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BUREAU OF TRANSPORT AND
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FROM THE DIRECTOR

This issue of *Waterline* includes our regular articles on stevedoring productivity and crew to berth ratios. An article on waterfront reliability presents the first data for a new quarterly series.

The performance indicators in *Waterline* are prepared from data provided by industry. As the underlying information systems have usually been developed to meet the needs of individual operators, additional work is often required to prepare indicators that are consistent between operators and over time. This work can require significant time and resources, particularly where there are changes in operators' information systems (eg following company mergers) or in workplace arrangements. The BTCE is grateful for the assistance of the many industry participants who provide data for *Waterline*.


The recent introduction of upgraded information systems by one terminal operator has resulted in some changes to the *Waterline* data on elapsed rates and net (ship) rates. The affected indicators, which start from the March quarter 1997, are clearly identified in the stevedoring productivity article in this issue.

Stephen Hunter
Director

IN BRIEF

Stevedoring productivity


The five-port average crane rate was 17.4 containers per hour in the March quarter compared with 17.1 containers per hour in the December quarter. Crane rates increased at Brisbane (17.3 containers per hour), Melbourne (19.0 containers per hour) and Fremantle (19.4 containers per hour). There was a decline at Sydney (14.9 containers per hour). Adelaide's crane rate was unchanged (19.6 containers per hour).

Most of the December quarter figures for Sydney, which were not available for the previous issue of *Waterline*, have now been received. The data indicate that the five-port average crane rate declined to 17.1 containers per hour in the December quarter from 18.0 containers per hour in the September quarter. 

Waterfront reliability


The BTCE has received the first data for the new quarterly series on waterfront reliability, covering container traffic at the five mainland capital city ports.

During the March quarter, a berth was available within four hours of the booked time for 92 per cent of ship calls. Availability of pilotage and towage services within one hour of the booked time was 100 per cent.

Initial data for several ports indicate that there is significant inter-port variation for the three stevedoring indicators – cargo receipt, stevedoring completion and stevedoring rate. The availability of time-series data in subsequent quarters will facilitate the analysis of stevedoring reliability, although differences in operational conditions appear to contribute to some of the inter-port variation. 

Crew to berth ratios

The crew to berth ratio for merchant shipping declined to 2.174 in the March quarter. However, the ratio was still above the level recorded at the beginning of the monitoring process in the September quarter 1993 (initial level 2.133).

The crew to berth ratio for offshore shipping increased to 2.373 in the March quarter. This was the highest figure for offshore shipping since the beginning of the monitoring process in the March quarter 1995 (initial level 2.327) 

STEVEDORING PRODUCTIVITY

Table 1 presents information on stevedoring productivity at Australia's major container terminals over the period to the end of the March quarter 1997. The indicators are expressed in containers per hour which provides the most rigorous basis for productivity comparisons. The teu-based data, which are retained in *Waterline* for the purposes of long-term historical comparison, are presented in figures 1 to 6 and table 6.

The stevedoring productivity data for Brisbane, Sydney, Melbourne and Fremantle are averages for the terminals operated by P&O Ports and Patrick at each port. The Adelaide data cover the SeaLand terminal.

Factors affecting the indicators

The recent introduction of upgraded information systems by one terminal operator has resulted in some changes to the company's data on elapsed rates and net (ship) rates from the March quarter 1997. The changes reflect improvements in data recording and processing, including more accurate application of the definitions for these two indicators.

As a result of the changes implemented by the terminal operator, the elapsed rates and net rates for the March quarter 1997 are not directly comparable with the preceding data for these indicators. This involves the five-port averages and the data for Brisbane, Sydney, Melbourne and Fremantle. The Adelaide data are not affected.

The available information suggests that the impact of the data changes has been to reduce the five-port average figures for the elapsed and net (ship) rates in table 1 by around one container per hour. The availability of more accurate data from the terminal operator has also affected the figures for ships handled and total teus (table 6).

In view of the changes to the terminal operator's data, the commentary in this issue of *Waterline* does not cover quarterly changes in elapsed rates or net rates at any ports except Adelaide. Quarterly comparisons of these rates will recommence in the September issue of *Waterline*.

Crane rates, which provide the principal indicator of stevedoring productivity in *Waterline*, are not affected by the changes to the terminal operator's data. The commentary in this article therefore includes comparisons of March and December quarter crane rates for all ports.

In a separate development, the Melbourne stevedoring indicators in *Waterline* no longer include Webb Dock since there has been a change in the way this facility is being operated by Patrick. Webb Dock is being developed to focus on roll-on/roll-off and breakbulk activities whereas the *Waterline* indicators cover lift-on/lift-off ships. Most of the lift-on/lift-off container traffic at Webb Dock is being transferred to the Swanson Dock terminals. The removal of Webb Dock affects the March quarter data for ships handled and total teus at Melbourne (table 6).

This issue of *Waterline* includes the December quarter five-port averages and Sydney figures for the crane rate and the net rate. These indicators were not published in the March issue due to delays in receiving key Sydney data. The five-port average and Sydney figures for the elapsed rate in the December and March quarters were not available at the time of publication of the current issue due to continuing problems with the computer system at one of the Sydney terminals.

Five-port average

The five-port average *crane rate* (productivity per crane while the ship is worked) was 17.4 containers per hour in the March quarter, compared with 17.1 containers per hour in the December quarter.

This followed a decline in the previous period. The five-port average crane rate fell to 17.1 containers per hour in the December quarter from 18.0 containers per hour in the September quarter.

The five-port average *net rate* (total productivity while the ship is worked) was 21.3 containers per hour in the March quarter. Information on the five-port average *elapsed rate* (productivity based on the time labour is aboard) was not available at time of publication due to the absence of Sydney data.

Brisbane

The crane rate at Brisbane increased to 17.3 containers per hour in the March quarter from 16.9 containers per hour in the December quarter.

In the March quarter, the net rate was 19.4 containers per hour and the elapsed rate was 17.3 containers per hour. The proportion of time not worked at Brisbane averaged 10.8 per cent over the quarter.

Sydney

Sydney's crane rate declined to 14.9 containers per hour in the March quarter from 15.4 containers per hour in the December quarter.

The decline in the March quarter followed a fall in the previous period. The crane rate of 15.4 containers per hour in the December quarter was down from 16.1 containers per hour in the September quarter.

In the March quarter, the net rate at Sydney was 20.0 containers per hour. Data on the elapsed rate were not available at time of publication.

Melbourne

Table 1 indicates that the crane rate at Melbourne increased to 19.0 containers per hour in the March quarter from 17.8 containers per hour in the December quarter. A small part of this reported increase was probably attributable to the removal of Webb Dock from the series.

In the March quarter, Melbourne's net rate was 23.0 containers per hour and the elapsed rate was 19.5 containers per hour. The proportion of time not worked at Melbourne averaged 15.3 per cent over the quarter.

Adelaide

Adelaide's crane rate was 19.6 containers per hour in the March quarter, the same as the figure in the December quarter.

The net rate rose to 24.6 containers per hour, from 23.1 containers per hour in the previous quarter. Adelaide's elapsed rate was 24.0 containers per hour in the March quarter, up from 22.6 containers per hour in the December quarter.

Adelaide continued to have a very low proportion of time not worked. The average proportion of elapsed time not worked was 2.4 per cent in the March quarter, similar to the figure of 2.2 per cent in the previous quarter.

Fremantle

At Fremantle, the crane rate increased to 19.4 containers per hour in the March quarter from 18.2 containers per hour in the December quarter.

In the March quarter, the net rate was 20.6 containers per hour and the elapsed rate was 16.2 containers per hour. The proportion of elapsed time not worked at Melbourne averaged 21.5 per cent over the quarter.

