final report

Project code:	**W LIV 0270**
Prepared by:	**Department of Agriculture and Food, Western Australia** **RT Norris & GJ Norman**
Date published:	**July 2010**
ISBN:	**9781741913866**

PUBLISHED BY
Meat & Livestock Australia Limited
Locked Bag 991
NORTH SYDNEY NSW 2059

National livestock export industry shipboard performance report 2009

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

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 2009.

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. The summary report provides a breakdown by species and major destinations.

The overall mortality rate for sheep during sea transport to all destinations during 2009 was 0.91% out of approximately 3.5 million sheep exported. This was higher than the 0.84% mortality rate observed in 2008. The main port of loading was Fremantle (2.5 million sheep exported with mortality rate of 0.91%), followed by Portland (0.7 million sheep exported with mortality rate of 0.86%) and Adelaide (0.3 million sheep exported with mortality rate of 1.01%).

The overall mortality rate among the 0.95 million cattle exported from Australia in 2009 was 0.10%. This was lower than the 0.12% mortality rate observed in 2008. The overall mortality rate on voyages to the Middle East/North Africa was 0.32% in 2009, a rise from 0.29% in 2008. The overall mortality rate on voyages to South-East Asia was 0.08%, similar to the 0.09% in 2008. The highest overall mortality rate on a regional basis was 0.32% for exports to the Middle East/North Africa, while the lowest overall mortality rate was 0.07% for exports to North-East Asia.

The overall mortality rate among the 577 goats exported by sea from Australia in 2009 was 0.17%, which was substantially less than the 0.51% observed in 2008. All goats exported by sea during 2009 went to South-East Asia.

Contents

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.
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 data refers to reports received during the calendar year, in contrast to the current report which refers to voyages which departed during the calendar year.

1 Project objectives

- Produce a report which summarises the mortality of sheep, cattle and goats for the 2009 calendar year and provides an informed analysis of mortality trends in the livestock export industry.

- Maintain data and expertise to provide analysis and informed comment.

2 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 (by age-sex category and port of loading) than is available from the Masters' report. The 2009 report is for voyages which departed Australia during 2009 and for which records were to hand on 12 April 2010. The Australian Bureau of Statistics provided information on the number of sheep exported to various destination countries from ports in Australia.

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 the results as originally published.

Codes are used where appropriate in order to maintain confidentiality.

Summary information was produced using Statistix 7.0 (Analytical software 2000 Tallahassee, Florida USA)

3 Results and discussion

3.1 Sheep

3.1.1 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 since 1985 as well as the trendline (linear regression) across the years. The number of sheep exported annually has varied between 3.5 and 6.5 million, and the annual mortality has varied between 0.75 and 3.0%. The trend for numbers of sheep exported and annual mortality has been downward, with a greater decline for annual mortality.

Figure 1 Number of sheep exported by sea from Australia to all destinations since 1985

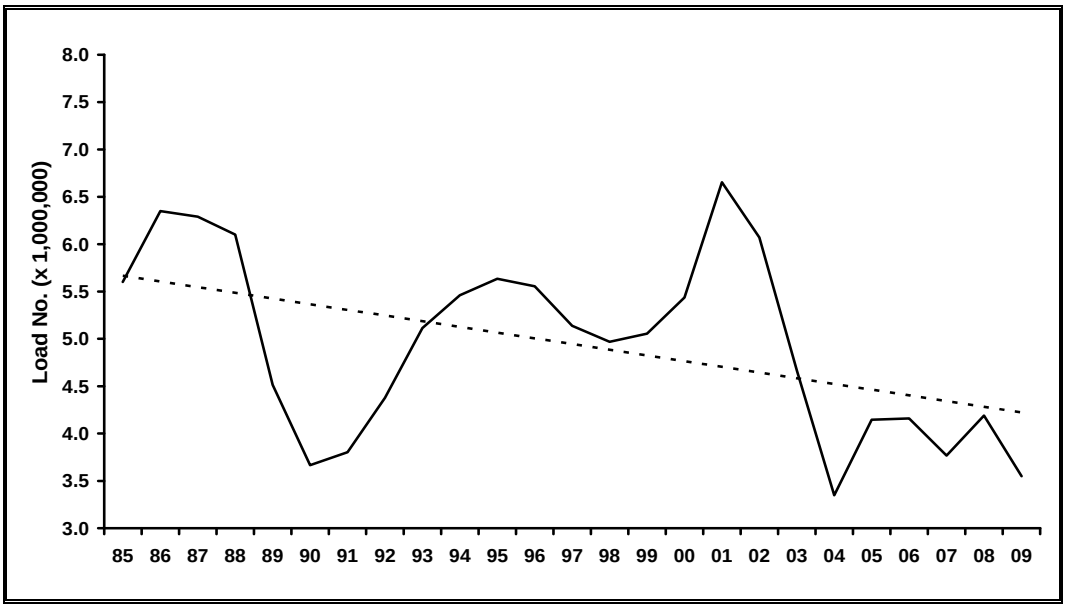
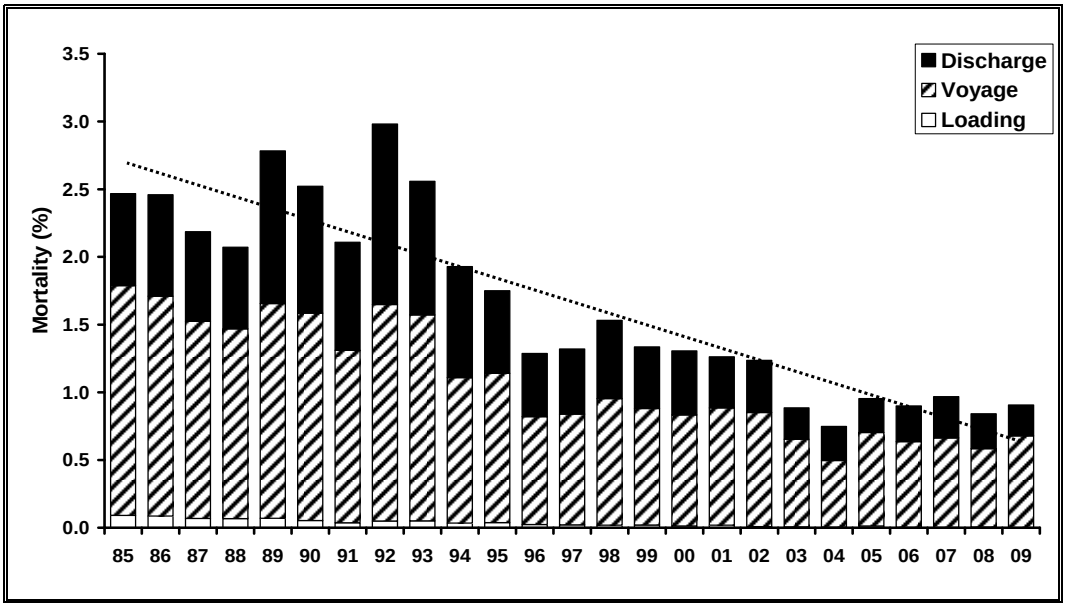


Figure 2 Annual mortality of sheep exported by sea from Australia to all destinations since 1985



3.1.2 Overview

Nearly all sheep exported live by sea from Australia in 2009 were sent to the Middle East and were mainly loaded at Fremantle, Adelaide and Portland.

There were 7,783 sheep exported to South-East Asia on five voyages which incurred a mortality rate of 0.40%. The average voyage length (voyage to first discharge port) for the region was 8.7 days with an additional 1.0 days discharging (most voyages had only one discharge port).

The average voyage length for exports to the Middle East was 16.1 days with 5.4 days discharging (most voyages had multiple discharge ports).

Except where indicated, the comments below refer to voyages of sheep to the Middle East.

3.1.3 Port of loading

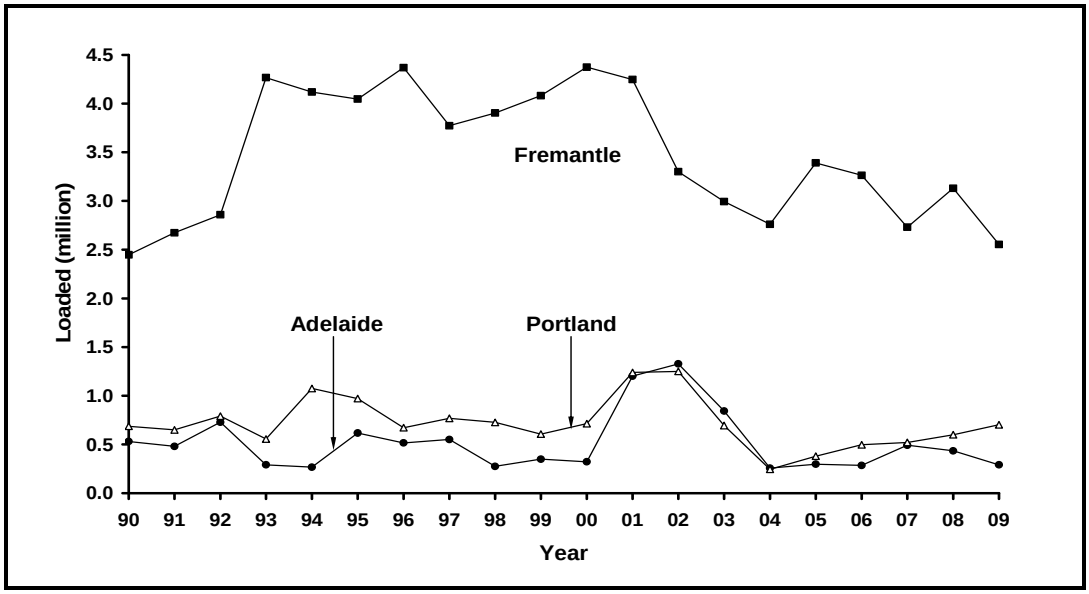
The number and classes of sheep exported by sea to the Middle East from Fremantle, Adelaide and Portland during 2009 are shown in Table 1. Overall numbers exported in 2009 fell by over 15% compared to 2008. The main changes in 2009 compared to 2008 were a decrease in exports of adult wethers from Fremantle and Adelaide (34% and 46% respectively), and a 27-fold increase in exports of young wethers from Portland. There was a 50% decrease in exports of ram adults from Fremantle.

