Australasian Transport Research Forum 2018 Proceedings
30 October to 1 November 2018, Darwin, Australia
Publication website: http://www.atrf.info

The Demand and Economic, Environmental & Social Impacts of Australian Cruise Tourism

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Abstract

Published figures on cruise tourism in Australia focus on port visits and passenger spending. The resultant economic impacts have been headlined in tourism and port plans as demonstrating the merit of further infrastructure investment. This paper seeks to review the basis of the economic impact figures. Just how many number cruise passengers are there on Australian cruises and how much do they spend when they get on-shore?

A 'top down' approach using fifteen years of data is used to project national demand first and then disaggregate the total down by State and port. In this way the projections are kept internally consistent and avoid the problems of ports developing their own forecasts independent of one another.

Unlike the US and Europe, embarkation, disembarkation and transit movements in Australian statistics are not distinguished and unlike NZ there is no published figure of 'unique' passenger numbers. To fill the gap, 636 individual cruise ship itineraries have been collated, analysed by type of cruise for 2018/19 and used to estimate the number of unique passengers, crew and ships by cruise type and also by port.

A review of on-shore passenger and crew expenditure of Australian and overseas estimates is presented that shows Australian Cruise Line Association (ACLA) estimates to be at high end of plausibility. Indeed, when the review estimates were applied instead, total port spending dropped to just a fifth of the ACLA estimate. So as an alternative to off-boat passenger spending figures, an on-board consumer surplus measure is put forward as a way of measuring the benefit to cruise passengers from infrastructure investment.

The paper ends by outlining the wider social and environmental impacts of cruise tourism that have been neglected in tourism and port plans. Unlike on-shore spending, the social and environmental impacts of cruise tourism are far more mixed. Air pollution for example is definitely negative. Given this, a passenger tax similar to that levied in Alaska is suggested and for 2018/19, if passengers were taxed at a similar rate of $47 each, an excise revenue of $43 million could be raised.

Keywords:

Cruise Tourism, Forecasting, Economic Impact Analysis, Social and Environmental Impacts, Akaroa Port Arthur, Burnie, Sydney White Bay Cruise Terminal, Venice, Hobart, Darwin, Vanuatu, Galveston, Alaska cruise tax.

1. Introduction

Australia is a nation of cruise lovers! According to the UN World Tourist Organisation, Australians went on 1.3 million cruises somewhere in the world in 2016 and with a population of 24 million, Australians averaged 54 cruises per thousand people, a figure way above second placed America with 36 cruises per thousand people.

Figure 1: International Comparison of Cruise Trips per 1,000 Population

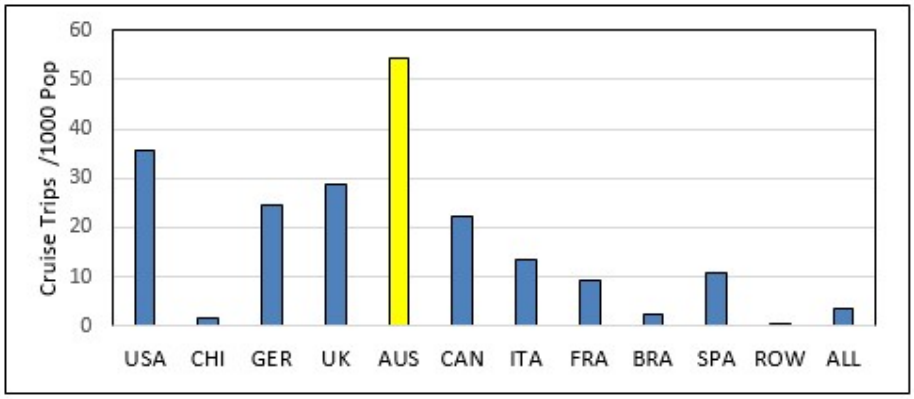


Table 1: International Comparison of Cruise Tourism

Country	Cruise Passenger Trips million	Population million	Cruise Pax /1000 Pop
USA	11.5	322	35.7
China	2.1	1,403	1.5
Germany	2.0	82	24.4
UK	1.9	66	28.8
Australia	1.3	24	54.2
Canada	0.8	36	22.2
Italy	0.8	59	13.6
France	0.6	65	9.2
Brazil	0.5	208	2.4
Spain	0.5	46	10.9
ROW	2.9	5,155	0.6
All	24.9	7,466	3.3

ROW Rest of World

Sources: Cruise numbers from UNWTO. Populations from various sources

This paper only looks at the cruise market in and around Australia which has grown at nearly 10% a year since the early 2000s in terms of visiting cruise ships. Such growth has created problems around port capacity and to justify expansion, port and State authorities have trumpeted the money that cruise ship passengers and crew bring to the local economy. In doing so they have often relied on figures published by the Australian Cruise Line Association (ACLA). These figures have focused on the number of port visits by cruise ships and the economic impact of on-shore spending.

Unlike the US and Europe, publicly available figures are not broken down into embarkation, disembarkation and transit movements which would help understand the high level of on-shore spending that ACLA claims.

Surveys undertaken in Hobart and Darwin and Pacific Island and NZ studies shed doubt on the ACLA figures. Indeed, given the uncertainty surrounding the expenditure figures, a simpler approach based on consumer surplus is put forward.

What the economic impact studies omit, despite the considerable research undertaken, is the social and environmental impact of cruise tourism. Unlike passenger and crew expenditure these impacts can be negative and detract from the economic impact estimates.

The information presented in this paper attempts to address these deficiencies. The paper sets sail in Section 2 with a definition of cruise ships, a map of Australia's cruise ports and anchorages followed by some comments on the data which is available. Section 3, charts the growth in cruise tourism in Australian waters over the last fifteen years (2003-2018) and looks at how it might grow over the next decade (2018-2028). Section 4 dives deep into the detail of individual cruise ship itineraries for 2018/19 to estimate the total number of 'unique' cruise passenger trips. Section 5 steps back on to dry land to look at the level of on-shore spending. Section 6 goes on a short tour of the social and environmental impacts of cruise liners before finally docking in section 7 with a revisit of the salient facts and findings.

2. Definitions, Data & Approach

There are differences of opinion on what defines a cruise ship. The port of Darwin distinguishes small from large cruise ships according to Gross Registered Tons (GRT). Ships over 50,000 tons are defined as 'Large' typically carrying 100 or more passengers.[1] Small cruise ships such as the Coral Discovery (72 passengers) use Darwin as a home port and cruise around the coastline of NT and WA.

The South Australia Tourism Commission classifies cruise vessels into four categories: expedition vessels, boutique, cruise ships and mega liners, as set out in Table 2.

Table 2: Classification of Cruise Ships

#	Class	Gross Registered Tons (Thousand)	Passenger Capacity	Comment
1	Expedition Vessels	10	10 - 50	Intimate experiences, adventurous itineraries (eg Antarctica, Africa and Asia)
2	Boutique Ships	10 - 32	50 - 600	Predominantly luxury to premium market specialising in unique experiences and itineraries
3	Cruise Ships	32 - 92	600 - 2,700	A broad market catering for mainstream itineraries/ports
4	Mega Liners	92 - 220	2,700 - 6,300	Maximising economy of scale, these ships have limited itineraries and port options in Australia.

Source: South Australian Cruise Ship Strategy 2020 South Australian Tourism Commission

For the purposes of this paper, cruise ships are defined as ocean going vessels with a capacity of 100 passengers or more. Thus expedition vessels and some boutique vessels are omitted if they carry less than 100 passengers. Adherence to the definition is dependent on the

[1] Port of Darwin reported 73 cruise ship visits in 2015-16 but CLA reported only 45. Port of Darwin recorded 30 'large' and 43 'small' cruise line visits.

compilers of port statistics and the Australian Cruise Line Association which reports cruise ship activity and upon which, the statistics in this paper are heavily based.

There is also the question as to what classifies as a cruise 'port'. Some ships 'dock' at 'anchorages' and ferry passengers a shore on tender vessels. As an example, 18 ships moored at Yorkey's Knob in 2015/16 which is 13 kilometres north of Cairns.[2]

Anchorages are more likely to go unrecorded if the island or hinterland is uninhabited and has nowhere for passengers to spend money (since ACLA statistics are principally about on-shore expenditure). There are also off-shore Australian protectorates such as Christmas Island, Norfolk Island and Willis Island where cruise ships visit.[3] Some ports/anchorages may also be aggregated for reporting purposes such as 'Whitsundays' which can include Airlie Beach and Hamilton Island visits.[4]

Based on cruise ship data compiled by ACLA, port schedules and cruise itineraries a total of 45 ports and anchorages have been visited (including 3 overseas protectorates) between 2003/4 and 2018/19. The locations of the ports and anchorages are shown in Figure 2.

Figure 2: Australia Cruise Ship Port and Anchorage Locations

[2] The visits to Yorkey's Knob do not appear to be recorded in ACLA statistics.

[3] Christmas Island and Norfolk Island are included in ACLA statistics but Willis Island, which is 450 kms east of Cairns beyond the Great Barrier Reef in the Coral Sea, is not. The island is uninhabited apart from a weather station with accommodation for four permanent staff and ten visiting people. It is not clear whether cruise passengers disembark but there is nothing to spend money on. There is reportedly a substantial library that caters for all tastes. Cruise itineraries for 2018/19 show 31 visits to Willis Island (see Appendix Table A1).

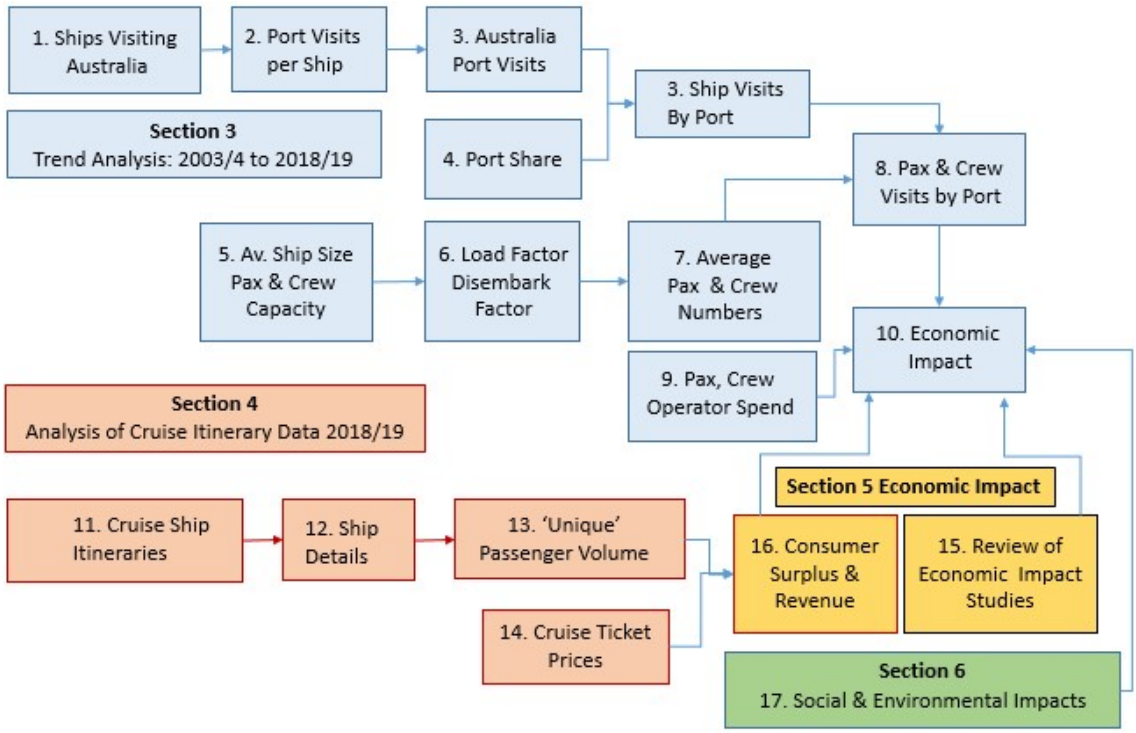
[4] Appendix Table A1 splits the visits to Hamilton Island and Airlie Beach.

The Australian cruise market runs all the year round with a peak season between October and April especially for the southern ports of Melbourne, Adelaide, Hobart and Freemantle. Outside the summer peak, some ships relocate back to the northern hemisphere. The more northerly ports of Sydney, Brisbane and Cairns operate all year round cruises to the Queensland coast and Pacific Islands.

A variety of data sources have been used. Twelve years of data from 2003/4 to 2015/16 on ship visits, capacity, ports visits and economic impacts (passenger spend etc.) was obtained from ACLA annual reports. Three more years of data was added by researching Port, State Tourism and miscellaneous web sites. For 2018/19, the Cruise Mapper and Crew-Center web sites were very useful.

The research approach is summarised in Figure 3 and has four strands. The first strand, shown in the light blue boxes (and described in Section 3) looks at the growth in cruise ships between 2003/4 and 2018/19 utilising data on ship arrivals, passenger and crew numbers and on-shore expenditure. The second strand shown in the pink boxes (Section 4), uses individual cruise itineraries for 2018/19 to build a profile of the cruise market and estimate the number of 'unique' passenger and crew trips, and cruise ticket revenue and consumer surplus. The third strand looks at the economic impact of cruise ships (box 15) in passenger and crew on-shore spending (Section 5). Finally, the green box looks at the social and environmental impacts of cruise ships (Section 6).

Figure 3: Study Methodology



3. Trends in Australian Cruise Line Patronage

3.1 Introduction

State Tourism Authorities and Port Authorities in Australia usually report cruise ship demand for their own States and ports. The States often refer to ACLA statistics. In this paper, ACLA data for 2003/4 to 2015/16 supplemented by port, government and miscellaneous sources for 2016/17 to 2018/19 is compiled and used to plot national, state and port trends and produce forecasts to 2028/29. Figure 3 presents the study methodology.

3.2 The Trend in the Number of Cruise Ships Operating in Australia

The number of cruise ships visiting Australia increased from 23 in 2003/4 to 50 in 2018/19, (an average growth rate of 5.7% p.a.). The left hand graph of Figure 4 shows the trend with two projections superimposed: a damped power function and a straight line.

The damped power function was estimated by regression and provided a better fit. Cruise ship numbers (*CSHIPS*) increase but at a declining rate reaching 59 visiting ships in 2028/29 (a growth of 1.6% p.a. on 2018/19). The function is shown in equation 1.

$$CSHIPS = [15{,}667{,}361 + 7{,}825(YEAR)]^{\frac{1}{3}}$$
$$(1{,}012{,}801) \quad (504) \quad R^2 = 0.96 \;\ldots.(1)$$

The straight line projection forecasts 71 ships in 2028/29 (annual growth of 3.5%) which is 12 more than the damped function.

The number of ports visited per cruise ship (*PpS*) increased from 14 in 2003/4 to 26 in 2018/19 reflecting a lengthening of the cruise season and an increase in regular Pacific and Domestic cruises from Sydney, Brisbane and Cairns. The right hand graph shows the increase.