Teus per hour

Figures 1 to 6 and table 6 present the stevedoring indicators in terms of teus per hour over the period from the WIRA process. They cover the same ship calls as the containers per hour data in table 1.

The changes in crane rates indicated by the teu-based measures in the March quarter were generally in the same direction as the changes indicated by the container-based measures. The only differences were at Brisbane and Adelaide where there were significant changes in the mix of 20 foot and 40 foot containers compared with the previous quarter.

WATERFRONT RELIABILITY

Issue 9 of *Waterline* presented the proposed reliability indicators that have been developed by the BTCE in consultation with major industry participants. The indicators will provide a basis for monitoring changes over time and for analysing factors affecting reliability at Australia's major container ports.

[Table 2](#) describes the current indicators of waterfront reliability. The category of linesmen, which was included in the proposed indicators reported in *Waterline* 9, has been deleted due to a lack of adequate data.

This article presents the initial information on waterfront reliability for container traffic at the five mainland capital city ports. The detailed data cover berth availability, pilotage and towage. Information on several aspects of stevedoring is also provided. It is anticipated that the indicators will be further developed in future issues of *Waterline*.

Ship arrival

Issue 9 of *Waterline* presented two indicators for ship arrival at port (aspect 1 in [table 2](#)). These indicators measure the extent to which ships achieve the expected arrival times advised to the providers of port services. If there is significant variation between actual and advised arrival times, it is more difficult for operators to provide port services at the times required by the shipping lines.

Data on ship arrival at port are currently being obtained from individual port authorities / corporations through the AAPMA. Collection of the data has been affected by variations in the recording and data extraction arrangements of individual port authorities / corporations. It is anticipated that indicators for four of the five mainland capital city ports will be published in the next issue of *Waterline*.

Berth availability, pilotage, towage

Nine shipping lines have supplied information on berth availability, pilotage and towage (aspects 2 to 4 in [table 2](#)). The lines generally provided the data using a standard reporting form. The BTCE also contacted most of the lines to ensure that the data for publication were consistent with the definitions specified for the indicators.

[Table 3](#) summarises the information on berth availability, pilotage and towage for the March quarter 1997. The data cover a total of 208 ship calls, mainly involving lift-on/lift-off container ships operating in the Europe, South-East Asia and North America trades.

The 208 ship calls are equivalent to 24 per cent of all calls at the container terminals in the five ports during the March quarter. The proportion of ship calls at individual ports ranged from 10 per cent at Brisbane to 38 per cent at Adelaide. This inter-port variation reflects the schedules and operations of the lines which responded to the request for data. The BTCE is working to improve the coverage of the three indicators by approaching additional lines for data.

[Table 3](#) indicates that a berth was available within four hours of the booked time for around 92 per cent of the ship calls covered by the lines' data. It appears that the major factor contributing to delays was occasional congestion at several ports.

[Table 3](#) shows that availability of pilotage and towage services within one hour (plus or minus) of the booked time was 100 per cent in the March quarter.

Stevedoring

The BTCE has received data on stevedoring (aspects 5 to 7 in [table 2](#)) from P&O Ports and Patrick. One operator's data cover the September and December quarters 1996, and the other operator's data are for the March quarter 1997. It is anticipated that more detailed information from these two operators, for the March or June quarter 1997, will be published in the September issue of *Waterline*.

The initial data involve container terminals at Brisbane, Sydney, Melbourne and Fremantle. However, one operator's information on stevedoring completion is currently limited to two of these ports due to the scope of its data collection system. In addition, the coverage of the initial data for individual operators was limited (on a one-off basis) by computing problems at Sydney (cargo receipt and stevedoring rate) and by operational issues at Melbourne (stevedoring completion).

As a result of these factors, the information for the indicators in this issue of *Waterline* is limited to terminals at Brisbane, Melbourne and Fremantle (cargo receipt, stevedoring rate) or Brisbane and Sydney (stevedoring completion). It is anticipated that the cargo receipt and stevedoring rate indicators in future issues will also include Sydney.

The information for the December and March quarters indicates that the proportion of *cargo receipts* (exports) completed by the cut-off averaged around 53 per cent at Brisbane, 91 per cent at Melbourne and 96 per cent at Fremantle. The relatively low figure for Brisbane should be interpreted with caution. One terminal operator advised that there are special arrangements for late receipt of refrigerated containers at Brisbane, and that these arrangements contribute to the efficient operation of the terminal which has a limited number of powered outlets.

Stevedoring completion provides one measure of the accuracy with which completion times (the basis for pilot and tug booking times) are forecast. The December and March quarter data indicate that the proportion of ships completed within one hour (plus or minus) of the time initially agreed was around 76 per cent at Brisbane and 26 per cent at Sydney. The extent of variation between the two ports was similar for the two terminal operators. An indicator of stevedoring completion based on confirmed time, which was included in the proposed indicators presented in *Waterline* 9, has been deleted from the series as the data are not collected by either terminal operator.

The *stevedoring rate* (as defined in [table 2](#)) provides a measure of the variability in performance over the quarter. The data for the December and March quarters indicate that the proportion of ship calls where the crane rate was within 2 containers per hour (plus or minus) of the quarterly average was around 43 per cent at Brisbane, 67 per cent at Melbourne and 29 per cent at Fremantle.

Crane rates at a terminal will always vary for individual ship calls due to differences in average exchanges, cellular configurations, the age and condition of the ship's fittings, the nature of the operation (eg discharge only, load only or load/discharge) and other factors. The inter-port variation in the stevedoring rate indicator reflects, at least in part, major differences in the mix of operations. For example, operations at Melbourne typically involve large exchanges concentrated in particular areas of the ship, whereas at Fremantle there is greater variation due to factors such as restows and handling aboard ship.

Other waiting time

For the purposes of the *Waterline* indicators, reliability is defined in terms of the *variability and predictability* of performance. The indicators of berth availability, pilotage and towage discussed earlier therefore focus on delays incurred as a result of the unavailability of a facility or service at the time booked for the ship.

The reliability indicators do not measure the *responsiveness or flexibility* of port service providers when there are changes in ship movement times. For example, if a ship arrives ahead of the scheduled time or is completed early by the stevedore, it will incur waiting time if the booked times for port services such as towage cannot be changed. These waiting times potentially impose additional costs on shipping lines if the time could otherwise be used productively.

Several of the lines which responded to the BTCE's request for data on berth availability, pilotage and towage identified waiting times caused by factors other than reliability issues. Some of the major factors in the March quarter were:

- early completion of stevedoring work – 10 ship calls (waiting time ranged between 1.6 hours and 8.4 hours);
- early ship arrival – 9 ship calls (waiting time ranged between 2.5 hours and 28.0 hours);
- awaiting arrival of stevedoring labour – 8 ship calls (waiting time ranged between 0.9 hours and 19.1 hours); and
- awaiting towage services due to other river moves (Melbourne) or tidal tankers (Sydney) – 3 ship calls (waiting time ranged between 1 hour and 3 hours).

Other sources of waiting time identified by the lines included ship repairs, adjustment of sailing schedules, late arrival of the ship, crane breakdowns, late changes to cargo layout, tides, weather, port holidays and industrial disputes.

A range of factors contribute to waiting time. They include aspects of ship operation, the trade-off between charges and service quality in a small market such as Australia, and the work practices of port service providers.

Concluding comments

During the March quarter, a berth was available within four hours of the booked time for 92 per cent of ship calls. Availability of pilotage and towage services within one hour of the booked time was 100 per cent. Initial data for several ports indicate that there is significant inter-port variation for the three stevedoring indicators – cargo receipt, stevedoring completion and stevedoring rate. The availability of time-series data in subsequent quarters will facilitate the analysis of stevedoring reliability, although differences in operational conditions appear to contribute to some of the inter-port variation.