Table 1 The numbers and classes of sheep exported by sea to the Middle East from Fremantle, Adelaide and Portland during 2009

Livestock		Fremantle	Adelaide	Portland	Total
Wethers	adults	1,036,413	223,014	555,596	1,815,023
	hoggets	191,031	30,478	35,485	256,994
	lambs	515,934	31,322	89,721	636,977
Rams	adults	50,720	5,493	15,818	72,031
	hoggets	63,366		592	63,958
	lambs	232,039		296	232,335
Ewes	adults	335,964	1,332	4,755	342,051
	hoggets	4,820			4,820
	lambs	118,330		83	118,413
Total	sheep	2,548,617	291,639	702,346	3,542,602

Most sheep exported by sea from Australia to the Middle East during 2009 were loaded at Fremantle (71.9% of all sheep, Figure 3) with smaller numbers loaded at Portland (19.8%) and Adelaide (8.2%).

Figure 3 Number of sheep exported by sea to the Middle East from Fremantle (Western Australia), Portland (Victoria) and Adelaide (South Australia) since 1990



3.1.4 Destination

The main importing countries for Australian sheep in 2009 are shown in Table 2. Kuwait was the main market (26% of all sheep) followed by Bahrain (21%), Saudi Arabia (16%) and Jordan (13%).

Table 2 Destination country for sheep exported from Australia during 2009

Country	Fremantle	Adelaide	Portland	Other	Total
Bahrain	378,733	80,420	288,674	0	747,827
Israel	23,400			0	23,400
Jordan	360,878	68,479	41,154	0	470,511
Kuwait	567,372	117,451	263,448	0	948,271
Oman	219,797	5,000	64,426	0	289,223
Qatar	352,695			0	352,695
Saudi Arabia	576,147			0	576,147
UAE	71,201	20,315	38,796	0	130,312
S.E. Asia	7,960	0	0	21,156	29,116
N.E. Asia	0	0	0	80	80
Other	0	0	0	27	27
Total	2,558,183	291,665	696,498	21,263	3,567,609

SOURCE – Australian Bureau of Statistics, April 2009

Note: - ABS figures also include exports by air and so figures in Table 2 do not reflect totals in Table 1.

3.1.5 Mortality rates

There were 17 voyages to the Middle East in 2009 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 wherever possible. Where analysis involving split-load voyages has been performed, the consignments of sheep from each load port have been considered as separate "voyages".

Using the above definition of voyage, there were 65 "voyages" of sheep to the Middle East during 2009. This involved 48 ship journeys.

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 total mortality rate for all sheep exported to all destination regions during 2009 was 0.91% (Table 3), an increase from 0.84% observed in 2008.

There were five shipments to South-East Asia, and the mortality rate was 0.40% out of 7,783 sheep loaded.

For shipments to the Middle East, the main change compared to 2008 was a substantially increased voyage mortality rate for shipments from Portland, with a smaller increase for shipments from Fremantle and Adelaide (Table 3 and Figure 4).

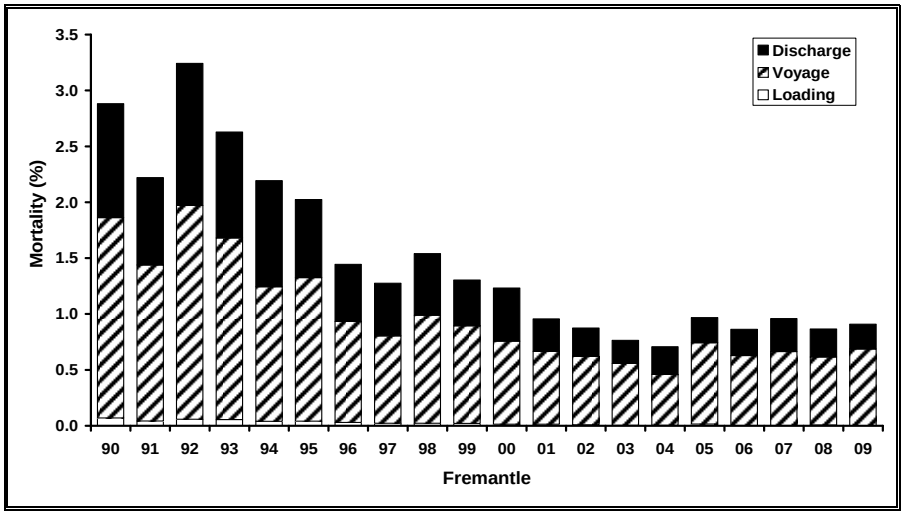
Table 3 Annual shipboard mortality rates for sheep exported from Fremantle, Adelaide and Portland to the Middle East, and Total mortality rate for all sheep exported to all destinations

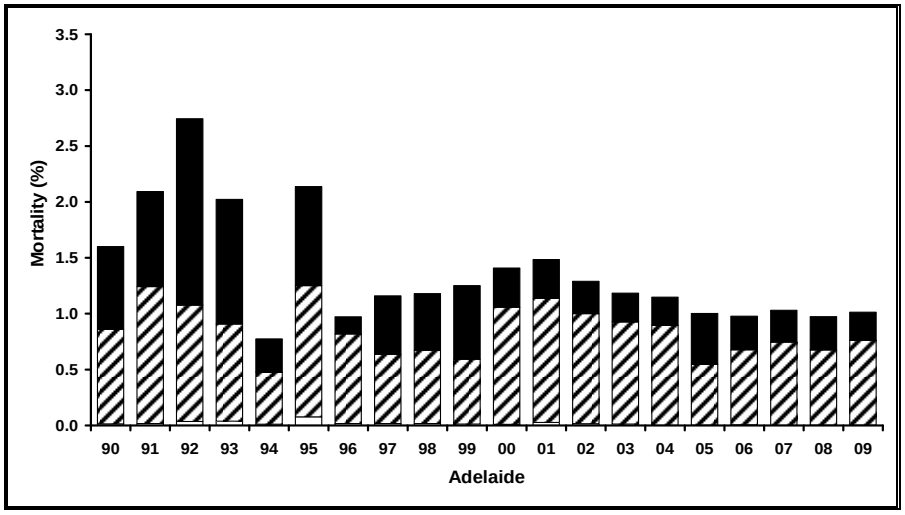
		Mortality rate (%)			
	Year	Load	Voyage	Discharge	Total
Fremantle*	2005	0.02	0.73	0.22	0.97
	2006	0.00	0.63	0.23	0.86
	2007	0.00	0.66	0.29	0.96
	2008	0.01	0.61	0.25	0.87
	2009	0.00	0.68	0.22	0.91
Adelaide*	2005	0.00	0.54	0.46	1.00
	2006	0.01	0.67	0.30	0.98
	2007	0.00	0.74	0.28	1.03
	2008	0.00	0.67	0.30	0.97
	2009	0.00	0.76	0.25	1.01
Portland*	2005	0.00	0.51	0.32	0.83
	2006	0.00	0.57	0.35	0.92
	2007	0.00	0.60	0.40	0.99
	2008	0.00	0.36	0.27	0.64
	2009	0.00	0.61	0.24	0.86
Total**	2005	0.01	0.69	0.25	0.95
	2006	0.00	0.63	0.26	0.90
	2007	0.00	0.66	0.31	0.97
	2008	0.00	0.58	0.26	0.84
	2009	0.00	0.68	0.23	0.91

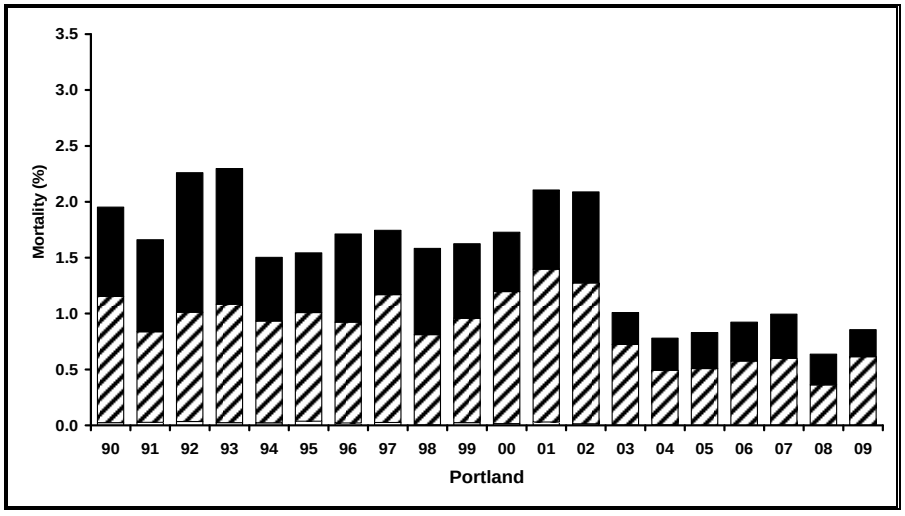
* Middle East only

** 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 since 1990







3.1.6 Class of sheep

The mortality rates of various classes of sheep exported from Australia to the Middle East are shown in Table 4 and Figure 5. The highest overall mortality rates for 2009 were in ewe hoggets, and adult and hogget rams (1.5, 1.3 and 1.3 respectively). The reasons for this result are not known; there was only one voyage of ewe hoggets with relatively few animals but there were multiple voyages of rams involving larger numbers (Table 1).

