

HACCP being installed and implemented

**Baseline 3: 2004**

Carcases and frozen trim

HACCP well entrenched

# Baseline 4

Primals and frozen trim

Carcases well covered by ESAM

Sampling conducted

- Summer: 24 Jan – 31 Mar
- Winter: 6 Jun – 30 Aug
- 29 Beef plants
- 12 Sheep plants

- Frozen carton sampling
  - 300g sampled per carton (drilled samples)
- Primal sampling
  - 3 sponges each of 300cm$^2$

Sponge 1: E. coli O157

Sponge 2: Salmonella, Listeria

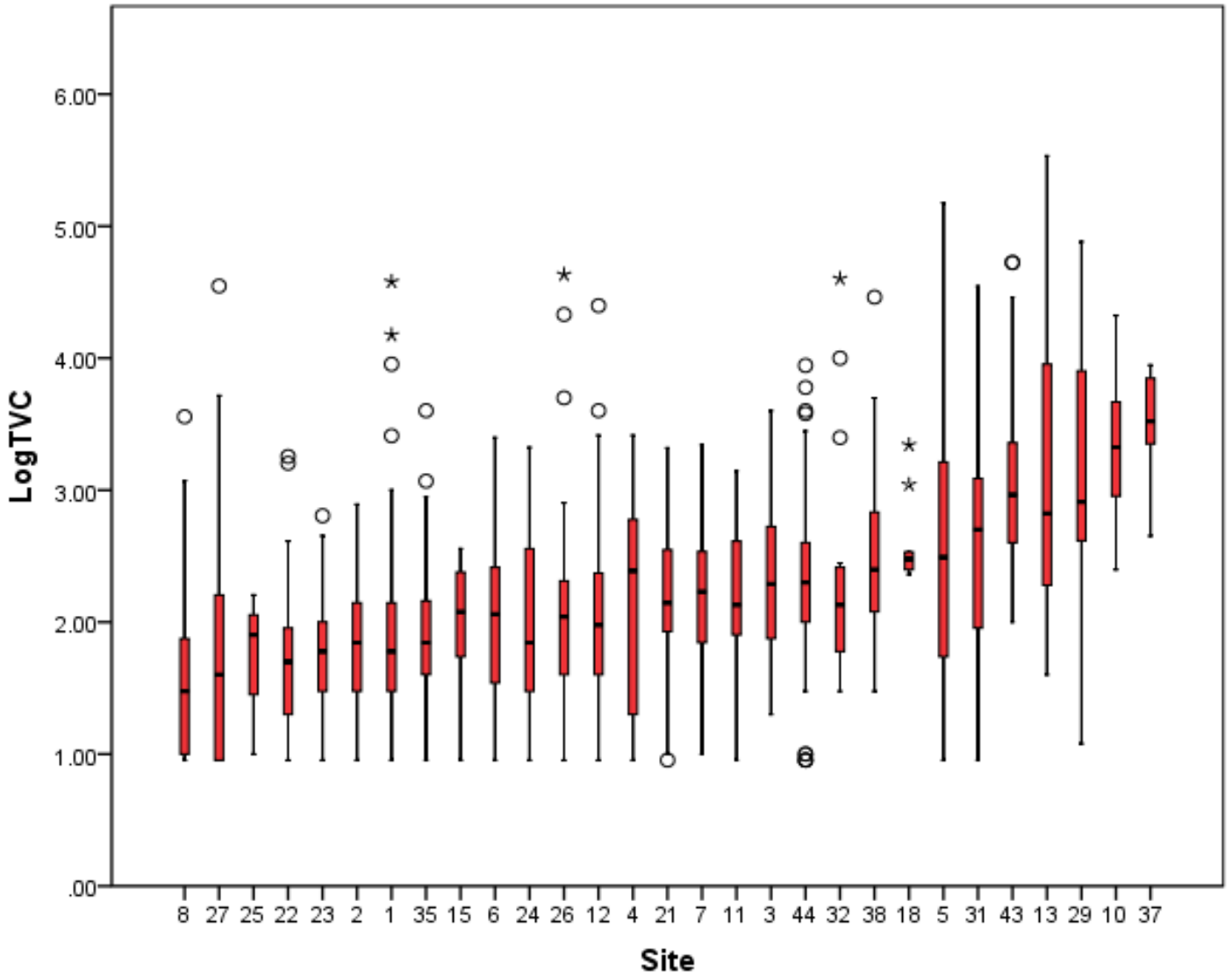
Sponge 3: TVC, Coliforms, E. coli, Staph, Campylobacter

# Frozen Boneless Beef (n=1165)

| | TVC | E. coli | Staph |
|---|---|---|---|
| Prevalence (%) | 94.9 | 2.1 | 3.4 |
| Mean log* (cfu/g) | 2.22 (166) | 1.32 (21) | 1.93 (85) |
| Max log* | 5.53 | 2.51 | 4.76 |

* count of the positive samples

# Frozen Boneless Beef – $\log_{10}$ TVC/g x Plant

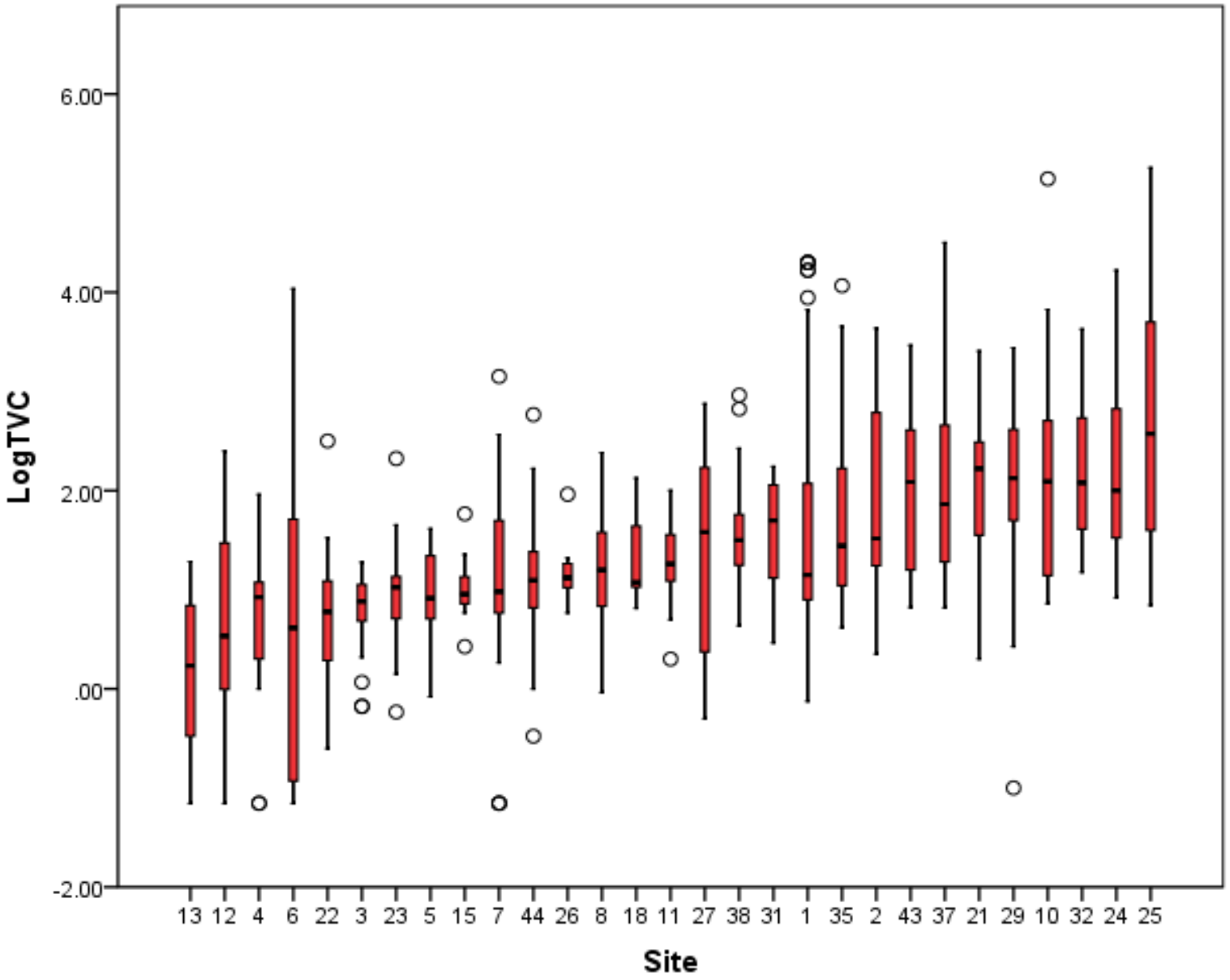


# Beef Primals (n=572 striploins, 572 outsides)

| | TVC | | E. coli | | Staph | |
|---|---|---|---|---|---|---|
| | S/loin | O/sde | S/loin | O/sde | S/loin | O/sde |
| Prev (%) | 99.1 | 99.1 | 10.7 | 25.2 | 7.7 | 8.4 |
| Mean log (cfu/cm$^2$)* | 1.25 (18) | 1.51 (32) | -0.49 (0.3) | -0.26 (0.5) | 0.19 (1.5) | 0.18 (1.5) |
| Max log* | 5.26 | 4.22 | 2.30 | 2.40 | 1.40 | 1.62 |