The logistic function shown in equation 2 best fit the data. For 2028/29, the projected number of port visits per ship is 29. By comparison, a simple linear forecast projected 33 visits.

$$PpS = 11 + [\exp(-470 + 0.233YEAR)\,/(1 + \exp(-470 + 0.233YEAR))] \times (30 - 11)$$
$$(71) \quad (0.04) \qquad\qquad (71) \quad (0.04) \quad R^2 = 0.769 \ldots\ldots.(2)$$

Total port visits (TPV) is calculated by multiplying visiting cruise ships (*CSHIPS*) by the number of ports visited per ship (*PpS*) as shown in equation 3.

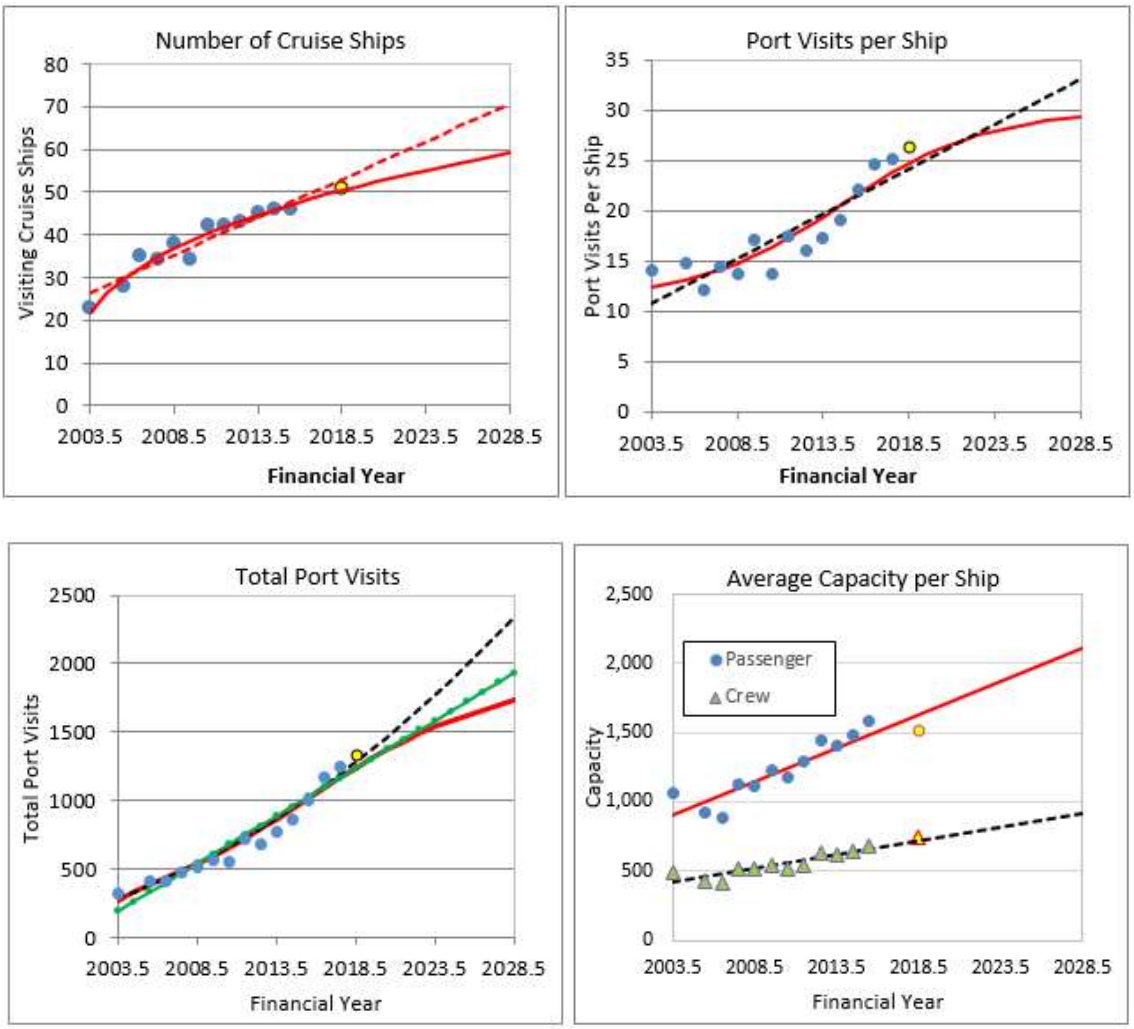
$$TPV = PpS \times CSHIPS \;\ldots..(3)$$

Port visits increased from 325 in 2003/4 to 1,341 for 2018/19 (growth of 9.9% p.a.) as shown in the bottom left hand graph. The forecast for 2028/29 is 1,730, an increase of 2.6% p.a.[5]

The bottom right hand graph shows ship capacity. Ships have increased 50% in size from an average passenger capacity of 1,000 in 2003/4 to 1,525 in 2018/19 (an annual growth of

[5] If port visits were forecast separately by linear regression (the green line), the forecast would have slightly higher (1,929) but if the two linear projections had been used, the forecast would have been noticeably higher (2,335).

Figure 4: Trend & Forecast Cruise Ship Visits and Capacity



2.9%). By 2028/29, with continued linear growth, average cruise ship capacity is forecast at 2,200 (an increase of 3.7% p.a. on 2018/19.[6]

Average crew size has also increased but at a slower pace rising from 500 in 2003/4 to 744 in 2018/19. The projection for 2028/29 is 912 crew per ship.

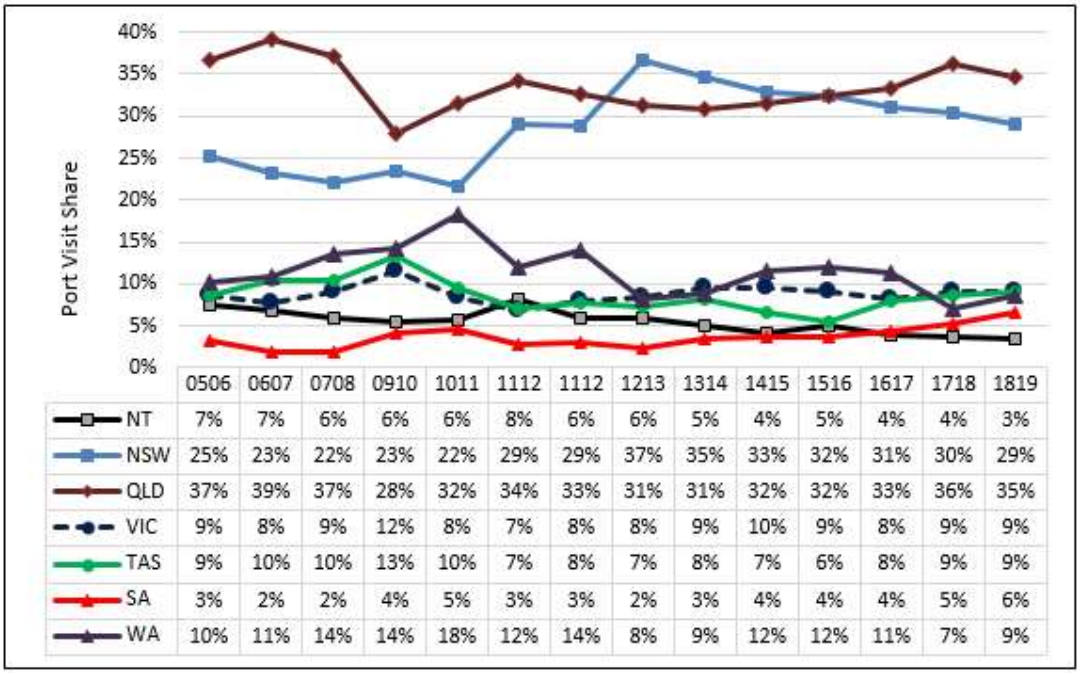
Together, the combination of more port visits and larger ships increased total port passenger capacity from 0.34 million in 2003/4 to just over 2 million in 2018/19, a growth of 12.5% per year. The projection for 2028/29 is 3.6 million, an increase of 6.1% p.a, which although half the historic trend is still a strong growth rate.

[6] Capacity was 1,418 if the mid-range capacity was used (some ships give a minimum and maximum). Had the data being weighted by the number of cruises, the capacity would have been averaged 1,916 because larger ships tend to make more cruises in Australia. The growth rates are affected by the 2018/19 estimate which is less than the linear trend prediction.

3.3 Ship Visits by State and Port

The second step in the analysis distributed port visits by State and Port. A detailed tabulation of the data is provided in Appendix A Table A1. Figure 5 plots the trend in port shares by State between 2005/6 and 2018/19.

Figure 5: Cruise Ship Visit Shares (%) by State



	0506	0607	0708	0910	1011	1112	1112	1213	1314	1415	1516	1617	1718	1819
NT	7%	7%	6%	6%	6%	8%	6%	6%	5%	4%	5%	4%	4%	3%
NSW	25%	23%	22%	23%	22%	29%	29%	37%	35%	33%	32%	31%	30%	29%
QLD	37%	39%	37%	28%	32%	34%	33%	31%	31%	32%	32%	33%	36%	35%
VIC	9%	8%	9%	12%	8%	7%	8%	8%	9%	10%	9%	8%	9%	9%
TAS	9%	10%	10%	13%	10%	7%	8%	7%	8%	7%	6%	8%	9%	9%
SA	3%	2%	2%	4%	5%	3%	3%	2%	3%	4%	4%	4%	5%	6%
WA	10%	11%	14%	14%	18%	12%	14%	8%	9%	12%	12%	11%	7%	9%

Around two thirds of cruise ship port visits were to ports in Queensland and NSW. Queensland's share declined slightly over the 14 year period from 37% to 35% whereas NSW's share peaked in 2013/14 at 37% then declined to 29% (possibly reflecting capacity issues in Sydney).

The shares of Victoria (VIC), Tasmania (TAS) and Western Australia (WA) have remained flat at just under 10% each. South Australia's (SA) share doubled from 3% to 6%. Northern Territory's share (NT) dropped from 7% to 3%.

Figure 6 presents the trend in ship visits for the eight largest ports plus an aggregation of the 'other ports' labelled "Small". The graph shows a precipitous decline in the share of Cairns from 20% in 2005/6 to 5% in 2018/19. Brisbane's share increased from 12% to 15% with Sydney's tracking the NSW share (peaking at 35% in 2013/14 then declining to 27% in 2018/19). The biggest increase was at 'small' ports with a near doubling from 16% to 31%.

The model in equation 4 was used to forecast port share to 2028/29. The logistic function ensured total port share remained at 100%. Pivoting on the 2018/19 'base' port shares (P_{io}) helped reduce forecasting error. The share parameters (β_i) tabulated below equation 4 reflect the observed trends in Figure 6. A positive parameter indicates growth and a negative parameter decline. The forecast is for Brisbane, Melbourne, Adelaide and 'Small' ports to grow modestly and Darwin, Cairns, Sydney, Hobart and Fremantle to decline slightly.

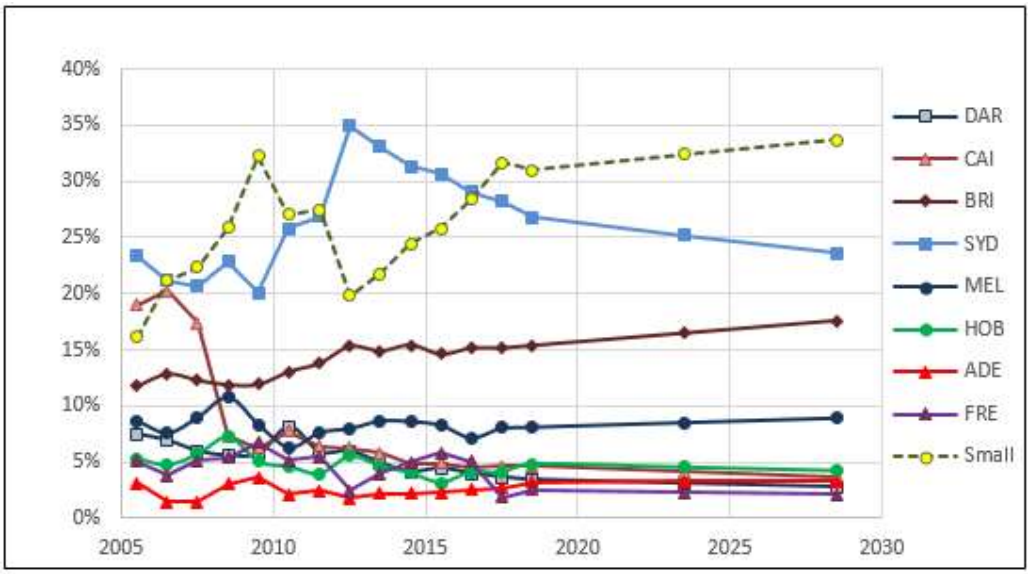
$$P_{it} = \frac{\exp(\beta_i YEAR)P_{io}}{\sum_i \exp(\beta_i YEAR)P_{io}} \qquad \ldots\ldots(4)$$

	DAR	CAI	BRI	SYD	MEL	HOB	ADE	FRE	Small
βi	-0.015	-0.014	0.020	-0.007	0.016	-0.007	0.009	-0.011	0.015

Equation 5 multiplies the port shares with total port visits to give a forecast for a particular port. The trends and projections are graphed in Figure 7 and summarised in Table 3.

$$TPV_{it} = P_{it} \times TPV \quad \ldots..(5)$$

Figure 6: Cruise Ship Visit Shares (%) by Port



The number of visits to small ports and anchorages increased from 67 in 2003/4 to 416 in 2018/19, (15.1% CAGR). Growth is forecast to continue but at slower pace of 3.5% p.a. with port visits reaching 584 in 2028/29.

For Sydney, the number of cruise ships is forecast to increase from 360 in 2018/19 to 409 in 2028/29, (1.3% CAGR). By way of comparison, the Port Authority of NSW projects cruise ship visits at 425 in 2027 (a growth rate of 1.9% p.a.).[7]

Visits to Brisbane are forecast to increase from 206 to 304 and Melbourne from 109 to 154. Hobart is forecast to increase from 65 to 73 despite a decline in share.

For Cairns (excluding Yorkey's Knob) little growth is forecast with visits increasing by just three ships from 62 in 2018/19 to 65 in 2028/29.