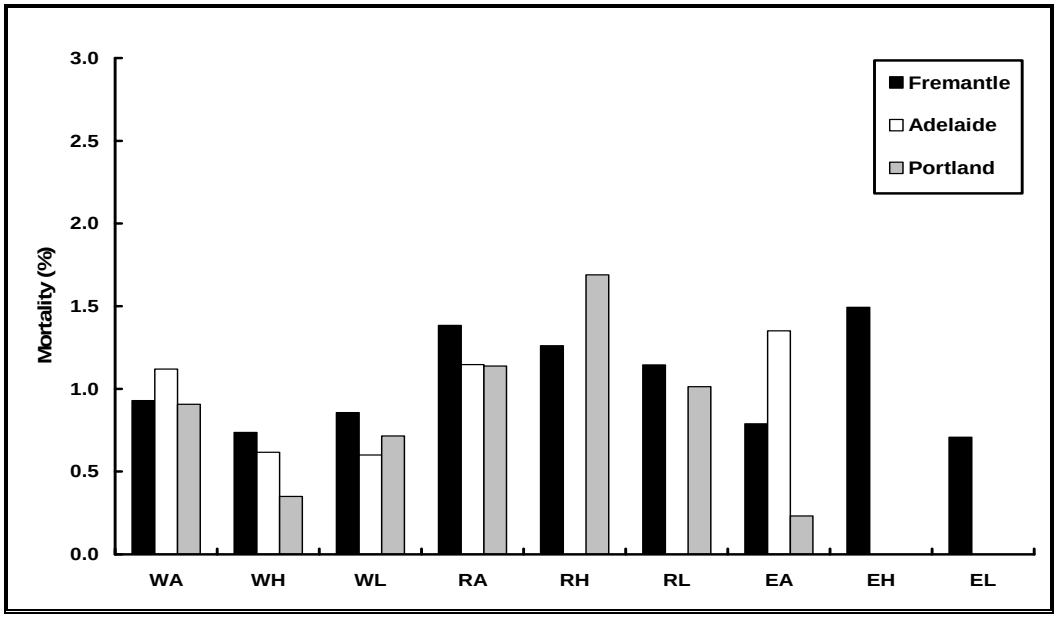
Table 4 Overall mortality (%) for classes of sheep exported from Fremantle, Adelaide and Portland to the Middle East in 2009

Class of sheep		Fremantle	Adelaide	Portland	Total
Wethers	adult	0.9	1.1	0.9	0.9
	hogget	0.7	0.6	0.3	0.7
	lamb	0.9	0.6	0.7	0.8
Rams	adult	1.4	1.1	1.1	1.3
	hogget	1.3	n/a	1.7	1.3
	lamb	1.1	n/a	1.0	1.1
Ewes	adult	0.8	1.4	0.2	0.8
	hogget	1.5	n/a	n/a	1.5
	lamb	0.7	n/a	0.0	0.7

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 in 2009

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

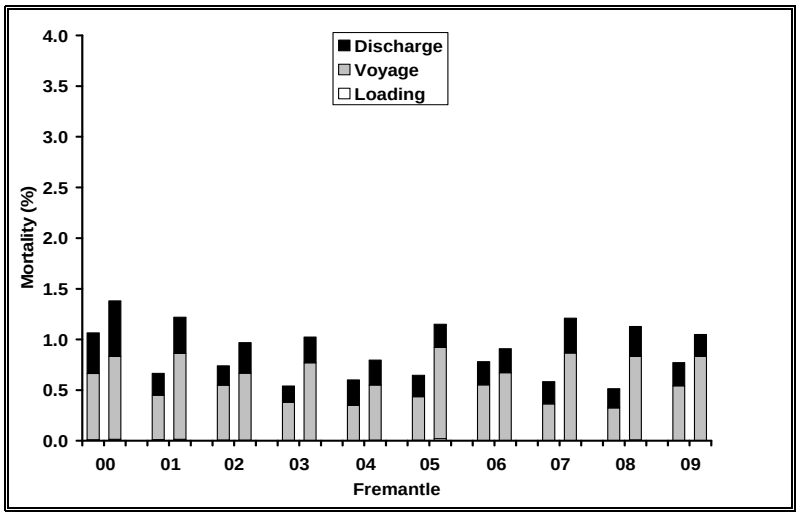


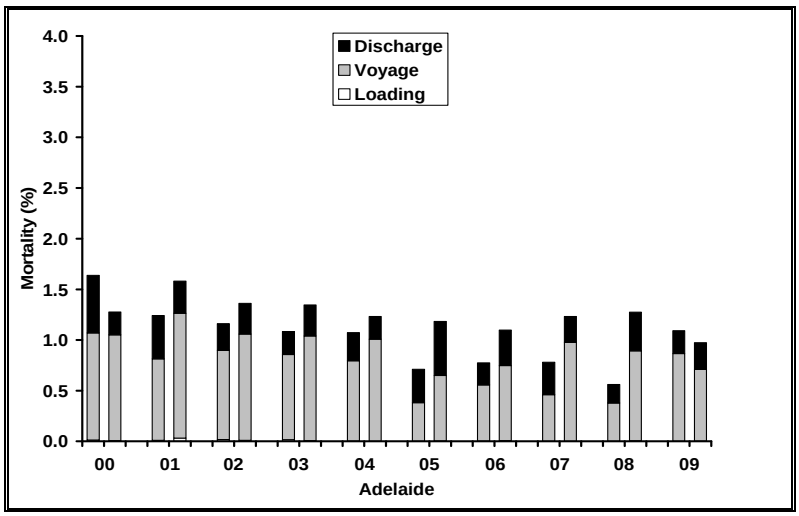
3.1.7 Time of year

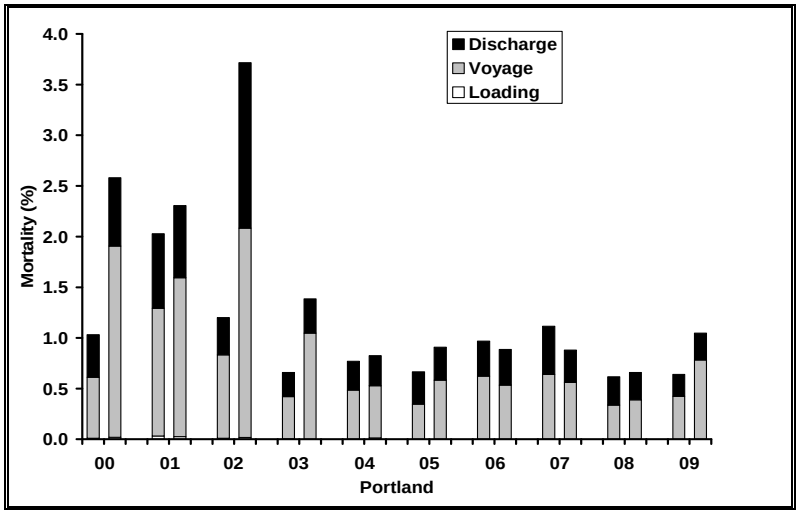
Mortality rates were higher ($P < 0.05$) in the second half of 2009 compared with the first half in sheep exported from Fremantle (0.77% and 1.05%) and Portland (0.64% and 1.05%). The effect was reversed for Adelaide (1.09% and 0.97%; Figure 6) with the mortality rate higher in the first half of the year ($P < 0.05$).

The likely reason is given in Higgs *et al* (1991) and involves seasonal cycles of metabolism.

Figure 6 Mortality (%) for sheep exported by sea from Fremantle, Adelaide and Portland to the Middle East for the first and second half of each year from 2000 to 2009

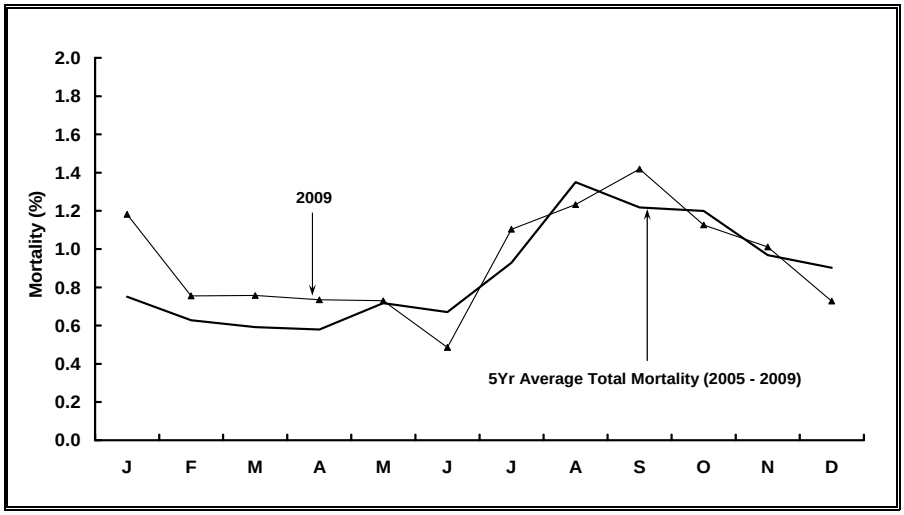






In 2009, monthly mortality rates (total mortality as a proportion of total loaded for each month) in sheep exported from Fremantle were similar to the 5-year monthly mortality rates (Figure 7).