* count of the positive samples

# Beef Primals – $\log_{10}$ TVC/cm$^2$ x Plant

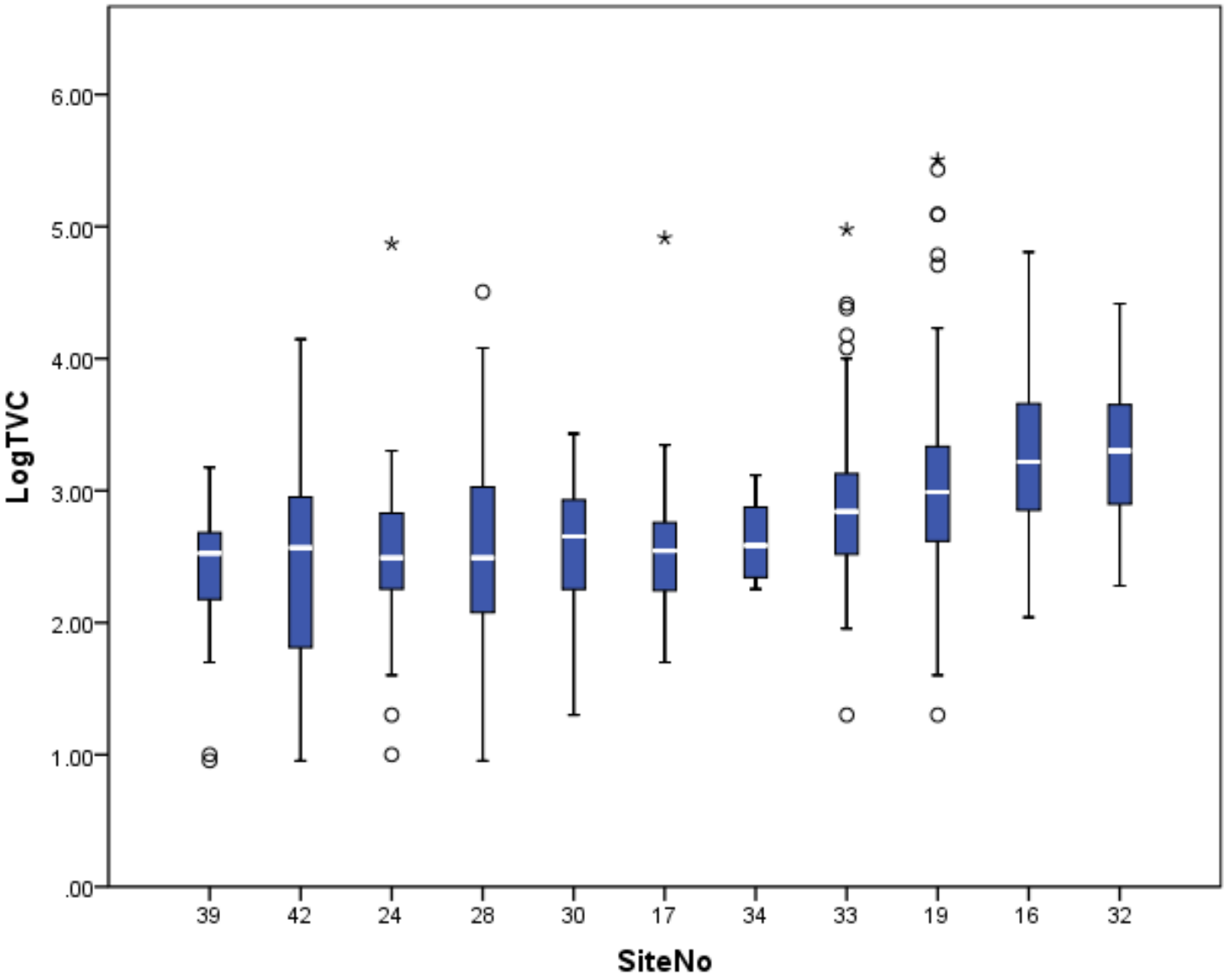


# Frozen Boneless Sheep meat (n=551)

| | TVC | E. coli | Staph |
|---|---|---|---|
| Prevalence (%) | 99.1 | 12.5 | 1.8 |
| Mean log* (cfu/g) | 2.80 (631) | 1.51 (32) | 1.66 (46) |
| Max log* | 5.51 | 3.30 | 2.32 |

* count of the positive samples

# Frozen Boneless Sheep meat – $\log_{10}$TVC/g x Plant

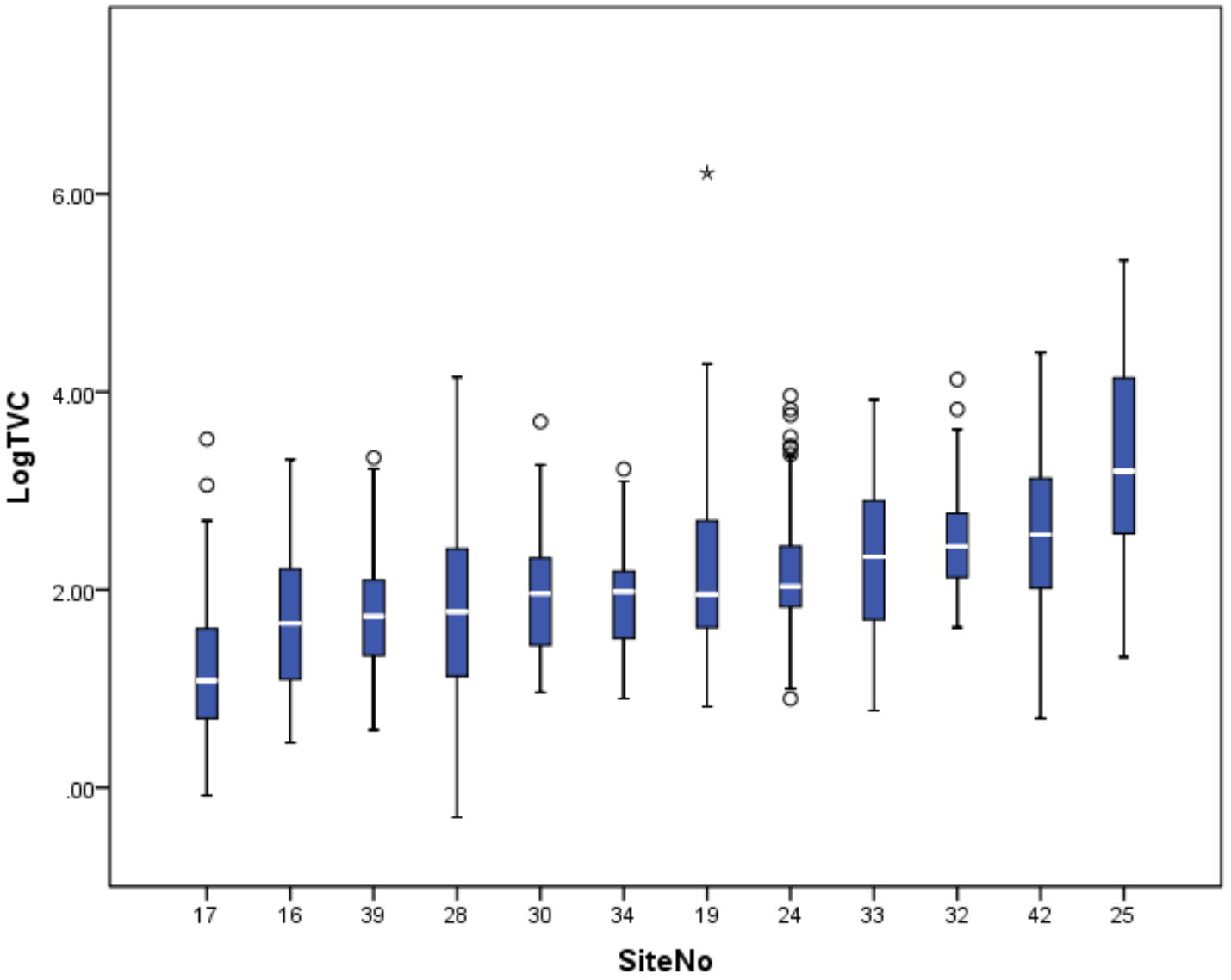


# Sheep meat Primals (n=613 legs, 613 shoulders)

| | TVC | | E. coli | | Staph | |
|---|---|---|---|---|---|---|
| | **Leg** | **Shld** | **Leg** | **Shld** | **Leg** | **Shld** |
| Prev (%) | 100 | 100 | 42.9 | 34.6 | 4.2 | 5.2 |
| Mean log ($cfu/cm^2$)* | 2.02 (105) | 2.29 (195) | -0.44 (0.4) | -0.63 (0.2) | -0.21 (0.6) | 0.34 (2) |
| Max log* | 4.64 | 6.21 | 2.36 | 1.82 | 1.15 | 2.96 |

