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Prepared by: **Department of Agriculture and Food, Western Australia**
RT Norris & GJ Norman

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National livestock export industry shipboard performance report 2012

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Executive summary

The objective of this project was to summarise the performance of the livestock export industry in terms of mortality levels of sheep, cattle and goats exported by sea from Australia during 2012.

Industry stakeholders, government, animal welfare groups and the general public have a keen interest in monitoring performance in different sectors of the livestock export trade. This summary report provides the only comprehensive breakdown by ship, species, time of year, load ports and major destinations over the calendar year.

The overall mortality rate for sheep during sea transport to all destinations during 2012 was 0.81% out of approximately 2.24 million sheep exported. This was higher than the 0.75% mortality rate observed in 2011. The main port of loading was Fremantle (1.42 million sheep exported with mortality rate of 0.82%), followed by Adelaide (0.37 million sheep exported with mortality rate of 0.88%) and Portland (0.13 million sheep exported with mortality rate of 0.47%).

The overall mortality rate among the 0.62 million cattle exported from Australia in 2012 was 0.11%. This was lower than the 0.12% mortality rate observed in 2011. The overall mortality rate on voyages to the Middle East/North Africa continued at the record low of 0.16% experienced in 2011. The overall mortality rate on voyages to South-East Asia was 0.04%, continuing the record low rate first observed in 2010 for the region. The highest overall mortality rate on a regional basis was 0.28% for exports to the newly examined region of South-East Europe (75,170 cattle exported), while the lowest overall mortality rate was 0.04% for exports to South-East Asia (361,383 cattle exported).

The overall mortality rate among the 635 goats exported by sea from Australia in 2012 was 0.00%. This is the first time this figure has been reached since recording began. All goats exported by sea during 2012 went to South-East Asia. Air transport of goats was again examined in 2012, with the vast majority of the 64,209 goats being flown to South-East Asia. The overall mortality rate for air-transported goats was also nil.

Contents

1 Background

The live export of sheep and cattle makes a significant contribution to the Australian economy and provides employment in services that support this industry. The livestock export trade provides important support for the sheep and cattle industries of Australia and is the only market outlet for producers in some areas of the country.

This report summarises information about mortalities in sheep, cattle and goats during sea transport from Australia. It allows industry, government and others to monitor mortality trends in these sectors. The report also lists relevant published studies and current research related to the industry.

The Australian Government Department of Agriculture, Fisheries and Forestry (DAFF) also presents mortality data, though in a different format, at their website: www.daff.gov.au/animal-plant-health/welfare/export-trade/mortalities. The DAFF report refers only to voyages for which data was *received* during the calendar year, in contrast to the current report which refers to data for all voyages which *departed* during the calendar year.

2 Project objectives

The project objectives were to:

a) Produce a report which summarises the mortality of sheep, cattle and goats for the 2012 calendar year and provide an informed analysis of mortality trends in the livestock export industry
b) Maintain data and expertise to provide analysis and informed comment

3 Methodology

The information in this report was obtained from ship Master's Reports which record livestock mortalities and other information about each voyage, and also from "Yellow Books". "Yellow Books" record more detailed information about numbers of livestock mortalities (daily mortality by type-age-sex category and port of loading over the loading, voyage and discharge phases) than is available from the Masters' Report.

The shipboard part of the export process is divided into three phases: loading (load); voyage to the first port of unloading (voyage); and discharge. The discharge phase includes all mortalities after arrival at the first port. Consequently if a ship called at more than one discharge port, all the mortalities after arrival at the first port were included in the discharge phase.

The current report is for voyages which departed Australia during 2012 and for which records were to hand on 30th April 2013. Information on the number of sheep exported to various destination countries from ports in Australia was sourced from the Australian Bureau of Statistics.

In recent years the significant rise in livestock exports to Turkey and the Black Sea has boosted the Miscellaneous category. A new destination region, South-East Europe, has been introduced to allow a more meaningful examination of exports to this region. South-East Europe includes ports in Turkey and the Black Sea. North-East Asia includes ports in China, Japan, Korea and eastern Russia.

From 2012 onward, graphs and tables presenting long-term overviews will be restricted to a rolling ten-year basis. It is considered that the older data does not reflect the current state of the trade in terms of standards required of industry, ships participating and markets serviced.

Readers should be aware that additional mortality information (Masters' reports or "Yellow Books") for a particular year may be received after publication of that year's summary report. These records are added to the database and used in subsequent analyses. Therefore, statistics for a particular year may vary slightly in subsequent reports from those originally published.

In order to maintain confidentiality, individual ships are identified by codes. Summary information was produced using Statistix 7.0 (Analytical software 2000 Tallahassee, Florida USA).

4 Results and discussion

4.1 Sheep

4.1.1 Performance trend

Figures 1 and 2 show the number of sheep exported and the number of mortalities during sea transport from all ports in Australia to all destinations over the last decade as well as the trend line (linear regression) across those years. The 2.24 million sheep exported in 2012 is the lowest number recorded (since 1985). The number of sheep exported annually since 2003 has varied between 2.24 and 4.67 million, and the annual mortality has varied between 0.75 and 0.97%. The trend for numbers of sheep exported and annual mortality has been downward.

Figure 1 Number of sheep exported by sea from Australia to all destinations since 2003

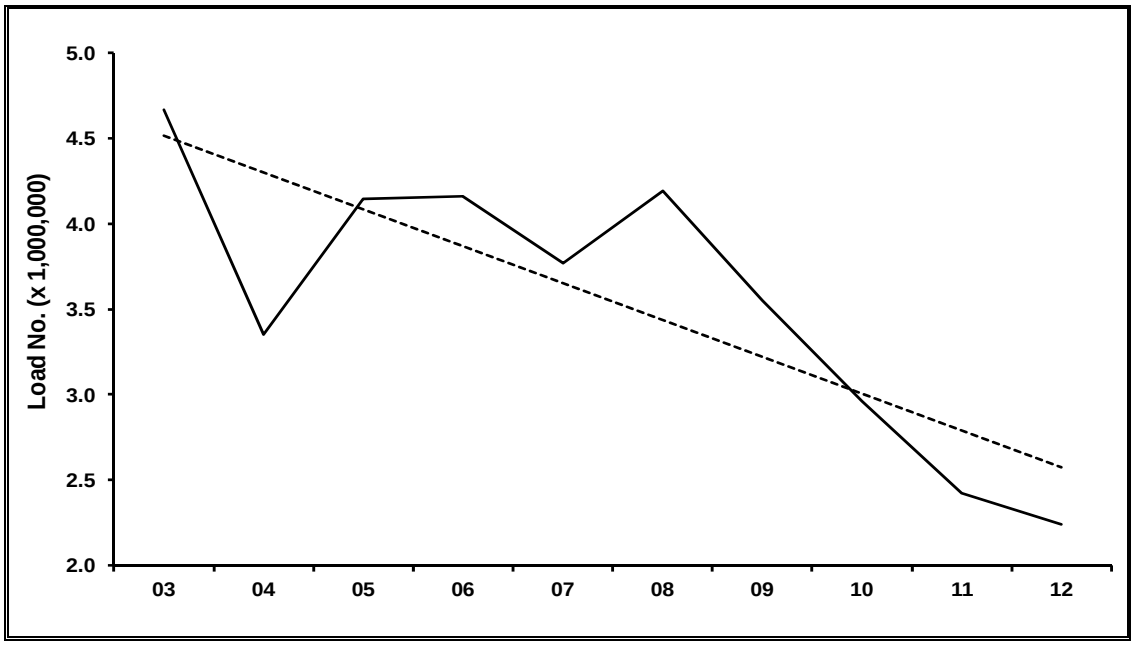
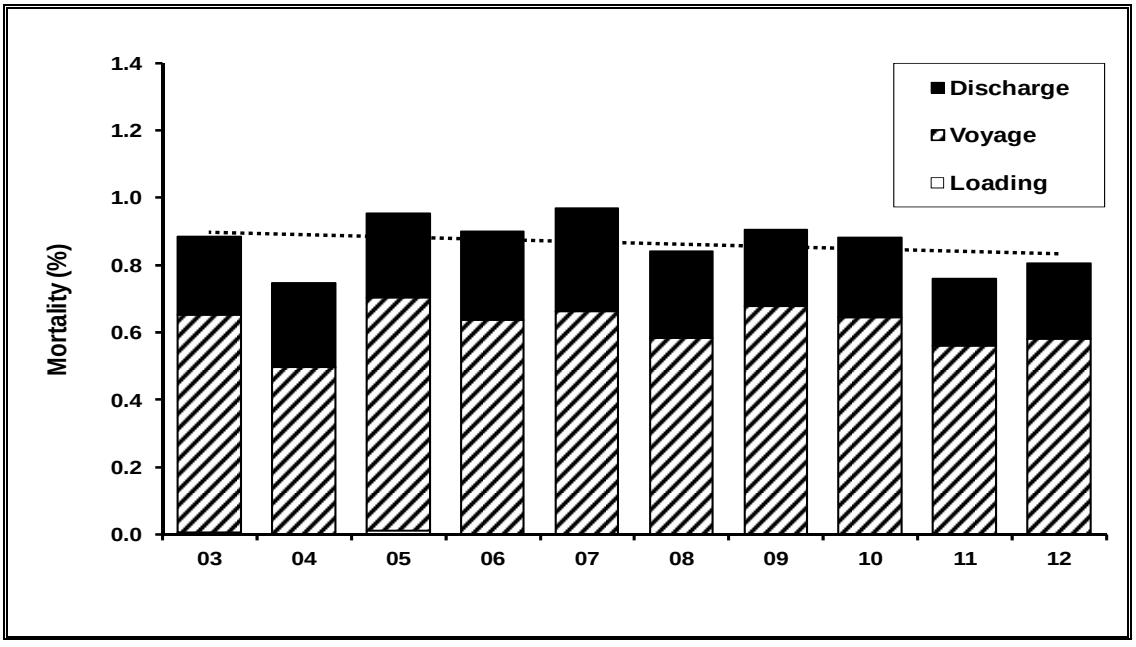


Figure 2 Annual mortality of sheep exported by sea from Australia to all destinations since 2003



4.1.2 Overview

All sheep exported live by sea from Australia in 2012 were loaded either at Fremantle (77.5%), Adelaide (16.5%), Portland (5.7%), and Geraldton and Darwin (0.3%). Overall average voyage and discharge lengths were 17.88 and 3.67 days respectively (Table 1).

The shipboard part of the export process is divided into three phases: loading (load); voyage to the first port of unloading (voyage); and discharge. The discharge phase includes all mortalities after arrival at the first port. Consequently if a ship called at more than one discharge port, all the mortalities after arrival at the first port were included in the discharge phase.

There were 6 voyages to the Middle East/North Africa in 2012 for which sheep were loaded at more than one port in Australia (split-load voyages). Mortalities for split-load voyages were attributed to the port of loading for all voyages in 2012. Where analysis involves split-load voyages, the consignments of sheep from each load port have been considered as separate “voyages”.

Using the above definition of voyage, there were 37 "voyages" of sheep to the Middle East/North Africa during 2012. This involved 30 ship journeys, six of which were split-loaded. An additional voyage was split because of a discharge anomaly (extraordinary length of time before arrival at the final discharge port) that resulted in a total mortality rate of 4.2% in that subgroup of sheep.

Approximately 1,979,000 sheep were exported to the Middle East/North Africa (88.4% of all sheep exported) and the average voyage length (voyage to first discharge port) for exports to this region was 17.01 days with 4.14 days for discharge (most voyages had multiple discharge ports). The overall mortality for these sheep was 0.81%.

Approximately 250,000 sheep (11.2%) were exported to South-East Europe. The overall mortality rate for these sheep was 0.78% with an average voyage length of 26.94 days and an additional 3.41 days for discharge.

Approximately 8,500 sheep (0.4%) were exported to South-East Asia. The overall mortality rate for these sheep was 0.31% with an average voyage length of 10.35 days and an additional 0.65 days for discharge.

Approximately 1,300 sheep (0.1%) were exported to Miscellaneous destinations. The overall mortality rate for these sheep was 0.46% with an average voyage length of 13.58 days and an additional 0.39 days for discharge.

Table 1 Mortality rates, number of voyages, voyage and discharge days, and number of sheep exported for voyages to major destination regions during 2012

Parameter	ME/N Africa	SE Asia	Misc	SE Europe	Total
Voyages (No.)	37	3	2	7	49
Sheep (No.)	1,978,618	8,5143	1,296	249,602	2,238,030
Mortality rate overall (%)	0.81	0.31	0.46	0.78	0.81
Mortality rate range (%)	0.2 – 4.2	0.0 – 0.4	0.3 – 0.6	0.3 – 1.4	0.0 – 4.2
Voyage days (Ave.)	17.01	10.35	13.58	26.94	17.88
Discharge days (Ave.)	4.14	0.65	0.39	3.41	3.67

Destination Country

The countries that imported Australian sheep in 2012 are shown in Table 2. The main importing countries were Kuwait (31% of all Australian sheep exports in 2012), followed by Qatar (23%) and Jordan (14%).

Overall export numbers fell by 8% compared to 2011. Exports to Jordan and Qatar rose by 34% and 26% respectively, while Turkey, Bahrain and Kuwait fell by 44%, 42% and 35% respectively.

Table 2 Destination country for sheep exported from Australia during 2012

Country	Fremantle	Adelaide	Portland	Other	Total
Bahrain	194,741	55,000			249,741
Israel	52,900	9,700		1,407	64,007
Jordan	180,800	147,160			327,960
Kuwait	613,645	37,999	55,000		706,644
Oman	15,772		4,120		19,892
Qatar	469,020	8,000	54,874		531,894
Saudi Arabia	18,000	51,000			69,000
Turkey	182,447	50,200	12,500		245,147
UAE	21,500	11,711			33,211
S.E. Asia	2,000			27,674	29,674
Other	1,300			146	1,446
Total	1,752,125	370,770	126,494	29,227	2,278,616

SOURCE – Australian Bureau of Statistics, March 2013

Note: As ABS figures include exports by air; figures in Table 2 may not reflect those in Table 1.

The destination regions of Middle East/North Africa and South East Europe will be examined in further detail below.