CREW TO BERTH RATIOS

As part of the shipping industry reform process, the BTCE has been monitoring crew to berth ratios for Australian merchant shipping (since the September quarter 1993) and offshore shipping (since the March quarter 1995). The results of the monitoring process were initially reported to participants in the reform process, and have been included in *Waterline* since the December 1996 issue.

The crew to berth ratio is defined as the number of seafarer days paid over a period of time, divided by the number of berth days the ship/s operated. Berth days operated is defined as the sum, over the period, of the number of people normally required each day by the relevant statutory authority and the ship operator to be employed in order to carry out the work of the ship/s in a safe and efficient manner.

This article updates the information on crew to berth ratios for Australian merchant and offshore shipping with data for the March quarter 1997.

Merchant shipping

Figure 7 presents information on the crew to berth ratio, and its components, for Australian merchant shipping over the period from the September quarter 1993 to the March quarter 1997.

The overall crew to berth ratio for merchant shipping was 2.174 in the March quarter. This was down from the December quarter 1996 ratio of 2.247 which was the highest ratio since the beginning of the monitoring process (initial level 2.133). The decrease in the March quarter partly reflected the ending of the additional crew requirements for several ships which were transferred between operators in the December quarter. It appears that some other factors also contributed to the decrease, as the crew to berth ratio in the March quarter (2.174) was below the ratio in the September quarter 1996 (2.195).

Individual components of the crew to berth ratio for merchant shipping generally declined in the March quarter, the only exception being compensation leave. Most of the reduction in the overall ratio was attributable to falls in the ship time, accrued leave and study leave ratios.

Ship time is the largest component of the crew to berth ratio for merchant shipping. The ship time ratio was 1.060 in the March quarter, down from 1.093 in the December quarter (initial level 1.025).

Accrued leave (initially called recreation leave in *Waterline*) gives effect to leave with pay for weekends and public holidays worked, annual leave with pay of five weeks per annum, sick leave, compassionate leave and leave in lieu of a 35-hour week. The accrued leave ratio decreased to 0.980 in the March quarter from 1.003 in the December quarter (initial level 0.971).

Compensation leave is the third largest component of the crew to berth ratio for merchant shipping. The compensation leave ratio was 0.078 in the March quarter compared with 0.077 in the December quarter (initial level 0.073).

The *long service leave* ratio for merchant shipping was 0.036 in the March quarter compared with 0.037 in the December quarter (initial level 0.035).

The remaining components accounted for 1 per cent of the overall crew to berth ratio for merchant shipping in the March quarter. The *study leave* ratio decreased to 0.016 in the March quarter from 0.027 in the December quarter (initial level 0.024). The *training and other paid leave* ratio declined to 0.005 from 0.010 over this period (initial level 0.006).

Table 4 shows the individual components of the crew to berth ratio for merchant shipping, by crew classification, in the March quarter. Engineers had the highest ratio (2.232) followed by deck officers (2.210), integrated ratings (2.141) and catering crew (2.122).

Offshore shipping

Figure 8 presents data on the crew to berth ratio, and its components, for Australian offshore shipping over the period from the March quarter 1995 to the March quarter 1997.

The overall crew to berth ratio for offshore shipping was 2.373 in the March quarter, up from 2.343 in the December quarter 1996. The March quarter ratio was the highest figure for offshore shipping since the beginning of the monitoring process (initial level 2.327).

Four components of the crew to berth ratio for offshore shipping increased in the March quarter and the remaining two components were unchanged. Most of the increase in the overall ratio was attributable to rises in the study leave and ship time ratios.

Accrued leave (initially called recreation leave in *Waterline*) is the largest component of the crew to berth ratio for offshore shipping. It comprises paid leave to compensate for work on public holidays, intervals of leave associated with the two-crew duty system, annual leave and time spent travelling in off-duty time. The accrued leave ratio was unchanged at 1.153 in the March quarter (initial level 1.151).

Ship time reflects days paid for ship duty (which may include travelling time and days signing on and off). The ship time ratio was 1.037 in the March quarter, up from the December quarter figure of 1.026 (initial level 1.021).

Compensation leave is the third largest component of the crew to berth ratio for offshore shipping. The compensation leave ratio increased to 0.119 in the March quarter from 0.116 in the December quarter (initial level 0.100).

The *long service leave* ratio for offshore shipping was 0.039 in the March quarter compared with 0.038 in the December quarter (initial level 0.038).

The remaining components accounted for around 1 per cent of the overall crew to berth ratio for offshore shipping in the March quarter. The *study leave* ratio increased to 0.025 in the March quarter from 0.010 in the December quarter (initial level 0.013). The *training and other paid leave* ratio was 0.000 in both periods (initial level 0.003).

Table 5 shows the individual components of the crew to berth ratio for offshore shipping, by crew classification, in the March quarter. Catering crew had the highest ratio (2.416) followed by integrated ratings (2.402), deck officers (2.396) and engineers (2.286).

Concluding comments

The crew to berth ratio for merchant shipping declined to 2.174 in the March quarter. However, the ratio was still above the level recorded at the beginning of the monitoring process in the September quarter 1993 (initial level 2.133).

The crew to berth ratio for offshore shipping increased to 2.373 in the March quarter. This was the highest figure for offshore shipping since the beginning of the monitoring process in the March quarter 1995 (initial level 2.327).

TABLES

Port/indicator	Quarter					
	Dec 1995	Mar 1996	Jun 1996	Sep 1996	Dec 1996	Mar 1997
TABLE 1 CONTAINER TERMINAL PERFORMANCE INDICATORS - CONTAINERS PER HOUR						
Brisbane						
Crane rate	15.8	17.6	16.7	16.5	16.9	17.3
Elapsed rate	17.0	19.0	17.2	17.2	17.4	17.3 ^b
Net rate	20.6	21.5	20.4	20.4	20.4	19.4 ^b
Sydney						
Crane rate	15.0	15.6	16.0	16.1	15.4	14.9
Elapsed rate	17.6	18.9	17.6	18.2	a	a
Net rate	21.0	22.1	22.4	23.3	22.7	20.0 ^b
Melbourne						
Crane rate	16.3	17.0	18.4	19.6	17.8	19.0
Elapsed rate	18.8	20.2	20.5	21.1	17.9	19.5 ^b
Net rate	21.9	23.4	25.9	25.6	21.7	23.0 ^b
Adelaide						
Crane rate	18.8	18.9	18.2	19.3	19.6	19.6
Elapsed rate	22.8	23.3	22.0	22.2	22.6	24.0
Net rate	23.3	23.8	22.5	22.8	23.1	24.6
Fremantle						
Crane rate	16.2	17.9	20.0	17.8	18.2	19.4
Elapsed rate	13.4	15.7	14.8	13.4	15.6	16.2 ^b
Net rate	16.7	18.9	20.0	19.4	20.5	20.6 ^b
Five ports						
Crane rate	15.9	16.9	17.7	18.0	17.1	17.4
Elapsed rate	17.7	19.3	18.6	19.0	a	a
Net rate	20.9	22.3	23.4	23.5	21.8	21.3 ^b
<p>a. Data not available at time of publication.</p> <p>b. March quarter 1997 elapsed rates and net rates for all ports except Adelaide are not directly comparable with earlier figures due to changes in a terminal operator's information systems.</p>						
Sources Patrick, P&O Ports and SeaLand.						