* count of the positive samples

# Sheep Primals – $\log_{10}$ TVC/cm$^2$ x Plant



# Pathogens – 2011

- *Listeria mono* was not detected
  - *Listeria spp* detected on 1/613 sheep leg in summer & 1/572 beef striploin in winter (both from the same site)
- Campylobacter not tested in frozen trim
  - Detected on 1/613 sheep shoulder in winter
- *E.coli* O157 not tested in frozen trim
  - Detected on 1/613 sheep shoulder in summer & 2/613 sheep legs in winter
- Salmonella detected in
  - 3.1% of sheep meat trim (17/551)
  - 2.8% sheep legs (17/613)
  - 0.8% sheep shoulders (5/613)

# Salmonella

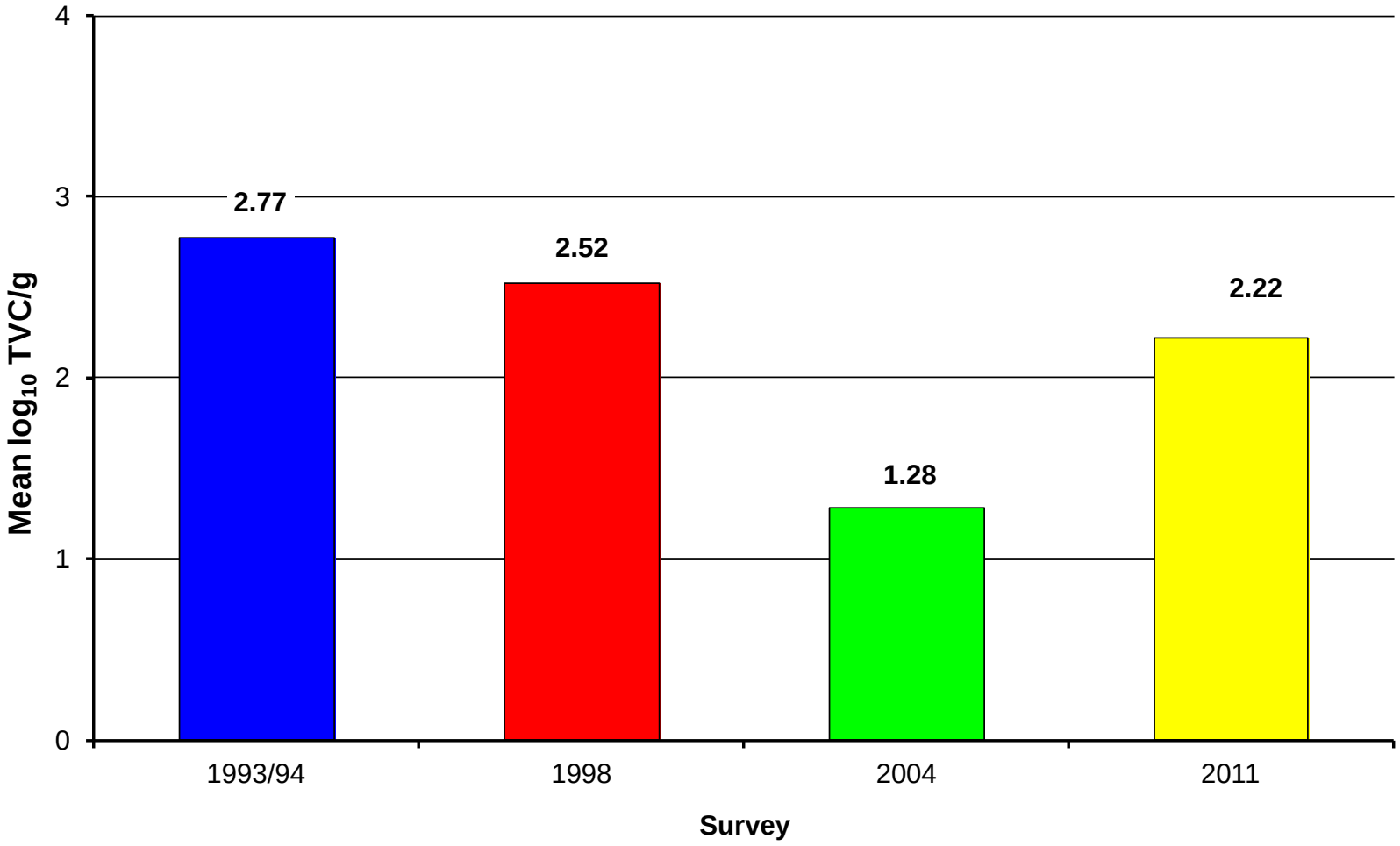
| ESAM | Positive samples | |
|---|---|---|
| | Summer | Winter |
| Carcases | 2 (0.4%) | 4 (0.7%) |

| | | Positive samples | | |
|---|---|---|---|---|
| | Summer | Winter | Total | % positive |
| Trim | 3 | 14 | 17 | 3.1 |
| Legs | 5 | 12 | 17 | 2.7 |
| Shoulders | 4 | 1 | 5 | 0.8 |
| | 0.70% | 1.52% | | |

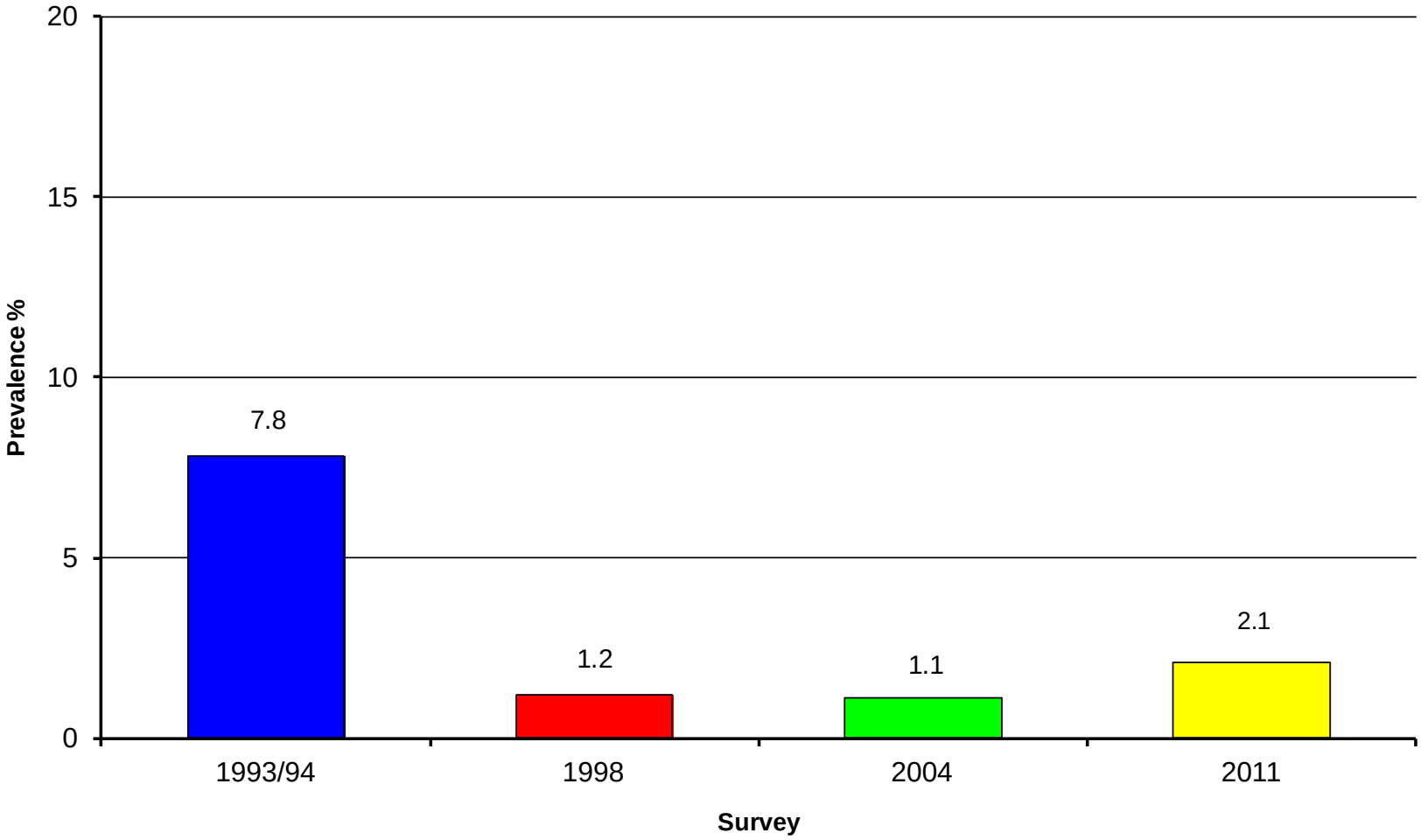
- ✓ 51% of positives came from two plants which were also processing goats
- ✓ 54% of positives came from plants which hot-boned
- ✓ One establishment had 13/28 (46%) positives in winter for boneless mutton