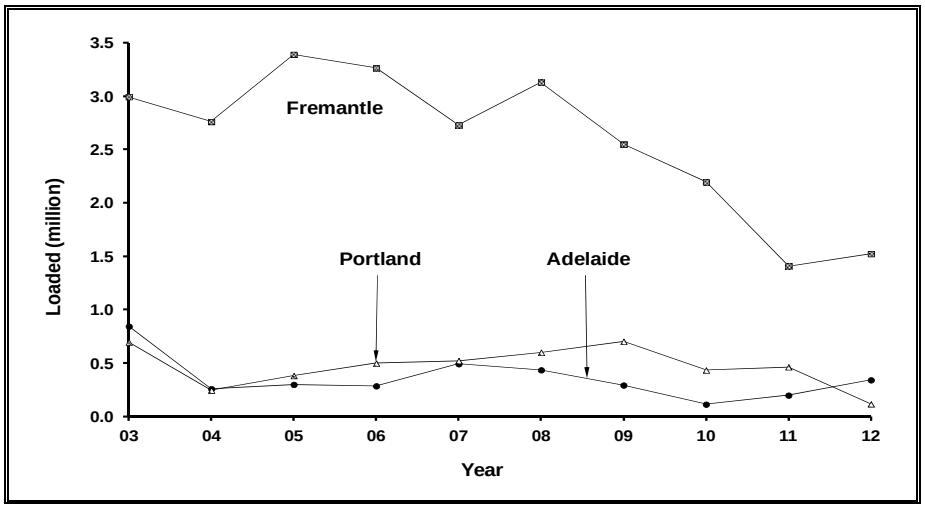
4.1.3 Middle East/North Africa

4.1.3.1 Port of loading

Most sheep exported by sea from Australia to the Middle East/North Africa during 2012 were loaded at Fremantle (77.0% of all sheep, Figure 3) with smaller numbers loaded at Adelaide (17.2%), Portland (5.8%) and Geraldton (0.1%).

The sheep exported from Geraldton comprised a single voyage with a mortality rate of 0.35%. Geraldton will not be individually referred to again in the sheep section of this report

Figure 3 Number of sheep exported by sea to the Middle East/North Africa from Fremantle (Western Australia), Portland (Victoria) and Adelaide (South Australia) since 2003



The number and class of sheep exported by sea to the Middle East/North Africa from Fremantle, Adelaide and Portland during 2012 are shown in Table 3. Overall numbers exported to the region in 2012 fell by 4.3% compared to 2011. Exports from Fremantle and Adelaide rose by 8% and 73% respectively, while exports from Portland fell by 75%. Exports to the region were the lowest since recording began in 1985.

The main changes in 2012 compared to 2011 were a 75% decrease in exports of wether adults from Portland, offset by increases from Fremantle and Adelaide of 52% and 158% respectively. There were significant reductions in wether hoggets from Fremantle, Adelaide and Portland (-20%, -47%, -100% respectively) and significant reductions in wether, ram and ewe lambs from Fremantle (-18%, -45%, -52% respectively). The only class to experience any significant overall increase in exports was adult wethers which rose by 12%.

Table 3 The numbers and classes of sheep exported by sea to the Middle East/North Africa from Fremantle, Adelaide and Portland during 2012

Livestock		Fremantle	Adelaide	Portland	Total
Wethers	adults	834,757	252,159	101,776	1,188,692
	hoggets	118,255	34,651		152,906
	lambs	315,807	42,897	10,974	369,678
Rams	adults	35,468	2,550	1,001	39,019
	hoggets	42,266	5,285	284	44,791
	lambs	78,625	629		83,910
Ewes	adults	74,690			74,690
	hoggets	475			475
	lambs	22,611	473		23,084
Total	sheep	1,522,954	340,256	114,035	1,977,245

4.1.3.2 Mortality rates

The total mortality rate for all sheep exported to all destination regions during 2012 was 0.81% (Table 4), an increase from 0.75% observed in 2011. While the 2012 mortality rates in sheep exported from Fremantle and Adelaide rose (36% and 16% respectively) compared to 2011, the mortality rate of sheep exported from Portland fell 60% to a record low of 0.42% (Table 3 and Figure 4).

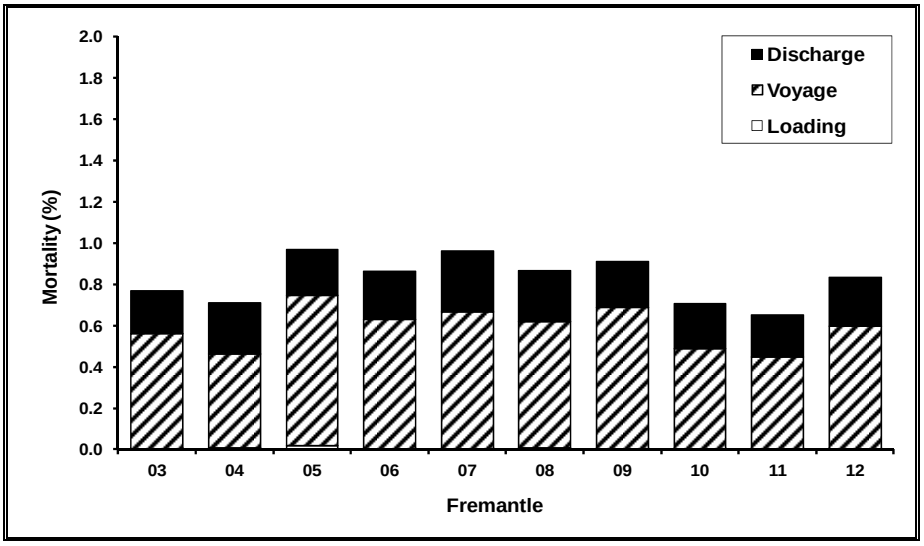
Table 4 Annual shipboard mortality rates for sheep exported from Fremantle, Adelaide and Portland to the Middle East/North Africa, and Total mortality rate for all sheep exported to all destinations

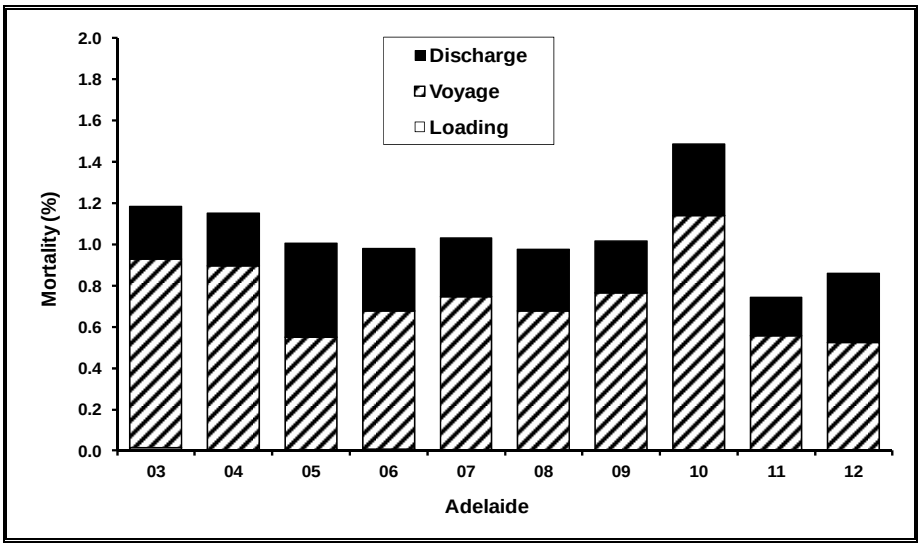
		Mortality rate (%)			
	Year	Load	Voyage	Discharge	Total
Fremantle*	2008	0.01	0.61	0.25	0.87
	2009	0.00	0.68	0.22	0.91
	2010	0.00	0.48	0.22	0.71
	2011	0.00	0.44	0.20	0.65
	2012	0.00	0.60	0.23	0.83
Adelaide*	2008	0.00	0.67	0.30	0.97
	2009	0.00	0.76	0.25	1.01
	2010	0.00	1.14	0.35	1.48
	2011	0.00	0.55	0.18	0.74
	2012	0.00	0.52	0.33	0.86
Portland*	2008	0.00	0.36	0.27	0.64
	2009	0.00	0.61	0.24	0.86
	2010	0.00	1.17	0.32	1.49
	2011	0.00	0.83	0.21	1.05
	2012	0.00	0.31	0.11	0.42
Total**	2008	0.00	0.58	0.26	0.84
	2009	0.00	0.68	0.23	0.91
	2010	0.00	0.64	0.24	0.88
	2011	0.00	0.55	0.20	0.75
	2012	0.00	0.58	0.23	0.81

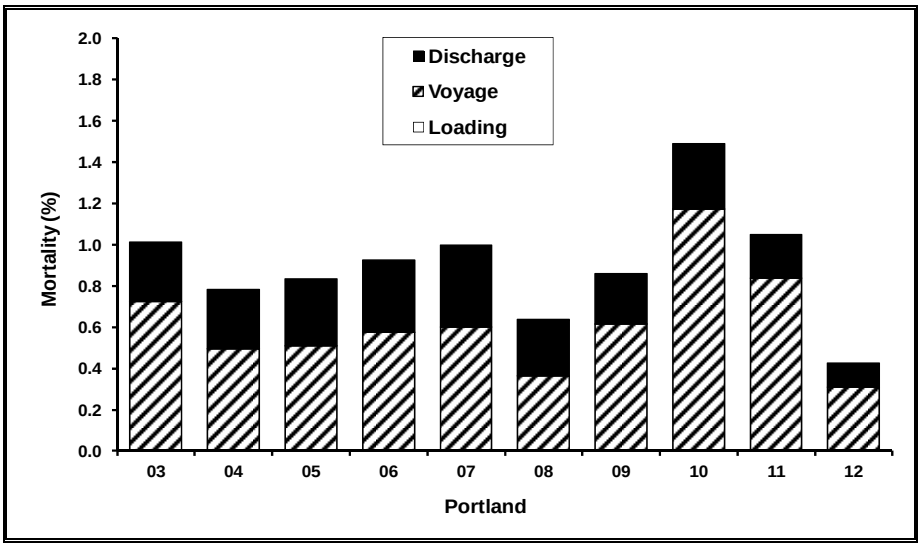
* Middle East/North Africa only

** Total includes all sheep exported by sea from Australia to all destinations

Figure 4 Annual mortality for sheep exported from Fremantle, Adelaide and Portland to the Middle East/North Africa since 2003







4.1.3.3 Class of sheep

The mortality rates of various classes of sheep exported from Australia to the Middle East/North Africa are shown in Table 5 and Figure 6. The highest total mortality rates for 2012 were in adult, hogget and lamb rams (1.4%, 1.3% and 1.2% respectively; refer to Table 3 for numbers loaded).

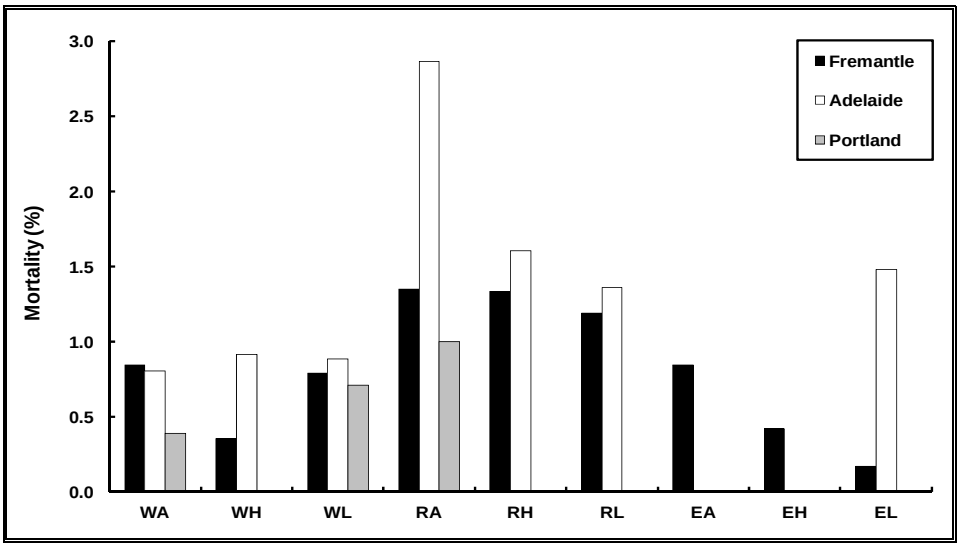
Table 5 Overall mortality (%) for classes of sheep exported from Fremantle, Adelaide and Portland to the Middle East/North Africa in 2012

Class of sheep		Fremantle	Adelaide	Portland	Total
Wethers	adult	0.85	0.80	0.39	0.80
	hogget	0.35	0.91	n/a	0.48
	lamb	0.79	0.89	0.71	0.80
Rams	adult	1.35	2.87	1.00	1.44
	hogget	1.33	1.61	0.00	1.34
	lamb	1.19	1.36	n/a	1.20
Ewes	adult	0.85	n/a	n/a	0.85
	hogget	0.42	n/a	n/a	0.42
	lamb	0.17	1.48	n/a	0.20

n/a - not applicable (no sheep of this class were loaded)

Figure 5 Overall mortality (%) for classes of sheep exported from Fremantle, Adelaide and Portland to the Middle East/North Africa in 2012

WA = wether adults WH = wether hoggets WL = wether lambs
RA = ram adults RH = ram hoggets RL = ram lambs
EA = ewe adults EH = ewe hoggets EL = ewe lambs