[7] The NSW Cruise Development Plan includes a graph (Figure 2) that gives the Port Authority of NSW forecast for cruise liner visits to Sydney.
https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/169013/NSW-Cruise-Development-Plan.pdf

Figure 7: Number of Cruise Ship Visits by Port 2003/4 to 2028/29

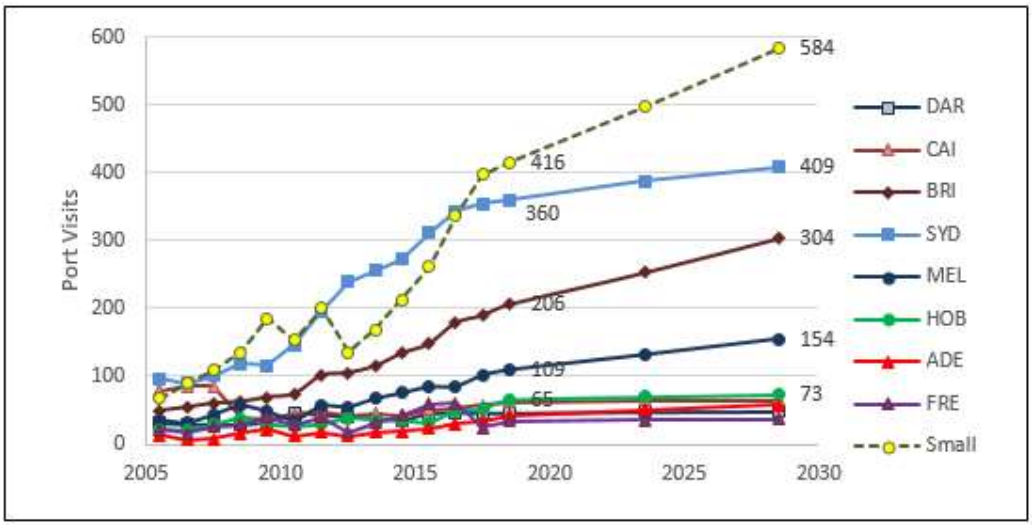


Table 3: Summary of Australia Cruise Shipping Trends & Predictions 2003/4 – 2028/29

Statistic	2003/4	2005/6	2018/19	2028/29	Compound Annual Growth Rate 2005/6-2018/19	2018/19-2028/29
Cruise Ships Visiting Australia	22	28	50	59	4.6%	1.6%
Port Visits per Ship	12.4	14.8	24.6	29.3	4.0%	1.8%
Total Port Visits	325	415	1,341	1,730	9.4%	2.6%
Passenger Capacity/Ship	1,000	923	1,525	2,200	3.9%	3.7%
Crew Capacity/Ship	500	430	744	912	4.3%	2.1%
Port Passenger Capacity (m)	0.3	0.4	2.0	3.8	13.8%	6.4%
Sydney Port Visits	na	97	360	409	10.6%	1.3%
Brisbane Port Visits	na	49	206	304	11.7%	4.0%
Melbourne Port Visits	na	36	109	154	8.9%	3.5%
'Big' Ports Visits (1)	na	348	925	1,147	7.8%	2.2%
Small Ports Visits	na	67	416	584	15.1%	3.5%

(1) Big ports = Darwin, Cairns, Brisbane, Sydney, Melbourne Hobart, Adelaide, Fremantle

3.4 Cruise Ship Port Dwell Times

Where wharf/terminal capacity is constrained, port visits can still increase if ships spent less time in port. There is, of course, a limit! Freemantle Port advises *"ships take up to 4–5 hours to disembark passengers, although smaller ships take 1–2 hours"*.[8] Obviously for 'transit' port visits, the aim is to give people sufficient time to look around and hopefully spend some money at local businesses! In this regard, surveys of Pacific Island cruise passengers (see section 6) have established that people typically spend around 3 to 4 hours ashore. [9]

Most ships arrive in the morning and depart in the evening thus spending less than a day in port and they also avoid paying port fees by staying past midnight. The exceptions are 'turnaround' ships which may dock overnight or stay for 2-3 days depending on the itinerary (passenger preferences regarding which day of the week to start their cruise).

[8] http://www.fremantleports.com.au/Visiting/Cruising/Pages/Cruise-Ship-Visits.aspx

[9] Unsurprisingly, surveys have shown a positive correlation between length of on-shore visit and passenger spend.

Table 4 presents dwell times compiled from arrival schedules for eight large cruise ports and a selection of eight smaller ports.

Table 4: Cruise Ship Port Dwell Times

Port/Anchorage	Period	Hours (decimal) in Port Mean	Median	Min	Max	% Overnight	Sample
Darwin	2018-19	18.1	12.0	8.0	64.0	32%	47
Cairns	2017-18	17.6	12.0	4.0	35.6	34%	87
Brisbane	2018 Oct-Dec	9.0	8.0	8.0	15.0	0%	65
Sydney	2018-19	12.5	11.0	5.5	60.0	9%	322
Melbourne	2018-19	12.2	0.0	6.0	58.0	14%	114
Hobart	2018-19	15.5	13.5	3.5	35.0	33%	64
Adelaide	2018-19	14.5	11.5	7.5	35.5	9%	43
Freemantle	2018-19	14.4	12.3	7.5	37.8	12%	34
Kangaroo Island (SA)	2018-19	11.0	11.0	9.0	16.0	0%	30
Port Lincoln (SA)	2018-19	11.1	11.5	10.5	11.5	0%	13
Geelong (VIC)	2018-19	11.7	0.0	4.0	15.0	0%	6
Philip Island (VIC)	2018-19	15.0	15.0	15.0	15.0	0%	5
Portland (VIC)	2018-19	10.5	10.5	10.0	11.0	0%	2
Burnie (TAS)	2018-19	9.6	10.0	7.5	12.0	0%	29
Port Arthur (TAS)	2018-19	9.7	10.0	6.0	11.0	0%	23
Coles Bay (TAS)	2018-19	4.0	4.0	4.0	4.0	0%	2
Large Ports	see above	13.5	9.6	3.5	64.0	15%	776
Small Ports	"	10.4	10.0	4.0	16.0	0%	110
All Ports	"	13.2	9.6	3.5	64.0	13%	886

Source: compiled from individual port cruise ship arrival data

A third of ships calling at Cairns, Darwin and Hobart berthed overnight. At the other 'large' ports, 10% berthed overnight. Brisbane was an exception with no ships staying overnight. At the smaller ports which are usually anchorages, no ship stayed overnight.

The median time spent in port was ten hours with a range from 3.5 to 64 hours. The average time was 13 hours. Ships visiting Brisbane, Sydney and Melbourne had shorter stays (9 to 12.5 hours) possibly reflecting space shortage or higher port fees. In the case of Sydney, there are anchorages at Point Piper and Athol Bay where cruise ships can moor. Cruise ships also go on 'Round Trip Cruises' (RTCs) that circulate outside the port for three days but do not visit any other port before returning. RTCs reduce port fees whilst earning some money. Section 3 estimates the number of RTCs by port.

4. Estimating the 2018/19 demand profile using Cruise Itineraries

4.1 Introduction

ACLA reports the number of passenger and crew visit days in port which are recorded as part of estimating the on-shore economic impact. However unlike NZ, the number of 'unique' passenger trips on cruise ships is not reported. This section uses cruise ship itineraries for 2018/19 to estimate a figure.

The analysis also enabled the number of port calls and passenger demand to be disaggregated into transit tourists (those going on-shore temporarily), passengers embarking at the first port of call and disembarking at the last port.[10]

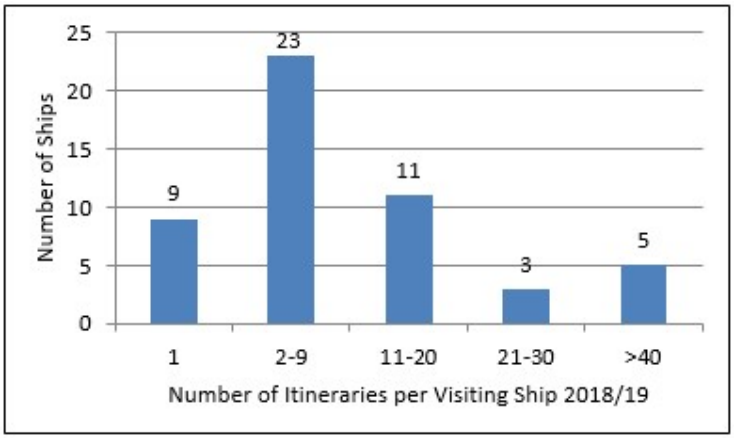
The list of cruise ships was drawn up from schedules of the eight largest ports. Altogether, 51 ships were identified. Most of the itineraries were obtained from the Cruise Mapper web site with the remainder obtained from cruise operator web sites. The total number of itineraries researched was 636.[11] The port estimates were then compared with port and ACLA estimates.

4.2 Cruise Ships Visiting Australia

51 ships were identified as visiting an Australian port between July 1st 2018 and June 30th 2019.[12]

Nine ships were scheduled to visit once. The Colombus is an example travelling to Sydney from Auckland and then sailing onto Europe. Just under half the ships (23) were scheduled to make between 2 and 9 cruises. Five ships were scheduled to operate all year round making at least 40 sailings from an Australian 'home' port. Pacific Dawn is one example with 66 planned cruises mainly from Brisbane to New Caledonia and Papua New Guinea. Figure 8 presents the profile of the number of itineraries for the visiting ships.

Figure 8: Number of Scheduled Cruise Journeys per Visiting Ship (2018/19)



Details of the cruise ships were obtained from Cruise Mapper and other web sites and are summarised in Table 5.[13]

Minimum and maximum passenger capacities are given for ships and in Table 5 both numbers plus a medium estimate (half the max and min figures) are given. The average passenger capacity was 1,525 (based on the medium figures). Larger ships tended to make

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[10] Data from the port Cairns indicates that some passengers join a cruise after the first port of embarkation or before the last port of arrival but the numbers are small.

[11] Sampling the itineraries using a data driven experimental design currently being developed by the Alan Turing Institute was considered but random bottlenecks meant it was above the plimsoll line for this study, Turing (2018).

[12] The ships were identified from arrival schedules of the eight largest ports.

[13] Details covered passenger and crew capacity, speed (knots), build year, build cost, refurbishment year, length (LOA), Gross Registered Tons (GRT), number of cabins, decks, decks with cabins, the star rating of the vessel (scored out of 5), operator and vessel flag.

more visits which increased the weighted average to 1,751. Total fleet capacity was 1.2 million which effectively gives a maximum for the number of unique passenger trips.[14]

The number of crew average 744 per ship (itinerary weighted) and totalled 473,000 for the visiting 'fleet'. The number of passengers per crew was 2.3 (1.2 million ÷ 473,000).

Table 5: Profile of Cruise Ships Visiting Australia in 2018/19

Statistic	Mean	Median	Weighted Mean (1)	Max	Min	Standard Deviation	Total		N
Number of itineraries	12.5	5	na	66	1	16.1	636		51
Max Passenger Capacity'	1,525	1,254	1,751	4,819	114	1,133	1,113,741	(3)	51
Min Passenger Capacity	1,311	1,090	2,081	4,162	108	940	1,323,832	(3)	51
Medium Passenger Capacity	1,418	1,172	1,917	4,491	113	1,036	1,218,942	(3)	51
Crew	581	465	744	1,350	70	334	473,387	(3)	51
Speed (Knots)	21	21	22	25	12	3	na		50
Build Cost ($Aus million) (2)	448	410	473	1,286	68	239	24,119	(4)	45
Age (Years)	18	18	19	46	1	10	Na		51
Length Overall (LOA metres)	226	219	250	348	90	60	Na		51
Gross Registered Tons (GRT)	57,337	48,075	36,717	167,800	4,200	36,717	1,872,546	(4)	51
Cabins	661	587	876	2,095	57	472	556,950	(4)	50
Decks	11.5	12	12.4	18	5	2.7	Na		50
Cabin Decks	6.6	7	6.5	10	4	1.4	Na		50
Star Rating (out of 5)	4.0	4.0	4.0	5.0	3.0	0.2	Na		49

(1) Ships weighted by number of itineraries. (2) Converted from US$ at $1US = $Aus1.368
(3) Calculated using weighted mean x 636 itineraries. (4) Weighted mean x 51 ships

The maximum speed of the visiting fleet averaged 22 knots per hour (40 kph) with a range from 12 to 25 knots per hour.[15]

The total capital value of the cruise ship fleet visiting Australia was $24 billion with the 'build' cost averaging $473 million per ship. The most expensive was the $US 940 million Ovation of the Seas built in 2016 with a passenger capacity of 4,819. The least expensive was The Black Watch built in 1972 for $US 50 million.

At 46, The Black Watch was also the oldest ship scheduled to visit Australia. The youngest was the luxury Le Laperouse (launched 1st Jan 2018 with 184 passenger capacity). The average age of the visiting fleet was 19 years.

The overall length (LOA) of visiting ships averaged 250 metres with a range from 90 to 348 metres. Thirteen ships (25% of the fleet) were longer than 270 metres which is a threshold used to determine 'mega' cruise ship berth requirements at some ports e.g. Brisbane.

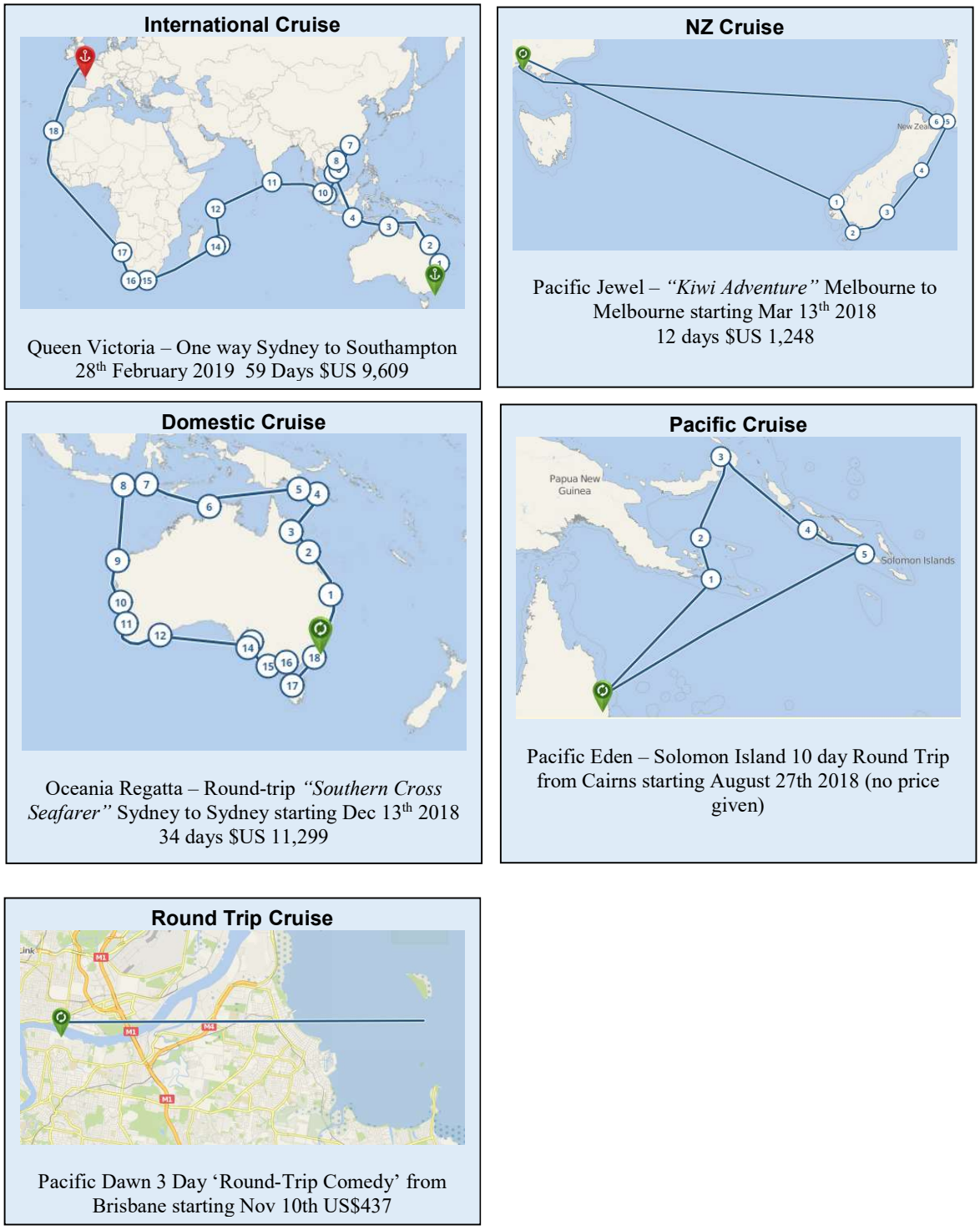
Gross Registered Tons (GRT) of visiting ships ranged from 4,200 tons for the Caledonian Sky to 167,800 tons for the Ovation of the Seas.[16]

[14] This assumes ships operate at the average capacity rather than the maximum and that each 'space' is used by one passenger on each itinerary.
[15] The slowest ship with a top speed of 12 knots per hour was the Island Sky a 26 year old expedition cruise liner. The fastest (25 knots per hour) were the Norwegian Jewel and Radiance of the Seas.
[16] Gross registered tonnage is a ship's total internal volume expressed in "register tons", each of which is equal to 100 cubic feet (2.83 m3). Gross register tonnage uses the total permanently enclosed capacity of the vessel as its basis for volume.