Figure 7 Monthly mortality rates for shipments from Fremantle to the Middle East in 2009 and the 5-year monthly averages for the period 2005 to 2009



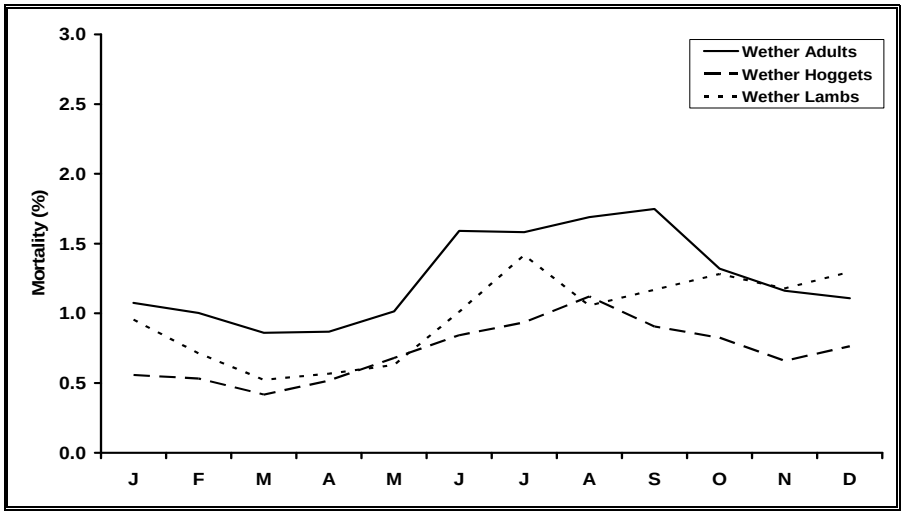
3.1.8 Time of year and age of sheep

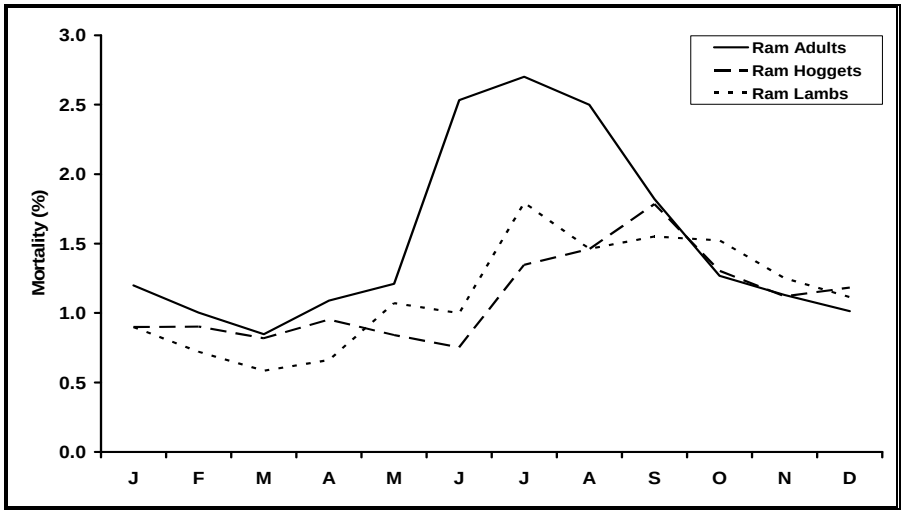
Figure 8 shows the monthly mortality rates (total mortality as a proportion of total loaded for each month) in wether and ram adults, hoggets and lambs, and ewe adults and lambs exported from Australia to the Middle East from 1997 to 2009. Results for ewe hoggets are not presented because of the paucity of data.

Figure 9 shows the mortality rates in the first and second half of the year for the wether classes over the same period. 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 sheep except for wether adults and hoggets in 2006.

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 shown in Figures 8 and 9 indicate that seasonal differences in mortality exist for wether hoggets and lambs as well as adults. Similar findings were observed for ram classes and for ewe adults and lambs (results not presented). For ewe hoggets, the paucity of data in most years made conclusions unreliable.

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 from 1997 to 2009





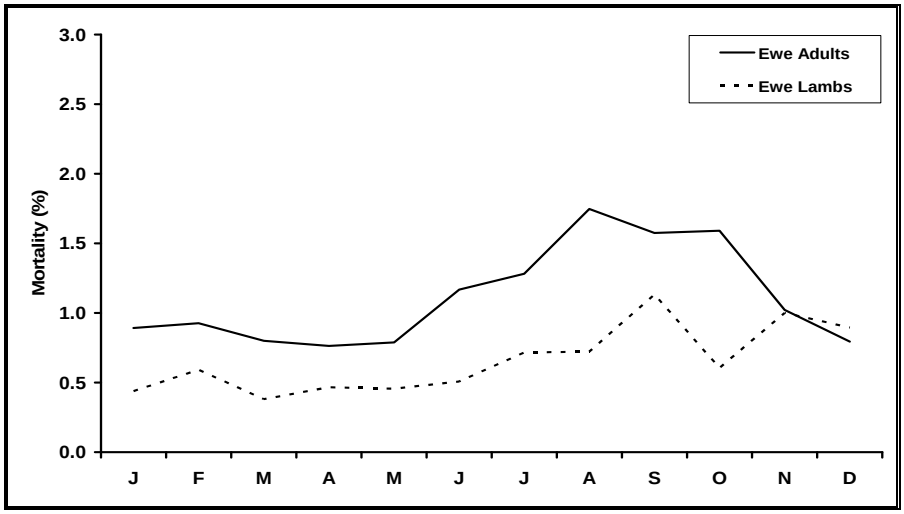
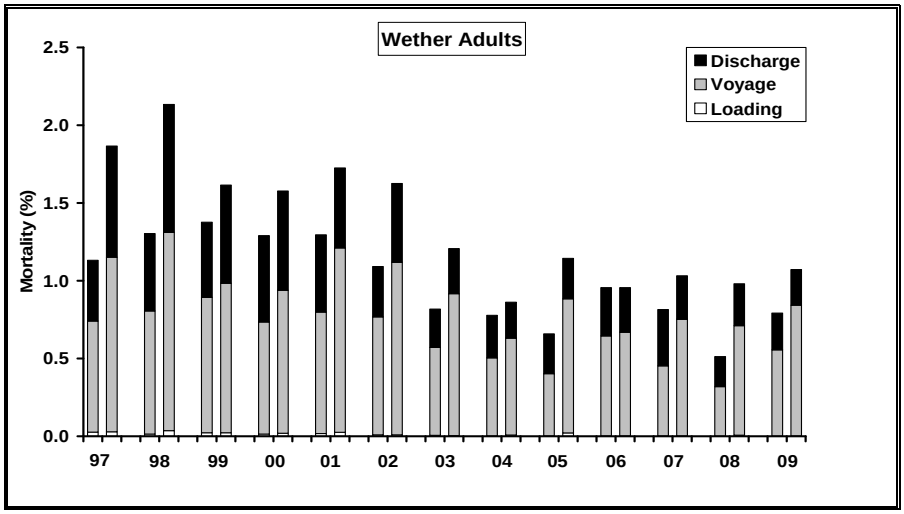
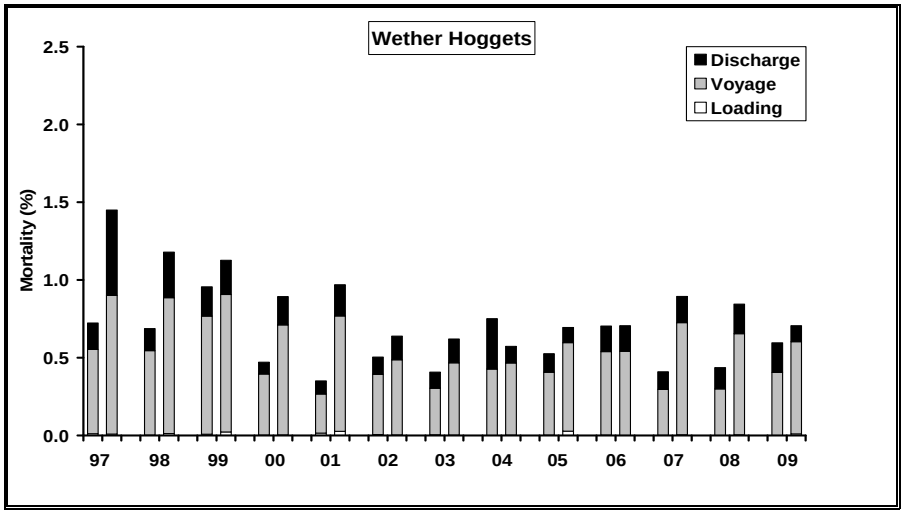
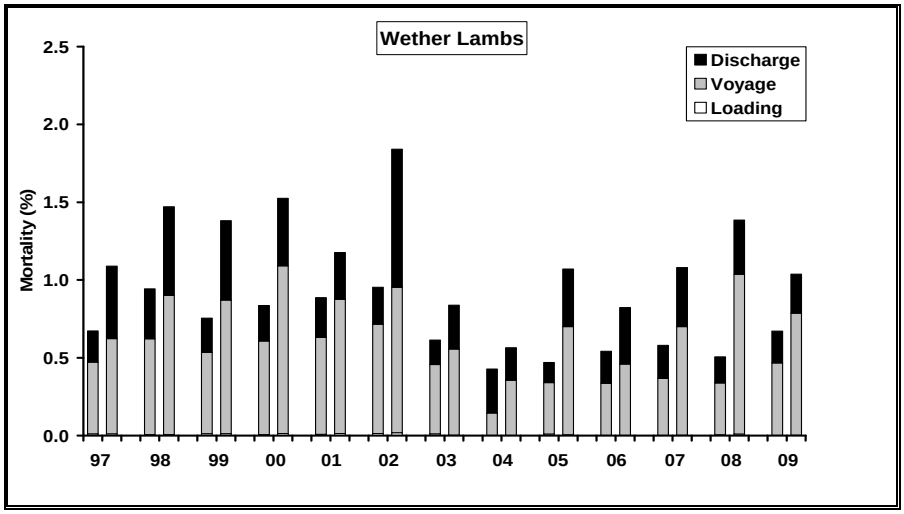


Figure 9 Mortality (%) for wether adults, hoggets and lambs exported by sea from Australia to the Middle East for the first and second half of each year from 1997 to 2009







3.1.9 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 from Fremantle (Table 6a), Adelaide (Table 6b) and Portland (Table 6c).