# Comparisons – previous baselines

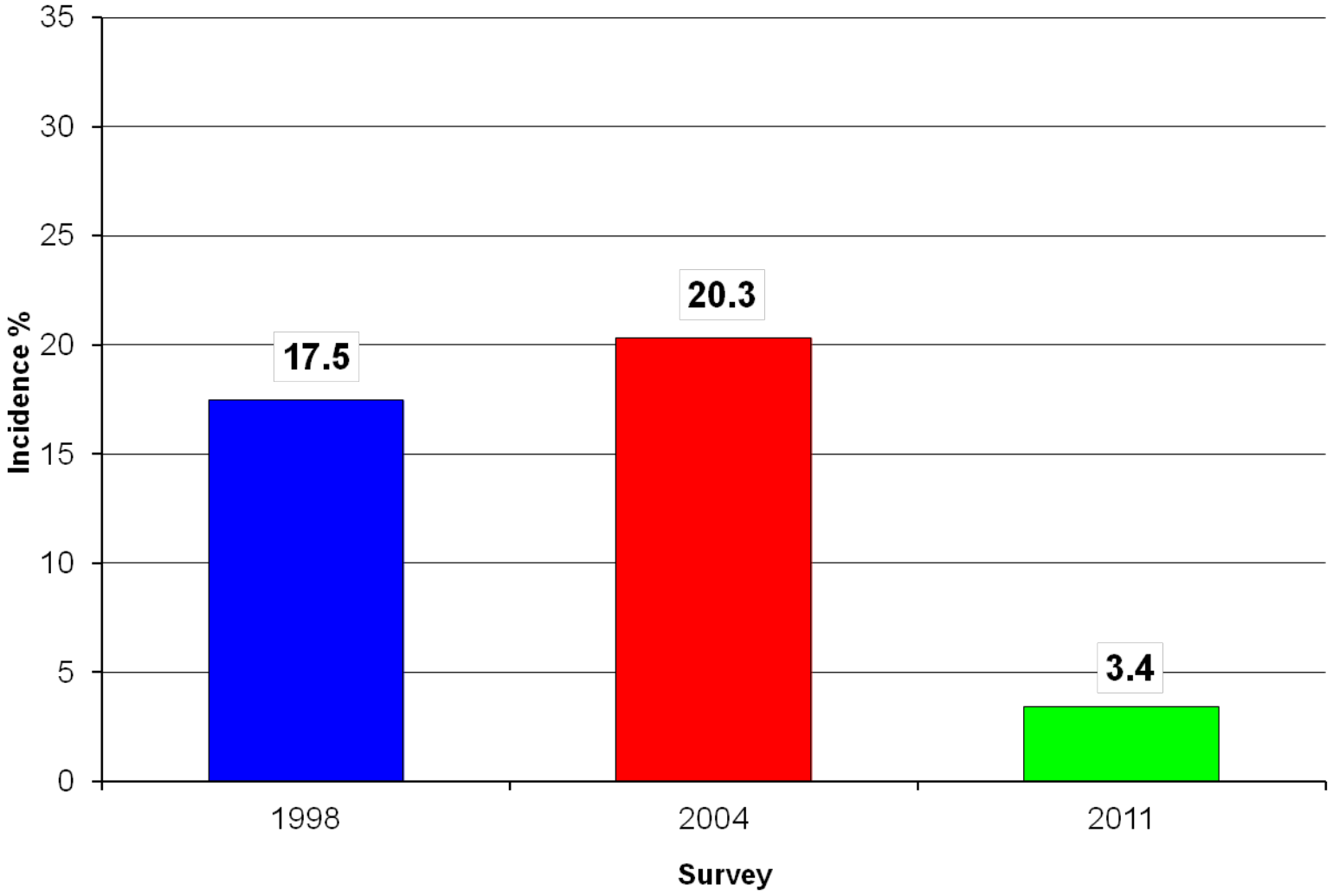
# TVC – Frozen Boneless Beef – 1993-2011



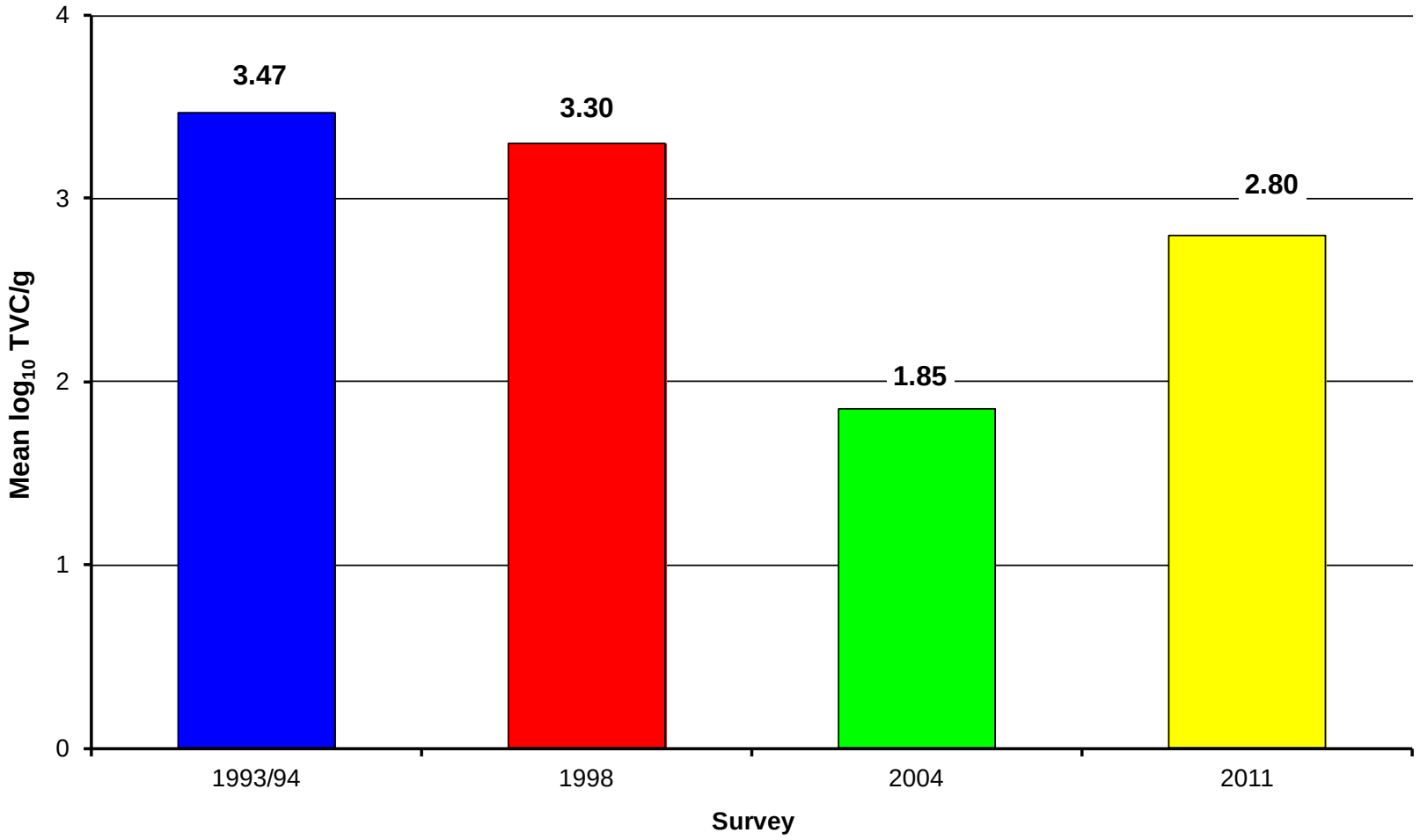
# *E.coli* – Frozen Boneless Beef – 1993-2011