4.3 'Unique' Passengers, Crew and Ships operating in Australia 2018/19

The profile data in Table 5 was combined with itineraries to estimate the number of 'unique' passenger trips classified into six types of cruise. Figure 9 provides examples of the itineraries of the cruise types.

Figure 9 Examples of Cruise Itineraries



The itinerary classes were: International, Pacific Island, NZ, Domestic, Round Trip Cruises (RTC) and repositioning movements.[17]

Table 6: Cruise Ships Operating in Australia 2018/19 by Month

Scheduled Cruise Ship Arrivals (2018/19)								
Month	INT	PAC	NZ	DOM	RTC	REPO	Total	Share
Jul	1	11	0	10	3	2	27	4%
Aug	3	13	1	14	1	1	33	5%
Sep	5	16	1	12	5	0	39	6%
Oct	5	24	5	17	3	0	54	8%
Nov	8	18	17	14	4	0	61	10%
Dec	3	29	21	20	11	0	84	13%
Jan	10	19	26	23	3	0	81	13%
Feb	18	9	27	31	13	1	99	16%
Mar	13	19	15	20	6	0	73	11%
Apr	8	12	2	12	3	0	37	6%
May	2	10	0	11	3	0	26	4%
Jun	0	8	0	10	4	0	22	3%
Total	76	188	115	194	59	4	636	100%
Share	12%	30%	18%	31%	9%	1%	100%	

Pacific cruises account for 188 (30%), Domestic cruises 194 (31%), NZ cruises 115 (18%) and International cruises 76 (12%).

RTCs are short, usually three day non-stop round trips sometimes marketed as 'Comedy Round Trips' or 'Food and Wine Weekends' are likely to produce little on-shore economic spend. Indeed their on-shore impact could be argued to negative since whilst on-board, passengers won't be spending in town. For 2018/19, RTC cruises totalled 59 (9%).

There were also four re-positioning movements carrying zero passengers.

As can be seen from the left hand graph of Figure 10, Australian cruises operate all year. Pacific Island, Domestic and RTCs continue through winter offering 20 to 40 cruises per month mainly from Sydney, Brisbane and Cairns.[18]

NZ and International cruises operate during the summer months. February is the peak month with 99 (16%) arrivals followed by 88 in December (13%), 81 in January (13%) and 73 (11%) in March.

The number of unique passengers was estimated by the multiplying ship passenger capacity (mid-estimates) by a 'load factor'. For International, Pacific and NZ cruises, an 85% load factor was adopted; 80% for domestic, 60% for RTCs and zero for repositioning movements.

The total number of unique passenger trips was 992,000 with Pacific Island cruises accounting for 326,000 trips (33%), Domestic 260,000 (26%), NZ 240,000 (24%), International 108,000 (10%) and RTCs 65,000 (7%).

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[17] Some itineraries can be classified into more than one category for example a cruise ship stopping at a Pacific Island but then going onto Singapore. A hierarchical system was adopted that allocated ships as International first, then Pacific and then NZ. There were exceptions such as around Australia cruises that included a Pacific island stop (see the example) and in this case, it was classed as Domestic. Domestic exclude RTCs and repositioning trips which are classed separately.

[18] The all-round market in Australia contrasts with an October to April market in NZ.

Figure 10: Cruise Ships Numbers & Passengers Operating in Australia by Month & Type 2018/19

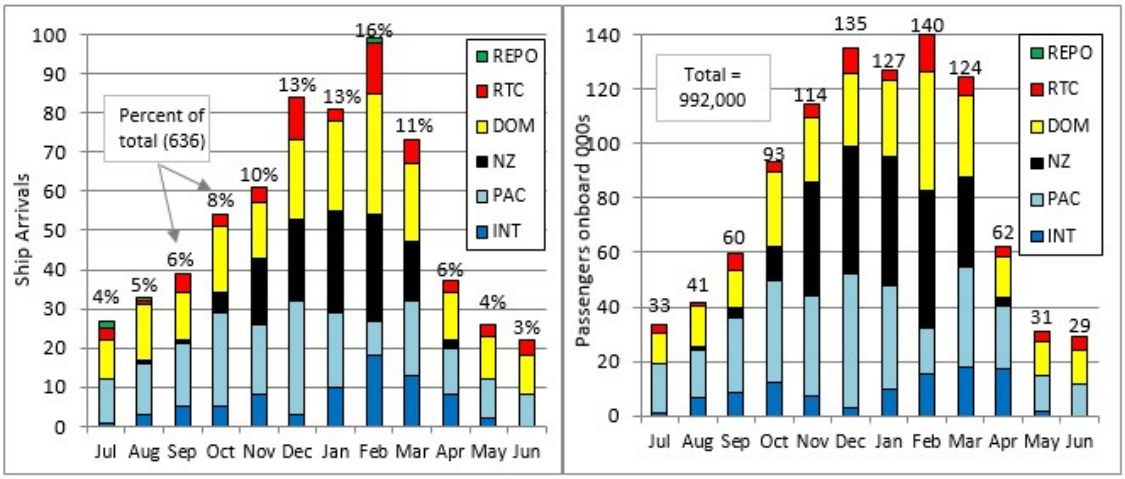

Table 7: Passengers on Cruise Ships Operating in Australia by Month & Type 2018/19

Expected Passengers Onboard (2018/19)								
Month	INT	PAC	NZ	DOM	RTC	REPO	Total	Share
Jul	1,178	17,764	0	11,362	3,425	0	33,729	3%
Aug	6,390	17,717	1,566	14,744	1,105	0	41,523	4%
Sep	8,482	27,614	3,329	13,978	6,145	0	59,547	6%
Oct	12,068	37,704	12,368	27,634	3,286	0	93,060	9%
Nov	7,358	36,506	41,738	24,149	4,617	0	114,368	12%
Dec	2,935	49,330	46,475	26,779	9,774	0	135,293	14%
Jan	9,739	38,320	47,433	27,688	3,551	0	126,732	13%
Feb	15,534	16,941	50,528	43,237	14,116	0	140,356	14%
Mar	17,668	36,821	32,964	30,459	6,731	0	124,643	13%
Apr	17,467	22,702	3,409	14,932	3,773	0	62,283	6%
May	1,980	12,672	0	12,618	3,689	0	30,959	3%
Jun	0	11,615	0	12,393	5,091	0	29,099	3%
Total	100,800	325,706	239,811	259,973	65,303	0	991,592	100%
Share	10%	33%	24%	26%	7%	0%	100%	

Unique crew trips totalled 473,000 which was half the number of passengers with the crew to passenger percentage ranging from 43% on NZ cruises to 66% on RTCs and 100% on repositioning movements.

As a comparison, the number of unique passengers reported by Statistics NZ for the year ending June 2017 was 220,000 with 88,000 unique crew trips (40% of passengers).[19] The Australia cruise market was therefore five times larger than the NZ market. For NZ/Australia cruises, the itinerary estimate was 240,000 which was 20,000 larger than Statistics NZ.

[19] The number was down from 235,000 in the previous year ending June 2016.

4.4 Comparison of Port Figures & Itinerary Estimates

The number of cruise visits to Australian ports (excluding Norfolk Island and Willis Island) was 1,290. This was 4% less than the port schedule estimate of 1,341).[20]

For Brisbane and Sydney, the itinerary estimate was 13% lower than port statistics whereas and for Melbourne, the estimate was 11% higher.[21]

Table 8: Port Visits by Cruise Ships 2018/19

	Itinerary Data: First Port Arrival plus Transit Visits							PORT	
Port	INT	PAC	NZ	DOM	RT	REPO	Total	STATS	Ratio#
DAR	25	8	0	9	0	2	44	46	0.96
CAI	25	12	1	23	0	0	61	62	0.98
BRI	27	65	5	62	19	0	178	206	0.86
SYD	35	109	71	72	26	1	314	360	0.87
MEL	6	12	57	39	7	0	121	109	1.11
HOB	4	3	35	28	0	0	70	65	1.08
ADE	5	4	6	24	4	0	43	43	1.00
FRE	10	6	4	11	3	0	34	34	1.00
SML	79	46	34	265	0	1	425	416	1.02
Total	216	265	213	533	59	4	1,290	1,341	0.96

Itinerary/Port Stats. Figures exclude visits to Norfolk Island & Willis Island

Darwin has a high share of international cruise ships with 25 out of 44 visits. Half of the visits to Hobart were NZ cruises (35 out of 70) and just under half for Melbourne (57 out of 121). Although Sydney had the highest number of international cruises they still only numbered 35 out of a total of 314. Sydney also had the highest number of RTCs (26) which are not likely to generate much on-shore spending. Brisbane had a lower share of NZ and International cruise visits (27 and 5 respectively out of 178) and a higher share of Pacific (65) and Domestic (62) cruises. For the small ports, 265 were Domestic and 79 International out of a total of 425 visits.

Just under 2.7 million port passenger movements were estimated from the itinerary data.[22] Included in this figure are embarkations, disembarkations and port transit movements. In the case of transit movements, a passenger going onshore then reboarding was counted as one movement. 94% of passengers were assumed to go ashore.[23]

For non-transit ship visits, all passengers were assumed to disembark with another set then embarking. There are therefore two passenger movements per visit.

Some passengers may join a cruise after the first port of departure. There are few statistics on this unfortunately. Cairns statistics for 2017-18 did show embarking and disembarking passengers to be negligible at 1% of total passengers (99% were transit passengers). Thus for simplicity, the analysis assumed zero percent.

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[20] A detailed tabulation by port is provided in Appendix A.

[21] For Sydney, port statistics gave 60 instances of 'refer Port Authority of NSW' rather than giving the ship's name. Most were for May 2019.

[22] Detailed tabulations are provided in Appendix B.

[23] The 94% figure is based on the Pacific Islands Tourism Impact Studies (see section 5) that quoted research by North American estimated by BREA. The percentage going onshore is likely to reflect the onshore activities available and the ease of accessing the shore (anchorage tenders being less convenient than walking down a gangway) and the ease of getting to the city centre. It is also worth noting that passengers could make more than one visit ashore.

The estimate of 2.6 million unique trips was 60% of the projected number of port day visits of 4.4 million for 2018/19 based on ACLA statistics.[24]

Table 9: Passenger Volume by Port 2018/19

	Embarkation plus Disembarkation plus Transit Passengers							ACLA	
Port	INT	PAC	NZ	DOM	RT	REPO	Total	STATS^	Ratio#
DAR	31,362	7,412	0	2,935	0	0	41,708	72,975	0.57
CAI	17,379	18,865	634	28,608	0	0	65,486	96,993	0.68
BRI	41,071	171,893	16,635	153,763	40,800	0	424,162	948,123	0.45
SYD	79,880	446,550	314,654	249,523	64,836	0	1,155,444	1,988,264	0.58
MEL	7,653	27,632	126,132	98,977	16,067	0	276,461	312,847	0.88
HOB	5,523	3,937	54,764	45,937	0	0	110,161	154,800	0.71
ADE	8,836	4,531	12,433	35,960	6,653	0	68,412	102,277	0.67
FRE	14,565	8,541	8,148	19,308	2,250	0	52,812	109,002	0.48
SML	68,795	37,638	37,930	336,112	0	0	480,476	652,971	0.74
Total	275,064	726,999	571,331	971,122	130,606	0	2,675,123	4,438,252	0.60

^ Based on ACLA stats for average port days per visit extrapolated to 2018/19

Itinerary/ACLA based estimate

The biggest difference was for Brisbane with the itinerary estimate only half the ACLA figure (424,000 versus 948,000). The forecast for Sydney was also lower (1.16 million versus 2 million). Melbourne was closer (276,000 versus 313,000).

Three quarters of Darwin passengers were on international cruises whereas for Melbourne only 7,600 out of 276,000 (3%) were international. For Hobart, 50% of passengers were on NZ cruises.

High numbers of Sydney and Brisbane passengers were travelling on Pacific Island cruises and for Small Ports, three quarters were on Domestic cruises (337,000 out of 480,000).

5. Economic Impact

5.1 Introduction

Investment in Australian port infrastructure (terminals, wharfs, etc.) to serve the cruise line industry has often been justified in terms of the on-shore spending of cruise operators, passengers, and crew. However Klein, a long standing Canadian critic of the cruise line industry comments: *"communities buy into the idea that cruise passengers spend $100 per port of call and see so many dollar signs there's no room for reason and debate".* Less mention is made of the value added to the economy or the opportunity cost of funding cruise infrastructure via the public purse[25] or the potentially negative impacts of pollution and congestion attributable to cruise ships.

[24] By linear extrapolation from ACLA figures for 2015/16. See Appendix Table A3 for figures by port.

[25] Sometimes referred to as the shadow price of taxation or the deadweight loss which effectively applies a mark-up to public sector funding with the rate depending on the funding source. A review by Ellis and Douglas (2015) found 'mark-ups' ranging from 20% to 60%.

5.2 Australian State Cruise Line Strategy Figures

Recent cruise plans of WA, SA and NSW and the Queensland Government's Ports North authority provide examples of economic impact figures being 'headlined'.

The Western Australian 'Cruise Shipping Strategic Plan 2012-2020 headlined the expenditure generated from cruise ships: *"cruise shipping makes a significant contribution to the economy. In 2011-12, the sector generated $185.7 million in expenditure."* [26] The figures were taken from the 2013 ACLA Economic Impact Report[27] which gave figures of 158,690 passengers (1,556 per visit) and 39,841 crew (391 per visit) days in port from 102 cruise ship visits.[28] Direct expenditure totalled $106 million comprising, $58.9m (56%) in operator expenditure, $5.8m (5%) in corporate expenditure, $35m (33%) in passenger spending and $6m (6%) in crew spending.[29] On average therefore, each ship is implied to generate expenditure of $1.55 million with passengers spending $221 and crew members $158 each.