There was only one voyage in the “high” category in 2009, involving ship 34 and the port of Fremantle. Approximately 67% of voyages from Fremantle, 57% of voyages from Adelaide and 69% of voyages from Portland were in the “low” category.

The number of voyages fell by approximately 11%, from 73 in 2008 to 65 in 2009.

Table 5a Number of voyages in low, medium and high mortality categories for ships loaded at Fremantle in 2009

Ship (code)	Mortality rate			Total
	Low <1.0%	Medium 1.0–2.0%	High >2.0%	
2	4	1	0	5
32	2	2	0	4
33	1	3	0	4
34	4	0	1	5
35	3	4	0	7
38	5	0	0	5
42	0	2	0	2
43	9	1	0	10
Total	28	13	1	42

Table 5b Number of voyages in low, medium and high mortality categories for ships loaded at Adelaide in 2009

Ship (code)	Mortality rate			Total
	Low <1.0%	Medium 1.0–2.0%	High >2.0%	
32	1	1	0	2
33	0	1	0	1
34	3	0	0	3
35	0	1	0	1
Total	4	3	0	7

Table 5c Number of voyages in low, medium and high mortality categories for ships loaded at Portland in 2009

Ship (code)	Mortality rate			Total
	Low <1.0%	Medium 1.0–2.0%	High >2.0%	
2	3	0	0	3
32	4	2	0	6
34	3	2	0	5
35	1	1	0	2
Total	11	5	0	16

3.2 Cattle

3.2.1 Performance trend

The number of cattle shipped from all ports in Australia to all destinations since 1995 as well as the trendline (linear regression) across those years is shown in Figure 10. Similarly, Figure 11 shows the number of cattle mortalities during sea transport since 1995. The number of cattle exported annually has varied from approximately 450,000 to 960,000, and the annual mortality has varied between 0.10 and 0.42%. The trend for numbers of cattle exported has been slightly upwards whereas the trend for annual mortality has been downward.

Figure 10 Number of cattle exported by sea from Australia to all destinations since 1995

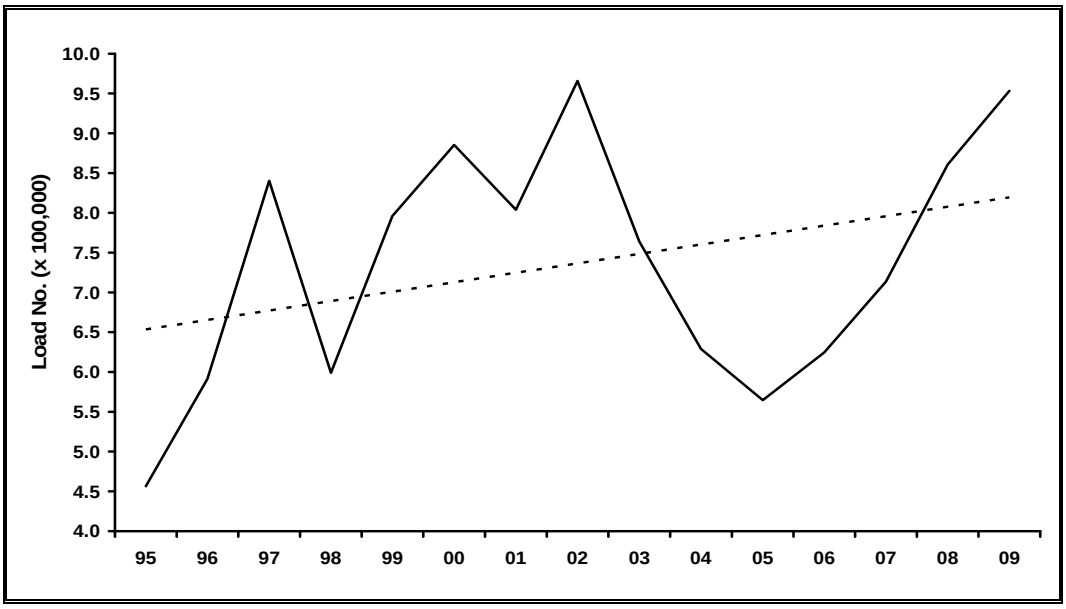
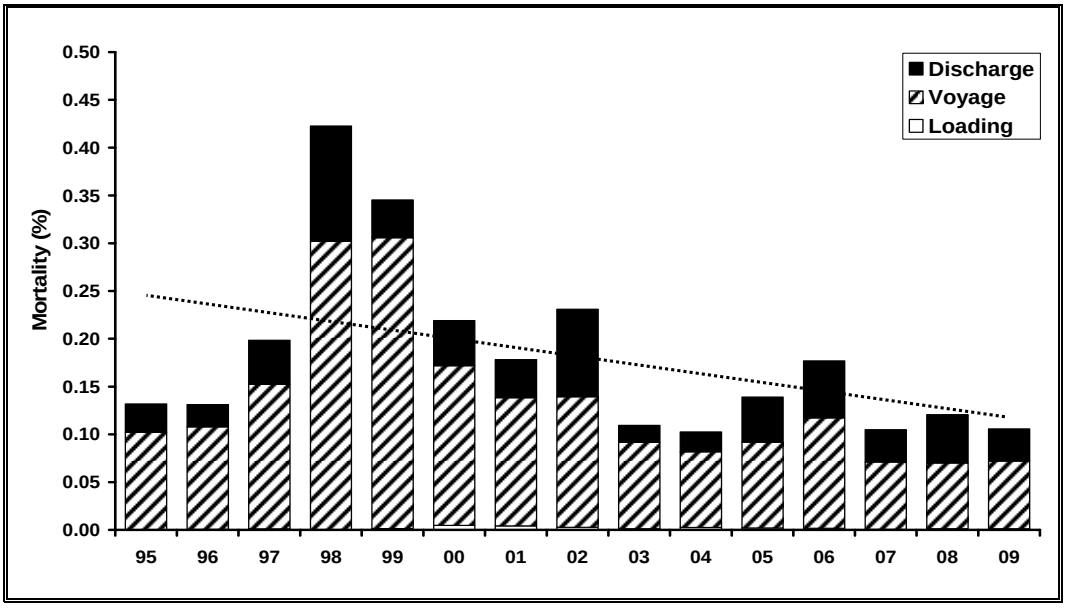


Figure 11 Annual mortality of cattle exported by sea from Australia to all destinations since 1995



3.2.2 Overview

The live cattle trade from Australia in 2009 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 virtually all sheep were shipped to the Middle East.

There were 15 voyages in 2009 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 353 "voyages" of cattle during 2009. This involved 338 ship journeys.

The overall mortality rate among the 0.95 million cattle exported from Australia in 2009 was 0.10% (Table 6). This was lower than the 0.12% observed in 2008. The highest overall mortality rate on a regional basis was for exports to Miscellaneous destinations, but that was represented by just one voyage. The lowest overall mortality rate was for exports to North-East Asia.

The overall number of cattle exported rose by 11% in 2009 compared to 2008, approaching the highest number of cattle exported, 0.96 million in 2002.

Previously, exports to South-East Asia were characterised by small consignments on short voyages. More recently, larger ships have been introduced which have involved loading and discharging at more than one port. In 2009, these larger vessels accounted for 28% of the trade to the region. The number of voyages to South-East Asia rose by 31% in 2009 compared to 2008 (288 and 219 respectively).

Exports to North-East Asia comprised steers sent to Japan and dairy cattle sent to China. The number of cattle exported to the region rose by 61% in 2009 compared to 2008, largely due to an increase in cattle exported from Portland to China.

Almost half (42%) of cattle voyages experienced no mortality during 2009.

Table 6 Mortality rates, number of voyages and number of cattle exported for voyages to major destination regions during 2009

Parameter	ME/N Africa	SE Asia	NE Asia	Misc	Total
Voyages (No.)	41	288	23	1	353
Cattle (No.)	98,183	795,465	48,116	3,493	945,257
Mortality rate overall (%)	0.32	0.08	0.07	0.37	0.10
Mortality rate range (%)	0.0 – 1.8	0.0 – 0.9	0.0 – 0.2	0.0 – 0.2	0.0 – 1.8
Voyages with nil mortalities (No.)	13	130	5	n/a	148

3.2.3 Middle East

The live cattle trade to the Middle East has remained low over the last seven years (Table 7). Overall mortality rates have remained below 0.5% since 1998 except for 2002 and 2006. In 2009 the mortality rate was 0.32% compared to 0.29% in 2008.