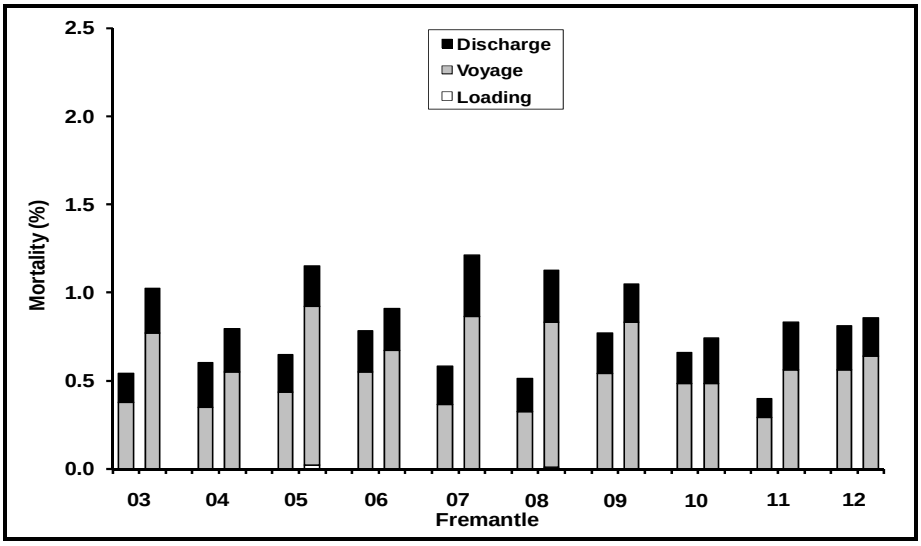


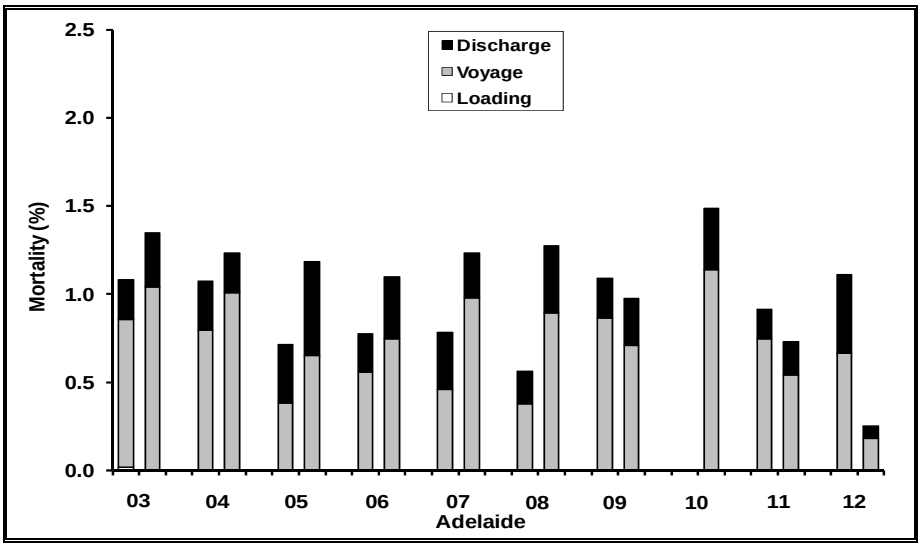
4.1.3.4 Time of year

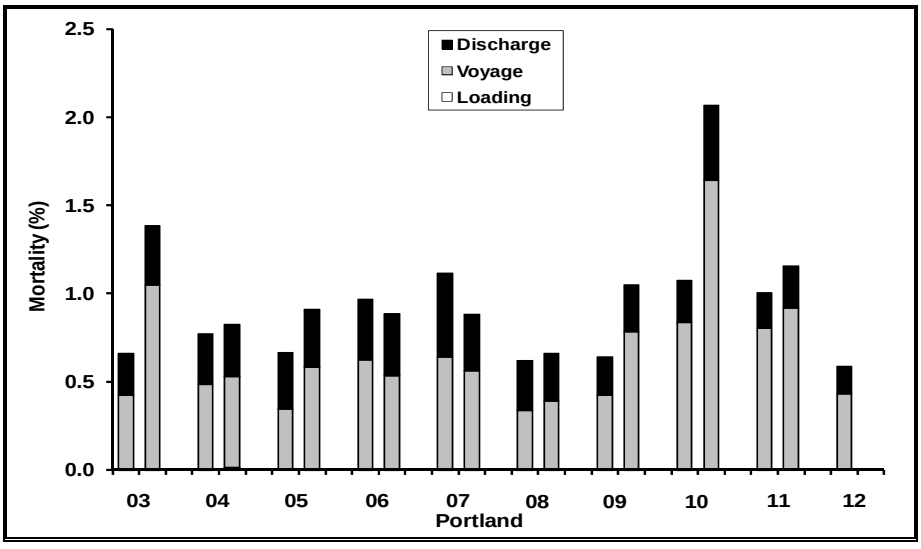
For the first time since recording for sheep began in 1985, overall mortality rates in sheep exported to the Middle East / North Africa during 2012 were lower ($P < 0.05$) in the second half of the year compared with the first half. This is the reverse of the expected outcome.

Sheep exported from Fremantle and Adelaide had significantly different ($P < 0.05$) mortality rates for the first and second halves of the year (Fremantle 0.81% and 0.85% respectively; Adelaide 1.11% and 0.25%), while Portland did not have any voyages in the second half of the year (Figure 6).

Figure 6 Mortality (%) for sheep exported by sea from Fremantle, Adelaide and Portland to the Middle East/North Africa for the first and second half of each year from 2003 to 2012

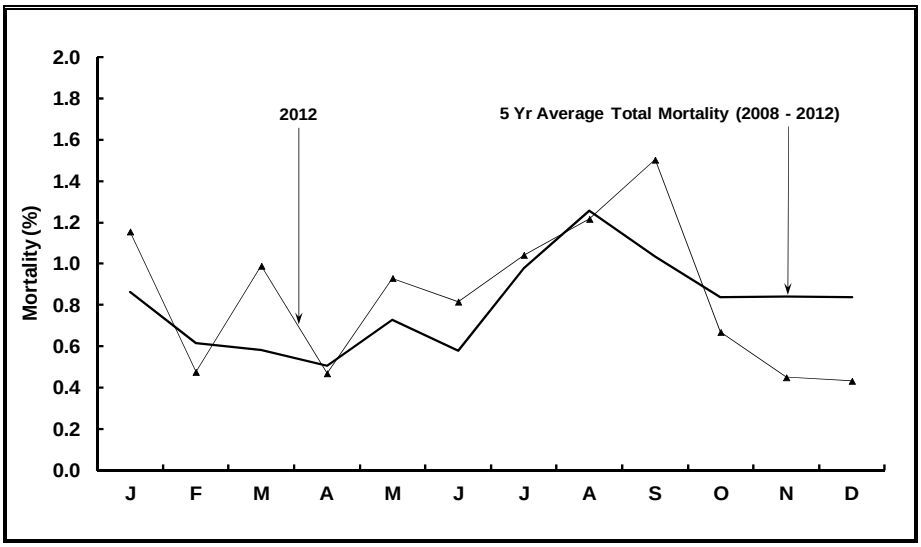






In 2012, monthly mortality rates (total mortality as a proportion of total loaded for each month) in sheep exported from Fremantle varied about the 5-year average, and were unusually low in November-December (Figure 7). Usually the larger numbers of Fremantle sheep drive overall mortality trends. The sharp decline in mortality rates of Fremantle sheep at the end of the year together with lower second-half-year mortalities of Adelaide sheep appears to be responsible for the overall mortality in the second half of the year being lower than in the first half.

Figure 7 Monthly mortality rates for shipments from Fremantle to the Middle East/North Africa in 2012 and the 5-year monthly averages for the period 2008 to 2012



4.1.3.5 Time of year and age of sheep

Figure 8 shows the monthly mortality rates (total mortality as a proportion of total loaded for each month) in wether and ram adults, hoggets and lambs, and ewe adults and lambs exported from Australia to the Middle East/North Africa from 2003 to 2012. Results for ewe hoggets are not presented because of the paucity of data.

Figure 9 shows the mortality rates in the first and second half of the year for the wether classes from 2003 to 2012. There were significantly more deaths ($P < 0.05$) in the second half of the year than in the first half for each year and each age category of wethers, with the following exceptions: adult and hogget wethers in 2006, and adult wethers in 2011, and all three wether classes in 2012. This reversal in 2012 was also evident in all three ram classes and in ewe lambs (results not presented).

Higgs et al (1991) identified a seasonal difference in mortality for adult wethers but not for wether hoggets and lambs. However, their data for this analysis was limited to 1989 only. The results as shown in Figures 8 and 9 indicate that seasonal differences in mortality exist for wether hoggets and lambs as well as adults. In general, similar findings were observed for ram classes and for ewe adults and lambs (half-year results for these classes are not presented here). For ewe hoggets, the paucity of data in most years made conclusions unreliable.

The reversal in the half-year mortality pattern for 2012 is quite remarkable, occurring in seven of the nine classes of sheep routinely examined in this report.

Figure 8 Monthly mortality (%) for wether and ram adults, hoggets and lambs, and ewe adults and lambs exported by sea from Australia to the Middle East/North Africa from 2003 to 2012.

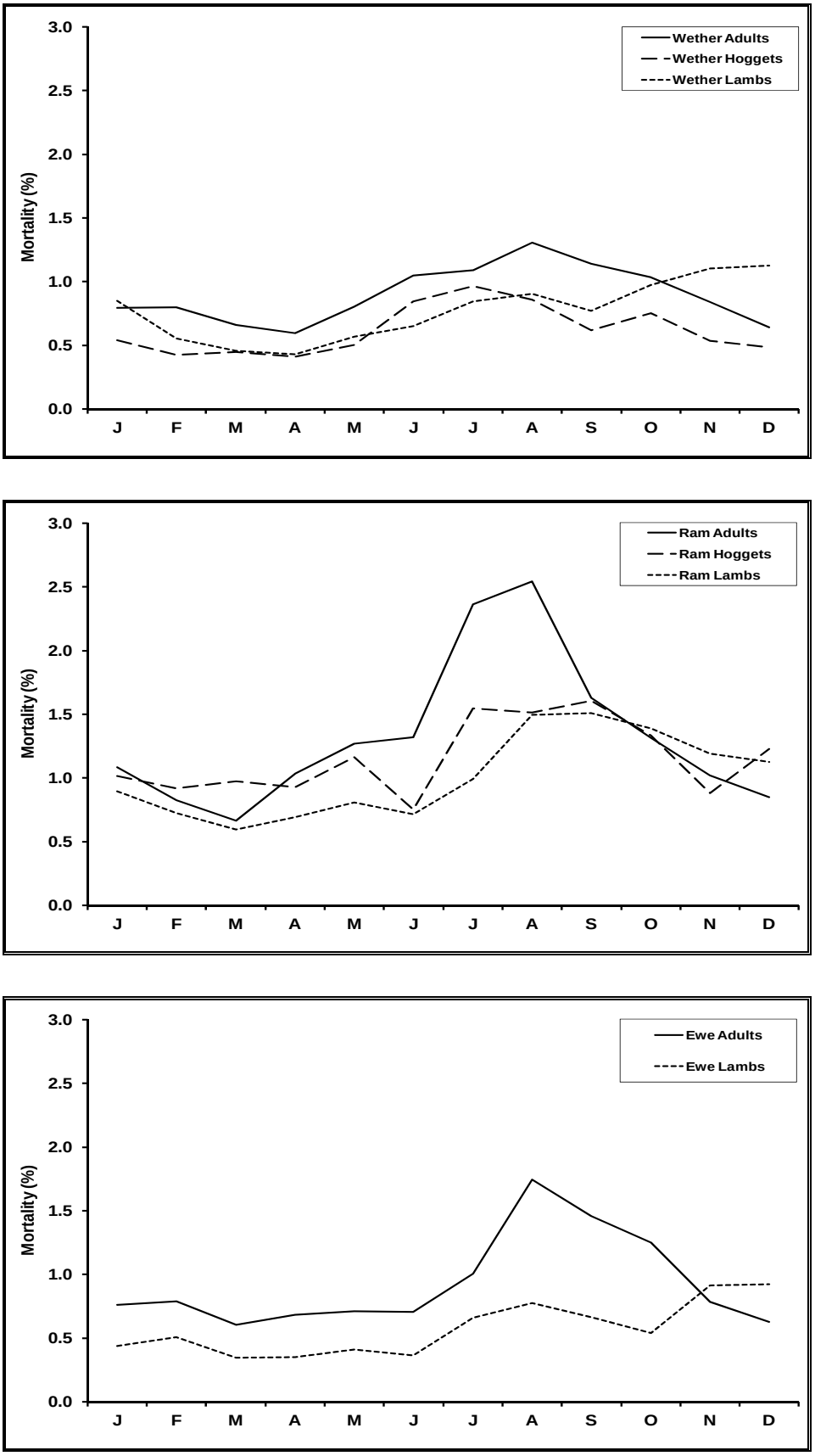
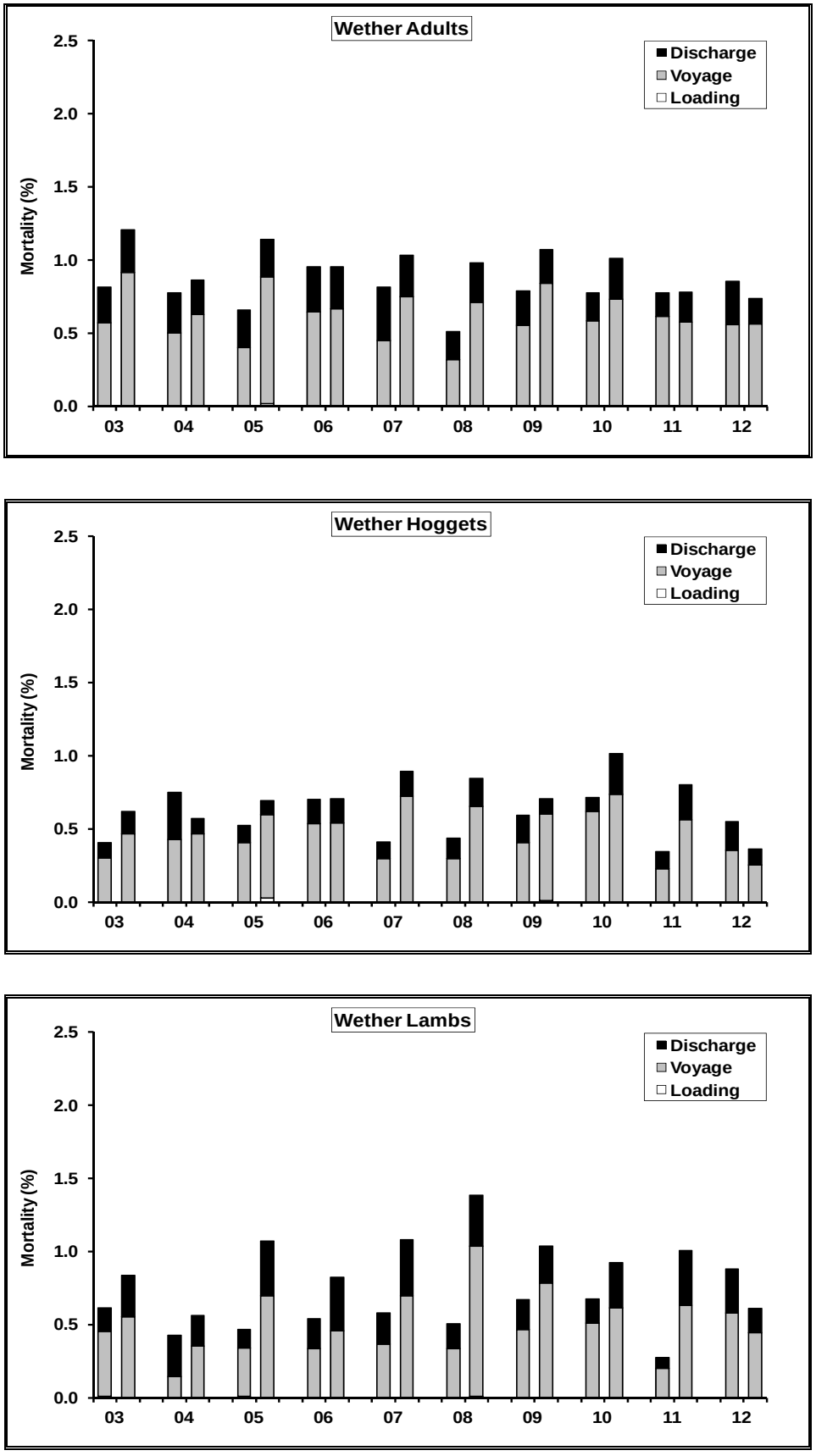


Figure 9 Mortality (%) for wether adults, hoggets and lambs exported by sea from Australia to the Middle East/North Africa for the first and second half of each year from 2003 to 2012.