Although ACLA acknowledges that expenditure by Australian passengers visiting Australian ports is an 'economic transfer', the WA Strategic Plan includes the 'transfer' in their headline figure. A lower figure of $87.8 m for Valued Added (VA) is mentioned in the report but it still retains spending by Australian cruise passengers. If the expenditure was limited to just international passengers, it would reduce to $66m ($646,000 per ship).

In South Australia, the *'2020 South Australian Cruise Ship Strategy'* views the cruise industry as *"the fastest growing tourism sector in Australia and South Australia contributing significantly to the state's economy over the past decade. Last year, the 2016/17 season contributed $98.5 million in economic value to South Australia".* The stated goal for 2020 is to "*attract 100 ship visits with a value of $200 million for the state economy".*

The value added for 2016/17 was from 49 cruise ships.[30] For 2015/16, (figures for 2016/17 were unavailable), 37 cruise ships produced direct expenditure of $26.9 million and Value Added of only $11m ($300,000 per ship) for SA.

For NSW, the *'2018 NW Cruise Development Plan'* reports that *"the cruise industry injected more than $27 million into NSW regional communities and $1.6 billion into the State overall... The NSW Government is committed to delivering these benefits. We have invested more than $135 million upgrading cruise terminal facilities in Sydney Harbour and more than $40 million developing the ports of Newcastle and Eden."*

ACLA gives a figure of $1billion for the direct economic impact of 325 ships visiting NSW in 2015/16 comprising $578m (57%) in passenger spend; $52m (5%) in crew spend; $70m (7%) in operations, $78m (8%) in bunker fuel and $228 (23%) in corporate expenditure. Of

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[26] The $185.7 million included indirect expenditure by Australian as well as international passengers. In terms of crew, ACLA (2013-14) estimated cruise ships employed 8,352 crew of which a fifth (1,500 - 2,000) were Australians (mainly on ships with Australian home bases such as Freemantle, Sydney, Melbourne, Brisbane and Cairns).

[27] Economic Impact of the Cruise Shipping Industry in Australia, 2011-12 ACLA, August 2012

[28] ACLA terminology varies. In the summary E.1 Table (ACLA Executive Summary 2012-13) the number of ship visits is given whereas in the port tabulations it is called 'ship visit days'. This paper refers to ship visits.

[29] ACLA reports have since added bunker fuel as an expenditure item however fuel is unlikely to add value to Australia since most is imported. International cruise ships may also pay very little if any fuel excise tax.

[30] *"South Australian Cruise Ship Strategy 2020"* by the South Australian Tourism Commission, South Australia (SA).

this NSW total, 99.5% was spent in Sydney and 0.5% ($4.5m) at Eden and Newcastle. Passenger days totalled 1.3 million and crew days 265,000. On average, passengers spent $57 at Eden, $195 at Newcastle and $445 at Sydney with crew estimated to spend $196 each.

Value Added (assuming NSW accounts for 55% of total Australia cruise activity) was $797m. Limited to international passengers would reduce Value Added to $411m which is a quarter of the $1.6 billion figure headlined in the Cruise Development Plan.

In North Queensland, a $120 million upgrade of the Port of Cairns will allow larger cruise ships over 300 metres to visit instead of anchoring at Yorkey's Knob 15kms away. The Queensland Minister for State Development, Manufacturing, Infrastructure and Planning called the upgrade a *"game-changer"* citing economic modelling that showed *"the project will deliver an $850 million boost to Far North Queensland tourism"* from 183 cruise ships visiting Cairns to triple the number of passenger days to 225,000 and creating 2,730 full-time equivalent jobs in 2031.[31]

The prediction of 183 visits in 2031 is from a base of 62 visits to Cairns plus 21 to Yorkey's Knob) in 2018/19. The top-down model (Figure 7) predicted little growth for Cairns to 2028/29 with an increase of just 3 visits. This forecast excludes Yorkey's Knob however where larger cruise ships anchor and either tender or bus transit passengers the 15 kilometres to Cairns city centre. For 2018/19, 21 cruise liners are scheduled to anchor at Yorkey's Knob increasing to 29 by 2028/29. If all of them relocate to Cairns, then a total of 94 will berth in 2028/29, an increase of 32 (+50%) on 2018/19. Ports North predictions imply an extra 68 ships will visit Cairns as a result of the port upgrade; whether these are totally new cruises or diverted from existing itineraries or other ports is not known.

The extra 100 cruise ships Ports North predicts will visit Cairns are predicted to give an economic 'boost' of $850 million so each extra ship boosts the economy to the tune of $8.5 million. If the number of passengers plus crew averages 3,112 per ship (2,200 passengers + 912 crew see Table 3), each additional person on-board effectively contributes $2,730 which is clearly a high number.

So it can be seen from these four examples that Australian State Authorities 'sell' cruise tourism to the public by headlining economic expenditure numbers which derive from ACLA statistics. Their veracity depends on how many passengers and crew go ashore, how much they spend when they get there and what proportion of this spending adds economic value. Aside from this detailed accountancy, there remains the nagging question as to whether Government should be promoting cruise tourism given its local and global environmental impact. It is left until section 6 to look at these potentially negative impacts.

5.3 Portland USA Study - Review of Cruise Passenger Spend

Harold Goodwin of the Responsible Tourism Partnership argues that *"you need to be very convincing about the economic benefit. If you have a cruise liner which is drawn up in the port, the chances are the people will have had a good breakfast on the boat. They might take lunch somewhere in the city, but they probably won't be very hungry, and they will probably have dinner back on the boat". So you've got to ask what they are going to spend money on. They're certainly going to visit some of the sights, but in Venice for example, less than 20%*

[31] https://www.portsnorth.com.au/big-ships-cruise-towards-cairns/

of people actually go to the Doge's Place. So that would suggest that over 80% of all the visitors are not paying to get into anything while they're there. They are just enjoying the free public realm aspects, and the same would be true in Barcelona".[32]

Woodward (2018) reviewed an economic impact study by Gabe and McConnon of cruise ships calling at Freeport Portland and identified four issues with the passenger expenditure survey that resulted in an overstated economic impact.[33] Woodward considered that Gabe and McConnon had overestimated the number of passengers and how much they spent.

The Portland survey obtained 1,287 questionnaires from passengers on three ships making five calls (Sep-Oct 2008) and estimated an average spend of $150. When grossed up the economic impact for the Greater Portland area was estimated at $7.2 million.[34]

Woodward was critical of the assumptions that 'all ships arrive at full occupancy' and that 'all passengers disembark'. Woodward's research of passenger fee collections estimated an average occupancy of 88% and that 87% not 100% of passengers disembark at transit stops based on review of cruise surveys. When combined, the number of disembarking passengers reduced by nearly a quarter from 47,800 to 36,600 per year.

Woodward also noted that Gabe and McConnon had not removed the cruise operator's mark-up on on-shore tours. A Copenhagen study estimated a 40-70% mark-up (with tour operators making little or no profit) and a Newfoundland study found tour operators retaining only 50% to 70% of the tour price.[35] Woodward thought a mark-up of 55% was reasonable which reduced on-shore 'local' spend by 15% to $128 per passenger.

Woodward was also critical of the group size of tourists. A 2016 survey of Halifax, Saint John and Charlottetown (Newfoundland) found cruise passengers travelling in groups of just over 2 with respondents including the expenditure of their partners and children in their estimate. Halving the estimate reduced it to $46.80 per passenger which was similar to Klein's figure of $64 for Atlantic Canada.

The cumulative effect of the Woodward's review was to reduce the direct economic impact by 72% from $7.2 million down to $2 million.

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[32] https://www.ship-technology.com/features/featurea-cruise-too-far-how-overtourism-impacts-the-worlds-top-destinations-5832202/

[33] Woodward produced the report for the Portland Press Herald/Maine Sunday Telegram. The Gabe and McConnon study https://new.umaine.edu/soe/wp-content/uploads/sites/199/2009/09/Portland-Cruise-Final.pdf was in context of the decision by the Freeport Portland (the largest seaport in the state of New England USA) to build a $US 26 million Ocean Gateway passenger terminal in 2002 (which also provides a berth for the Nova Scotia ferry) without a study of the economic impact. Gabe and McConnon did a post build survey in 2009. Ben Harbor and Rockland were also considering in piers capable of allowing large cruise ships to dock rather than anchor. There was opposition against expanding visits by large cruise ships in both towns.https://www.pressherald.com/2018/06/11/long-touted-economic-benefits-of-cruise-ships-far-overstated/

[34] All figures in this paper are in Australian dollars unless otherwise stated. The US estimate was converted at an exchange rate of $A1.37 = $US1.

[35] Klein et al (2017) *"Economic Impact of Cruise Tourism in Atlantic Canada" presentation.* https://www.mun.ca/econ/more/events/Economic_Impact_of_Cruise_Tourism.pdf

5.4 US & Europe Estimates of Cruise Spending of Passengers and Crew

The Portland study was concerned with transit passengers rather than embarking and disembarking passengers. In Australia, port visits where passengers disembark and embark are referred to as 'turnarounds' and for these passengers the amount of spending depends on whether passengers stay overnight and whether airfares are included. What is actually included in ACLA statistics is unclear however although some idea can be inferred from expenditure figures at transit ports like Hobart compared to turnaround ports like Sydney.

For the USA, Business Research & Economic Advisors (BREA) has estimated the passenger spend for embarkation ports (i.e., where cruises originate) and ports-of-call (i.e. transit ports). On average (in Australian dollars), transit passengers spend $171. Embarking or disembarking passengers who stay at least one night average $355 whereas those who are 'in town' for only the day of embarkation (or disembarkation) spend only $43. BREA estimates that 40% stay overnight so the weighted average is $167 per passenger which is lower than transit passengers. Crew were estimated to spend $64 per visit (36% of transit passengers).[36]

Table 10: Average Spend of Passengers & Crew on USA Cruises

Person Type	$Aus^	% of Transit Spend
Transit Passengers	171	100%
Embarkation (&Disembarking) Passenger - Average	167	98%
" " - Stay 1 night or more#	355	207%
" " - Do not stay overnight#	43	25%
Crew	64	38%

^ Aus$1.37 = US$. # figures imply 40% stay at least one night and 60% do not stay overnight
Source: BREA (2017)

CLIA Europe also publish economic impact figures. For 2017, the average spend per embarkation passenger was $471 with transit passengers spending $103.[37] Taking account the mix of transit and embarkation passengers gave an average spend of $162. Crew averaged $16 which lowered the overall average to $119.

Embarkation included $339 (72%) spent on airfares which will have little local economic impact. Omitting airfares reduced spending to $132 which compares with the US estimate of $167. The overall weighted average including crew was $113.

Table 11: Average Spend of Passengers & Crew on European Cruises

Passenger/Crew Type	Total Spend €m	Number millions	Spend per Head €	Spend per Head $Aus	Excluding Airfares $Aus
Embarkation Passengers	1,890	6.5	291	471	132
Transit Passengers	2,170	34.1	64	103	103
Passenger Total	4,060	40.6	100	162	116
Crew^	165	16.81	9.8	16	16
All	4,225	57	73.6	119	113

^ Of the 16.81 million crew members who arrived at port cities 6.7 made on-shore purchases (40%)
Source: CLIA Europe (2018)

[36] Spending was defined as 'spending per visit' and not spending 'per visit day'.
[37] Crew expenditure increases to $40 when calculated for crew who disembark (40% of the total).

5.5 Australian Surveys of Expenditure

Tourism Tasmania and Tourism Northern Territories (NT) have undertaken expenditure surveys of cruise passengers and crew.

Tourism Tasmania conducted a survey of 900 cruise ship passengers and 100 crew between December 2016 and April 2017.[38] People were interviewed on-board 19 ships after they had completed their onshore visits at Hobart, Port Arthur and Burnie.

The average age of passengers was 59 with international passengers older than Australians (62 versus 55). 61% were female. There was an even split of Australian and international passengers although the shares varied markedly by port from 11% international at Port Arthur to 62% at Hobart and 74% at Burnie. 80% of crew were made with 94% non-Australian (a third were from the Philippines).

Sightseeing was the most popular on-shore activity at 64%. 42% visited a historic site/attraction, 37% dined in a restaurant/café, 30% shopped in the city centre, 27% used wireless internet and 43% participated in an organised tour. The average spend was $140. Hobart had the highest spend ($172), Burnie was second ($138) and Port Arthur the lowest ($106). International passengers tended to spend more ($164) than Australians ($117) and crew spent $42.[39]

Tourism NT with Tourism Research Australia (TRA) undertook surveys of 974 passengers and 43 crew on eight cruise ships between March and April 2015.[40] 80% travelled in groups of two; 58% were over 64 (the average was 65); 58% were Australian (25% NSW/ACT, 13% QLD, 10% TAS/VIC, 6% WA and 4% SA/NT) and 42% international (22% UK, 6% NZ, 6% US, 3% Canada, and 5% other). The average passenger spend in Darwin was $94. Of this, $17 was spent on pre-paid tours for which the cruise operator would likely charge a 'mark-up'. If the mark-up was 50%, the average 'on-shore' spend reduces to $85 per passenger.

Table 12: Average Spend for Cruise Liner Passengers in Darwin

Item	Percent Spending	Av Spend $ ^	Spend $+
Shopping	70%	65	46
Food & Drink	69%	17	12
Transport	25%	14	4
Entertainment	5%	40	2
Pre-Paid Tours	12%	144	17
Non Pre-Paid Tours	20%	58	12
Other	7%	28	2
No spend	2%	0	0
Total	na	na	94

^ average spend per person spending on the item

+ average spend per cruise line passenger

Source: Based on Figure 1 of TRA/NT Report

The Tasmania and Darwin surveys are compared with the ACLA 'per day' estimates for 2015/16. The Tasmania estimate was higher ($140 versus $117) but the Darwin estimate was a third that of ACLA ($94 versus $279). The explanation for Darwin might be that ACLA

[38] https://www.tourismtasmania.com.au/__data/assets/pdf_file/0010/58645/Cruise-Survey-Report-2016-17.pdf

[39] It is not clear whether this figure was for all crew or for only those who went on-shore.

[40] file:///C:/Users/user/Downloads/darwin-cruise-ship-survey-september-2015_northern-territory_australia.PDF

included accommodation and airfares.[41] The crew spend for Tasmania was also a third that of ACLA ($42 versus $116).

Table 13: Comparison of Cruise Passenger and Crew Spend Estimates

Port	State Tourism Survey	ACLA Under 2015/16^
Tasmania	140	117
Crew	42	116
Darwin	94	279
Darwin Crew	nk	90

^ calculated as expenditure divided by visit days

5.6 Pacific Island Spending Estimates

As section 4 showed, 30% of Australian cruises are to Pacific Islands. Two studies have assessed the economic benefit of cruise liners to Vanuatu and Papua New Guinea (including the Solomon Islands).[42] The Vanuatu study interviewed 4,039 passengers and 926 crew between March and May 2014. The Papua New Guinea (PNG) including the Solomon Islands surveyed 2,254 passengers on two cruises in November 2015 and January 2016.[43]

The estimated passenger spend reflected the length of time ashore (around 4 hours) and the opportunities for spending available. Spending varied from $9 on small islands to $26 in Honiara and $96 in Port Villa. Crew expenditure ranged from $5 on small islands to $51 at Port Villa.[44] Table 14 presents the figures.