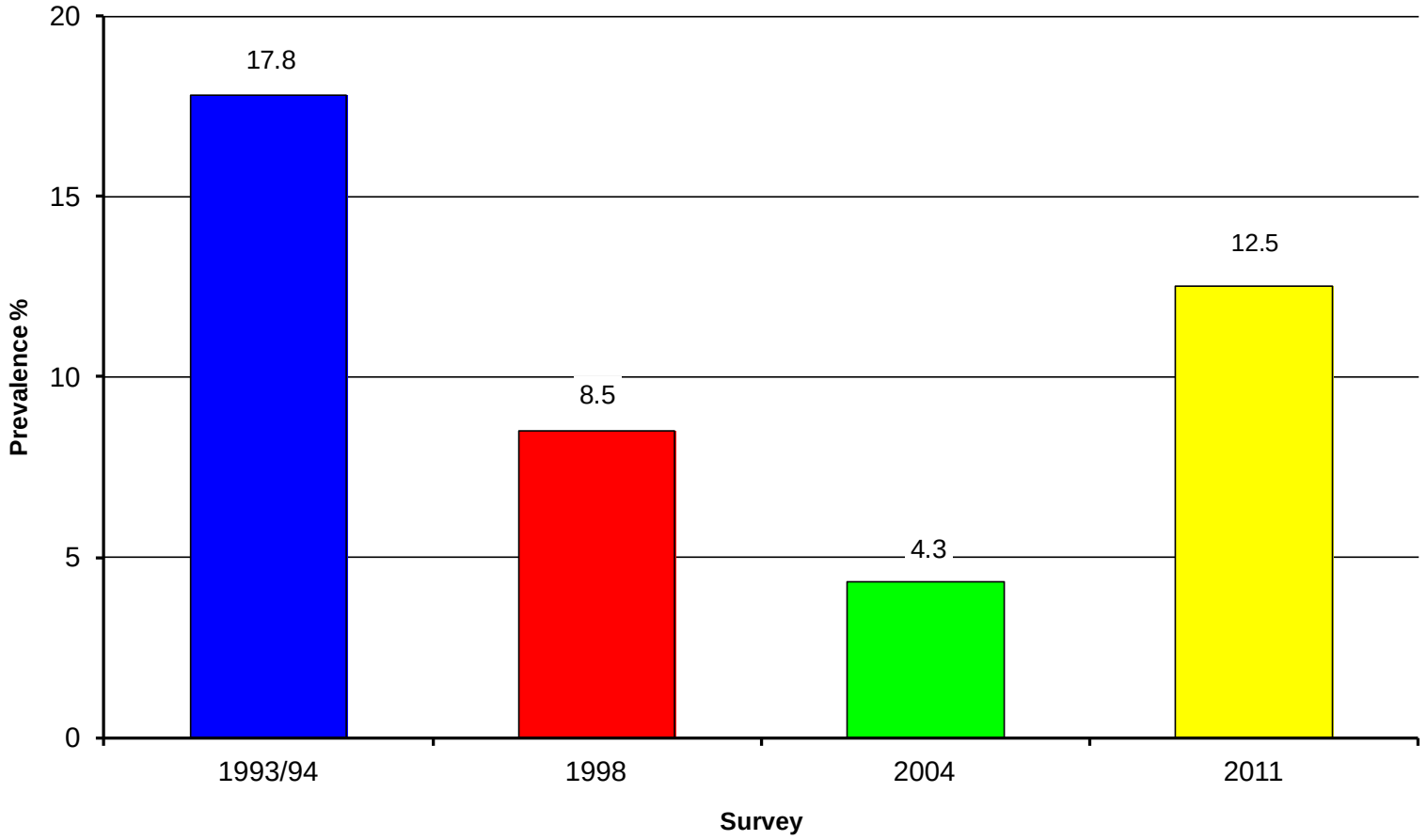
# *S.aureus* – Frozen Boneless Beef – 1993-2011



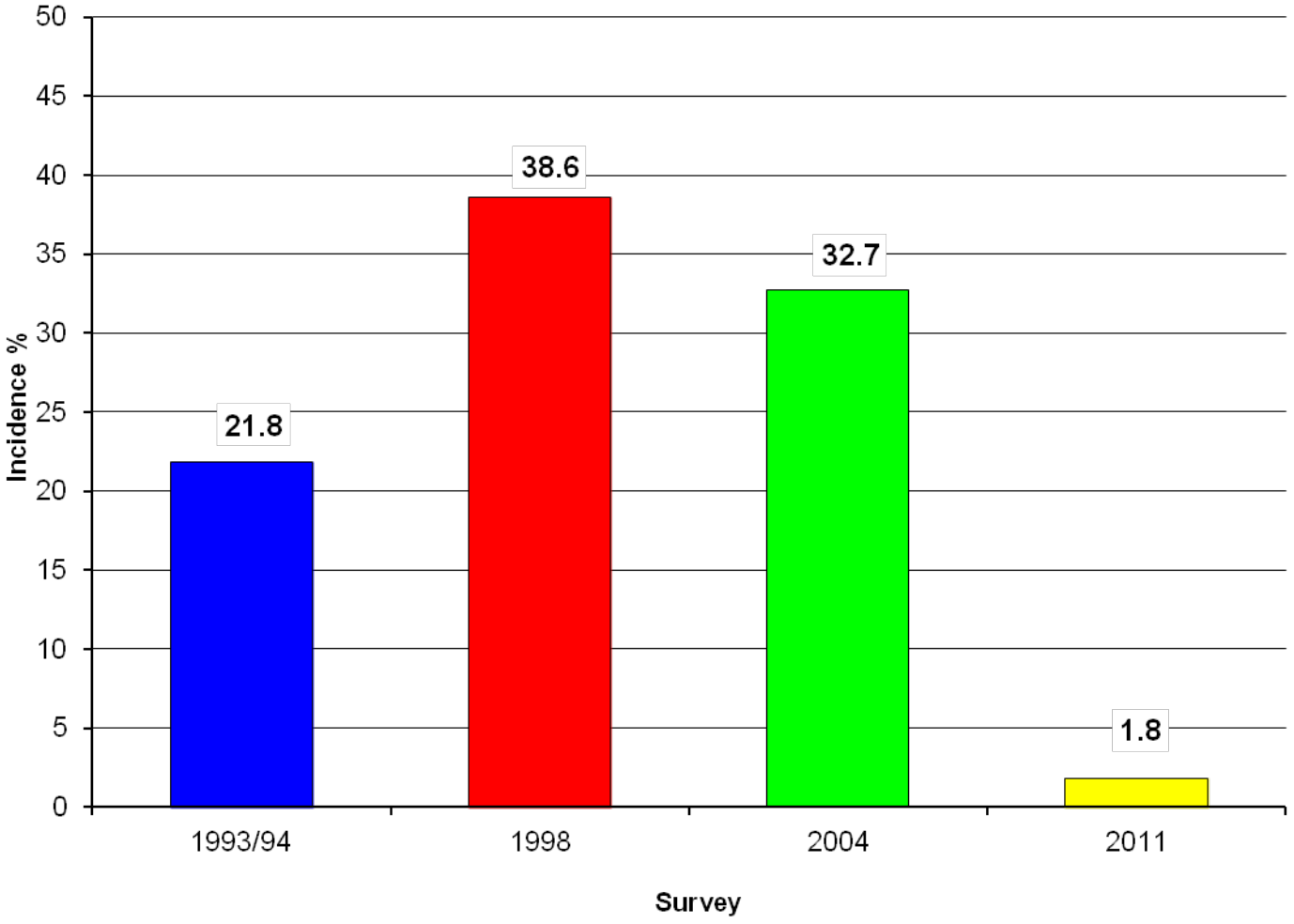
# TVC – Frozen Boneless Sheep meat – 1993-2011