4.1.3.6 Ship

The voyages of each ship were classified into low (mortality rate up to 1.0%), medium (mortality rate from 1.0 to 2.0%) and high (mortality rate greater than 2.0%) mortality categories for sheep exported to the Middle East/North Africa from Fremantle (Table 6a), Adelaide (6b) and Portland (6c).

There was only one voyage in the "high" category in 2012. Approximately 74% of voyages from Fremantle, 57% from Adelaide and 100% from Portland were in the "low" category.

The number of voyages to the region departing from Fremantle, Adelaide and Portland fell by approximately 16% in 2012, down from 45 in 2011 to 36 in 2012.

Table 6a Number of voyages in low, medium and high mortality categories for ships loaded at Fremantle in 2012

Ship (code)	Mortality rate			Total
	Low <1.0%	Medium 1.0–2.0%	High >2.0%	
32	1	0	0	1
33	2	1	0	3
34	7	0	0	7
35	2	1	0	3
42	2	1	0	3
43	3	3	1	7
46	0	1	0	1
48	1	0	0	1
120	1	0	0	1
Total	19	7	1	27

Table 6b Number of voyages in low, medium and high mortality categories for ships loaded at Adelaide in 2012

Ship (code)	Mortality rate			Total
	Low <1.0%	Medium 1.0–2.0%	High >2.0%	
33	0	1	0	1
34	0	1	0	1
35	3	0	0	3
42	0	1	0	1
48	1	0	0	1
Total	4	3	0	7

Table 6c Number of voyages in low, medium and high mortality categories for ships loaded at Portland in 2012

Ship (code)	Mortality rate			Total
	Low <1.0%	Medium 1.0–2.0%	High >2.0%	
43	2	0	0	2
Total	2	0	0	2

4.1.4 South-East Europe

The recognition of South-East Europe as a separate discharge region stems from the greatly increased trade to that area in recent years. Also the region is geographically and climatically distinct from Middle East / North Africa despite its proximity.

There were 21 voyages made to South-East Europe over the period 2010 to 2012 (Table 7). There were 4 split-loaded voyages in 2011 and one in 2012, in which sheep were loaded at two ports during the same journey.

Table 7 Mortality rates, number of voyages, average voyage and discharge length, and number of sheep exported to the South-East Europe from 2010 to 2012

Year	Voyages (No.)	Sheep (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyage days	Discharge days
2010	4	215,038	1.16	0.7 – 1.5	23.10	8.05
2011	10	418,640	0.85	0.5 – 1.1	25.72	5.35
2012	7	249,602	0.78	0.3 – 1.4	26.94	3.41

4.1.4.1 Port of loading

During 2012, sheep were exported to South East Europe mainly from Fremantle (83%) followed by Adelaide (12%) and Portland (5%) (Table 8). Mortality rates in 2012 were highest from Adelaide, followed by Portland.

The voyages from each port were classified into various mortality categories as shown in Table 9. There were no voyages in the high category during 2012.

Table 8 Mortality rates, number of voyages, average voyage and discharge length, and number of sheep exported from various ports to the South-East Europe for 2012

Port	Voyages (No.)	Sheep (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyage days	Discharge days
Fremantle	4	207,659	0.73	0.3 – 1.3	25.25	3.13
Adelaide	2	30,020	1.11	0.8 – 1.4	29.37	4.67
Portland	1	11,923	0.88	n/a	28.84	2.05

Table 9 Number of voyages in low, medium and high mortality categories for shipments from various ports to the South-East Europe for 2012

Port	Mortality rate			Total
	Low <1.0%	Medium 1.0–2.0%	High >2.0%	
Fremantle	3	1	0	4
Adelaide	1	1	0	2
Portland	1	0	0	1
Total	5	2	0	7

4.1.4.2 Time of year

Voyages to South East Europe destinations occurred in only five months during 2012. There is not enough data yet to draw any meaningful trend relating to the time of year, either for the 2012 monthly mortality profile or for an average over a number of years.

4.1.4.3 Ship

Table 10 shows the number of voyages in the various mortality categories for each ship. All voyages were in the low or medium categories.

Table 10 Number of voyages in low, medium and high mortality categories for shipments to the South-East Europe during 2012

Ship (code)	Mortality rate			Total
	Low <1.0%	Medium 1.0–2.0%	High >2.0%	
33	2	0	0	2
35	2	1	0	3
46	1	1	0	2
Total	5	2	0	7

4.1.4.4 Class of sheep

The numbers exported and mortality rates of various classes of sheep exported from Australia to the South East Europe are shown in Tables 11 and 12. The highest overall mortality rates for 2012 were in hogget and lamb rams (1.15% and 1.14% respectively).

Table 11 The numbers and classes of sheep exported by sea to the South East Europe from Fremantle, Adelaide and Portland during 2012

Livestock		Fremantle	Adelaide	Portland	Total
Wethers	adults	93,586	12,540	8,172	114,298
	lambs	83,252	14,049	2,409	99,710
Rams	adults	706	0	0	706
	hoggets	3,950	3,431	522	7,903
	lambs	23,901	0	820	24,721
Ewes	adults	2,264	0	0	2,264
Total	sheep	207,659	30,020	11,923	249,602

Table 12 Overall mortality (%) for classes of sheep exported from Fremantle, Adelaide and Portland to the South East Europe in 2012

Class of sheep		Fremantle	Adelaide	Portland	Total
Wethers	adult	0.42	0.61	0.60	0.45
	lamb	1.00	1.50	1.04	1.07
Rams	adult	0.14	n/a	n/a	0.14
	hogget	0.91	1.34	1.53	1.14
	lamb	1.09	n/a	2.81	1.15
Ewes	adult	0.00	n/a	n/a	0.00

4.2 Cattle

4.2.1 Performance trend

The number of cattle shipped from all ports in Australia to all destinations since 2003 as well as the trend line (linear regression) across those years is shown in Figure 10. Figure 11 shows the number of cattle mortalities during sea transport since 2003. The number of cattle exported annually has varied from approximately 560,000 to 950,000, and the annual mortality has varied between 0.10 and 0.18%. The overall trend for numbers of cattle exported has been slightly upwards whereas the trend for annual mortality has been neutral.

Figure 10 Number of cattle exported by sea from Australia to all destinations since 2003

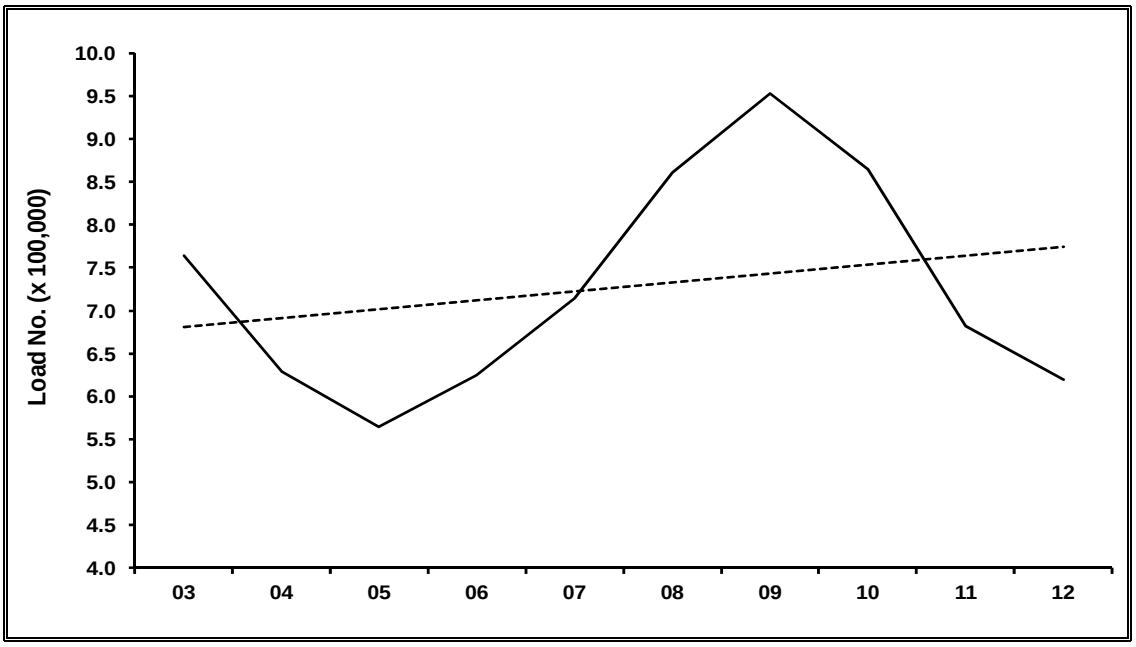
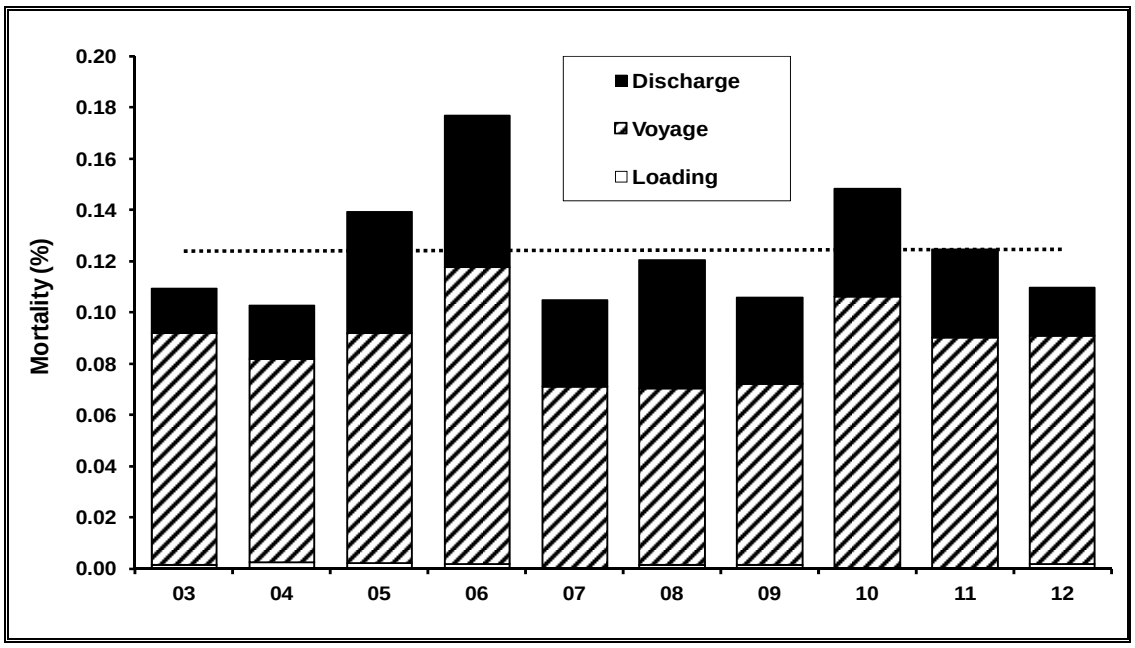


Figure 11 Annual mortality of cattle exported by sea from Australia to all destinations since 2003



4.2.2 Overview

The live cattle trade from Australia in 2012 was characterised by the large number of ports of loading in Australia and the regions to which the animals were shipped. This is in contrast to the live sheep trade where there were only three main ports of loading, and the majority of sheep were shipped to the Middle East/North Africa.

There were 15 voyages in 2012 for which cattle were loaded at more than one port in Australia. Mortalities for split-load voyages were attributed to the port of loading where possible. Where analysis involving split-load voyages has been performed, the consignments of cattle from each load port have been considered as separate “voyages”.

Using the above definition of voyage, there were 209 "voyages" of cattle during 2012. This involved 191 ship journeys, which was 13% more than in 2011. One split-loaded voyage was further split for discharging in two regions, and as was one single port loaded voyage. The overall number of cattle exported fell by 9% in 2012 compared to 2011.

The overall mortality rate among the 0.62 million cattle exported from Australia in 2012 was 0.11% (Table 13). This was lower than the 0.12% observed in 2011. The highest overall mortality rate on a regional basis was for exports to South-East Europe (0.28%), while the lowest overall mortality rate was for exports to South-East Asia (0.04%).

The number of cattle exported to the Middle East/North Africa in 2012 rose by 23% compared to 2011, while the number of voyages rose by 11%. The mortality rate to the region remained the same.

The number of voyages to South-East Asia rose by 12% in 2012 compared to 2011 (127 and 113 respectively), while the number of cattle exported to the region fell by 19%. Trade to South-East Asia accounted for 58% of all cattle exported in 2012.

In previous years, exports to South-East Asia involved small consignments on short voyages, but since 2004, larger ships have been introduced which load and discharge at more than one port. In 2012 there was only one split-loaded voyage, but the larger vessels still accounted for 28% of the trade and 11% of the voyages to the region.

Exports to North-East Asia mainly comprised steers sent to Japan and dairy cattle sent to China. The number of cattle exported to the region in 2012 rose by 9% compared to 2011.