Table 14: Expenditure of Cruise Passengers in the Pacific Islands

Study	Year	Port	Av Passenger Spend $Aus	Av Crew Spend $Aus#
Vanuatu	2014	Port Vila	96	51
"	"	Luganville	45	29
"	"	Mystery Island	11	5
PNG	2016	Alotau	47	28
"	"	Rabaul	76	28
"	"	Small Islands^	9	5
Solomon Islands	"	Honiara	28	28

^ Doini Island, Kiriwina, Kitava

The PNG study gave figures were based on the Vanuatu study

Sources: "Assessment of the Economic Impact of Cruise Ships to Vanuatu" August 2014.

[41] BREA estimated little difference between transit and embarking passengers for North American with both spending around $170.

[42] Both studies were commissioned by the Australian Department of Foreign Affairs and Trade, Carnival Australia and IFC (a member of the World Bank Group) and were conducted by Net Balance Management Group Pty Ltd.

[43] Cruise 1: November 2015 - Pacific Dawn with 2020 passengers and 690 crew capacity visited five ports in PNG (Alotau, Kitava, Rabaul, Kiriwina and Doini Island) Cruise 2: January 2016 - Sea Princess with 2,272 passengers and 875 crew capacity visited five ports in PNG (Alotau, Doini Island, Kiriwina, Kitava, and Rabaul), one port in SI (Honiara) and one port in Vanuatu (Port Villa).

[44] The PNG study did not survey crew and based its estimates on the Vanuatu study. The PNG report commented that 13% of staff go ashore at small islands stops and 26% at medium sized island stops which suggests that the figures in the Table must be for crew who do go ashore (rather than all crew).

The majority of cruise ships visiting the Pacific islands operate out of Sydney and Brisbane on seven to ten day itineraries. If Australians make-up 80% of cruise line Pacific Island patronage, their aggregate annual 'on-shore' spend would be around $25m.[45]

5.7 NZ Spending Estimates

Spend estimates for cruise tourism have been estimated by M.E consulting for the NZ Cruise Association (a sister organisation of the ACLA).

The total direct 'in-port' spend was $329 million.[46] The average was $1,400 per journey and $242 per port day. Crew averaged $53 per day. Around 80% of Australians were travelling on cruises to/from Australian ports so if these passengers spent the average, the 'loss' to the Australia economy could be around $126 million.

Table 15: Expenditure of Cruise Passengers in NZ

Expenditure Aus $m^			Ship Statistics			Passengers			Crew	
Pax	Crew	Ship	Ships	Voyages	Port Days	Australian Journeys	Total Journeys	Port Days	Total	Port Days
329	29	215	42	138	747	112,700	235,900	1,363,200	101,600	540,300

Source: "*Cruise Tourism's Contribution to the New Zealand Economy*" by m.e consulting (2017) for NZ Cruise Association

^ exchange rate NZ$ = $Aus0.92

5.8 Trend in ACLA Port Spending Estimates

As section 5.2 mentioned, State Tourism authorities have 'headlined' economic impact figures and these estimates originate from ACLA statistics. It is therefore appropriate to review the ACLA figures and Figure 11 helps do this by showing the growth in passenger port days and average spending between 2004/5 to 2015/16 as estimated by ACLA.[47]

In 2004/5, passenger days averaged just under 1,000 per cruise ship visit. Since then, passenger days at big ports have increased at five times the rate of small ports.

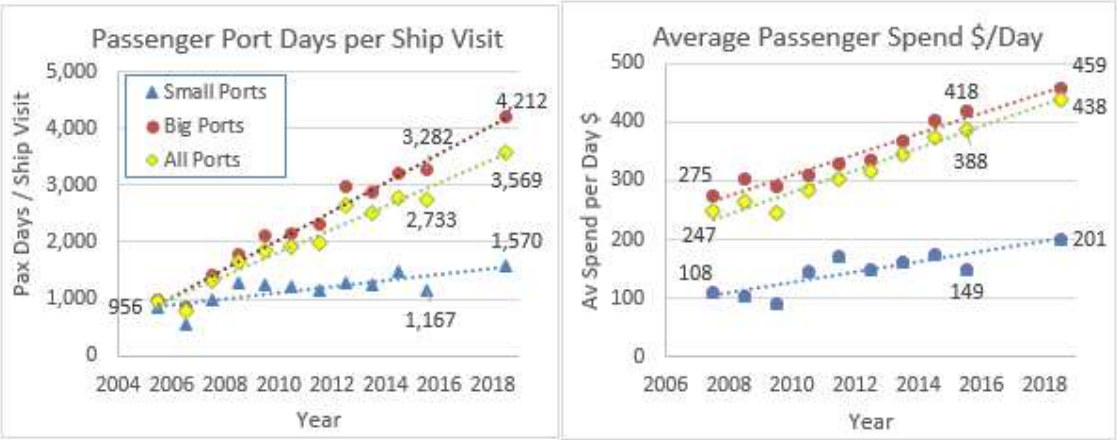
In 2008/09, passengers spent $275 per day at big ports but only $108 at small ports and since 2008/09, the spending gap has widened with big ports averaging $418 but small ports only $149 in 2015/16.

[45] In terms of spending, the Vanuatu study found Australian and NZ passengers spent $25 more that the average passenger. Although rarely mentioned, on-shore spending by Australian cruise passengers on Pacific Islands could be considered an economic cost (equivalent to imports) that offsets international cruise passengers spending at Australia ports.

[46] The M.E. report states *"it is important to note that expenditure includes international airfares, fuel, airfares and other imports, which have very little impact on the New Zealand economy. The expenditure associated with imports typically does not 'stick' to the local economy and goes straight overseas".*

[47] The 'big' ports were Darwin, Cairns, Brisbane, Sydney, Melbourne, Hobart, Adelaide and Freemantle. Table A in the Appendix gives the figures for each port.

Figure 11: Trend in Passenger Port Days and Average Passenger Spend



Extrapolating the ACLA trends to 2018/19 predicts 3,282 passenger days per ship at big ports and 1,167 at small ports with spending of $459 per passenger day at big ports and $201 per day at small ports. Combining the ship visit numbers (1,349 see Table 3) and spend figures produces total passenger spending of $2.1 billion in 2018/19.

Assuming passenger days and spending continue to grow at ACLA rates, total on-shore passenger spending will exceed $6 billion by 2028/29 (an increase of 11% per year from 2018/19 onwards).[48]

5.9 An Alternative Expenditure Estimate for 2018/19

The ACLA passenger and crew expenditure estimates are higher than overseas estimates as can be seen from Table 16. The average of the estimates gives figures of $105 for transit passengers, $92 for embarking passengers and $50 for crew. These figures are around a quarter of the ACLA figure of $388 for passengers and $188 for crew.

Table 16: Average Cruise Passenger Spend 2018/19

Estimate	1 ACLA Australia	2 NZCA NZ	3 Woodward Portland	4 Klein N. Scotia	5 BREA USA	6 CLIA Europe	7 Tourism NT / TAS Darwin	8 Tasmania	9 ADFAT Pac Isl	10 Av 3-9
Transit	388	242	47	64	171	132	94	140	86	105
Embark			na	na	167	103	na	na	Na	92
Crew	188	53	na	na	67	40	na	42	40	47

Notes: 3 Freeport Portland USA, 4 Nova Scotia, 6 excludes airfares, 8 Hobart, Burnie and Port Arthur 9 Average of Port Villa & Rabaul
Crew spending is for crew who go onshore (40%)

It is reasonable that passengers will spend more at big ports reflecting the greater spending opportunities available so a figure of $150 was adopted for passengers at big ports and $100 at small ports with $60 and $40 respectively for crew who go onshore.

Applying these figures to the itinerary based estimates of passenger and crew numbers gives a total spend of $409 million from 1,341 port visits scheduled for 2018/19. Per port visit,

[48] The increase is in nominal prices. If inflation runs at 3% per year over the period 2018/19 – 2028/29 then the real increase in aggregate passenger spending would by 8% per year.

passenger and crew spending averages $305,000 at an average of $115 per person. Passengers account for $377 million of the spending and crew $30 million.

Table 17: Estimated Passenger & Crew On-shore Expenditure for 2018/19 ($ million)

Port	Passenger	Crew	Total
DAR	6.3	0.5	6.8
CAI	9.8	0.9	10.7
BRI	63.6	5.0	68.7
SYD	173.4	13.0	186.4
MEL	41.5	3.2	44.7
HOB	16.5	1.3	17.8
ADE	10.3	0.9	11.1
FRE	7.9	0.7	8.6
SML	48.1	4.2	52.3
Total	377.4	29.7	407.1

The main finding is that passenger spending at 407 million is only one fifth of the $2.1 billion figure derived from ACLA figures. This is such a major difference that it warrants further investigation especially given the weight placed on ACLA figures in Tourism and Port planning.

5.10 An Alternative Measure of Cruise Passenger 'Consumer Surplus'

An alternative approach to valuing the demand-side benefits of cruise tourism benefits is consumer surplus.[49] Consumer surplus is the difference between the maximum price that cruise passengers would be willing to pay for a cruise and the price they actually pay.[50]

Table 18 presents the prices for five types of cruise.[51] The average price was $242 per night (with the typical cruise lasting ten days). The median price was lower at $171 reflecting the effect of 'luxury' cruises which shift the average price upwards. Pacific cruises had the lowest price ($152) and international cruises the highest ($221). NZ and Domestic cruises averaged $170 and RTCs $182.

Table 18: Advertised Cruise Prices by Type of Cruise for 2018/19

	Cost per Night $Aus			
Class	Mean	Median	Nights	Observations
International	353	221	28	57
Pacific	201	152	10	164
NZ	218	171	13	87
Domestic	269	170	6	178
Round Trip Cruise	196	182	3	55
All	242	171	10	541

[49] Cruise ships are 'floating hotels' with cruise passengers demanding cabins for their 'own sake'. This contrasts to being a 'derived demand' as a commuting trip to work by a ferry would be treated. Rather than seeking to minimise travel time and cost as a ferry commuter would be assumed to do, cruise passengers pay for the time they spend on the cruise ship (rather than being willing to pay to save travel time).

[50] A feature of cruise pricing is the ability to set a range of prices (price discriminate) which enables operators to capture some of the consumer surplus.

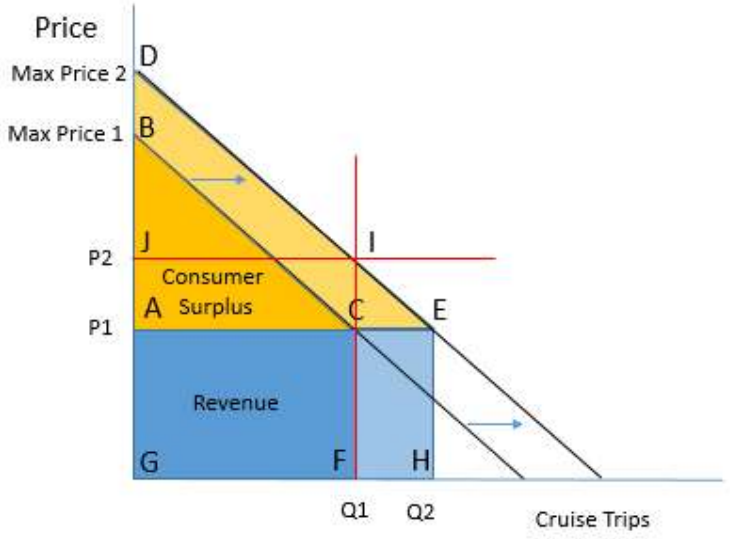
[51] Prices are usually advertised as 'prices from' and are presented as a guide. The prices of the itineraries were denominated in US dollars. The prices were converted into Australian dollars at 1$US = $Aus1.368.

Figure 12 shows how consumer surplus can be calculated and used to assess a hypothetical port upgrade such as building a wharf to replace an anchorage.

Before the upgrade, cruise demand is at Q1. The amount of consumer surplus is the golden triangle ABC bounded by the maximum and the actual price ({PMax1 – P}/Q1). Revenue is the blue rectangle ACFG (P1 x Q1). The upgrade shifts the demand curve outwards to Q2 with consumer surplus increasing to triangle ADE and revenue increasing to rectangle AEHG (PxQ2). The difference in consumer surplus is the trapezoid DEBC and the difference in revenue is ECFH.

Port Authorities could increase berthing fees to pay for the upgrade. If this led to cruise operators increased their prices to P2, cruise demand would reduce to Q1 with consumer surplus sinking back down to pre-upgrade levels. Revenue would increase to IJFG (P2xQ1) which would be offset by the berthing fees paid to the Port Authority.

Figure 12: Measuring Cruise Passenger Benefit via Consumer Surplus



To implement the consumer surplus approach the following would be needed, (i) a price elasticity of cruise demand, (ii) some knowledge of how demand is likely to respond to changes in service provision[52] (iii) a way of re-apportioning consumer surplus to the operator where price discrimination is important (iv) a way to attribute the gains to Australian and non-Australian passengers if the CBA is to be done from the perspective of Australia and (v) a way of pricing land-side infrastructure to transfer some of the cruise liner gains to the infrastructure provider.[53]

A price elasticity of demand of -1 is reasonable on the assumption that cruise operators set prices to maximise revenue. With an average price of $242 and demand of 926,000

[52] 'Willingness to Pay' surveys could be used. An example is the joint rating and Stated Preference approach developed by Douglas (2017) for Sydney ferries. A star rating scale was used for vessels and wharves. It is noted that there is already a 5 star rating scale for cruise ships (see Table 5).

[53] The Independent Pricing and Regulatory Tribunal of NSW (2017) has undertaken a review of the prices set cruise liners at Circular Quay and White Bay in Sydney.

passengers, consumer surplus for the Australian cruise market in 2018/19 would equal $1.14 billion and revenue $2.28 billion.

The total demand side benefit is therefore $3.4 billion which compares with $2.1 billion on-shore passenger spending for 2018/19 extrapolated from ACLA statistics and the alternative 'itineraries based estimate' of $407 million.

6. Social and Environmental Impacts

6.1 Introduction

There is a huge iceberg of research on the social and environmental impacts of cruise tourism floating outside the limits of this paper.[54] What is attempted before returning to port is some overseas benchmarking of tourism numbers at Australia's big and small ports followed by a 'sail-by' of prominent environmental impacts.

6.2 Comparing the Australia's Big Cruise Ports with Europe and USA

Cruise ships can be impressive and glamorous. Crowds of people gather to watch cruise ships such as the Queen Mary or a mega-ship like the Ovation of the Seas sail into port. Indeed, ports often advertise the arrival and departure of these ships and advise where the best vantage point will be.[55]

Others view cruise ships as out of place and bringing hordes of tourists. For Australia although ships and passengers have surged over the last decade (as section 3 showed), the numbers remain relatively low when compared to Miami, Rome (Civitavecchia) Barcelona and Southampton as Table 17 and Figure 13 show.