Table 7 Mortality rates, number of voyages and number of cattle exported to the Middle East from 1995 to 2009

Year	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyages with nil mortalities (No.)
1995	11	14,557	0.67	0.0 – 2.1	2
1996	36	65,066	0.65	0.0 – 5.0	14
1997	62	137,869	0.67	0.0 – 4.2	15
1998	122	266,286	0.69	0.0 – 41.5*	23
1999	112	314,981	0.35	0.0 – 3.3	25
2000	96	274,159	0.42	0.0 – 8.0	22
2001	101	287,242	0.32	0.0 – 5.0	27
2002	102	265,005	0.61	0.0 – 35.0*	33
2003	52	106,080	0.45	0.0 – 2.0	18
2004	31	61,679	0.43	0.0 - 1.3	9
2005	38	90,808	0.34	0.0 – 1.0	12
2006	43	119,297	0.52	0.0 – 4.3	13
2007	41	74,256	0.19	0.0 – 0.5	16
2008	46	120,122	0.29	0.0 – 0.8	19
2009	41	98,183	0.32	0.0 – 1.8	13

* exceptional voyages involving presumed heat stroke in 1998 and heat stroke in 2002

3.2.3.1 Port of loading

There were 3 ports of loading for voyages to the Middle East in 2009, and most cattle were exported from Fremantle, followed by Portland and Adelaide (Table 8). Mortality rates in 2009 were highest from Portland, followed by Fremantle.

The voyages from each port were classified into various mortality categories as shown in Table 9. There were five voyages in the medium or high categories, three loaded at Fremantle and two at Portland. No mortalities occurred on 39% of the voyages from Fremantle.

Table 8 Mortality rates, number of voyages and number of cattle exported from various ports to the Middle East for 2009

Port	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)
Fremantle	31	89,601	0.32	0.0 – 1.1
Adelaide	1	534	0.00	n/a
Portland	9	8,048	0.41	0.1 – 1.8

Table 9 Number of voyages in nil, low, medium and high mortality categories for shipments from various ports to the Middle East for 2009

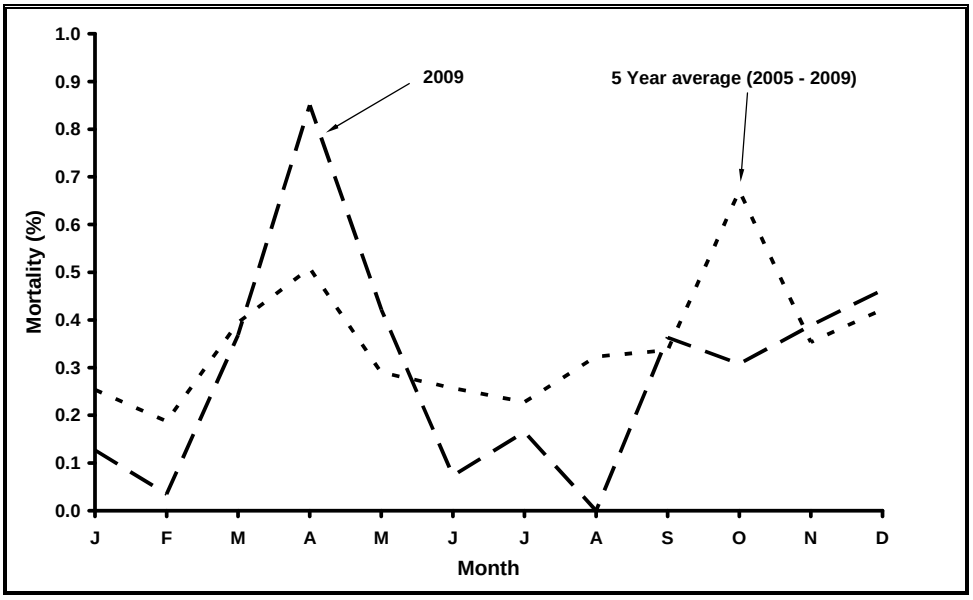
Port	Mortality rate				Total
	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	
Fremantle	12	16	2	1	31
Adelaide	1	0	0	0	1
Portland	0	7	1	1	9
Total	13	23	3	2	41

3.2.3.2 Time of year

In 2009, monthly mortality rates (total mortality as a proportion of total loaded for each month) in cattle exported from all ports to the Middle East remained below 0.85% throughout the year.

The monthly mortality rate in 2009 approximated the 5-year average and was below it for all months except April and May (Figure 12).

Figure 12 Monthly mortality rates of cattle on voyages from all ports to the Middle East for 2009 and the 5-year monthly rates for the period 2005 to 2009



3.2.3.3 Voyages from southern ports 1999 to 2009

Additional observations were made for the ports of Fremantle, Adelaide and Portland because of the higher mortality rates on voyages from these ports compared to northern ports in previous years.

All voyages to the Middle East in 2009 originated from southern ports of Australia.
The mortality rate and number of cattle exported from Fremantle in 2009 was similar to 2008. Mortality rates from Fremantle have remained relatively constant at 0.4% or less (Table 10).
There have been few cattle exported from Adelaide since 2004, with low mortality rates since then.

The mortality rate of 0.4% in cattle from Portland during 2009 was approximately double that of rates since 2004 if one exceptional voyage in 2006 is excluded.

Table 10 Mortality rates for cattle loaded at Fremantle, Adelaide or Portland from 1999 to 2009

Year	Fremantle			Adelaide			Portland		
	Voys (No.)	Cattle (No.)	Mort. (%)	Voys (No.)	Cattle (No.)	Mort. (%)	Voys (No.)	Cattle (No.)	Mort. (%)
1999	43	103,290	0.33	10	30,139	0.51	14	45,087	0.83
2000	45	94,787	0.43	7	19,158	0.66	13	40,748	1.01
2001	48	104,404	0.34	11	22,274	0.53	16	35,797	0.82
2002	57	103,914	0.36	17	25,035	0.47	15	46,624	2.03*
2003	50	68,167	0.45	9	16,083	0.70	9	11,146	0.35
2004	22	54,585	0.42	5	4,743	0.63	4	2,351	0.30
2005	28	66,098	0.39	1	1,171	0.08	6	11,310	0.14
2006	33	99,577	0.39	1	310	0.00	6	9,132	2.28†
2007	27	53,178	0.19	3	1,231	0.08	8	9,932	0.19
2008	34	102,007	0.31	2	1,053	0.28	9	13,404	0.18
2009	31	89,183	0.32	1	543	0.00	9	8,048	0.41

* 0.74% if one high mortality voyage is excluded
† 0.20% if one high mortality voyage is excluded

3.2.3.4 Ship

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

Table 11 shows the number of voyages in the various mortality categories for each ship. 88% of voyages were in the nil or low categories. There were five voyages in the medium or high categories involving ships 32, 34, 35, 43 and 119.

Table 11 Number of voyages in nil, low, medium and high mortality categories for shipments to the Middle East for 2009

Ship (code)	Mortality rate				Total
	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	
32	2	4	1	0	7
33	0	4	0	0	4
34	2	4	0	1	7
35	1	4	1	0	6
38	1	3	0	0	4
42	1	1	0	0	2
43	6	2	0	1	9
119	0	0	1	0	1
121	0	1	0	0	1
Total	13	23	3	2	41

3.2.3.5 Class of cattle

In 2009, the highest mortality rates occurred in beef cows (0.88%) followed by adult steers (0.52%) and beef heifers (0.47%; Table 12).

1,696 cattle on one voyage could not be identified to class. These cattle incurred a mortality rate of 0.59%.

To avoid any misunderstandings, young cattle will no longer be referred to as “calf”, as this term may imply a small, unweaned animal. In this report and in the future, young cattle will be referred to as “weaners”.

Table 12 Mortality rates, number of voyages and number of cattle in various classes exported to the Middle East in 2009

Class	Voyages (No.)	Cattle (No.)	Mortality rate (%)	Mortality rate range (%)
Steer adult*	9	4,626	0.58	0.0 – 1.0
Steer weaner	4	962	0.21	0.0 – 0.8
Bull adult*	36	61,963	0.27	0.0 – 1.1
Bull weaner	6	19,083	0.38	0.0 – 0.6
Cow dairy	6	1,003	1.20	0.0 – 4.1
Heifer beef	9	2,874	0.49	0.0 – 1.6
Heifer dairy	11	5,976	0.20	0.0 – 0.1

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

3.2.4 South-East Asia

Approximately 0.8 million cattle were exported to South-East Asia in 2009 (Table 13). The mortality rate fell to 0.08% while the number of voyages to the region increased by 31%. No mortalities were reported on 45% of the voyages to the region. The mortality rate has remained below 0.1% since 2001.

Table 13 Mortality rates, number of voyages and number of cattle exported to South-East Asia from 1995 to 2009

Year	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyages with nil mortalities (No.)
1995	365	430,653	0.11	0.0 – 8.5	206
1996	415	505,777	0.05	0.0 – 1.2	280
1997	507	678,585	0.09	0.0 – 1.7	277
1998	229	296,823	0.17	0.0 – 8.8	127
1999	326	462,540	0.34	0.0 – 74.7*	162
2000	385	587,049	0.11	0.0 – 5.3	168
2001	312	472,363	0.08	0.0 – 5.0	139
2002	365	656,767	0.07	0.0 – 8.5	191
2003	306	587,716	0.05	0.0 – 2.2	190
2004	217	465,498	0.05	0.0 – 1.8	118
2005	169	403,819	0.09	0.0 – 0.8	73
2006	166	452,516	0.09	0.0 – 1.0	66
2007	205	573,729	0.09	0.0 – 4.0	92
2008	219	682,265	0.09	0.0 – 1.9	93
2009	288	795,465	0.08	0.0 – 0.9	130

* exceptional voyage involving heat stroke caused by ventilation failure due to contaminated fuel

3.2.4.1 Port of loading

Most cattle exported to South-East Asia in 2009 were loaded at Darwin (44%) followed by Townsville (16%) and Broome (12%, Table 14). The mortality rate was highest for cattle exported from Fremantle (0.17%).

The voyages from each port were classified into various mortality categories as shown in Table 15. All except four voyages were in the nil or low categories. No voyages were in the high category in 2009.