No deaths were recorded on 41% of all cattle voyages during 2012.

Table 13 Mortality rates, number of voyages, voyage and discharge days, and number of cattle exported for voyages to major destination regions during 2012

Parameter	ME/N Africa	SE Asia	NE Asia	Misc	SE Europe	Total
Voyages (No.)	31	127	30	7	14	209
Cattle (No.)	98,236	361,383	74,941	10,245	75,170	619,975
Mortality rate overall (%)	0.16	0.04	0.17	0.25	0.28	0.11
Mortality rate range (%)	0.0 – 0.9	0.0 – 0.8	0.0 – 0.7	0.0 – 0.9	0.0 – 0.9	0.0 – 0.9
Voyage days (Ave.)	18.53	6.71	17.55	17.91	28.78	11.87
Discharge days (Ave.)	2.74	1.32	0.76	0.76	3.58	1.58
Voyages with nil mortalities (No.)	11	63	7	3	1	85

4.2.3 Middle East/North Africa

The live cattle trade to the Middle East/North Africa during 2012 rose by 23% compared to 2011 (Table 14). Overall mortality rates have remained at or below 0.5% over the last decade. In 2012 the mortality rate of 0.16% was equal to the lowest achieved since recording for cattle began in 1995.

Table 14 Mortality rates, number of voyages, average voyage and discharge length, and number of cattle exported to the Middle East/North Africa from 2003 to 2012

Year	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyage days	Discharge days	Nil mortality voyages (No.)
2003	52	106,080	0.45	0.0 – 2.0	16.31	5.65	18
2004	31	61,679	0.44	0.0 – 1.3	16.10	5.55	9
2005	36	85,209	0.34	0.0 – 1.0	15.60	5.17	11
2006	43	119,297	0.52	0.0 – 4.3	16.05	4.42	13
2007	41	74,256	0.19	0.0 – 0.5	16.43	4.23	16
2008	46	120,122	0.29	0.0 – 0.8	17.09	5.02	19
2009	41	98,183	0.33	0.0 – 1.8	15.37	4.62	13
2010	37	163,869	0.40	0.0 – 1.6	17.57	3.75	14
2011	28	80,180	0.17	0.0 – 0.7	17.91	3.14	10
2012	31	98,236	0.16	0.0 – 0.9	18.53	2.74	11

4.2.3.1 Port of loading

There were 6 ports of loading for voyages to the Middle East/North Africa in 2012, with most cattle exported from Fremantle and Broome (Table 15). Mortality rates in 2012 were highest from Portland, followed by Port Hedland and Fremantle.

The voyages from each port were classified into various mortality categories as shown in Table 16. There was only one voyage in the medium or high categories, loaded at Portland. No mortalities occurred on 47% and 40% of the voyages from Fremantle and Broome respectively, while 97% of all voyages to the region were in the nil to low mortality categories.

Table 15 Mortality rates, number of voyages, average voyage and discharge length, and number of cattle exported from various ports to the Middle East/North Africa for 2012

Port	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyage days	Discharge days
Fremantle	19	49,237	0.17	0.0 – 0.3	17.01	3.41
Broome	2	28,687	0.14	0.1 – 0.2	18.59	2.07
Geraldton	2	6,095	0.08	0.1 – 0.1	18.45	0.96
Port Hedland	1	5,679	0.18	n/a	24.41	2.07
Portland	5	4,543	0.26	0.1 – 0.9	20.25	0.95
Adelaide	2	3,995	0.13	0.1 – 0.1	25.05	3.68

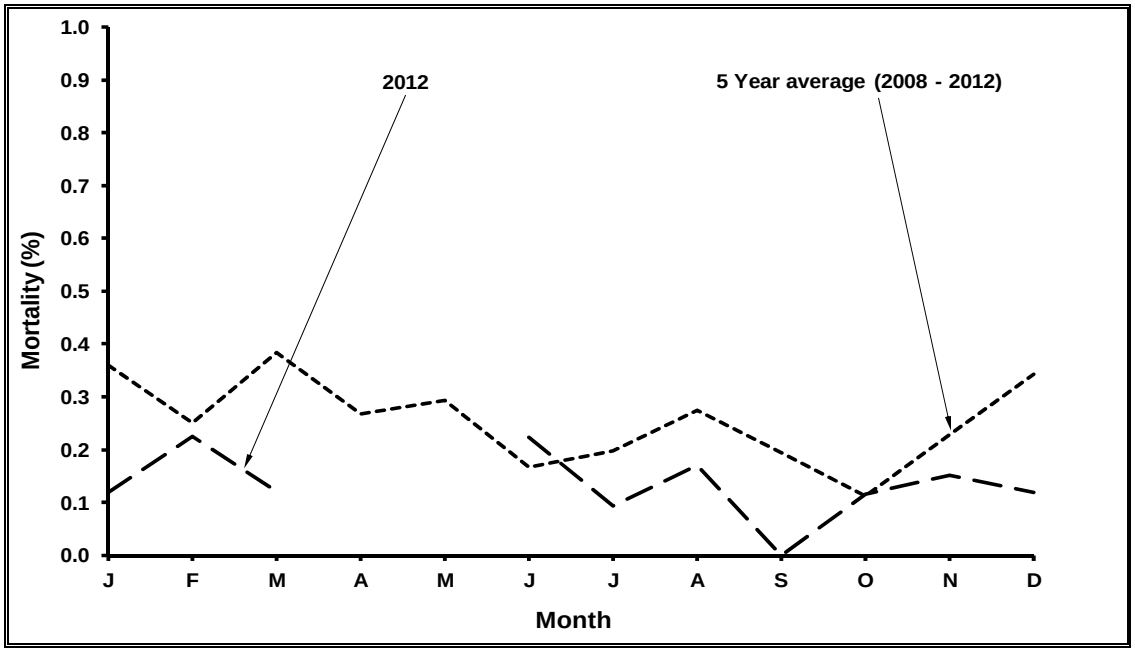
Table 16 Number of voyages in nil, low, medium and high mortality categories for shipments from various ports to the Middle East/North Africa for 2012

Port	Mortality rate				Total
	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	
Fremantle	9	10	0	0	19
Broome	0	2	0	0	2
Geraldton	0	2	0	0	2
Port Hedland	0	1	0	0	1
Portland	2	2	1	0	5
Adelaide	0	2	0	0	2
Total	11	19	1	0	31

4.2.3.2 Time of year

In 2012, monthly mortality rates (total mortality as a proportion of total loaded for each month) in cattle exported from all ports to the Middle East/North Africa remained below 0.25% throughout the year (Figure 12). The only month of 2012 in which the mortality rate rose above the 5 year average was June.

Figure 12 Monthly mortality rates of cattle on voyages from all ports to the Middle East/North Africa for 2012 and the 5-year monthly rates for the period 2008 to 2012



Note – one 2010 high mortality voyage excluded; if included, Feb' percentage would have been 0.58% for the 5 year average profile

4.2.3.3 Ship

The voyages of each ship sailing from Australia to the Middle East/North Africa were classified into four mortality categories: nil (no mortalities); low (mortality rate up to 0.5%); medium (from 0.5 to 1.0%); and high (greater than 1.0%). Note that for this comparison, "voyage" equates to consignment from a port. If a ship loaded at two ports, then two "voyages" are shown, one for each port.

Table 17 shows the number of voyages in the various mortality categories for each ship. Most voyages (97%) were in the nil or low categories. There was one voyage in the medium category, involving ship 120.

Table 17 Number of voyages in nil, low, medium and high mortality categories for shipments to the Middle East/North Africa for 2012

	Mortality rate				
Ship (code)	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	Total
32	0	1	0	0	1
33	0	3	0	0	3
34	1	0	0	0	1
35	0	3	0	0	3
42	2	0	0	0	2
43	4	4	0	0	8
45	0	1	0	0	1
46	1	1	0	0	2
47	1	1	0	0	2
48	0	3	0	0	3
95	0	1	0	0	1
120	1	0	1	0	2
121	1	1	0	0	2
Total	11	19	1	0	31

4.2.3.4 Class of cattle

In 2012, the highest total mortality rates occurred in beef heifers (0.20%) followed by adult bulls (0.19%), and weaner bulls (0.16%; Table 18). Bull classes made up 57% of all cattle shipped to the region.

Table 18 Mortality rates, number of voyages and number of cattle in various classes exported to the Middle East/North Africa in 2012

Class	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)
Bull adult*	25	33,953	0.19	0.0 – 0.5
Steer adult*	12	29,964	0.12	0.0 – 0.9
Bull weaner	9	22,375	0.16	0.0 – 0.3
Heifer beef	7	5,550	0.20	0.0 – 1.0
Steer weaner	2	3,540	0.09	0.0 – 0.1
Heifer dairy	4	2,817	0.14	0.0 – 0.2
Cow dairy	2	37	0.00	n/a

* may include young as well as mature animals (ie animals not separately classified as "weaner")

4.2.4 South-East Asia

Approximately 0.36 million cattle were exported to South-East Asia in 2012 (Table 19), representing a fall of 19% compared to 2011 and being the lowest volume since recording began in 1995. The mortality rate for voyages to the region remained at the record low 0.04% for the third consecutive year while the number of voyages rose by 12%. A nil mortality rate was reported on half of the voyages to the region. The mortality rate has remained at or below 0.1% over the last decade.

Table 19 Mortality rates, number of voyages, average voyage and discharge length, and number of cattle exported to South-East Asia from 2003 to 2012

Year	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyage days	Discharge days	Nil mortality voyages (No.)
2003	306	587,716	0.05	0.0 – 2.2	6.46	0.87	190
2004	217	465,498	0.05	0.0 – 1.8	6.17	0.92	118
2005	169	403,819	0.10	0.0 – 0.8	6.06	0.97	73
2006	166	452,516	0.09	0.0 – 1.0	6.24	1.38	66
2007	205	573,729	0.09	0.0 – 4.0	6.47	1.10	92
2008	219	682,264	0.10	0.0 – 1.9	6.33	1.14	93
2009	288	795,465	0.08	0.0 – 0.8	6.27	0.99	130
2010	202	551,761	0.04	0.0 – 0.4	6.47	0.86	105
2011	113	446,708	0.04	0.0 – 0.8	6.95	1.72	55
2012	127	361,383	0.04	0.0 – 0.8	6.71	1.32	63

4.2.4.1 Port of loading

Most cattle exported to South-East Asia in 2012 were loaded at Darwin (68%) followed by Broome (16%) and Wyndham (6%, Table 20). The mortality rate was highest for cattle exported from Geraldton (0.26%).

The voyages from each port were classified into various mortality categories as shown in Table 21. All except one voyage was in the nil or low categories. No voyages were in the high category in 2012.

Table 20 Mortality rates, number of voyages, average voyage and discharge length, and number of cattle exported from various ports to South-East Asia in 2012

Port	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyage days	Discharge days
Darwin	79	246,752	0.04	0.0 – 0.8	6.55	1.49
Broome	25	58,014	0.03	0.0 – 0.3	6.08	0.88
Wyndham	8	19,880	0.04	0.0 – 0.1	5.60	0.70
Fremantle	5	15,216	0.04	0.0 – 0.2	7.66	1.00
Karumba	7	12,812	0.09	0.0 – 0.3	10.56	1.33
Townsville	1	6,023	0.05	n/a	12.39	7.50
Geraldton	2	2,686	0.26	0.1 – 0.4	6.89	0.44

Table 21 Number of voyages in nil, low, medium and high mortality categories for shipments from various ports to South-East Asia for 2012

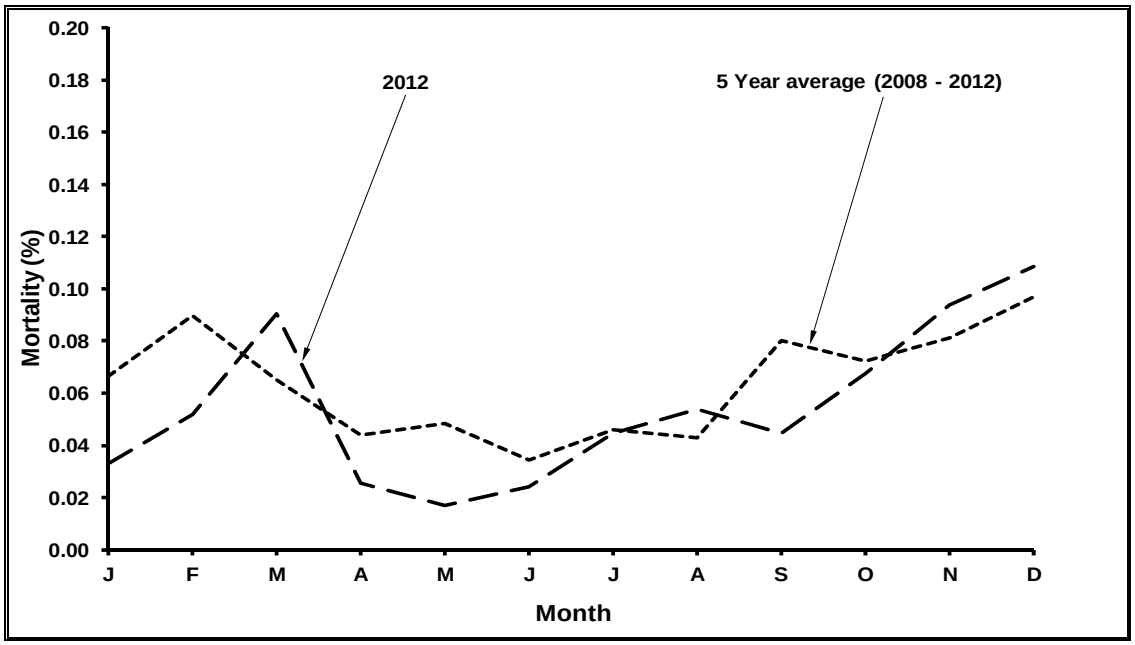
Port	Mortality rate				Total
	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	
Darwin	36	42	1	0	79
Broome	18	7	0	0	25
Wyndham	5	3	0	0	8
Fremantle	1	4	0	0	5
Karumba	3	4	0	0	7
Townsville	0	1	0	0	1
Geraldton	0	2	0	0	2
Total	63	63	1	0	127

4.2.4.2 Time of year

Monthly mortality rates (total mortality as a proportion of total loaded for each month) for voyages to South-East Asia in 2012 were below 0.10% throughout the year except for the month of December (Figure 13).