Miami with 5.1 million cruise passengers has five times Sydney (1.2 million). Expressed in terms of population, Galveston with 34.8, Dubrovnik with 26.8 and Palma (Majorca) 19.5 are streets ahead of Sydney which only manages 0.2 cruise passengers per capita. Admittedly, Sydney's metropolitan wide population statistic dilutes the actual impact around Circular Quay and Balmain/Roselle (see section 6.5).

Both Dubrovnik and Venice want to reduce cruise tourism. The Mayor of Dubrovnik considers 750,000 cruise passengers to be way too many and announced a plan to cap the number in 2017: *"we are ready to lose some money but we will have a better quality of life for citizens and tourists".* Numbers have not been reduced however although arrivals have been spaced more evenly through the week and within the old city, the Council has removed 80% of the souvenir stands and 30% of outside restaurant tables to ease overcrowding.[56]

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[54] An extensive review is provided in the 2013 report of the Charleston International Symposium https://www.wmf.org/sites/default/files/article/pdfs/Charleston-Report.pdf

[55] The willingness of people to travel to see a cruise ship implies an 'existence value' that could be tacked onto a Cost Benefit study. Professional photographers also make a living selling photographs of cruise ships.

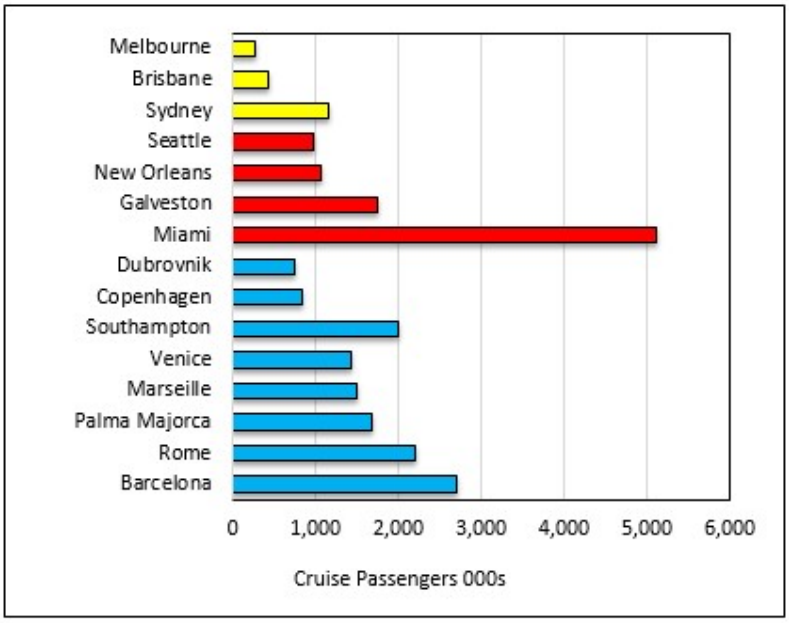
[56] https://www.telegraph.co.uk/travel/cruises/news/has-dubrovnik-solved-over-crowding-from-cruise-lines/

Table 19: Cruise Passenger Numbers at the Biggest Ports

City	Year	Embarking	Dis-embarking	Transit	Total	Population 000s	Cruise Pax/ Capita
Barcelona	2017	720	720	1,272	2,712	1,700	1.6
Rome	2017	425	425	1,354	2,204	2,870	0.8
Palma Majorca	2017	371	371	931	1,673	86	19.5
Marseille	2017	207	208	1,072	1,487	945	1.6
Venice	2017	613	613	201	1,427	269	5.3
Southampton	2017	900	900	200	2,000	254	7.9
Copenhagen	2017	265	265	319	849	1,280	0.7
Dubrovnik	2017	34	34	681	749	28	26.8
Miami	2016	2,551	2,551	nk	5,102	441	11.6
Galveston	2016	869	869	nk	1,738	50	34.8
New Orleans	2016	534	534	nk	1,068	379	2.8
Seattle	2016	484	484	nk	968	3,867	0.3
Sydney	2018/19	563	562	30	1,155	5,131	0.2
Brisbane	2018/19	188	189	47	424	4,851	0.1
Melbourne	2018/19	92	95	89	276	2,408	0.1

Sources: CLIA Europe (2017) USA CLIA (2017) Australia - 2018/19 Itinerary estimates

Figure 13: Comparison of Cruise Passengers Numbers using European & North American Ports



In 2018, the Venetian authorities decided to ban cruise ships over 55,000 tonnes from passing through St Mark's Basin and docking in the historic city from 2021.

Instead they will berth at Marghera an industrial centre with tourists using small boats and land transport to visit the historic city. The decision has been controversial with cruise advocates arguing that cruise ships are part of the tourism dominated economy whereas proponents argue that mega cruise ships are 'out of scale', damage the historical infrastructure and pollute the waters.[57]

[57] https://www.independent.co.uk/travel/news-and-advice/venice-cruise-ship-ban-55-tonnes-marghera-port-where-is-it-italy-a8044026.html

Figure 14: Cruise Ships in Venice Lagoon & Sydney Harbour

Eye-candy or eyesore? Cruise ships dominating Venice & Sydney vistas. Photos courtesy of AFP & Pixabay

6.3 The Impact of Cruise Tourists on Small Towns – Generalising from Akaroa NZ

Akaroa is a small community of 624 residents on the Banks peninsula south of Christchurch NZ. The 2010/11 earthquakes which seriously damaged Christchurch and the port of Lyttelton led to an increase in cruise visits to Akaroa from 16 in 2009/10 to 86 in 2010/11. Cruise passengers increased six-fold from 21,000 to 125,000 with up to 4,000 passengers coming ashore per cruise ship between 9am and 4pm (outnumbering residents 5 to 1).

In response to the surge in cruise numbers, Christchurch and Canterbury Tourism (CCT) commissioned Wilson and Shone (2013) of Lincoln University to undertake a survey of residents in May 2013.

Figure 15: Cruise Ship Passengers arriving at Akaroa NZ

Passengers arrive at Akaroa on a tender from the cruise ship Noordam. Photo / Mike Scott NZ Herald 3rd May 2017

81% of the 313 residents surveyed had contact with cruise ship visitors during non-work time and 52% had had contact during work time. Contact was mostly positive with 47%

considering it had improved their quality of life, 48% considering it had had 'no impact' and 5% considering it had reduced their quality of life.

Attitudes towards cruise visitors were more divided. 23% were positive, 52% were neutral and 25% negative. The most positive were Akaroa residents. Less enthusiastic were non-resident ratepayers (mostly holiday home owners) and residents of outer bays.

Nine out of ten thought cruise ship tourism had benefited Akaroa with 50% considering it had greatly benefitted Akaroa. The main benefits were economic, tourism-related employment and social.

A set of congestion related problems were identified including a strain on facilities and infrastructure; crowding in public buildings and footpaths; traffic congestion from tour buses; visitor management and environmental issues.

Respondents saw limiting cruise ship arrivals as a solution to the strain on facilities as well as relocating the bus waiting area; redistributing fees from cruise ship anchorage/berthing levies; modifying visitor behaviours and community adaptation.

In terms of transferring the Akaroa results to small town Australia, Table 18 benchmarks six Australian coastal towns where cruise ships are scheduled to visit in the 2018/19 season (one per state).

Only Airlie Beach and Port Arthur come close to Akaroa in terms of cruise tourists per capita. Airlie Beach is a tourist resort on the Queensland coast with a population of 1,208 serving the Whitsunday Islands. Port Arthur is a heritage township on the south coast of Tasmania with a population of 251. Based on the 2018/19 itineraries, 86,000 passengers are expected to visit Airlie Beach and 35,000 Port Arthur. In terms of population, the per capita rates of 71 and 139 are comparable with Akaroa with 165 cruise tourists per capita.

Table 20: Comparison of Cruise Passenger Numbers at Small Australia Towns and Akaroa NZ

Town	Cruise Visits 18/19	Cruise Passengers 18/19	Population 2016 Census	Cruise Pax per Capita
Airlie Beach QLD	58	86,000	1,208	71
Eden NSW	15	15,000	3,151	5
Portland VIC	2	1,200	10,754	0.1
Port Arthur TAS	22	35,000	251	139
Kangaroo Island SA	30	37,000	4,702	8
Exmouth WA	7	6,000	2,200	3
Akaroa NZ (2010/11)	86	103,000	624	165

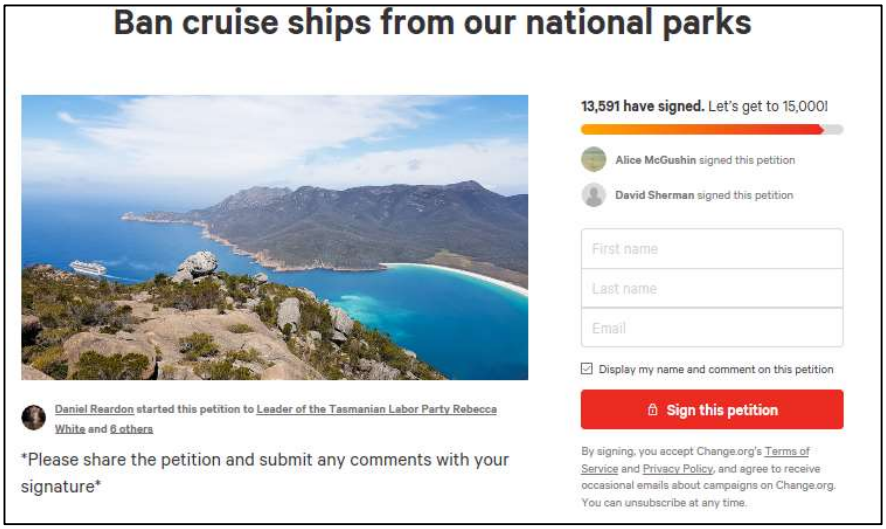
6.4 Environmental Sensitivity

Photographs in brochures of cruise ships in areas of outstanding natural beauty sells tickets. Areas of beauty in Australasia include Wineglass Bay in Tasmania, the Great Barrier Reef on the Queensland coast and Fjordland in NZ.

Although a cruise ship can be an impressive sight to some, others vehemently oppose cruise ships sailing into areas of environmental sensitivity. One example of strident opposition is the petition to ban cruise ships from Wineglass Bay, see Figure 16.[58]

The incident which sparked the petition was the Diamond Princess rotating in Wineglass Bay on 15th December 2017. In doing so, the cruise ship created a plume of disturbed sediment. By 28th September 2018, the petition had garnered 13,591 signatures.

Figure 16: Petition to Ban Cruise Ships from Wineglass Bay



The Great Barrier Reef (GBR) stretches over 2,000 kilometres from Bundaberg to Papua New Guinea and is a UNESCO World Heritage area. Most cruise ships don't offer the opportunity to explore the GBR itself since as Cruise Critic remarks the term 'scenic cruising' *"is a sure sign that you will only be able to gaze down longingly on the azure waters, wondering what lies below".* However a seven-hour $230 excursion permit bought at the Whitsundays will get you a 2.5 hour trip on a reef pontoon observatory platform.[59]

Avoiding grounding on the GBR mandates cruise ships keep to designated shipping areas. There remains the risk of ships straying however which is what the Costa Luminosa, did on March 8th 2018 near the Geranium Passage. The ship was detained by the Australian Maritime Safety Authority for *"crossing marginally into a compulsory pilotage to avoid a close quarter situation with another vessel*".[60] Operator Carnival Corporation blamed *'inadequate voyage planning'*.[61]

The projected increases in cruise tourism (a reported 250% for the GBR over the next two decades) have prompted calls for a review of maritime management systems for the GBR because of the increased possibility of human error.[62] The current systems were introduced in

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[58] https://www.change.org/p/will-hodgman-ban-ships-from-our-national-parks

[59] https://www.cruisecritic.com.au/articles.cfm?ID=1830

[60] http://www.abc.net.au/news/2018-03-21/close-call-prompts-review-of-shipping-on-great-barrier-reef/9568194

[61] Carnival Corporation also operated the Costa Concordia which struck a rock off the western coast of Italy in 2012 with the loss of 32 lives.

[62] See for example the Whitsundays Great Barrier Reef Marine Park Amendment https://www.legislation.gov.au/Details/F2017L00932

2010 when the 225 metre coal carrier the Shen Neng 1 ran aground east of Rockhampton and was fined $39 million for leaving a 2.2 kilometre scar on the reef and an oil slick.

6.5 Cruise Ship Pollution

Cruise ships have been criticised for air pollution, waste discharge and green-house gas emissions.

Cruise ships use heavy fuel oil which has a higher sulphur content that road fuel. The sulphur dioxide and particulates emitted from cruise ship funnels can be harmful to crew and passengers and also to people who live or work around cruise ports (due to ship engines being kept running to provide energy whilst docked).

Cruise ships use 'fuel switching' to comply with air pollution regulations.[63] On the high seas, sulphur content is limited to 3.5% (to be reduced to 0.5% in 2020). Within emission control areas (ECAs) such as the North American and United States Caribbean Sea Emission Control Area, the limit is 0.1%. The European Economic Area (EEA) has a 0.5% fuel sulphur limit.

The Channel 4 'Dispatches' program undertook an undercover measurement of the air particulate matter emitted from the funnels of the P&O Oceana, a 2,000 passenger ship.[64] On the upper deck downwind of the funnels, 84,000 ultra-fine particulates per cubic centimetre were measured which increased to 226,000 next to the funnels. By comparison, the air quality around Piccadilly Circus in London, using the same recording devices, measured emissions at 38,400 particulates per cubic centimetre.[65]

Air pollution from cruise liners whilst berthed has been a problem at some city ports. It has been claimed that shipping pollution (including industrial shipping) in Marseille causes up to 10% of the city's air pollution. Despite EU rules that mandate cruise ships switch to diesel with lower sulphur levels when docked, Marseille residents view the industry as *"a kind of floating tourism that suffocates local people living near ports and doesn't sit well with the luxury holiday brochures"* and they want cruise operators to move towards cleaner energy.[66]

A Canadian Cost Benefit study of Cruise Tourism by Scarfe (2011) estimated that whilst berthed 163 cruise ship produced 72 tonnes of sulphur dioxide (1.6% sulphur content) 119 tonnes of nitrous oxides, 10 tonnes of particulate matter less than or equal to 10 microns and 8 tonnes of particulate matter less than or equal to 2.5 microns.[67]

In Sydney, health concerns of residents living near the White Bay Cruise Terminal led to the NSW Government introducing regulations in October 2015 to enforce cruise ships to use

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[63] The International Maritime Organization (IMO) regulates international air emissions from ships under Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL) including sulphur oxides, nitrogen oxides and ozone depleting substances. Carr and Corbett (2017).

[64] https://www.euractiv.com/section/air-pollution/news/daily-emissions-of-cruise-ships-same-as-one-million-cars/

[65] P&O responded that the Oceana will be fitted with exhaust gas cleaning systems to reduce emissions.