BTCE

TABLE 2 INDICATORS OF WATERFRONT RELIABILITY

Aspect	Indicator
1. Ship arrival at port	Proportion of ship arrivals within ± 1 hour of the scheduled ship arrival time advised 24 hours before to the port authority. Proportion of ship arrivals within ± 15 minutes of the confirmed ship arrival time advised 6 hours before to port service providers.
2. Berth availability	Proportion of ship arrivals where the berth is available within 4 hours of the scheduled berthing time advised 24 hours before to the port authority.
3. Pilotage	Proportion of ship movements where the pilot is available to board the ship at the agreed location within ± 1 hour of the confirmed ship arrival/departure time advised 6 hours before by the ship's agent.
4. Towage	Proportion of ship movements where tugs are available to assist the ship at the agreed location within ± 1 hour of the confirmed ship arrival/departure time advised 6 hours before by the ship's agent.
5. Cargo receipt	Proportion of receipts (exports) completed by the cut-off ^a .
6. Stevedoring completion	Proportion of ship visits where stevedoring completion time is within ± 1 hour of the time initially agreed between the terminal operator and the client when the overall work program for the ship is prepared.
7. Stevedoring rate	Proportion of ship visits where the average crane rate for the ship is within ± 2 containers per hour of the average crane rate for the terminal over the period.
a.	<i>Cargo receipt cut-off is usually the end of the evening shift prior to the ship's arrival. One terminal operator uses the end of the morning shift of the day of arrival for afternoon ship arrivals.</i>

TABLE 3 AVAILABILITY OF BERTH, PILOTAGE AND TOWAGE SERVICES AT BOOKED TIME, MARCH QUARTER 1997

(Number of ship calls)

Port/operation	Delay (hrs)								Total no. of ship calls
	0	1	2	3	4	5-10	11-20	>20	
Brisbane									
Berth availability	14	0	0	1	0	0	0	0	15
Pilotage	15	0	0	0	0	0	0	0	15
Towage	15	0	0	0	0	0	0	0	15
Sydney									
Berth availability	39	0	1	2	0	5	2	1	50
Pilotage	50	0	0	0	0	0	0	0	50
Towage	50	0	0	0	0	0	0	0	50
Melbourne									
Berth availability	59	0	0	0	0	0	3	1	63
Pilotage	63	0	0	0	0	0	0	0	63
Towage	63	0	0	0	0	0	0	0	63
Adelaide									
Berth availability	24	0	0	1	0	1	0	0	26
Pilotage	26	0	0	0	0	0	0	0	26
Towage	26	0	0	0	0	0	0	0	26
Fremantle									
Berth availability	50	0	0	0	0	3	1	0	54
Pilotage	54	0	0	0	0	0	0	0	54
Towage	54	0	0	0	0	0	0	0	54
Five ports									
Berth availability	186	0	1	4	0	9	6	2	208
Pilotage	208	0	0	0	0	0	0	0	208
Towage	208	0	0	0	0	0	0	0	208

Source Data provided by shipping lines.



TABLE 4 **MERCHANT SHIPPING CREW TO BERTH RATIOS BY ACTIVITY AND CREW CLASSIFICATION, MARCH QUARTER 1997**

Crew type	Ship time	Accrued leave	Compensation	Long service leave	Study leave	Training & other	Total ^a
Deck officers	1.093	0.997	0.024	0.036	0.040	0.019	2.210
Engineers	1.107	1.013	0.041	0.036	0.031	0.003	2.232
All officers	1.100	1.005	0.033	0.036	0.035	0.011	2.221
Integrated ratings	1.031	0.963	0.111	0.035	0.000	0.001	2.141
Catering crew	1.015	0.947	0.125	0.035	0.000	0.001	2.122
All ratings	1.026	0.958	0.115	0.035	0.000	0.001	2.135
All crew	1.060	0.980	0.078	0.036	0.016	0.005	2.174

a. Components may not sum to totals due to rounding.

Source Data provided by ship operators.



TABLE 5 **OFFSHORE SHIPPING CREW TO BERTH RATIOS BY ACTIVITY AND CREW CLASSIFICATION, MARCH QUARTER 1997**

Crew type	Ship time	Accrued leave	Compensation	Long service leave	Study leave	Training & other	Total ^a
Deck officers	1.055	1.153	0.089	0.039	0.060	0.000	2.396
Engineers	1.027	1.153	0.030	0.037	0.038	0.000	2.286
All officers	1.041	1.153	0.060	0.038	0.049	0.000	2.343
Integrated ratings	1.023	1.153	0.186	0.039	0.000	0.000	2.402
Catering crew	1.082	1.153	0.141	0.039	0.000	0.000	2.416
All ratings	1.033	1.153	0.179	0.039	0.000	0.000	2.404
All crew	1.037	1.153	0.119	0.039	0.025	0.000	2.373

a. Components may not sum to totals due to rounding.

Source Data provided by ship operators.



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TABLE 6 CONTAINER TERMINAL PERFORMANCE INDICATORS, SELECTED AUSTRALIAN PORTS - TEUS PER HOUR