The monthly mortality rate profile for 2012 approximated that of the 5-year average.

Figure 13 Monthly mortality rates of cattle on voyages from all ports to South-East Asia for 2012 and the 5-year monthly rates for the period 2008 to 2012



4.2.4.3 Ship

The voyages of each ship from Australia to South-East Asia were classified into various mortality categories as shown in Table 22. All voyages except one were in the nil or low mortality categories.

The number of voyages to the region increased by 12% in 2012 compared to 2011.

Table 22 Number of voyages in nil, low, medium and high mortality categories for shipments to South-East Asia for 2012

Ship (code)	Mortality rate				Total
	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	
43	0	3	0	0	3
44	1	8	0	0	9
45	0	1	0	0	1
47	1	0	0	0	1
59	3	5	0	0	8
77	5	3	0	0	8
95	5	0	0	0	5
103	3	2	0	0	5
114	8	4	0	0	12
115	7	3	0	0	10
117	6	9	0	0	15
120	3	7	0	0	10
121	3	0	0	0	3
123	7	4	0	0	11
124	6	10	1	0	17
125	5	4	0	0	9
Total	63	63	1	0	127

4.2.4.4 Class of cattle

In 2012 all cattle exported to South-East Asia were able to be identified by class.

Adult steers and beef heifers comprised 50% and 29% respectively of all classes exported to the region in 2012 (Table 23).

The highest mortality rates occurred in beef cows (0.21%) followed by weaner bulls (0.08%).

Table 23 Mortality rates, number of voyages and number of cattle in various classes exported to the South-East Asia in 2012

Class	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)
Steer adult*	105	182,057	0.04	0.0 – 1.1
Heifer beef	89	106,312	0.03	0.0 – 0.6
Bull adult*	64	28,484	0.06	0.0 – 1.6
Steer weaner	10	17,738	0.02	0.0 – 0.1
Cow beef	26	13,772	0.21	0.0 – 2.9
Heifer dairy	7	8,740	0.03	0.0 – 0.2
Bull weaner	9	3,608	0.08	0.0 – 0.4
Cow dairy	1	672	0.00	n/a

* may include young as well as mature animals (ie animals not separately classified as "weaner")

4.2.5 North-East Asia

The number of cattle exported to North-East Asia in 2012 rose by 9% compared to 2011 while the number of voyages fell by 1 (Table 24). The mortality rate has remained under 0.2% over the last decade.

Table 24 Mortality rates, number of voyages, average voyage and discharge length, and number of cattle exported to North-East Asia from 2003 to 2012

Year	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyage days	Discharge days	Nil mortality voyages (No.)
2003	36	66,861	0.12	0.0 - 1.1	16.58	2.03	10
2004	50	95,534	0.11	0.0 – 0.8	16.00	1.26	12
2005	39	58,164	0.09	0.0 – 0.4	16.48	1.74	15
2006	26	37,963	0.12	0.0 – 1.3	17.09	1.28	11
2007	21	34,837	0.06	0.0 – 0.2	16.60	1.71	10
2008	19	29,873	0.06	0.0 – 0.4	17.51	1.04	10
2009	23	48,116	0.07	0.0 – 0.2	16.91	0.70	5
2010	34	69,638	0.08	0.0 – 0.3	18.25	0.62	10
2011	31	68,773	0.15	0.0 – 0.5	18.08	0.87	5
2012	30	74,941	0.17	0.0 – 0.7	17.55	0.76	7

4.2.5.1 Port of loading

Cattle were exported to North-East Asia mainly from Portland, Brisbane and Geelong (Table 25). All cattle loaded at Brisbane were exported to Japan while those loaded at Geelong and Fremantle were exported to China. Two shipments from Portland went to North-Eastern Russia, but the rest of Portland cattle went to China.

The voyages from each port were classified into various mortality categories as shown in Table 26. 93% of all voyages were in the nil or low categories.

Table 25 Mortality rates, number of voyages, average voyage and discharge length, and number of cattle exported from various ports to North-East Asia for 2012

Port	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyage days	Discharge days
Portland	15	50,468	0.16	0.0 – 0.6	17.52	0.93
Brisbane	8	12,115	0.32	0.1 – 0.7	15.17	0.49
Geelong	5	11,755	0.07	0.0 – 0.3	20.34	0.69
Fremantle	2	603	0.17	0.0 – 0.3	20.38	0.66

Table 26 Number of voyages in nil, low, medium and high mortality categories for shipments from various ports to North-East Asia for 2012

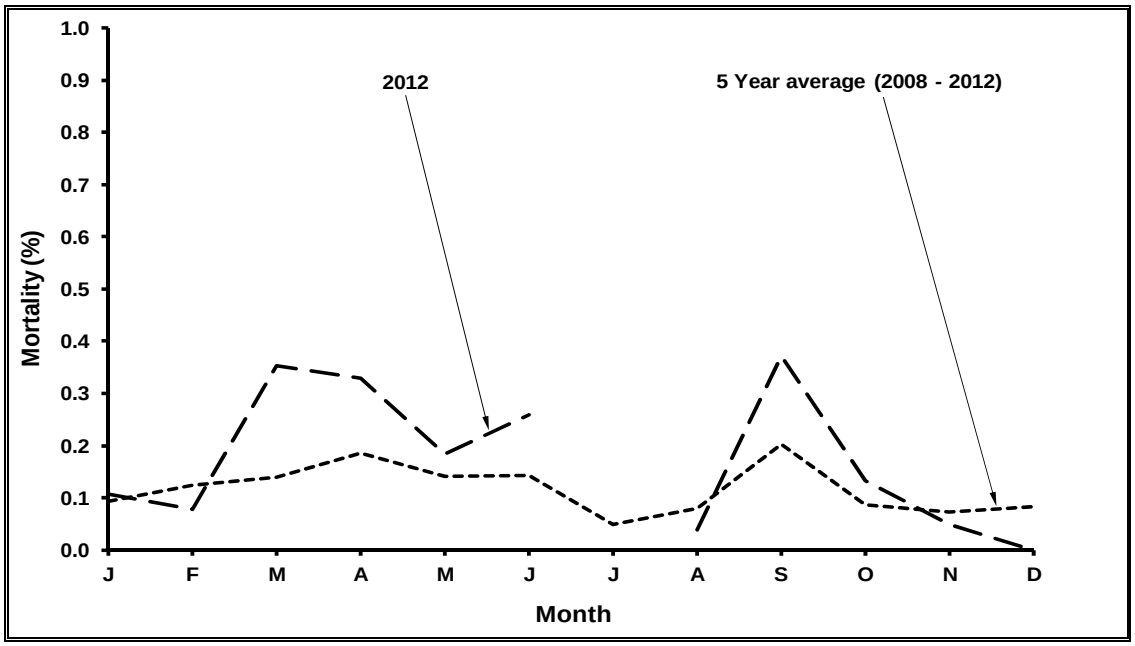
Port	Mortality rate				Total
	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	
Portland	3	11	1	0	15
Brisbane	0	7	1	0	8
Geelong	3	2	0	0	5
Fremantle	1	1	0	0	2
Total	7	21	2	0	30

4.2.5.2 Time of year

Monthly mortality rates (total mortality as a proportion of total loaded for each month) for voyages to North-East Asia in 2012 were below 0.3% throughout the year except for the months of March, April and September (Figure 14).

The monthly mortality rate in 2012 approximated the five year average except for the same months of March, April and September.

Figure 14 Monthly mortality rates of cattle on voyages from all ports to North-East Asia for 2012 and the 5-year monthly rates for the period 2008 to 2012



4.2.5.3 Ship

The voyages of each ship taking cattle from Australia to North-East Asia were classified into various mortality categories as shown in Table 27. Almost all voyages were in the nil or low categories.

Table 27 Number of voyages in nil, low, medium and high mortality categories for shipments to North-East Asia for 2012

	Mortality rate				
Ship (code)	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	Total
44	1	1	1	0	3
59	2	2	0	0	4
77	1	2	0	0	3
95	2	2	0	0	4
103	0	2	0	0	2
114	0	1	0	0	1
115	0	4	0	0	4
120	1	3	0	0	4
121	0	2	0	0	2
123	0	2	1	0	3
Total	7	21	2	0	30

4.2.5.4 Class of cattle

Mortality rates for each class of cattle exported to North-East Asia during 2012 are presented in Table 28. The North-East Asian cattle trade comprised mainly steers exported to Japan and heifers exported to China and North-Eastern Russia.

The highest mortality rates occurred in weaner steers (0.49%) followed by adult steers (0.27%).

Table 28 Mortality rate, number of voyages and number of cattle in the classes exported to North-East Asia in 2012

Class	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)
Heifer dairy	18	49,781	0.15	0.0 – 0.6
Heifer beef	7	13,244	0.13	0.0 – 0.5
Steer weaner	3	6,088	0.49	0.2 – 0.7
Steer adult*	5	5,670	0.27	0.1 – 0.6
Bull adult*	2	158	0.00	n/a

* may include young as well as mature animals (ie animals not separately classified as "weaner")

4.2.6 South-East Europe

In recent years the significant rise in livestock exports to Turkey and the Black Sea has boosted the Miscellaneous category. A new destination region, South-East Europe, has been introduced to allow a more meaningful examination of exports to this area.

The number of cattle exported to South-East Europe has increased significantly since 2010 while the mortality rate has increased since 2009 (Table 29). The mortality rate in cattle exported to the region fell by 45% in 2012 compared to 2011.

Table 29 Mortality rates, number of voyages, average voyage and discharge length, and number of cattle exported to South-East Europe from 2006 to 2012

Year	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyage days	Discharge days	Nil mortality voyages (No.)
2006	1	3,382	0.09	n/a	19.18	1.98	0
2007	6	7,062	0.18	0.0 – 0.2	26.99	1.18	1
2008	8	14,341	0.11	0.0 – 0.2	25.42	1.17	1
2009	1	3,493	0.37	n/a	41.60	0.96	0
2010	11	78,673	0.44	0.0 – 0.8	25.08	5.03	1
2011	15	83,033	0.51	0.2 – 1.4	26.78	5.00	0
2012	14	75,170	0.28	0.0 – 0.9	28.78	3.58	1

4.2.6.1 Port of loading

Cattle exported to South-East Europe in 2012 were all from the southern ports of Fremantle, Adelaide and Portland (Table 30). Most cattle were loaded at Fremantle (43%) followed by Adelaide (40%) (Table 14). The mortality rate was highest for cattle exported from Portland (0.35%).

The voyages from each port were classified into various mortality categories as shown in Table 31. 86% of voyages were in the nil or low categories. No voyages were in the high category in 2012.

Table 30 Mortality rates, number of voyages, average voyage and discharge length, and number of cattle exported from various ports to South-East Europe in 2012

Port	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyage days	Discharge days
Fremantle	6	32,212	0.30	0.0 – 0.5	24.63	4.09
Adelaide	5	30,323	0.23	0.1 – 0.4	30.42	3.88
Portland	3	12,635	0.35	0.1 – 0.9	34.34	2.03

Table 31 Number of voyages in nil, low, medium and high mortality categories for shipments from various ports to South-East Europe for 2012

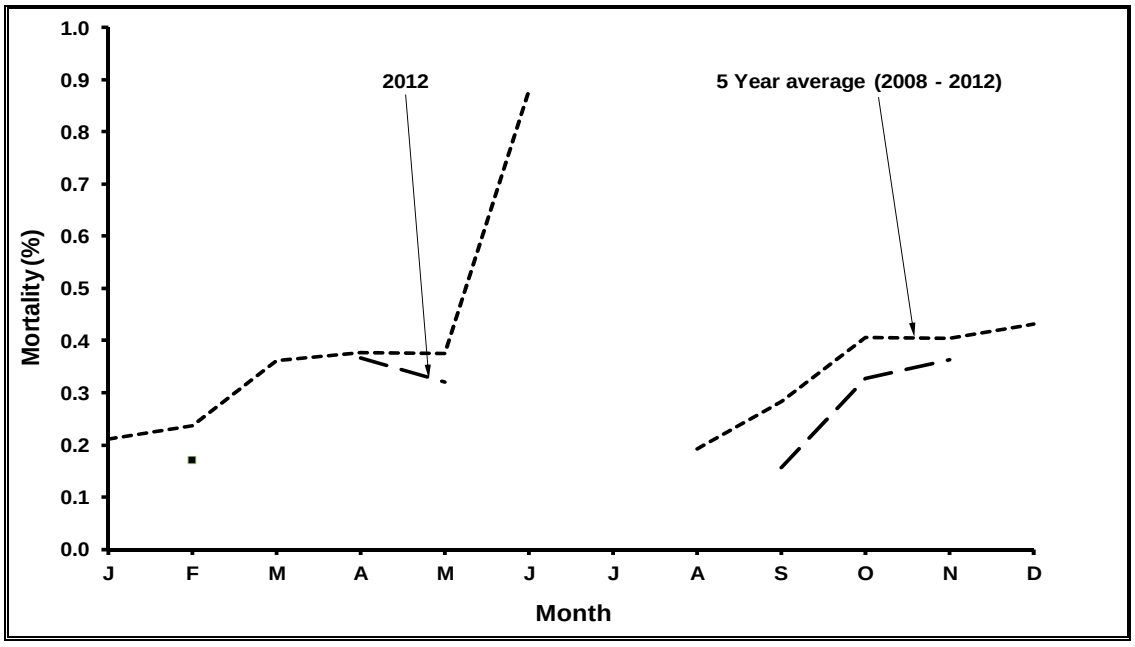
Port	Mortality rate				Total
	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	
Fremantle	1	4	1	0	6
Adelaide	0	5	0	0	5
Portland	0	2	1	0	3
Total	1	11	2	0	14

4.2.6.2 Time of year

Monthly mortality rates (total mortality as a proportion of total loaded for each month) for voyages to South-East Europe in 2012 were below 0.4% throughout the year (Figure 15).

For the six months on which voyages occurred during 2012, the monthly mortality profile was similar to the five year average.

Figure 15 Monthly mortality rates of cattle on voyages from all ports to South-East Europe for 2012 and the 5-year monthly rates for the period 2008 to 2012



Note – one 2011 high mortality voyage excluded; if included, June percentage would have been 1.18% for the 5 year average profile

4.2.6.3 Ship

The voyages of each ship taking cattle from Australia to South-East Europe were classified into various mortality categories as shown in Table 32. There were no voyages in the high category in 2012.