Table 14 Mortality rates, number of voyages and number of cattle exported from various ports to South-East Asia in 2009

Port	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)
Mackay	1	2,909	0.07	n/a
Townsville	11	124,432	0.05	0.0 – 0.1
Mourilyan	6	8,259	0.10	0.0 – 0.4
Weipa	1	1,701	0.12	n/a
Karumba	10	18,058	0.03	0.0 – 0.1
Darwin	123	348,247	0.09	0.0 – 0.9
Wyndham	27	75,730	0.02	0.0 – 0.2
Broome	46	98,768	0.05	0.0 – 0.4
Port Hedland	15	23,382	0.10	0.0 – 0.4
Geraldton	28	48,695	0.05	0.0 – 0.2
Fremantle	20	45,284	0.17	0.0 – 0.7

Table 15 Number of voyages in nil, low, medium and high mortality categories for shipments from various ports to South-East Asia for 2009

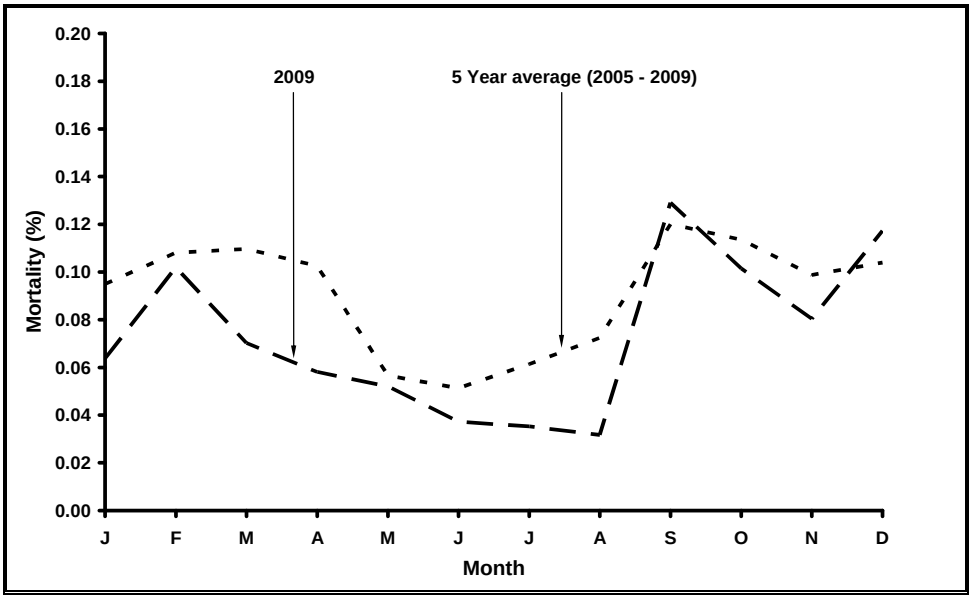
Port	Mortality rate				Total
	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	
Mackay	0	1	0	0	1
Townsville	1	10	0	0	11
Mourilyan	1	5	0	0	6
Weipa	0	1	0	0	1
Karumba	5	5	0	0	10
Darwin	54	67	2	0	123
Wyndham	18	9	0	0	27
Broome	26	20	0	0	46
Port Hedland	5	10	0	0	15
Geraldton	14	14	0	0	28
Fremantle	6	12	2	0	20
Total	130	154	4	0	288

3.2.4.2 Time of year

Monthly mortality rates (total mortality as a proportion of total loaded for each month) for voyages to South-East Asia in 2009 were below 0.14% throughout the year.

The monthly mortality rate in 2009 approximated the 5-year average and was below it for all months except September.

Figure 13 Monthly mortality rates of cattle on voyages from all ports to South-East Asia for 2009 and the 5-year monthly rates for the period 2005 to 2009



3.2.4.3 Ship

The voyages of each ship from Australia to South-East Asia were classified into various mortality categories as shown in Table 16. Almost all (99%) voyages were in the nil or low mortality categories.

The number of voyages to the region increased by 31% in 2009 compared to 2008.

Table 16 Number of voyages in nil, low, medium and high mortality categories for shipments to South-East Asia for 2009

Ship (code)	Mortality rate				Total
	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	
33	0	1	0	0	1
35	1	0	0	0	1
42	0	16	2	0	18
43	1	1	0	0	2
59	0	5	0	0	5
77	10	12	0	0	22
88	8	10	0	0	18
90	5	11	0	0	16
95	10	16	0	0	26
103	9	9	0	0	18
109	6	13	1	0	20
112	9	13	0	0	22
113	18	7	0	0	25
114	14	9	1	0	24
115	3	1	0	0	4
117	12	13	0	0	25
119	7	8	0	0	15
120	16	9	0	0	25
121	1	0	0	0	1
Total	130	154	4	0	288

3.2.4.4 Class of cattle

Only 27% of cattle exported to South-East Asia in 2009 could be identified by class. Of those, the highest mortality rates occurred in adult bulls (0.55%) followed by beef cows (0.25%; Table 17).

Table 17 Mortality rates, number of voyages and number of cattle in various classes exported to the South-East Asia in 2009

Class	Voyages (No.)	Cattle (No.)	Mortality rate (%)	Mortality rate range (%)
Steer adult*	25	125,530	0.06	0.0 – 0.6
Steer weaner	3	4,503	0.02	0.0 – 0.1
Bull adult*	21	16,392	0.55	0.0 – 2.4
Cow beef	20	16,006	0.25	0.0 – 1.3
Cow dairy	1	491	0.00	n/a
Heifer beef	21	49,365	0.04	0.0 – 0.2

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

3.2.5 North-East Asia

The number of cattle exported to North-East Asia in 2009 rose by 61% compared to 2008, breaking the downward trend in exports since 2004 (Table 18). This was mainly due to an increase in dairy cattle exported from Portland to China. Mortalities have remained low since 2007 at 0.07% or less. Prior to this the mortality rate has remained relatively constant over six years at about 0.1%.

Table 18 Mortality rates, number of voyages and number of cattle exported to North-East Asia from 1995 to 2009

Year	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)	Voyages with nil mortalities (No.)
1995	7	7,311	0.29	0.1 - 0.5	0
1996	9	12,587	0.40	0.1 - 1.2	0
1997	11	15,960	0.29	0.0 - 2.6	4
1998	10	14,734	0.17	0.0 - 0.4	2
1999	8	10,772	0.22	0.0 - 0.4	1
2000	10	13,830	0.14	0.0 - 0.4	4
2001	14	18,190	0.11	0.0 - 0.9	5
2002	17	22,483	0.12	0.0 - 0.7	7
2003	36	66,861	0.12	0.0 - 1.1	10
2004	50	95,534	0.10	0.0 - 0.8	12
2005	37	52,565	0.09	0.0 – 0.4	14
2006	26	37,963	0.12	0.0 – 1.3	11
2007	21	34,837	0.06	0.0 – 0.2	10
2008	19	29,873	0.06	0.0 – 0.4	10
2009	23	48,116	0.07	0.0 – 0.2	5

3.2.5.1 Port of loading

Cattle were exported to North-East Asia mainly from Portland followed by Brisbane (Table 19). All cattle loaded at Brisbane were exported to Japan while those loaded at Portland and Fremantle were exported to China.

The voyages from each port were classified into various mortality categories as shown in Table 20. All voyages were in the nil or low categories.

Table19 Mortality rates, number of voyages and number of cattle exported from various ports to North-East Asia for 2009

Port	Voyages (No.)	Cattle (No.)	Mortality rate overall (%)	Mortality rate range (%)
Fremantle	2	522	0.00	n/a
Portland	11	32,596	0.07	0.0 - 0.2
Brisbane	10	14,998	0.08	0.0 - 0.1

Table 20 Number of voyages in nil, low, medium and high mortality categories for shipments from various ports to South-East Asia for 2009

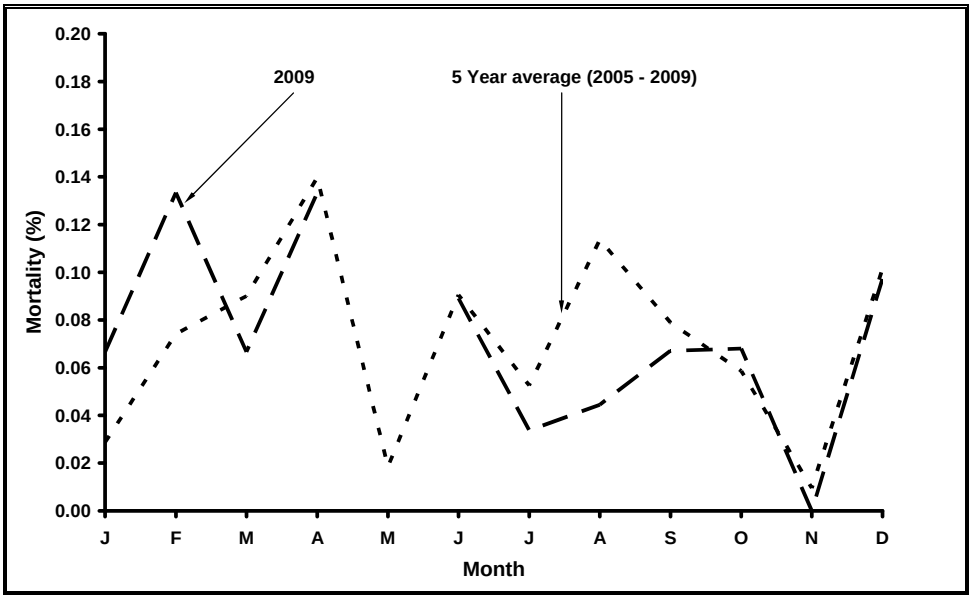
Port	Mortality rate				Total
	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	
Fremantle	2	0	0	0	2
Portland	1	10	0	0	11
Brisbane	2	8	0	0	10
Total	5	18	0	0	23

3.2.5.2 Time of year

Monthly mortality rates (total mortality as a proportion of total loaded for each month) for voyages to North-East Asia in 2009 were below 0.14% throughout the year.