	Mar-92	Jun-92	Sep-92	Sep-93	Dec-93	Mar-94	Jun-94	Sep-94	Dec-94	Mar-95	Jun-95	Sep-95	Dec-95	Mar-96	Jun-96	Sep-96	Dec-96	Mar-97
Brisbane																			
Ships handled	85	96	93	na	106	111	112	140	140	187	136	123	135	132	124	133	140	141	156
Total teus	28235	39058	45055	na	49622	46529	37820	52983	51596	50574	41723	47065	58851	46439	39037	51008	66115	62904	47471
Crane rate	17.0	18.0	19.8	na	21.2	21.1	20.4	20.8	20.3	18.9	18.4	18.0	18.6	18.9	20.0	19.9	20.6	20.6	20.0
Elapsed rate	19.6	21.2	25.6	na	26.6	24.6	20.9	22.6	21.5	19.6	17.8	18.6	19.5	21.0	21.5	20.5	20.9	21.1	20.3 ^b
Net rate	21.1	22.9	27.4	na	29.4	27.5	23.9	25.9	25.7	23.4	20.9	21.6	22.5	24.6	24.4	24.3	25.1	24.9	22.7 ^b
Sydney																			
Ships handled	105	109	112	na	205	238	177	240	223	221	218	202	192	203	206	216	228	249	251
Total teus	71702	68359	81287	na	124028	139321	116914	129586	142659	152326	144868	140113	148431	143746	146038	148290	156344	174982	158323
Crane rate	18.6	19.8	20.9	na	19.8	20.4	16.4	18.5	16.9	16.0	18.9	18.1	19.3	18.5	19.5	19.9	20.3	19.6	18.7
Elapsed rate	19.9	22.9	24.1	na	22.6	22.0	18.7	20.8	19.4	20.3	21.6	20.7	23.4	21.8	23.8	22.1	23.1	a	a
Net rate	26.3	31.2	30.4	na	29.4	28.3	28.3	29.1	25.0	26.3	28.0	26.6	29.9	25.7	28.0	27.9	29.5	28.9	25.1 ^b
Melbourne																			
Ships handled	108	121	121	na	235	306	211	265	267	244	265	228	221	227	228	262	274	282	230
Total teus	73441	82757	86486	na	129687	143350	153420	158849	159039	180134	173338	152983	161943	173566	162911	170884	203371	202376	162156
Crane rate	16.7	18.1	19.4	na	22.3	18.9	19.7	19.1	18.5	20.2	20.8	19.4	19.8	19.6	20.5	22.3	24.5	22.4	23.6
Elapsed rate	19.2	20.9	22.6	na	25.9	20.0	19.5	19.2	17.9	21.5	23.9	23.7	24.1	22.8	24.4	25.0	26.5	22.1	24.3 ^b
Net rate	22.1	23.9	24.9	na	29.3	22.9	23.8	22.7	21.3	25.8	26.9	25.9	26.6	26.4	28.3	31.7	32.2	27.2	28.7 ^b
Adelaide																			
Ships handled	22	20	21	na	21	26	28	34	31	33	35	50	34	42	47	63	70	74	69
Total teus	10810	10710	10763	na	9650	12616	13243	12461	13167	15038	16832	21676	14319	17318	15955	18803	20519	23351	21963
Crane rate	19.8	18.7	19.1	na	19.8	20.9	20.6	19.1	19.8	20.2	21.5	20.2	20.9	21.4	21.5	21.5	22.7	24.0	24.6
Elapsed rate	27.2	24.4	25.9	na	23.1	25.5	27.8	24.7	24.6	24.2	24.9	24.9	24.9	26.1	26.6	26.1	26.2	27.7	30.2
Net rate	28.2	25.0	27.9	na	26.1	26.6	29.8	25.7	26.0	25.7	25.3	25.7	26.5	26.7	27.2	26.7	26.8	28.3	30.9
Fremantle																			
Ships handled	71	75	72	na	116	115	127	135	121	124	128	136	139	124	143	153	159	161	159
Total teus	25403	26572	27690	na	37566	40910	40587	40986	36635	46969	44388	45308	50050	44662	47597	51113	50791	55593	51784
Crane rate	21.0	18.6	20.4	na	19.0	19.8	19.8	19.3	21.6	22.9	20.2	19.3	19.5	19.2	21.2	23.4	20.8	21.5	23.3
Elapsed rate	16.8	15.1	18.2	na	13.1	15.5	15.2	14.6	14.9	16.5	17.7	15.5	17.7	15.8	18.3	17.6	16.0	18.6	19.7 ^b
Net rate	21.0	18.6	21.4	na	19.4	21.0	19.8	19.5	21.8	23.4	21.6	20.5	21.1	19.8	22.2	23.5	22.6	24.2	25.0 ^b
Five Ports																			
Ships handled	391	421	419	na	683	796	745	814	782	809	782	739	721	728	748	827	871	907	865
Total teus	209591	227456	251281	na	350553	382726	361984	394865	403096	445041	421149	407145	433594	425731	411538	440098	497140	519206	441697
Crane rate	18.0	18.7	20.1	na	20.9	19.9	18.8	19.2	18.5	18.9	19.9	18.9	19.5	19.2	20.3	21.3	22.3	21.2	21.5
Elapsed rate	19.4	20.7	23.1	na	23.4	21.0	19.2	19.9	18.9	20.4	21.9	21.2	22.5	21.7	23.2	22.6	23.6	a	a
Net rate	23.3	24.7	26.5	na	28.2	25.3	25.0	25.0	23.4	25.4	26.1	25.0	26.5	25.3	27.1	28.5	29.1	27.2	26.4 ^b

na not available

a Data not available at time of publication.

b Elapsed rates and net rates from the March quarter 1997 are not directly comparable with earlier figures (except at Adelaide) due to changes in a terminal operator's information systems.

Notes 1. Award shift breaks are included in the measure of time used to calculate net rates and crane rates to the end of the September quarter 1992, and excluded from the measure of time in later quarters. This means that rates for the earlier period would be higher if they had been prepared on the same basis as the rates for the period from the September quarter 1993.

2. For data back to the December quarter 1989, refer to Waterline 2.

Sources WIRA, Patrick, P&O Ports and SeaLand.

INDEX OF WATERLINE ARTICLES - ISSUES 1 TO 11

Subject	Issue	Date	Pages	Coverage of article ^a
Burnie	10	March 1997	9-11	Services, facilities & port interface costs for container traffic
Coal ports in Australia	6	March 1996	10-13	Ports, terminals, capacity and operational changes, performance
Crew to berth ratios	9	December 1996	7-11	September quarter 1996
	10	March 1997	14-18	December quarter 1996
	11	June 1997	9-12	March quarter 1997
Distribution of benefits of waterfront reform	3	May 1995	11-14	Stevedoring, ship operators, importers, exporters
International comparisons of waterfront performance	4	October 1995	11-13	Overview of recent work
	5	December 1995	9-11	New Zealand ports
	6	March 1996	13-16	Asian ports
	7	June 1996	12-14	European ports
	8	September 1996	14	New Zealand (timber & steel coil)
Liner shipping	5	December 1995	11-13	Conference/non-conference shares in Australian trades to 1994/95
Non-containerised general cargo	8	September 1996	11-14	Cargoes, ships, ports, stevedoring, performance data
Port charges comparisons – methodology	4	October 1995	9-11	Teu exchanges and comparisons of port costs
Port charging – structures and terminologies	9	December 1996	11-13	Australia's six largest container ports
Port Interface Cost Index	1	July 1994	2-5	July-December 1993
	2	December 1994	2-5	January-June 1994
	3	May 1995	2-5	July-December 1994
	5	December 1995	2-5	January-June 1995
	7	June 1996	6-9	July-December 1995
	8	September 1996	6-9	January-June 1996
	10	March 1997	6-9	July-December 1996
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	10	March 1997	12-13	1995/96

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Subject	Issue	Date	Pages	Coverage of article^a
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	2	December 1994	5, 9	January-June 1994
	3	May 1995	6-7	July-December 1994
	6	March 1996	8-9	January-June 1995
	7	June 1996	10-11	July-December 1995
	8	September 1996	10-11	January-June 1996
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Reliability	6	March 1996	6-7	Stevedoring industrial disputes
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	11	June 1997	6-8	March quarter 1997
Stevedoring performance ^b	1	July 1994	5-11	December quarter 1993
	2	December 1994	6-11	March & June quarters 1994
	3	May 1995	7-11, 15	September & December qtrs 1994
	4	October 1995	2-9, 15	March & June quarters 1995
	5	December 1995	5-9, 15	September quarter 1995
	6	March 1996	2-7, 19	December quarter 1995
	7	June 1996	2-6, 15	March quarter 1996
	8	September 1996	2-5, 15	June quarter 1996
	9	December 1996	2-5, 15	September quarter 1996
	10	March 1997	2-5, 19	December quarter 1996
	11	June 1997	2-5, 15	March quarter 1997

a. *Period is latest quarter or half-year covered. Articles may also include earlier data.*

b. *For earliest available data on stevedoring performance (from December quarter 1989), see issue 1 (table 7) or issue 2 (table 6).*