Table 32 Number of voyages in nil, low, medium and high mortality categories for shipments to South-East Europe for 2012

	Mortality rate				
Ship (code)	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	Total
33	0	2	0	0	2
35	0	3	1	0	4
46	0	4	0	0	4
47	1	2	1	0	4
Total	1	11	2	0	14

4.2.6.4 Class of cattle

Mortality rates for each class of cattle exported to South-East Europe during 2012 are presented in Table 33. Cattle to South-East Europe comprised bulls (31%) and steers (25%) exported to Turkey and dairy cattle (43%) exported to Russia. There were 218 adult bulls exported to Russia as well.

In 2012 the highest mortality rates occurred in adult bulls (0.42%) followed by adult steers (0.34%).

Table 33 Mortality rate, number of voyages and number of cattle in the classes exported to South-East Europe in 2012

Class	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)
Heifer beef	3	16,863	0.26	0.1 – 0.4
Heifer dairy	4	15,722	0.22	0.0 – 0.9
Bull weaner	6	15,659	0.27	0.0 – 0.6
Steer adult*	7	13,570	0.34	0.0 – 1.1
Bull adult*	10	7,835	0.42	0.0 – 1.3
Steer weaner	3	5,521	0.24	0.0 – 0.4

* may include young as well as mature animals (ie animals not separately classified as "weaner")

4.2.7 Miscellaneous destinations

The introduction of the new region, South-East Europe, has allowed a more meaningful examination of both the Miscellaneous and South-East European regions. This separation has significantly altered the numbers previously reported as having been exported to Miscellaneous destinations. The revised numbers are shown in Table 34.

In 2012 Miscellaneous destinations included Mauritius and Sri Lanka. The mortality rate in cattle exported to Miscellaneous destinations was 0.25% in 2012.

Table 34 Mortality rates, number of voyages, average voyage and discharge length, and number of cattle exported to Miscellaneous destinations from 2003 to 2012

Year	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyage days	Discharge days	Nil mortality voyages (No.)
2003	2	1,001	0.00	n/a	8.00	0.50	2
2004	2	573	0.52	0.0 – 0.5	11.00	0.50	1
2005	0	0	n/a	n/a	n/a	n/a	n/a
2006	0	0	n/a	n/a	n/a	n/a	n/a
2007	2	1,444	0.62	0.2 – 1.0	14.25	0.37	0
2008	4	5,768	0.12	0.0 – 0.2	19.07	0.90	3
2009	0	0	n/a	n/a	n/a	n/a	n/a
2010	1	800	0.00	n/a	12.88	0.39	1
2011	2	3,006	0.00	n/a	14.04	0.67	2
2012	7	10,245	0.25	0.0 – 0.9	17.91	0.76	3

4.2.7.1 Port of loading

Most cattle exported to Miscellaneous destinations in 2012 were loaded at Fremantle (46%) followed by Geraldton (20%) (Table 35). The mortality rate was highest for cattle exported from Geraldton (0.87%).

The voyages from each port were classified into various mortality categories as shown in Table 36. 71% of voyage was in the nil or low categories. No voyages were in the high category in 2012.

Table 35 Mortality rates, number of voyages, average voyage and discharge length, and number of cattle exported from various ports to Miscellaneous destinations in 2012

Port	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyage days	Discharge days
Fremantle	3	4,681	0.09	0.0 – 0.2	13.86	0.69
Geraldton	1	2,061	0.87	n/a	15.52	1.32
Portland	2	2,003	0.15	0.0 – 0.6	26.32	0.77
Broome	1	1,500	0.07	n/a	15.60	0.43

Table 36 Number of voyages in nil, low, medium and high mortality categories for shipments from various ports to Miscellaneous destinations for 2012

Port	Mortality rate				Total
	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	
Fremantle	2	1	0	0	3
Geraldton	0	0	1	0	1
Portland	1	0	1	0	2
Broome	0	1	0	0	1
Total	3	2	2	0	7

4.2.7.2 Time of year

There were only four months on which voyages to Miscellaneous destinations occurred during 2012. There is not enough data to draw any meaningful trend relating to the time of year, either for the monthly mortality profile or for the five year average.

4.2.7.3 Ship

The voyages of each ship taking cattle from Australia to Miscellaneous destinations were classified into various mortality categories as shown in Table 37. There were no voyages in the high category in 2012.

Table 37 Number of voyages in nil, low, medium and high mortality categories for shipments to Miscellaneous destinations for 2012

Ship (code)	Mortality rate				Total
	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	
43	1	0	1	0	2
114	1	0	0	0	1
125	1	2	1	0	4
Total	3	2	2	0	7

4.2.7.4 Class of cattle

Mortality rates for each class of cattle exported to Miscellaneous destinations during 2012 are presented in Table 38. In 2012 the highest mortality rates occurred in beef cows (4.39%) followed by dairy heifers (0.15%).

Table 38 Mortality rate, number of voyages and number of cattle in the classes exported to Miscellaneous destinations in 2012

Class	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)
Bull adult*	5	6,734	0.07	0.0 – 0.2
Heifer dairy	2	2,003	0.15	0.0 – 0.6
Heifer beef	1	552	0.00	n/a
Steer adult*	2	546	0.00	n/a
Cow beef	1	410	4.39	n/a

* may include young as well as mature animals (ie animals not separately classified as "weaner")

4.3 Goats

4.3.1 Performance trend

Figures 16 and 17 show the number of goats exported and the mortality rates during sea transport from all ports in Australia to all destinations over the last decade as well as the trend line (linear regression) across those years. The number of goats exported annually has varied between approximately 600 and 53,000, and the annual mortality has varied between 0.00 and 0.88%. The trend for annual mortality has continued downward.

Figure 16 Number of goats exported by sea from Australia to all destinations since 2003

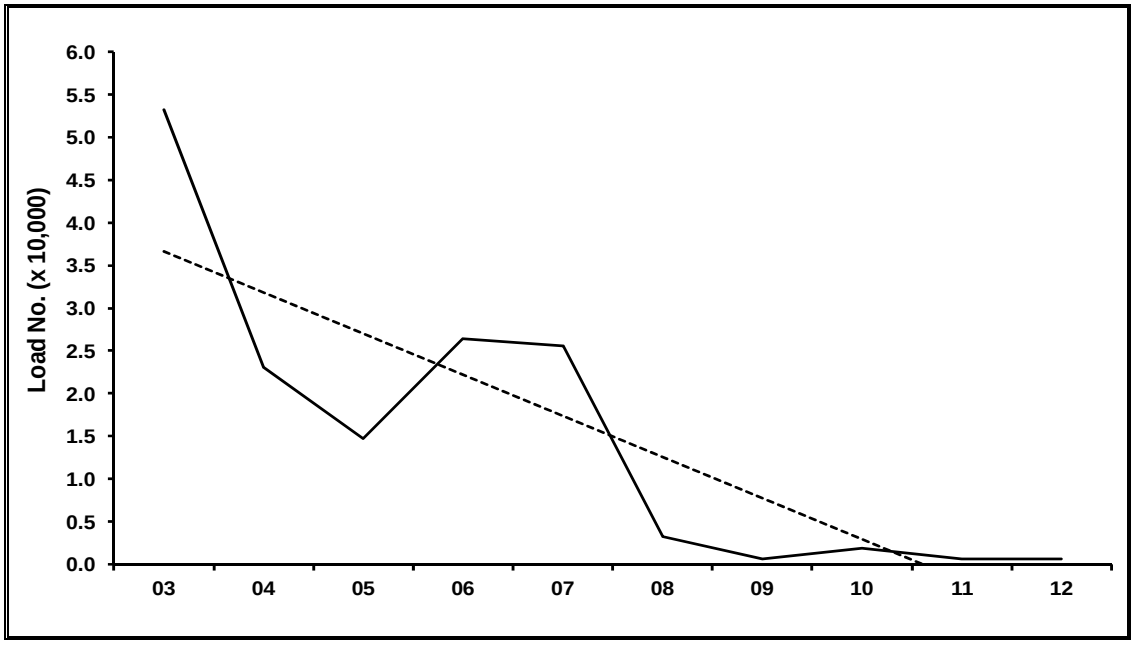
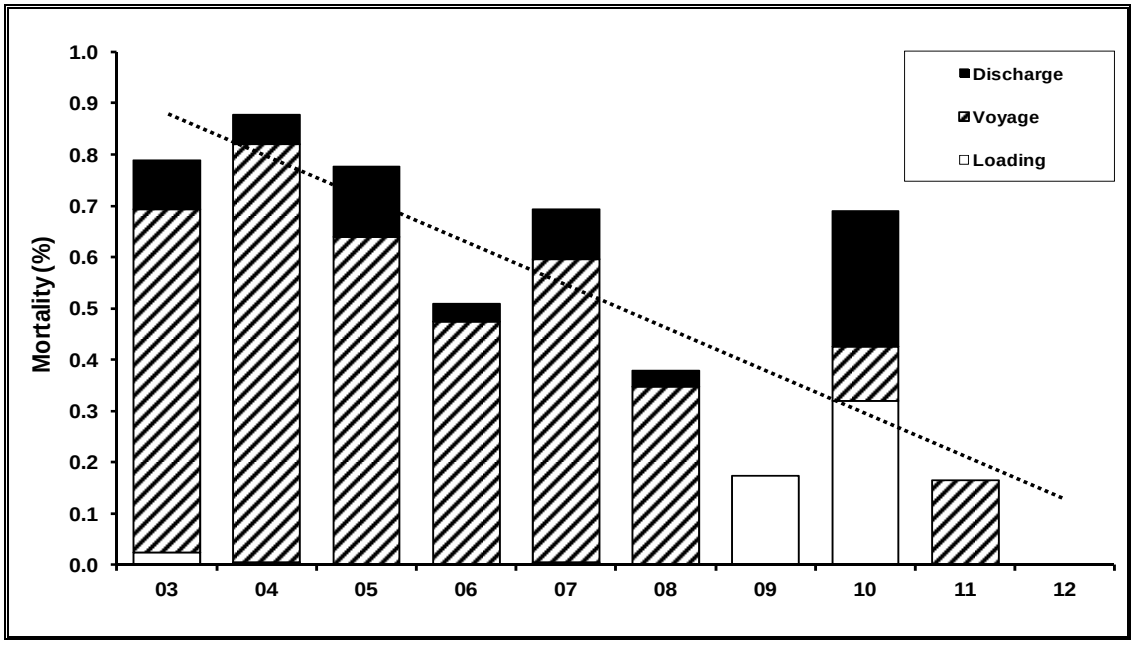


Figure 17 Annual mortality of goats exported by sea from Australia to all destinations since 2003



4.3.2 Overview

All goats (635) exported by sea from Australia in 2012 were carried on a single voyage which departed from the port of Darwin and went to South-East Asia. This voyage experienced a mortality rate of 0.00% (Table 39).

For a number of years the export of live goats has been undertaken mainly by air, with minimal mortalities. The main destination for such goats is South-East Asia.

4.3.3 South-East Asia

The number of goats exported by sea to South-East Asia peaked in 2002, but has fallen substantially since then (Table 39). The mortality rate in 2012 fell to 0.00%, the first time this figure has been achieved since recording began in 1993.

Table 39 Mortality rates, number of voyages and number of goats exported by sea to South-East Asia from 2003 to 2012

Year	Voyages (No.)	Goats (No.)	Mortality rate overall (%)	Mortality rate range (%)
2003	41	36,048	0.76	0.0 – 3.1
2004	29	20,801	0.93	0.0 - 2.6
2005	25	14,694	0.78	0.0 – 2.0
2006	25	25,353	0.49	0.0 – 3.0
2007	21	21,204	0.35	0.0 – 1.1
2008	8	3,180	0.50	0.0 – 2.9
2009	2	577	0.17	0.0 – 0.3
2010	5	1,885	0.69	0.0 – 1.2
2011	1	610	0.16	n/a
2012	1	635	0.00	n/a

4.3.4 Air transport of live goats

Air transport has played a significant role in the export of live goats for many years, and during 2012 accounted for the 99.0% of live goat exports (64,209 out of 64,844 goats exported). The number of goats exported by air in 2012 rose by 25% compared to 2011.

4.3.4.1 Load point / destination

The loading points and destination countries for goats transported by air from Australia in 2012 are shown in Table 40.

The majority of these goats were loaded at Sydney and Adelaide airports, accounting for 60% and 40% respectively.

The main importing countries for goats exported by air in 2012 were Malaysia (99% of total exports) and Sarawak (1%).

Table 40 Load point and destination country for goats exported by air from Australia during 2012

Country	Adelaide	Melbourne	Sydney	Total
Malaysia	26,034		37,296	63,330
Sarawak			782	782
Other		32	65	97
Total	26,034	32	38,143.	64,209

SOURCE – Department of Agriculture, Fisheries and Forestry

* Other includes Brazil, China, Indonesia, New Zealand and USA

4.3.4.2 Mortalities

Goats exported by air experienced nil mortalities during 2012. Similar levels of mortality were seen over 2008 to 2011 (Table 41).

Table 41 Mortality rates and number of goats exported by air to all destinations from 2008 to 2012

Year	Goats (No.)	Total Mortalities (No.)	Mortality rate overall (%)
2008	73,167	1	0.001
2009	84,923	0	0.000
2010	78,905	8	0.010
2011	51,487	1	0.002
2012	64,209	0	0.000

SOURCE – Department of Agriculture, Fisheries and Forestry

5 Conclusion and recommendations

5.1 Sheep, cattle and goats

This report successfully summarises the mortalities of sheep, cattle and goats for the 2012 calendar year. Mortality trends were analysed and the overall mortalities for sheep, cattle and goats exported by sea were 0.81%, 0.11% and 0.00%. It is recommended that this project continue to be funded and reported on an annual basis in the future. This is the only comprehensive report of its type, providing breakdowns by ship, species, time of year, load ports and major destinations over the calendar year. The report is of interest and importance to a wide range of stakeholders.

In the past much of the analysis for South-East Asia was derived from ship Master's Reports (voyage mortality reports that must be provided to AMSA and DAFF for all shipments of livestock). In 2012 100% of cattle exported to South-East Asia could be identified by class, up from 95% in 2011. The Industry cooperation facilitating this outcome is laudable. This improvement required much extra input from Industry which would have been easier using an earlier version of the Master's Report.

In this report, graphs and tables presenting long-term overviews were restricted to a rolling ten-year basis. It is considered that the older data does not reflect the current state of the trade in terms of standards required of industry, ships participating and markets serviced.