The monthly mortality rate in 2009 was similar to the five year average except for January, February and August.

Figure 14 Monthly mortality rates of cattle on voyages from all ports to North-East Asia for 2009 and the 5-year monthly rates for the period 2005 to 2009



3.2.5.3 Ship

The voyages of each ship taking cattle from Australia to North-East Asia were classified into various mortality categories as shown in Table 21. All voyages were in the nil or low categories.

Table 21 Number of voyages in nil, low, medium and high mortality categories for shipments to North-East Asia for 2009

	Mortality rate				
Ship (code)	Nil 0.0%	Low >0.0–0.5%	Medium >0.5–1.0%	High >1.0%	Total
59	1	4	0	0	5
87	2	8	0	0	10
95	0	1	0	0	1
103	1	1	0	0	2
120	0	1	0	0	1
121	1	3	0	0	4
Total	5	18	0	0	23

3.2.5.4 Class of cattle

Mortality rates for each class of cattle exported to North-East Asia during 2009 are presented in Table 22. The North-East Asian cattle trade comprised steers exported to Japan and dairy heifers exported to China.

In 2009 the highest mortality rates occurred in steer adults (0.08%).

Table 22 Mortality rate, number of voyages and number of cattle in the classes exported to North-East Asia in 2009

Class	Voyages (No.)	Cattle (No.)	Mortality rate (%)	Mortality rate range (%)
Steer adult	10	14,998	0.08	0.0 - 0.1
Heifer dairy	13	33,118	0.07	0.0 - 0.2

3.3 Goats

3.3.1 Performance trend

Figures 15 and 16 show the number of goats exported and the mortality rates during sea transport from all ports in Australia to all destinations since 1993 as well as the trendline (linear regression) across the years. The number of goats exported annually has varied between approximately 600 and 114,000, and the annual mortality has varied between 0.38 and 2.69%. The trend for annual mortality has continued downward.

Figure 15 Number of goats exported by sea from Australia to all destinations since 1993

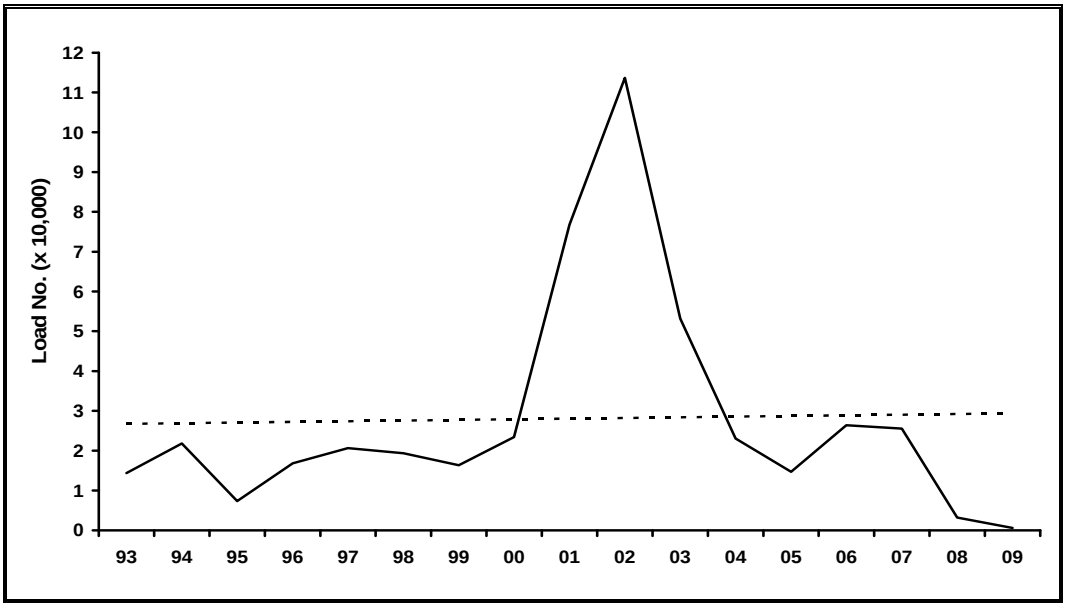
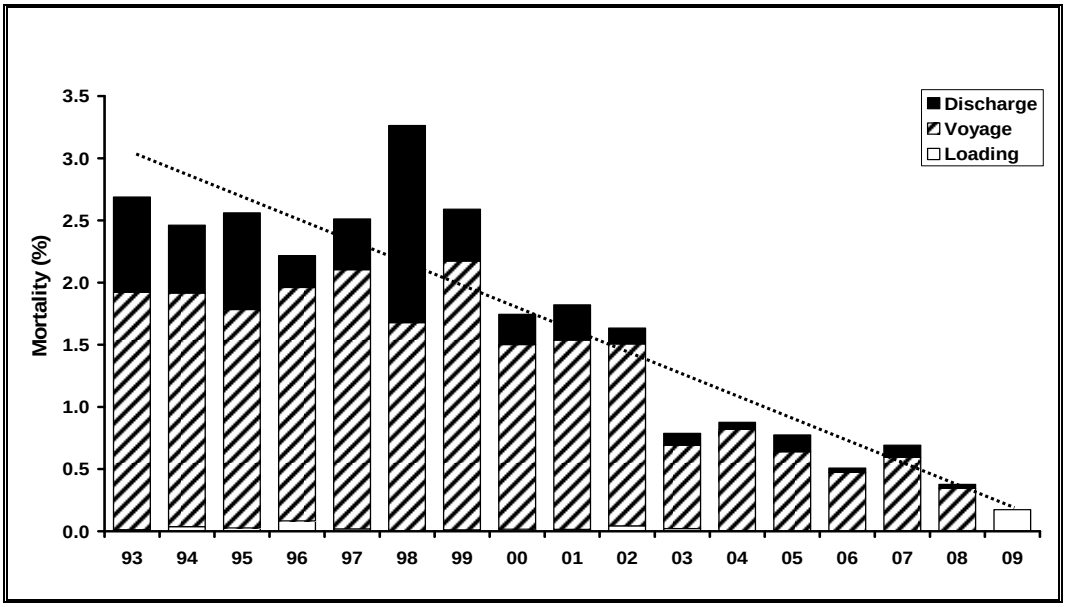


Figure 16 Annual mortality of goats exported by sea from Australia to all destinations since 1993



3.3.2 Overview

The number of goats exported by sea from Australia in 2009 fell to 577. These were shipped on two voyages to South-East Asia and there was only one death, giving a mortality rate of 0.17% (Table 23). The sole death in 2009 occurred during loading at the port of Darwin giving a mortality rate of 0.25%. The other voyage was from Fremantle.

3.3.3 South-East Asia

The number of goats exported by sea to South-East Asia peaked in 2002, but has fallen substantially since then (Table 23). The mortality rate in 2009 fell to a record low of 0.17%, down from 0.50% in 2008.

Table 23 Mortality rates, number of voyages and number of goats exported by sea to South-East Asia from 1993 to 2009

Year	Voyages (No.)	Goats (No.)	Mortality rate overall (%)	Mortality rate range (%)
1993	17	7,497	1.63	0.0 - 4.7
1994	19	7,867	1.89	0.0 - 5.5
1995	11	4,818	2.24	0.0 - 7.8
1996	12	5,208	1.73	0.0 - 4.1
1997	26	14,363	2.53	0.0 - 7.0
1998	14	10,698	4.55	0.0 – 28.8*
1999	19	10,143	2.44	0.0 - 5.0
2000	28	14,728	1.65	0.0 - 8.7
2001	45	31,150	1.37	0.0 - 6.9
2002	49	42,032	1.05	0.0 - 9.9
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

* One voyage delayed at discharge, resulting in excessive discharge mortality

Further analysis of goat exports may not be performed in future annual reports if the numbers continue at low levels.

4

5 Conclusion and recommendations

5.1 Sheep, cattle and goats

It was concluded that the project objectives were met; the mortalities of sheep, cattle and goats for the 2009 calendar year were summarised and mortality trends analysed. 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 and is of keen interest to a wide range of stakeholders. Only 27% of cattle exported to South-East Asia in 2009 could be identified by class. Previous versions of the Master's report contained enough detail to allow this analysis but the report has subsequently been modified.

Further analysis of goat exports may not be performed in future annual reports if the numbers exported continue at the low levels observed in 2009.

6 Appendices

6.1 Appendix 1 - Published studies

A list of scientific and extension publications, relevant to the live sheep trade, is shown below.

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

Norris, RT, Richards, RB, Creeper, JH, Jubb, TF, Madin, B and Kerr JW (2003) Cattle deaths during sea transport from Australia Aust Vet J **81:** 156-161

Stockman, CA (2006) The physiological and behavioural responses of sheep exposed to heat load within intensive sheep industries PhD Thesis, Murdoch University, Perth

Beatty, DT, Barnes, A, Taplin, R, McCarthy, M and Maloney, SK (2007) Electrolyte supplementation of live export cattle to the Middle East Aust J Exp Agric **47:** 119-124

6.2 Appendix 2 - Acknowledgements

The cooperation of ships' officers in recording details of daily mortalities is gratefully acknowledged.

The Australian Maritime Safety Authority (AMSA) is gratefully acknowledged for provision of Master's Reports

This work was funded by Meat and Livestock Australia, LiveCorp and the Department of Agriculture and Food, Western Australia.