# *E.coli* – Frozen Boneless Sheep meat 1993-2011

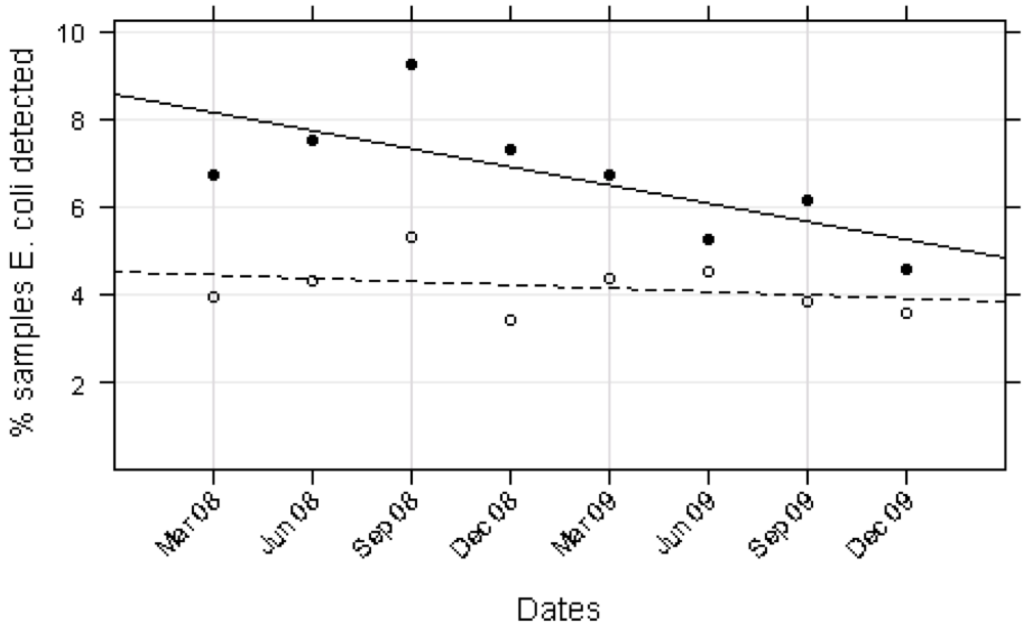


# *S.aureus* – Frozen Boneless Sheep meat 1993-2011

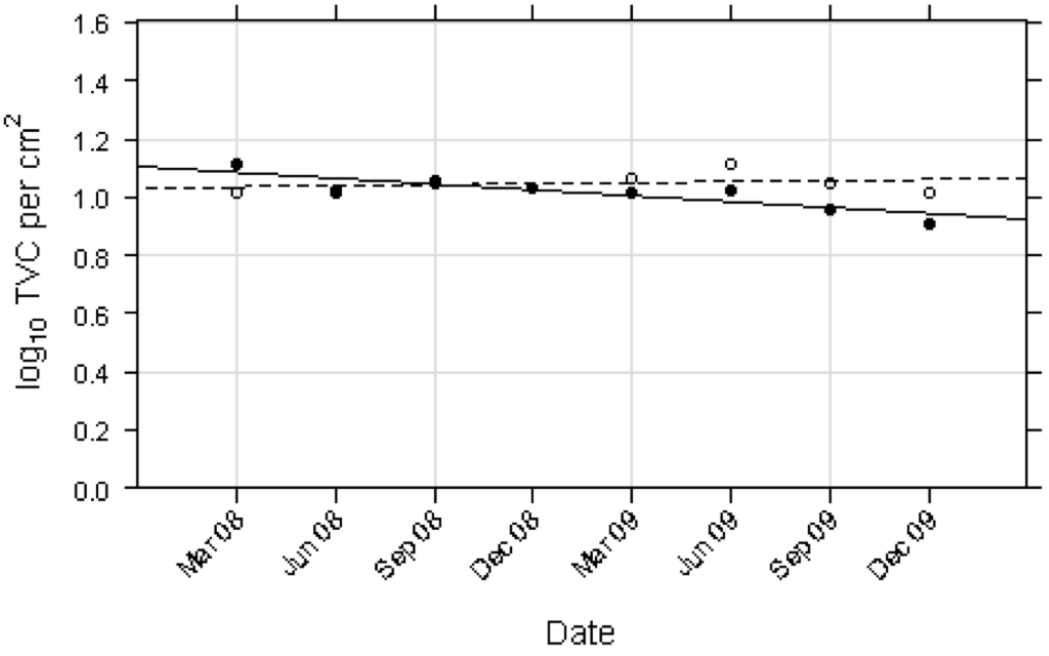


# Counts increased – why?

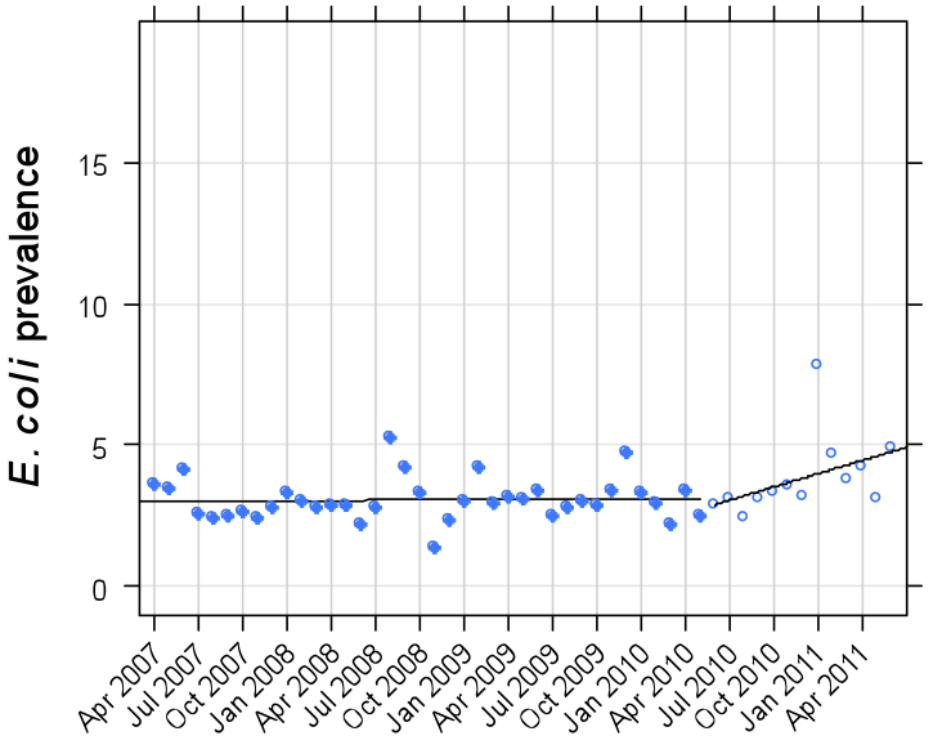
# Trends good – *E. coli* on beef carcases in 2008/09