FIGURES

FIGURE 1 FIVE MAJOR PORTS STEVEDORING PERFORMANCE – TEUS PER HOUR

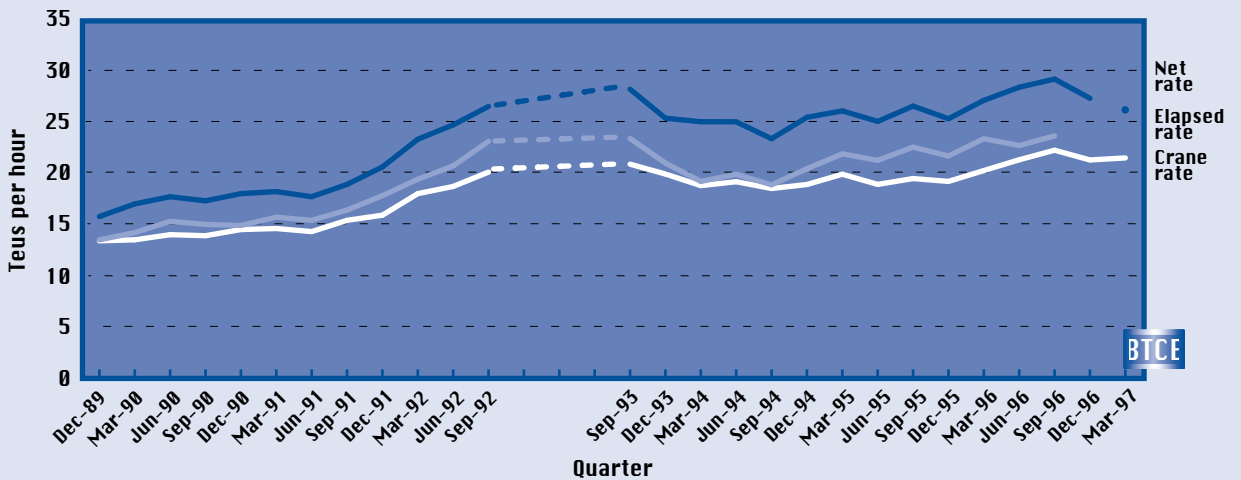
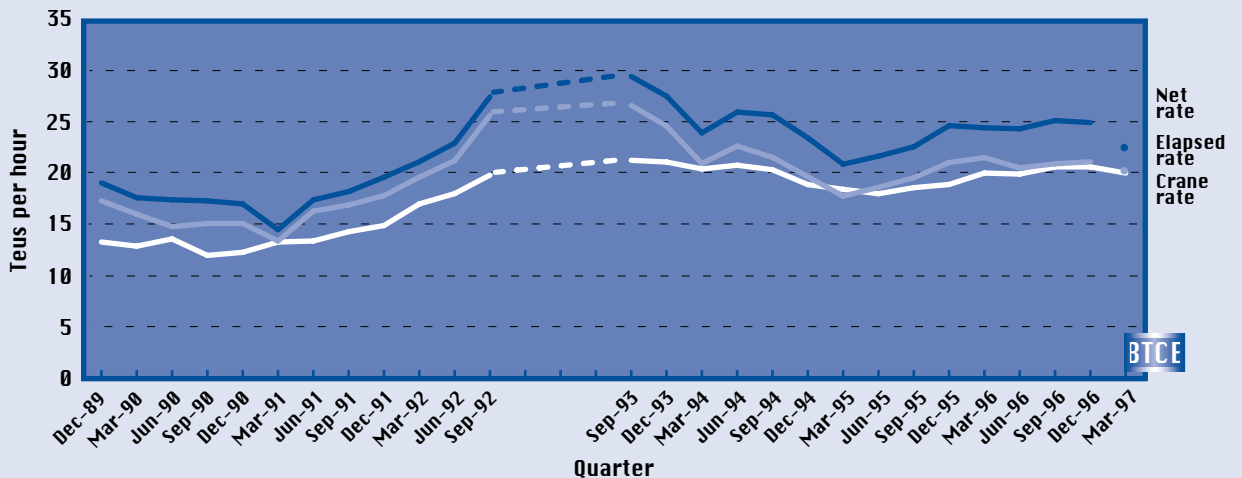


FIGURE 2 BRISBANE CONTAINER TERMINALS PERFORMANCE – TEUS PER HOUR



Notes Elapsed rates and net rates from the March quarter 1997 are not directly comparable with earlier figures (except at Adelaide) due to changes in a terminal operator's information systems. Award shift breaks are included in the measure of time used to calculate net rates and crane rates to the end of the September quarter 1992, and are excluded from the measure of time in later quarters. Data are unavailable for December quarter 1992 to June quarter 1993.

FIGURE 3 SYDNEY CONTAINER TERMINALS PERFORMANCE – TEUS PER HOUR

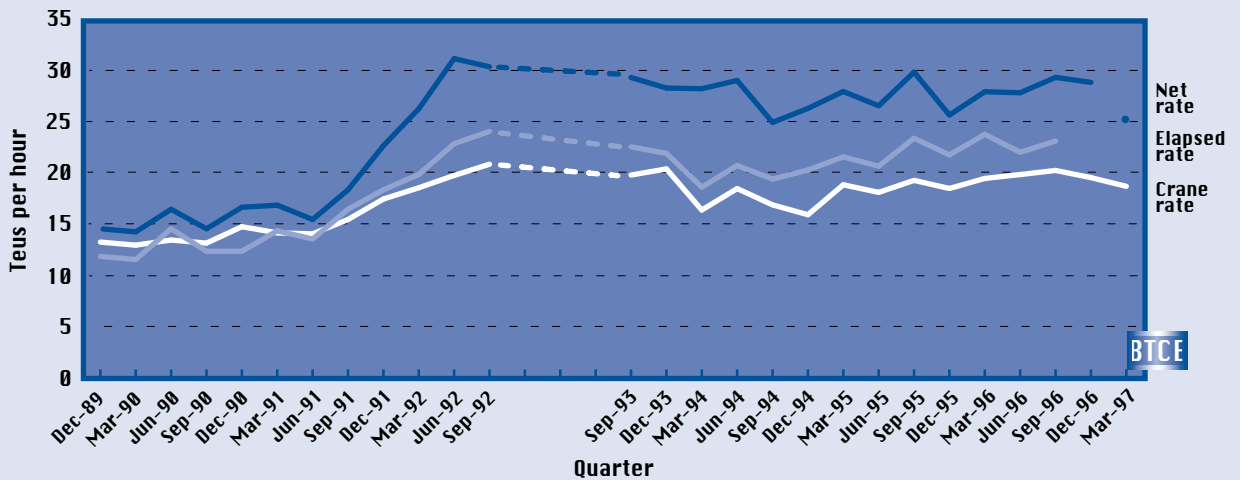
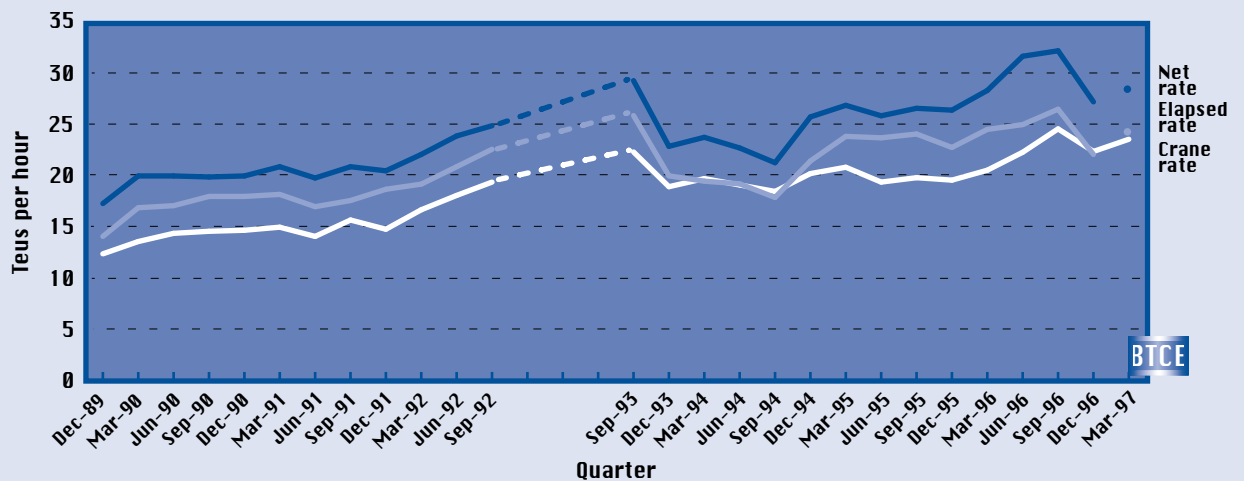


FIGURE 4 MELBOURNE CONTAINER TERMINALS PERFORMANCE – TEUS PER HOUR



Notes Elapsed rates and net rates from the March quarter 1997 are not directly comparable with earlier figures (except at Adelaide) due to changes in a terminal operator's information systems. Award shift breaks are included in the measure of time used to calculate net rates and crane rates to the end of the September quarter 1992, and are excluded from the measure of time in later quarters. Data are unavailable for December quarter 1992 to June quarter 1993.