In this report, the markets of Turkey and the Black Sea have been included in the new destination region South-East Europe. This reflects the fact that they are no longer minor, “Miscellaneous” destinations, and that they don’t fit the Middle East / North Africa region because of geographical and climatic differences.

6 Appendices

6.1 Appendix 1 – Research update

6.1.1 Investigating morbidity and mortality in cattle exported to the Middle East

This project was initiated in response to concerns regarding elevated mortalities in some cattle voyages to the Middle East that were attributed to bovine respiratory disease (BRD). The project aims to describe the causes of death in cattle exported from Australia to the Middle East and to develop systems that can be used by industry to describe causes of death in future.

A new Veterinary Export Handbook was developed that included a detailed description of how to perform a necropsy, common findings, sample collection and protocols for numbers of animals to be sampled. (See 6.1.6 Veterinary Disease Handbook)

Voyages were enrolled if they met the following criteria: 3,000 or more cattle; long haul voyages (greater than10 days duration), destined for Middle East / North African or South-East European countries.

From July 2010 to the end of the shipboard phase in October 2012, the project enrolled 31 voyages from a total of 57 eligible voyages. 28% of all mortalities on enrolled voyages were sampled.

The cooperation from exporters and AA Veterinarians is gratefully acknowledged.

Analysis of all available voyage and feedlot data up to October 2012 has almost been completed, and an industry stakeholder meeting will be held later in 2013 to deliver the results of the project.

6.1.2 Veterinary pathology and disease investigation course for AAVets

A training needs analysis conducted as part of the MLA/LiveCorp R&D project 'Developing cattle data collection systems' reviewed the current levels of veterinary expertise required on board livestock ships and identified areas where further training would ensure optimal and standardised disease investigation and data collection techniques.

As a result, a veterinary training course was developed with the aim of:
1. Delivering two training courses for AQIS Accredited Veterinarians to:
(i) Provide conceptual frameworks, using scenarios and case studies, to assist the monitoring of animal health and the investigation of animal disease events on sea voyages.
(ii) Provide hands-on training in the safe and systematic necropsy of an animal to determine cause of death, including gross description (written and photographic) and collection and packaging of specimens for subsequent examination by a pathologist.
2. Providing reference information and material, and checklists that can be used on voyages to assist optimal investigation and management of health and disease.
3. Producing a high-quality DVD as an ancillary training aid for post mortem procedures.

The training courses were held at Murdoch University, Murdoch, WA in January and July 2011. They were both considered to be successful, with positive feedback from participants.

The necropsy DVD has been completed and is available upon request to MLA.

It is likely that the project findings and reference materials will be included in an Industry Stockman's training course and/or online training, rather than a circulating final report.

6.1.3 Monitoring and evaluation of the HotStuff model

Cattle and sheep being shipped to ports north of the equator can be exposed to conditions that impose thermoregulatory challenges. The maintenance of homeostasis in these animals can be aided by setting limits to the wet-bulb temperature on the animal decks. The wet-bulb temperature on the animal decks is, in turn, influenced by the ambient conditions and the stocking density.

A heat stress risk assessment model (named 'HotStuff') was developed for MLA / LiveCorp for use on long haul live export voyages to the Middle East. The HotStuff model restricts the stocking density on live export ships based on expected ambient conditions and the ship characteristics (especially the ventilation rate, or 'pen air turnover' on the animal decks).

In 2009 a technical review was undertaken by a panel of experts to examine the scientific basis, methodology and assumptions of the core elements that underpin HotStuff. Overall, the panel concluded that the methodology and assumptions underpinning HotStuff were sound, reasonable and supported by scientific literature, and that the model developers had followed well-defined and logical principles of adaptive management in the presence of uncertainty. The Review findings and a link to the Project Report can be found at the internet site - http://www.mla.com.au/Research-and-development/Final-report-details?projectid=14963

The objectives of the current Monitoring and Evaluation Project are:
1. Review the HotStuff model and information that has been made available by industry in order to establish a framework and methodology that will form the basis for ongoing assessment and performance of the model.
2. Based on findings from objective one, implement and maintain a data collection system that can be used to validate the HotStuff model over a two year period.
3. Based on the data collected over the two year period, evaluate the HotStuff model predictions and provide recommendations for model enhancement.

The project completed the review of data and established the data collection system over the years 2011-2012. During this time research officers deployed loggers measuring dry bulb temperature and relative humidity on board the animal decks of ships carrying livestock across the equator.

Evaluation of data gathered for 35 voyages led to the following recommendations:

1. That the Project data be first discussed with the HotStuff developers to resolve some issues identified. From this discussion a concensus should be formed on the most appropriate measures of
   (i) 'on-deck maximum temperatures', which would then be compared against the '5%-mortality' temperatures assumed in HotStuff for different classes of animal
   (ii) 'heat rise due to animals' so that estimation of 'effective' deck ventilation can be made. These statistics would then be checked against the values used in the HotStuff model, and perhaps cause ventilation values to be changed.
2. Once the first recommendation has been resolved, present and discuss the Project methods and results at an Exporters seminar. Further monitoring to 'audit' the ventilation rate of each deck of current livestock vessels can be decided upon.

The Project is due for completion in 2013

6.1.4 Refining shipboard stocking densities

The project, Refining shipboard stocking densities has been completed and the Final Report is available at http://www.mla.com.au/Research-and-development/Final-report-details?projectid=15355.

The project objectives were to:
1. Build on the outcomes of previous research to develop justifiable stocking density standards
2. Determine the animal welfare outcomes in cattle and sheep during sea transport at different stocking densities.
3. For each class of livestock there were three stocking densities investigated:
(i) Current ASEL (LIVE.233)
(ii) 10% less than ASEL and
(iii) 10% greater than ASEL standard

Weight change, lying behaviour and environmental conditions were studied for selected sheep on two voyages to the Middle East and cattle on one voyage to Indonesia.

Generally, stocking density or space allowance had no effect on weight gain and no or a transient effect (sheep voyage 1) on lying time. There was a common trend for lying behaviour across the three voyages where animals spent more time lying when offered more space, particularly during the initial stages of the voyage.

It was concluded that the current ASEL stocking densities are appropriate based on the animal welfare indicators applied in these investigations.

6.1.5 Scabby mouth

The project, Investigating the Incidence of Scabby Mouth has been completed and the Final Report is available at http://www.mla.com.au/Research-and-development/Final-report-details?projectid=15337.

The project objectives were to:
1. Review relevant literature relating to scabby mouth and scabby mouth vaccination as it affects sheep in Australia on farm and in the live export industry
2. Determine the current use of scabby mouth vaccination in the Australian sheep flock
3. Determine the prevalence of scabby mouth in Australian sheep prior to departure and at the point of discharge in the Middle East
4. Provide recommendations to industry on the current vaccination protocols for sheep destined for Middle East markets

The study recommended that a single-vaccination strategy replace the current double-vaccination strategy, entailing vaccination at marking or at least 21 days prior to delivery to the assembly facility. It also recommended that the disease prevention strategy embrace principles of both exclusion (closer inspection to remove infected sheep) and immunity (vaccination). Changes to the existing protocol should be monitored through stringent inspection during delivery of sheep to assembly facilities coupled with a research program to monitor/evaluate subsequent shipments.

The study concluded that the development of a killed or virulent field strain vaccine administered intramuscularly or subcutaneously would have immediate industry application and that the industry monitors any developments in this regard.

6.1.6 Vet Disease Handbook

The Live Export Veterinary Disease Handbook provides best practice information and standardised approaches to ensure that veterinarians and stockpersons can achieve optimum and consistent animal health and welfare outcomes for exported animals, and covers the period from arrival at assembly feedlots to slaughter at overseas destinations.

The Handbook covers:
1. The causes, diagnosis, treatment and prevention of disease conditions known to occur in export livestock species (sheep, goats, dairy cattle and beef cattle)
2. Diseases and conditions likely to occur in animals during the period from arrival at the assembly feedlot, during the export voyage and ending with discharge and feedlotting at the overseas destinations
3. Treatment(s) for all conditions that utilise therapeutics described in the LiveCorp / MLA Best Practice Use of Veterinary Drugs Manual

The Handbook has been published in limited printing and is available upon request to MLA

6.1.7 Training DVD – On board livestock management

The crew responsible for the management and handling of livestock aboard livestock vessels can have widely varying degrees of experience with animals. Often the only training provided to new crew members is from crew perceived as “more experienced” members on board. Given this variability in backgrounds and experience there is a need to provide an industry standard of training in animal husbandry, handling and welfare.

The purpose of this project was to develop and produce DVD training material to be used in training ship’s crew and stockmen on the management, handling and husbandry of Australian cattle and sheep on board livestock vessels.

The Project has been completed and the DVDs are available upon request to MLA.

6.1.8 Performance data collection – scoping study

The purpose of this project is to summarise current methods used by industry to collect, store, analyse and use data related to animal health and performance during export. Also a range background issues related to this proposal will be identified and brief descriptions of opportunities for improvements that can take advantage of hardware/software advances will be presented.

The Project will describe findings from a review and consultation process with export industry stakeholders including:
a. Current systems used by exporters for collecting and using data/information related to animal health and performance, for animals that use individual (cattle) and non-individual (sheep) animal identification systems.
b. A description of exporter's expectations and their perceived potential benefits of an integrated information management system.
c. Opportunities offered by advances in hardware/software for more efficient and effective collection and use of data related to animal health and performance.
d. Development of an industry-agreed list of data providing optimal value to individual operators and the industry for routine business management and strategic purposes.
e. Opportunities for collection of data at various steps along the export chain from property of origin in Australia to assembly feedlot, export vessel, port of unloading at a foreign country, and final destination (property/feedlot/slaughter facility) in a foreign country.
f. Recommendations for long term data storage and analysis including suggested outputs for annual reporting.
g. Constraints/concerns related to collection of animal health and performance data (technical issues, confidentiality/commercial sensitivities, security, ownership).
h. Lessons learned from relevant projects such as MLA Projects Live.123 and W.LIV.0252 (see 6.1.1 above).
i. Options for designing, building, implementing and maintaining system components that can offer improved data collection and information management for export operators.

The report will summarise feedback from industry stakeholders and describe options for developments of systems that benefit from advances in hardware/software capability, and that offer business benefits that will contribute to QA requirements as outlined in the Independent Review into Livestock Export Trade.

The Project commenced in July 2012, with recommendations for long-term data collection and project completion due in September 2013.

6.1.9 Contingency Planning review

While a Consignment Risk Management Plan (CRMP) and associated contingency plan is an Australian Government requirement for all live exports, recent incidents have demonstrated the need to review the adequacy of the contingency plans and institute changes where necessary.

Contingency planning is a necessary process to prepare for emergencies or disasters which may occur in the live export trade. The purpose of the project is to review and identify consignment risks and develop contingency planning options during the export of livestock.

The key objectives are:
1. To critically and technically assess the key emergency situations which could possibly occur during the export of livestock, and to identify all of the potential contingency options. For each of the potential contingency responses identified, the benefits, costs and associated risks will be clearly identified and described. To assist the process, an Advisory Group and a Research Group will be established to guide discussions, assist drafting and provide technical advice.
2. An Operations and Governance Manual will be prepared which outlines the available contingencies for managing emergencies and which can be used to guide optimal contingency selection.
3. A model template for developing a contingency risk management plan (CRMP) will be provided.

Project commenced December 2012, and the current forecast completion date is September 2013.

6.2 Appendix 2 - Published studies

A list of scientific and extension publications, relevant to the livestock export trade, is shown below in order of publication date.

Norris, RT and Richards, RB (1989) Deaths in sheep exported by sea from Western Australia – analysis of ship Master's reports Aust Vet J **66:** 97-102

Norris, RT, Richards, RB and Dunlop, RH (1989a) An epidemiological study of sheep deaths before and during export by sea from Western Australia Aust Vet J **66:** 276-279

Norris, RT, Richards, RB and Dunlop, RH (1989b) Pre-embarkation risk factors for sheep deaths during export by sea from Western Australia Aust Vet J **66:** 309-314

Richards, RB, Norris, RT, Dunlop, RH and McQuade, NC (1989) Causes of death in sheep exported live by sea Aust Vet J **66:** 33-38

McDonald, CL, Norris, RT, Ridings, H and Speijers, EJ (1990) Feeding behaviour of Merino wethers under conditions similar to lot-feeding before live export Aust J Exp Agric **30:** 343-348

Norris, RT, McDonald, CL, Richards, RB, Hyder, MW, Gittins, SP and Norman, GJ (1990) Management of inappetant sheep during export by sea Aust Vet J **67:** 244-247

Thomas, KW, Kelly, AP, Beers, PT and Brennan, RG (1990) Thiamine deficiency in sheep exported live by sea Aust Vet J **76:** 215-218

Higgs, ARB, Norris, RT and Richards, RB (1991) Season, age and adiposity influence death rates in sheep exported by sea Aust J Agric Res **42:** 205-214

Norris, RT (1991) Studies of factors affecting sheep deaths during lot-feeding and sea transport PhD Thesis, Murdoch University, Perth

Richards, RB, Hyder, MW, Fry, JM, Costa, ND, Norris, RT and Higgs, ARB (1991) Seasonal factors may be responsible for deaths in sheep exported by sea Aust J Agric Res **42:** 215-226

Norris RT, Richards RB and Norman, GJ (1992) The duration of lot-feeding of sheep before sea transport Aust Vet J **69**: 8-10

Scharp, DW (1992) Performance of Australian wethers in Arabian Gulf feedlots after transport by sea Aust Vet J **69:** 42-43

Higgs, ARB, Norris, RT and Richards, RB (1993) Epidemiology of salmonellosis in the live sheep export industry Aust Vet J **70:** 330-335

Richards, RB, Norris, RT and Higgs, ARB (1993) Distribution of lesions in ovine salmonellosis Aust Vet J **70:** 326-330

McDonald, CL, Rowe, JB and Gittins, SP (1994) Feeds and feeding methods for assembly of sheep before export Aust J Exp Agric **34:** 589-94

Higgs, ARB, Norris, RT, Baldock, FC, Campbell, NJ, Koh, S and Richards, RB (1996) Contagious ecthyma in the live sheep export industry Aust Vet J **74:** 215-220

Higgs, ARB, Norris, RT, Love, RA and Norman, GJ (1999) Mortality of sheep exported by sea: evidence of similarity by farm group and of regional differences Aust Vet J **77:** 729-733

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6.3 Appendix 2 - Acknowledgements

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