# Trends good – TVC on beef carcases in 2008/09

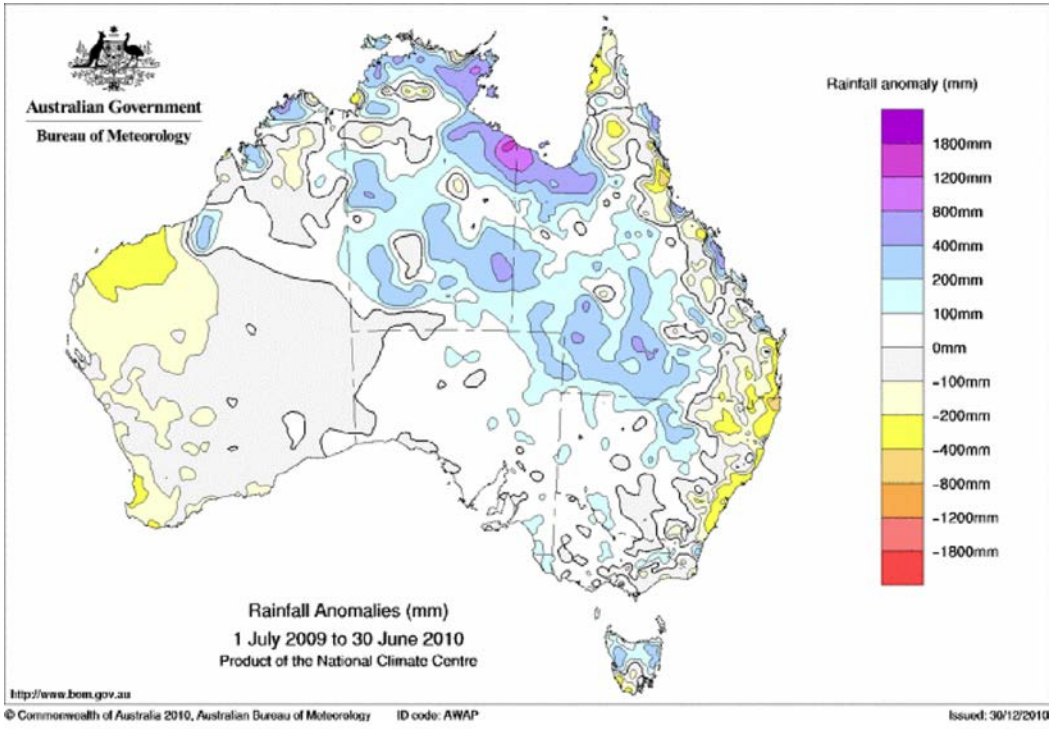


# Upswing late in 2010-early 2011



# Reasons for the upswing?

- MLA's risk management panel reviewed data and thought weather patterns in winter 2010-summer 2011 may be responsible
- Common belief that wet conditions lead to higher counts on carcases due to condition of hides
- SARDI were commissioned to have a close look at ESAM data and see if any alignment with high rainfall


Australian Government
Bureau of Meteorology
Rainfall anomaly (mm)
1800mm
1200mm
800mm
400mm
200mm
100mm
0mm
-100mm
-200mm
-400mm
-800mm
-1200mm
-1800mm
Rainfall Anomalies (mm)
1 July 2009 to 30 June 2010
Product of the National Climate Centre
http://www.bom.gov.au
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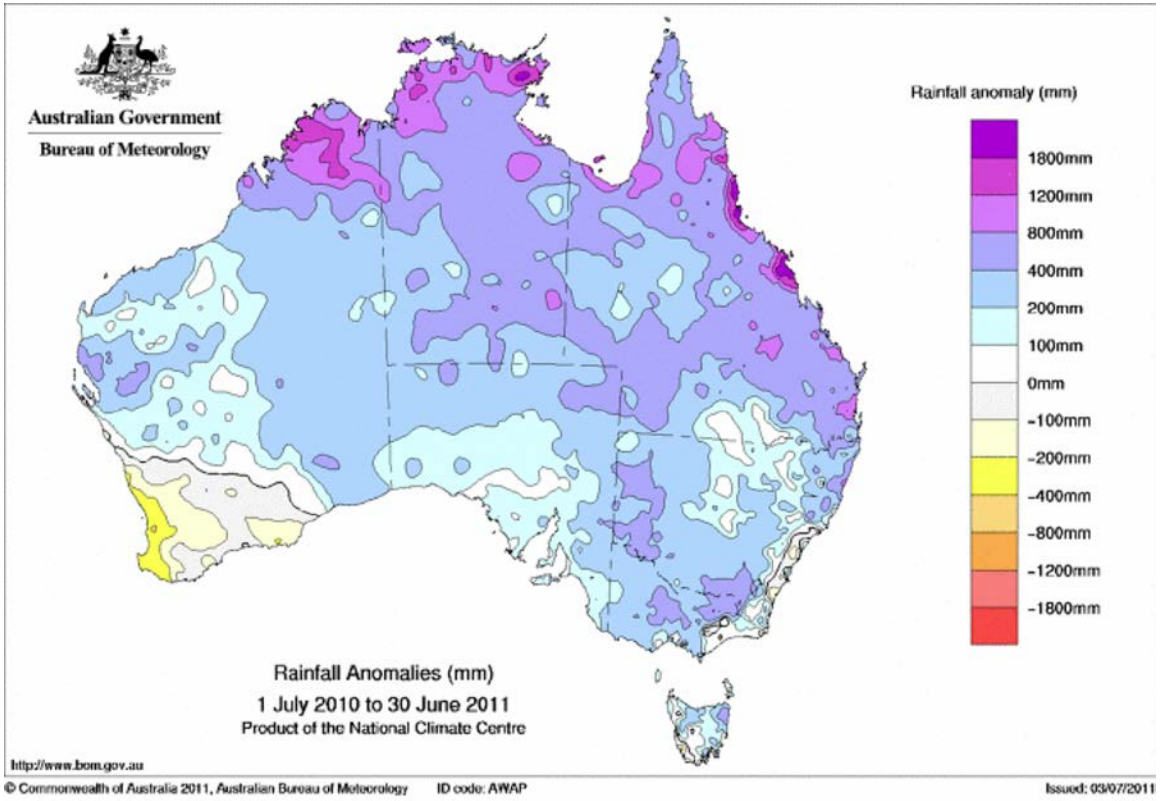
ID code: AWAP
Issued: 30/12/2010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Rainfall Anomalies (mm)
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http://www.bom.gov.au
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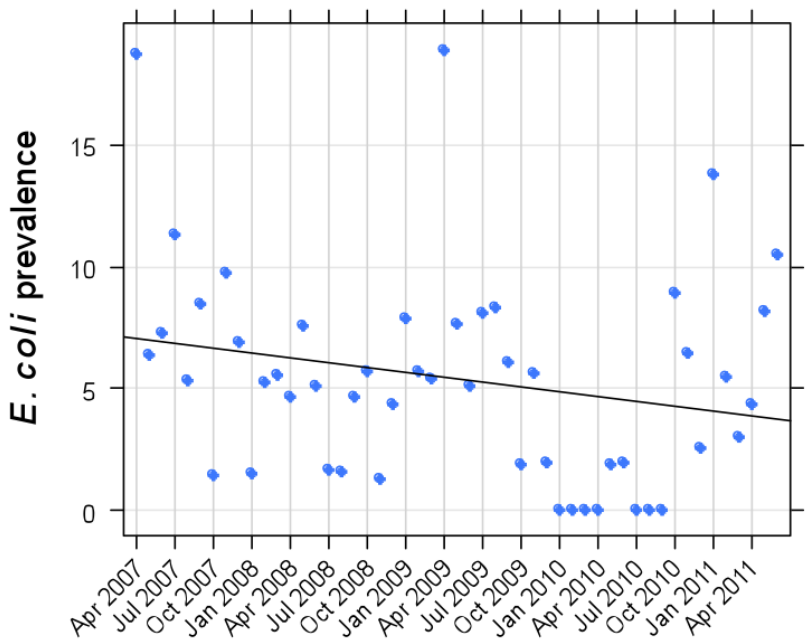
ID code: AWAP
Issued: 03/07/2011

# Theory

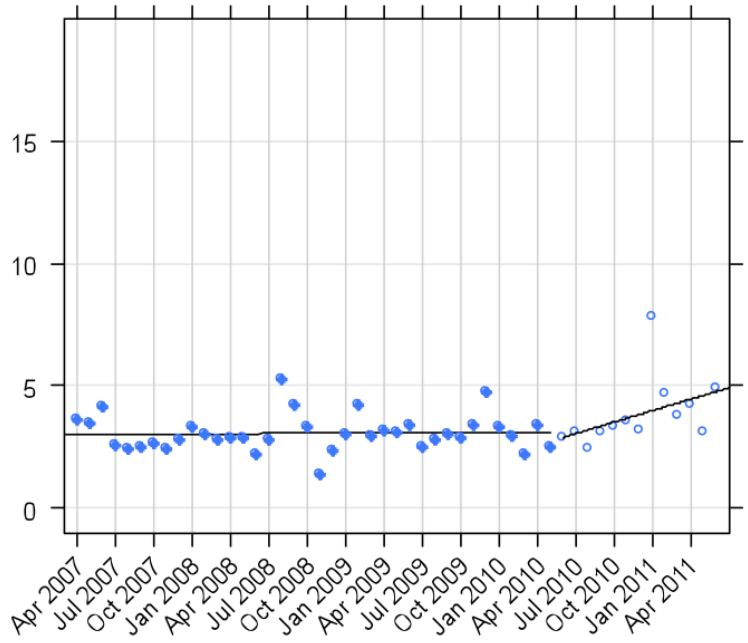
- If rainfall is a factor in upward trends in counts there should be a difference between WA (dry) and eastern states (much wetter than normal)