Sources WIRA, Patrick, P&O Ports and SeaLand.

FIGURE 5 ADELAIDE CONTAINER TERMINAL PERFORMANCE – TEUS PER HOUR

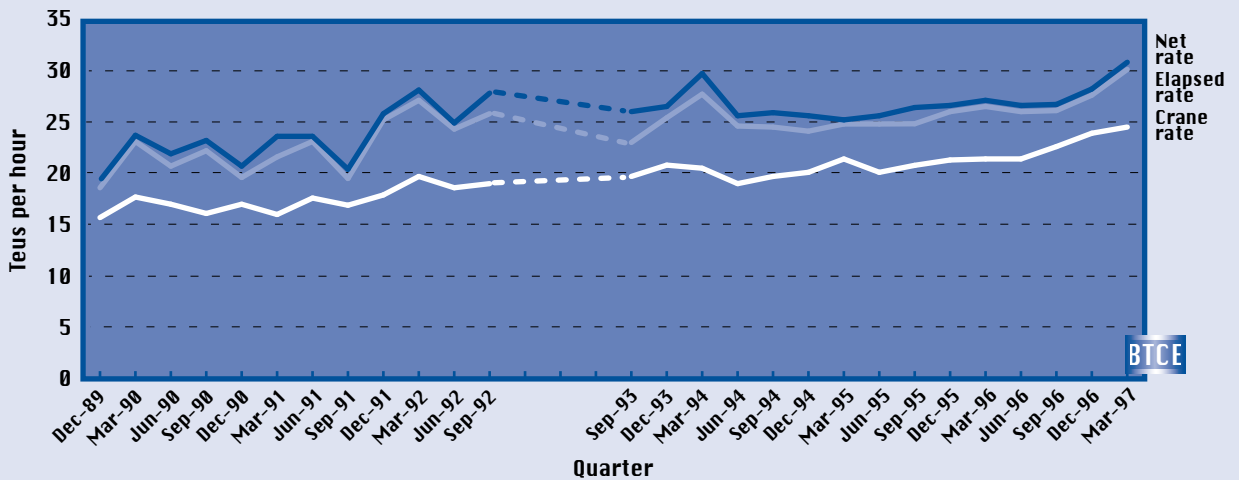
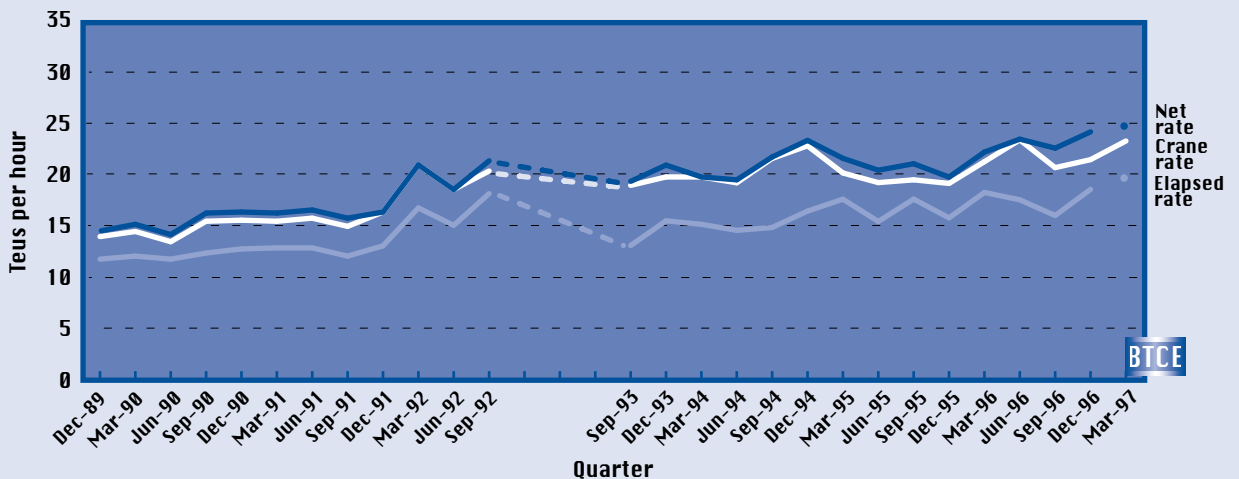


FIGURE 6 FREMANTLE CONTAINER TERMINALS PERFORMANCE – TEUS PER HOUR



Notes Elapsed rates and net rates from the March quarter 1997 are not directly comparable with earlier figures (except at Adelaide) due to changes in a terminal operator's information systems. Award shift breaks are included in the measure of time used to calculate net rates and crane rates to the end of the September quarter 1992, and are excluded from the measure of time in later quarters. Data are unavailable for December quarter 1992 to June quarter 1993.

Sources WIRA, Patrick, P&O Ports and SeaLand.

FIGURE 7 CREW TO BERTH RATIOS—AUSTRALIAN MERCHANT SHIPPING

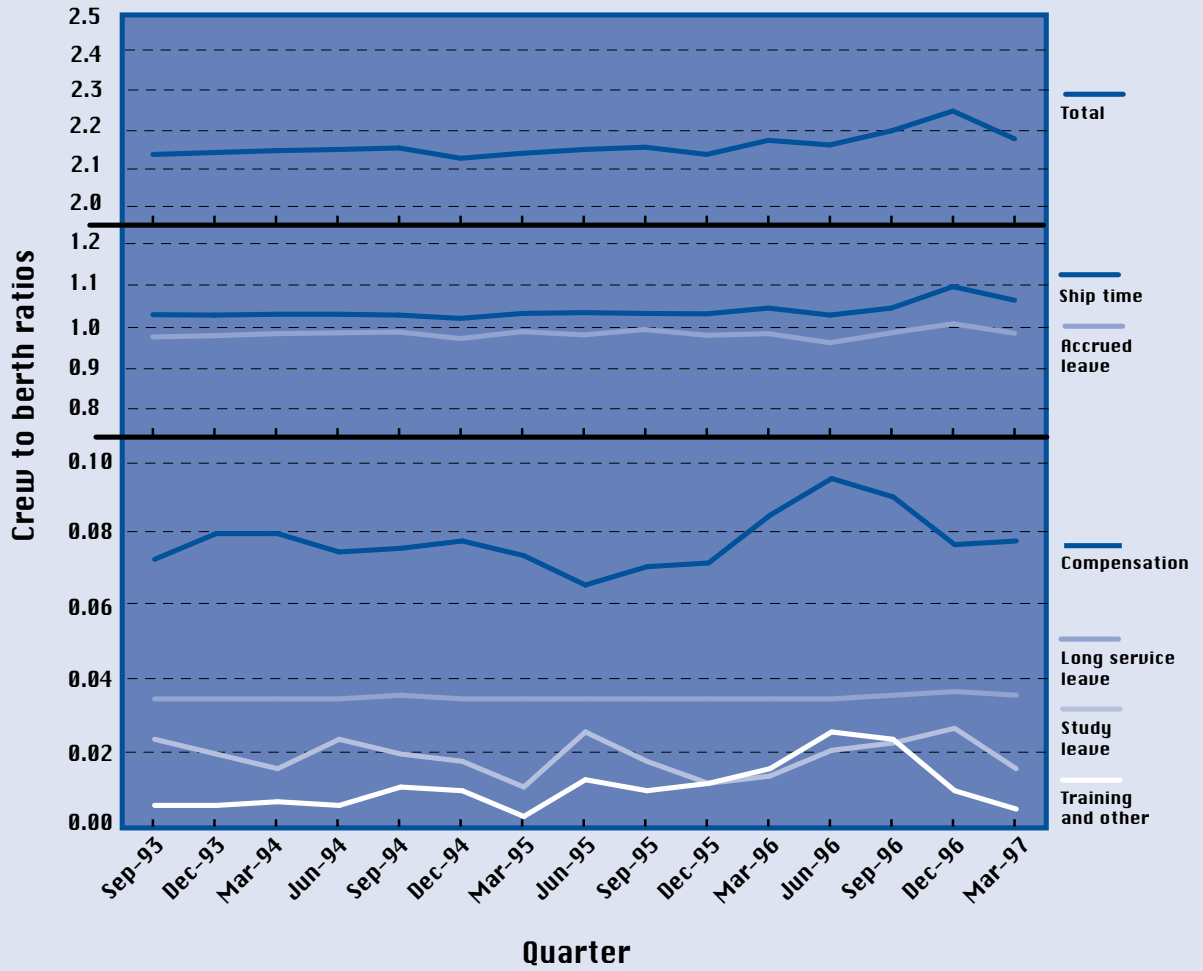
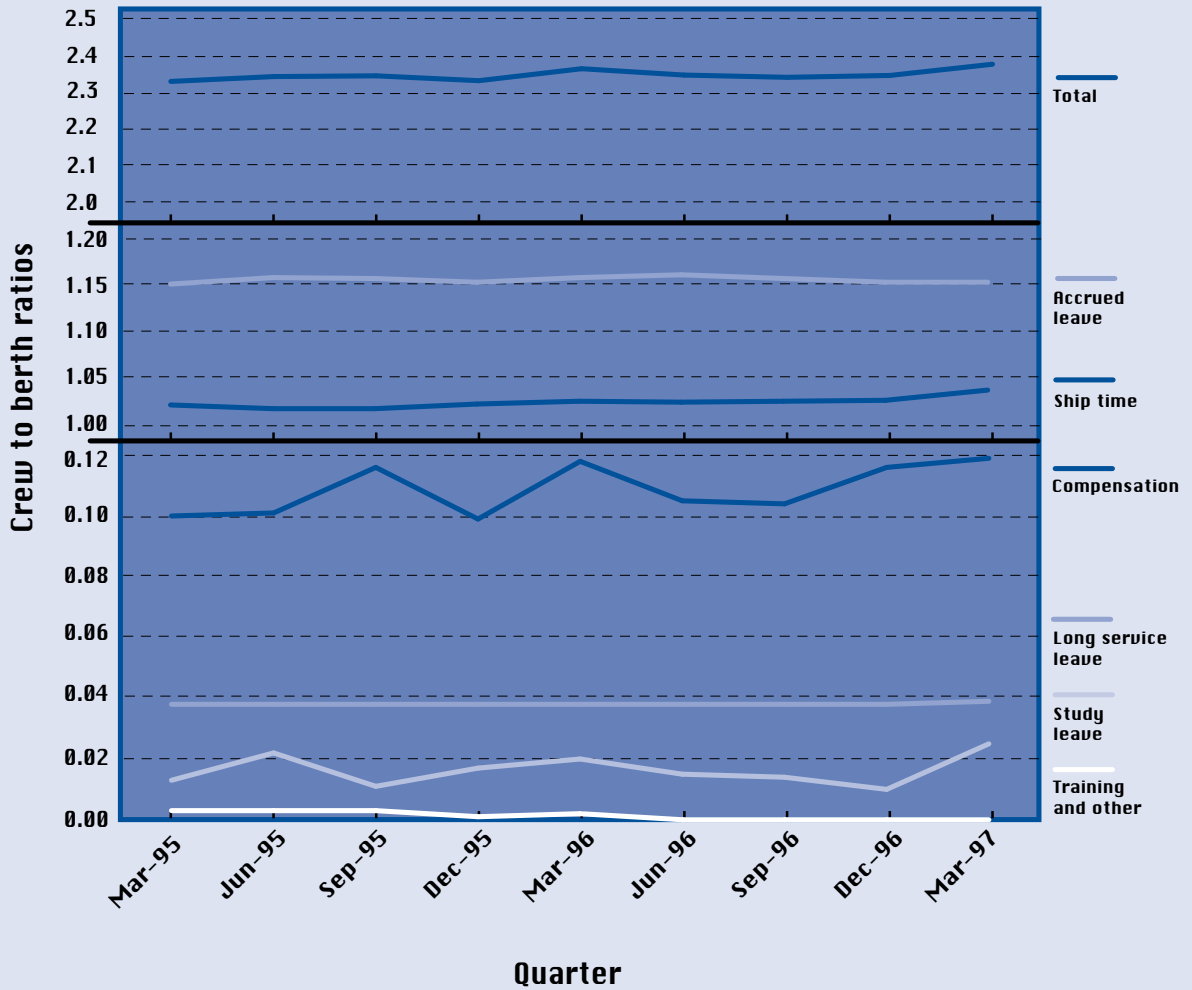


FIGURE 8 CREW TO BERTH RATIOS—AUSTRALIAN OFFSHORE SHIPPING



BTCE MARITIME RESEARCH

The Bureau of Transport and Communications Economics (BTCE) undertakes applied economic research on current and emerging issues of interest to the Commonwealth Transport and Regional Development portfolio and the Department of Communications and the Arts. The research covers maritime, aviation, transport externalities, land transport and communications issues.

The BTCE's research contributes to the improved understanding of factors influencing the efficiency and growth of the transport, regional development and communications sectors and the development of effective policies in these areas. The Bureau also aims to stimulate public debate on important issues by publishing the results of its research and providing information to the public on the structure and economic performance of the transport and communications sectors.

The major projects under way in the maritime area are:

- Our newsletter *Waterline* which monitors trends in Australian stevedoring productivity, waterfront reliability, port interface costs, other aspects of port performance and crew to berth ratios;
- A joint project with the Indonesian Government to investigate transport synergies between eastern Indonesia and northern Australia;
- A maritime data base which covers international sea and air freight (by value, weight, commodity) and ship visits to Australia (ship type and origin-destination).

Another BTCE project, *Transport and Communications Indicators*, includes information on liner cargoes (imports and exports) and bulk exports. The Bureau also provides research support for committees of inquiry such as the Review of the Tasmanian Freight Equalisation Scheme.

Information on the BTCE's maritime research can be obtained from the Research Manager, Sue Elderton, (06) 274 6800. Information on individual projects is also available from the project leaders. For *Waterline*, contact Kym Starr, (06) 274 6857. For the Indonesian project, contact Neil Gentle, (06) 274 6735. The maritime data base is managed by Stephen Wheatstone, (06) 274 6751.

ABBREVIATIONS

AAPMA	Association of Australian Ports and Marine Authorities
BTCE	Bureau of Transport and Communications Economics
teu	Twenty-foot equivalent unit
WIRA	Waterfront Industry Reform Authority

DEFINITIONS

Elapsed time – the total time over which the ship is worked, measured from labour aboard to labour ashore.

Elapsed rate – the number of containers or teus moved per elapsed hour.

Net time – the elapsed time minus the time unable to work the ship due to award shift breaks, ship's fault, weather, awaiting cargo, industrial disputes, closed holidays, or shifts not worked at the ship operator's request.

Net rate – the number of containers or teus moved per net hour.

Crane rate – the number of containers or teus moved per net crane hour.

ACKNOWLEDGMENTS

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