- SARDI divided data according to WA and rest of Australia

## Western Australia




## Rest of Australia



# Why should rainfall have such a marked affect?

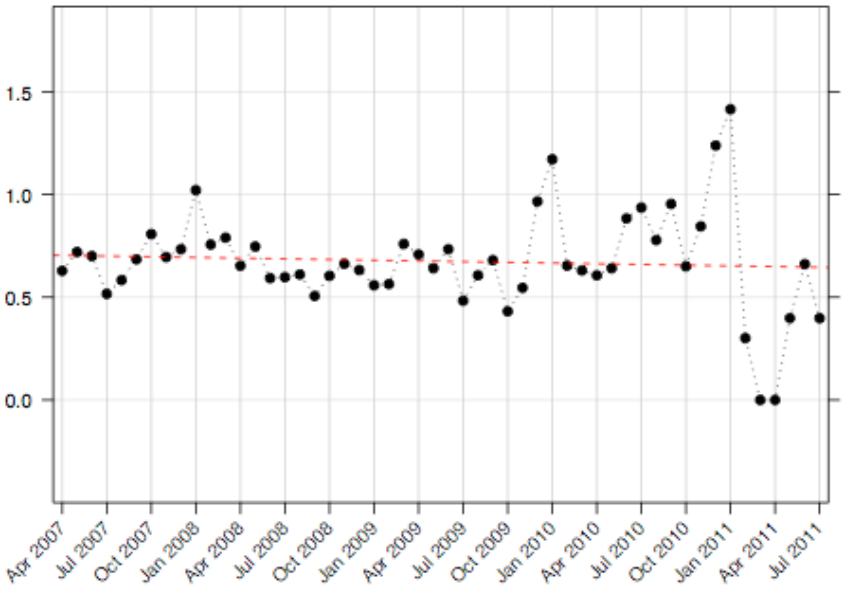
- Publications link counts with:
  - Contamination of the hide
  - Processing rate (chain speed)
- Could these have changed in 2010-2011?
- We hear about difficulty getting stock to railheads and on trucking routes

# Neighbouring establishments

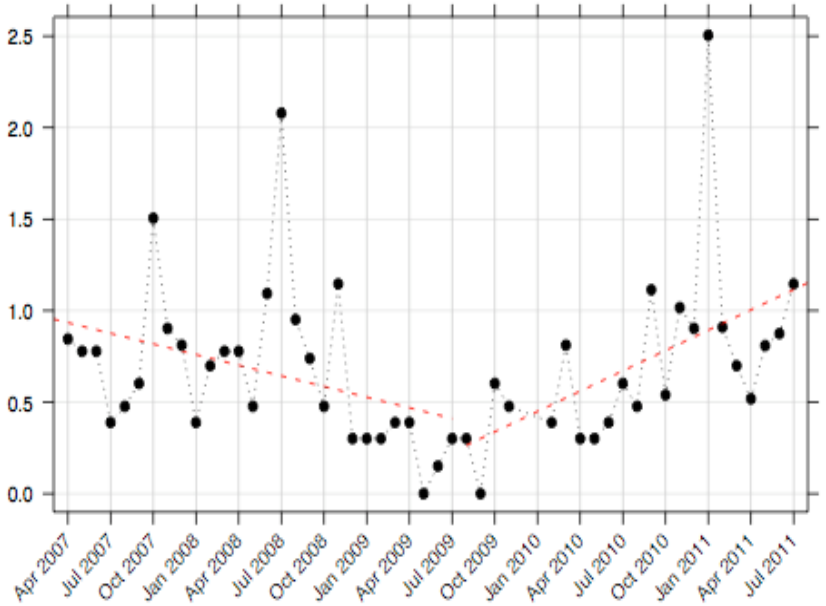
- Not all establishments had increased counts
- Two beef plants in Queensland are 300km apart
- About the same slaughter throughput
- But they are different – why?

# Neighbouring establishments

## Establishment A



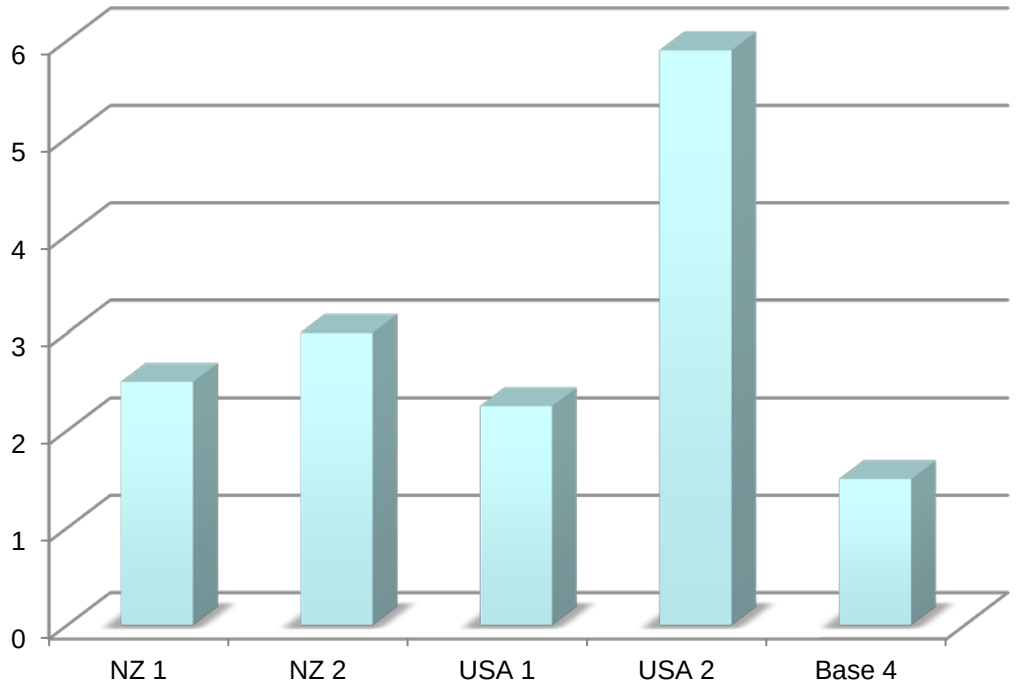

## Establishment B

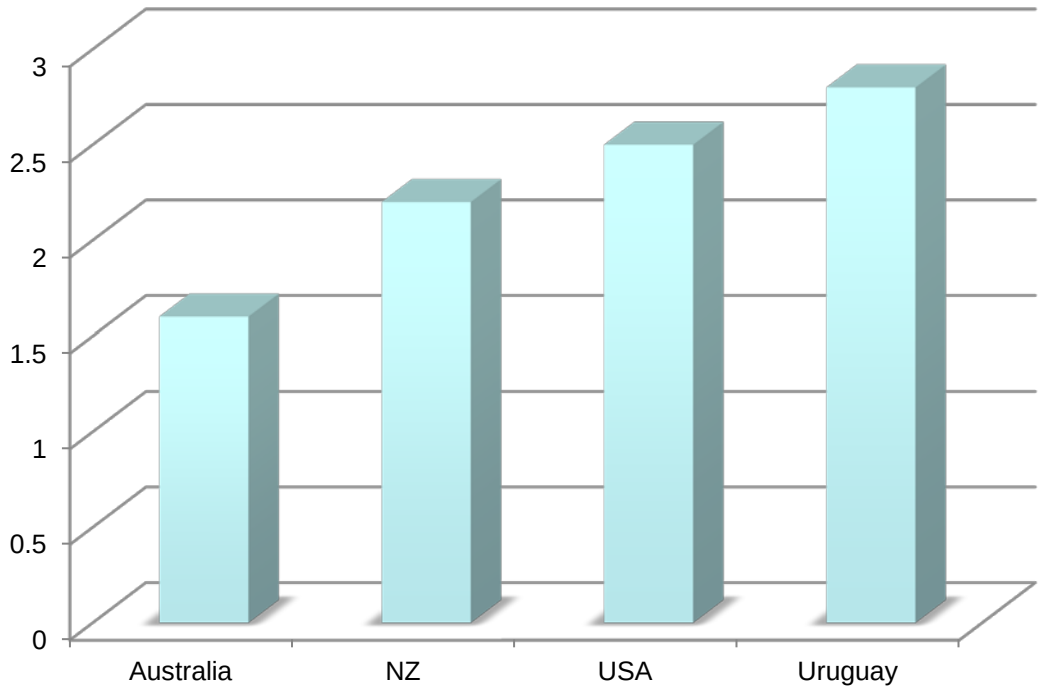


# Comparisons – other studies

# Beef Primals at packaging

Log TVC



# Boneless beef

Log TVC