[66] https://www.theguardian.com/world/2018/jul/06/i-dont-want-ships-to-kill-me-marseille-fights-cruise-liner-pollution

[67] Scarfe reported that The Vancouver Island Health Authority considered that *"there are occasions when sulphur dioxide levels are elevated so as to cause health impacts that could affect the quality of life and well-being of some area residents."*

low-sulphur fuel (0.1%) whilst berthed (from 1 hour after arrival to 1 hour before departure).[68]

Figure 17: Funnel Fumes from a Cruise Ship Berthed at White Bay Sydney

In terms of waste, the Charleston International Symposium (2013) reports that an average cruise ship generates *"30,000 gallons of sewage (or black water); 255,000 gallons of non-sewage wastewater from showers, sinks, laundries, baths, and galleys (or gray water)… tens of thousands of gallons of ballast water, bearing pathogens, and invasive species from foreign ports… and air pollution from diesel engines at a level equivalent to thousands of automobiles."* [69] Scarfe (op cit) valued the environmental cost of cruise ship waste at $5 million per year for the southern Vancouver area of British Colombia.

In terms of global warming, a New Zealand study by Howitt (2010) found that cruise travel emissions were three to four times higher than air travel. George Marshall of the Climate Outreach Information Network estimated a high multiple of 7.6 using the Queen Elizabeth II as an example.[70]

To reduce CO2 emissions, 170 countries agreed at the United Nations' International Maritime Organisation in July 2018 to introduce a plan to decarbonise the shipping sector from 2023 onwards.

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[68] https://www.amsa.gov.au/marine-environment

[69] https://www.wmf.org/sites/default/files/article/pdfs/Charleston-Report.pdf

[70] Cunard's estimate the fuel used per day of the QEII at 433 tonnes. The ship takes six days to travel from Southampton to New York. If the ship is full, every passenger making a return trip consumes 2.9 tonnes. A tonne of shipping fuel contains 0.85 tonnes of carbon, which produces 3.1 tonnes of carbon dioxide when burnt. Thus each passengers is responsible for 9.1 tonnes of emissions which is 7.6 times more than making the return trip by plane. https://www.theguardian.com/travel/2006/dec/20/cruises.green

6.6 An Alaskan Style Cruise Passenger Tax

One solution to both funding port infrastructure and addressing negative environmental impacts from cruise tourism is to impose an 'Alaskan' style excise tax. Alaska imposes an excise tax on travel on commercial passenger vessels (CPVs), typically cruise ships that have 250 or more berths that provide overnight accommodations in the state's marine waters.[71] Passengers traveling on the vessels are liable for a tax of US$34.50 per passenger per voyage which works out at Australian $47. The revenue raised is distributed at US$5 per passenger (Aus $6.80) to each of the first seven ports of call in Alaska.[72]

The effect of the tax is depicted in Figure 18 with Table 21 presenting the estimates for 2018/19. No administration cost of the tax has been included.

Figure 18: Impact of an Alaskan Style Cruise Passenger Tax

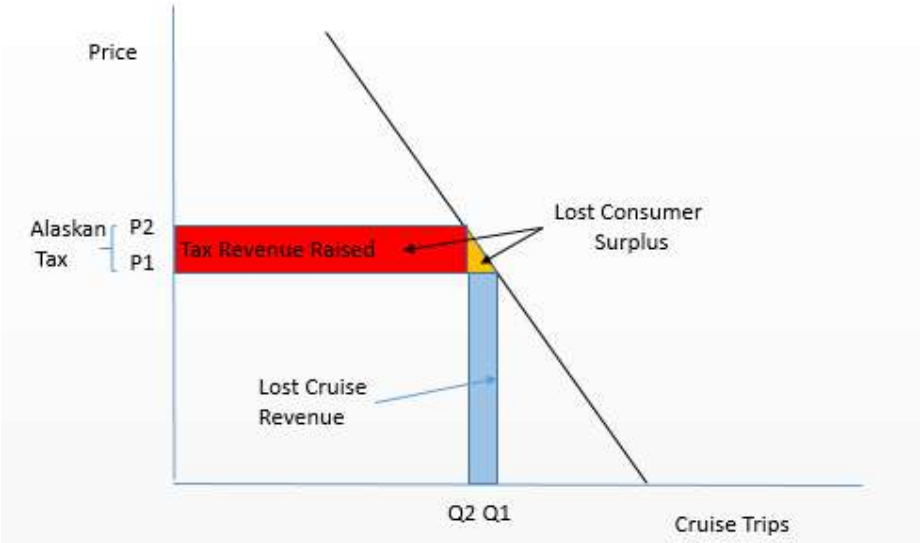

Table 21: Impact of an Alaskan Style Cruise Passenger Tax

Cruise Passenger Unique Trips 2018/19	926,000
Average Cruise Price $	2,420
'Alaskan Tax' in Australian Dollars $	47
Cruise Price with 'Alaskan Tax' $	2,467
Percentage increase in price from tax	1.9%
Elasticity	-1
Loss in Cruise Passenger Trips per year	17,984
Cruise Passenger Unique Trips with Tax	908,016
Tax Revenue $m	42.7
Lost Consumer Surplus $m	43.9
Lost Cruise Ship Revenue $m	43.5
Port Visits 2018/19 (Port Stats)	1,341
Allocated Tax Revenue per Visit	31,842

[71] http://www.tax.alaska.gov/programs/programs/reports/Historical.aspx?20000

[72] The tax is reduced by any municipal taxes imposed on each passenger that were in effect prior to Dec. 17, 2007.

For 2018/19 the price of a cruise averaged $2,420 for a ten day tour (see Table 16). An Alaskan Tax of $47 would raise the price 1.9% to $2,467 with demand reducing by the same amount given the assumed price elasticity of -1. The tax would raise $42.7 million but reduce consumer surplus by $43.9 (reflecting the dead weight loss triangle of taxation of $0.4 million). Cruise ship revenue would decrease by $43.5 million.

With 1,341 port visits scheduled for 2018/19, the allocated tax would equate to just under 32,000 per visit. Thus for Sydney, the tax would raise $11.5 million from the 360 visiting ships in 2018/19. For Darwin, the tax would raise $1.5 million from 46 visits.

Whether or not the tax produced a welfare gain would depend on the externality costs of cruise ships and also on the shadow price of the public funds of funding cruise port infrastructure by other means. The structure of any tax or charge should therefore reflect the specific negative impacts (noise and air pollution, local traffic congestion, special policing) and also encourage their reduction. For example, the fee should be higher for ships that burn dirtier fuels or have poor emission controls and lower for those that have better shore-side traffic management.[73]

7. Conclusions

Australia has become a nation of cruise lovers both in Australia and abroad. This paper has looked at the growth in the Australian market between 2003/4 and 2018/19 which has seen visiting cruise ships double from 22 to 50, port visits quadruple from 325 to 1,341 and cruise ships get 50% bigger from an average of 1,000 passengers to just over 1,500 passengers.

Growth is forecast to continue over the next decade albeit at a slower pace reflecting a maturing domestic market and increasing social and environmental concerns. By 2028/29, the number of cruise ships is forecast to reach 71 with port visits totalling 1,730 and average ship size reaching 2,200 passengers.

Around Australia, the shares of tourism volumes amongst the States has remained reasonably constant and this is unlikely to change markedly over the next decade. Queensland and NSW had an all-year round industry and account for two-thirds of cruise ship visits Victoria, Tasmania and WA which are summer only have just under 10% share each with the Northern Territory and South Australia accounting for the remainder.

Across Australia's ports, Cairns saw a precipitous decline in share from 20% in 2005/6 to 5% in 2018/19 whilst Brisbane's share increased from 12% to 15%. Sydney's share peaked at 35% in 2013/14 then declined to 27% in 2018/19. The biggest increase in share was at 'small' ports and anchorages with a near doubling from 16% to 31%.

For Sydney, Australia's biggest cruise port, the projection is for a gradual increase from 360 in 2018/19 to 409 in 2028/29 (14%) which compares with a forecast of 425 by the Port Authority of NSW for 2027. Higher increases are forecast for Brisbane up 47%, Melbourne up 42% and small ports and anchorages up 40%.

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[73] Such a tax or charge would be one example of *managing tourist travel for economic efficiency, see* Todd Litman who has developed www.vtpi.org/tdm/tdm46.htm.

For Cairns, the number of visiting ships is forecast to rise by only 5% from 62 to 65 with Yorkey's Knob, where larger ships anchor, increasing from 21 to 29. These figures are in stark contrast to the 100 extra cruise ship visits forecast by Ports North for 2031.

The trends and projections have been based on Australian Cruise Line Association (ACLA) annual reports up to 2015/16 and port, government, cruise itineraries and miscellaneous sources to 2018/19. ACLA statistics focus on port visits. Unlike the US and Europe, embarkation, disembarkation and transit movements are not distinguished. Unlike NZ there is no published figure of 'unique' passenger numbers.

To estimate the number of unique passengers, 636 individual itineraries for 51 different ships for 2018/19 were researched, collated and disaggregated by type of cruise. Pacific cruises accounted for 188 (30%) of the itineraries, Domestic cruises 194 (31%), NZ cruises 115 (18%) and International cruises 76 (12%). There were also 59 (9%) Round Trip Cruises (RTCs) which are short, three day, non-stop trips unlikely to produce any net on-shore economic spend.

At 1,290, the total number of cruise visits to Australian ports for 2018/19 matched up well with the port schedule based estimate of 1,341.

The number of unique passenger trips was 992,000 with Pacific Island cruises accounting for 326,000 trips (33%), Domestic 260,000 (26%), NZ 240,000 (24%), International 108,000 (10%) and RTCs 65,000 (7%).

As a comparison, the number of unique passengers reported by Statistics NZ was 220,000 for 2017 which makes the Australia cruise market five times larger. For NZ/Australia cruises, the itinerary estimate was 240,000 (20,000 larger than the Statistics NZ 2017 estimate).

ACLA statistics have been used to forecast individual port of individual State. This paper has presented a 'top down' approach with national forecasts first then individual port forecasts second which at least introduces consistency.

Growth in cruise tourism has economic, social and environmental consequences that aren't all positive. The Australian Cruise Line Association (ACLA) focusses on the local on-shore spending of passengers, crew and cruise operators which is always positive. These 'economic impacts' are then 'headlined' by State Tourism and Port Authorities. For example, Northern Ports claims that the $120 million development of port of Cairns allowing mega cruise ships to berth will 'boost' the economy by $850 million in 2031 from an extra 100 ships visiting.

The question this review has sought to answer is how reasonable the ACLA economic impact figures are? Back in 2008/09, ACLA figures show passengers spending $275 per day at big ports but only $108 at small ports. Since 2008/09, the spending gulf has widened to the extent that passengers at big ports spend $418 per visit day but only $149 at small ports.

To investigate these figures, a review of Australian and overseas surveys was undertaken with the resulting figures only around one quarter that of ACLA: transit passengers spend $105 embarking passengers $92 and crew $50 per visit. When the review based figures were applied to the itinerary passenger and crew port figures for 2018/19, the resulting total spend

was $407 million; just only one fifth of the $2.1 billion figure derived from ACLA figures. This is a major difference and warrants further investigation.

The wider social and environmental impacts of cruise tourism have been neglected in State Tourism and Port Development Plans with economic spend dominating the headline figures. Unlike on-shore expenditure, the social and environmental impacts of cruise tourism are likely to be far more mixed. Indeed, air pollution from cruise ships is well established as a health risk for passengers and crew and to city residents whilst ships are docked. An Alaskan cruise passenger tax could be a valid alternative to the ongoing public funding of cruise port infrastructure. Such a tax could raise $43 million from the 920,000 Australian cruise passengers in 2018/19. It should be structured to reflect the specific negative impacts of cruise tourism and encourage their reduction.

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Disclaimer

The view expressed in this paper are purely those of the authors and do not intend to reflect in anyway those of other entities that they may be associated with.

Appendix

Table A1: Cruise Ship Visits by Year (1 July-June 30)

		ACLA Annual Reports											Port Data / Various			Itin
		05	06	07	09	10	11	11	12	13	14	15	16	17	18	18
	Port	06	07	08	10	11	12	12	13	14	15	16	17	18	19	19
NT	Darwin	31	29	29	29	33	46	43	41	38	36	45	47	46	46	45
NT	Elcho Is	0	0	0	0	0	0	0	0	0	0	1	0	0	0	-
NT	Tiwi Is	0	0	0	0	0	0	0	0	0	0	2	0	0	0	-
NT	Yirrkala	0	0	0	0	0	0	0	0	0	0	2	0	0	0	-
QLD	Thursday Isl	0	0	6	4	8	4	8	5	6	7	7	8	8	10	10
QLD	Cooktown	0	0	0	4	3	4	1	2	4	0	3	4	11	3	2
QLD	Port Douglas	0	0	0	4	19	19	25	18	23	30	29	20	28	20	17
QLD	Fraser Coast	0	0	0	0	0	0	0	0	0	0	2	3	7	4	6
QLD	Cairns	79	85	85	38	36	44	47	43	45	42	50	53	58	62	63
QLD	Yorkeys Knb	0	0	0	0	0	0	0	0	0	0	0	24	18	21	17
QLD	Townsville	3	7	5	9	12	7	10	4	9	4	3	8	21	14	16
QLD	Gladstone	0	0	0	0	0	0	0	0	0	0	4	7	4	9	9
QLD	Bundaberg	0	1	0	0	0	0	0	0	0	0	0	0	0	1	-
QLD	Whitsundays	21	17	25	25	35	41	47	38	33	44	43	62	83	63	66
QLD	Mooloolaba	0	0	0	0	0	0	0	0	0	0	7	9	6	10	10
QLD	Moreton Isl	0	0	0	0	0	0	0	0	3	14	33	16	22	41	40
QLD	Brisbane	49	54	60	62	69	74	101	105	115	134	148	179	190	206	178
NSW	Newcastle	7	3	6	3	5	13	12	10	9	9	10	5	9	13	17
NSW	Sydney	97	89	101	119	116	146	197	240	256	273	311	344	354	360	314
NSW	P Kembla	0	0	0	0	0	0	0	0	0	0	0	5	3	1	1
NSW	Eden	1	5	1	0	4	5	2	2	2	3	7	14	15	14	15
VIC	Mrngtn Pen	0	0	0	0	0	0	0	1	0	2	3	0	1	0	-
VIC	Melbourne	36	32	44	56	48	36	56	55	67	75	84	85	101	109	118
VIC	Portland	0	0	0	0	0	0	0	0	1	4	3	6	4	2	2
VIC	Philip I	0	0	0	4	1	1	0	0	0	0	1	4	3	5	5
VIC	Geelong	0	0	0	0	0	2	2	1	5	2	1	1	3.5	6	3
TAS	Burnie	9	14	14	24	18	11	17	9	12	12	11	17	23	29	27
TAS	King Isl	2	3	0	1	0	0	2	0	0	0	0	0	0	0	-
TAS	Hobart	22	20	28	38	29	26	29	38	36	35	32	49	51	65	70
TAS	Port Arthur	0	3	1	3	6	3	8	3	8	8	10	22	28	23	22
TAS	Port Davey	0	0	1	0	0	0	0	0	0	0	0	0	0	0	-
TAS	Coles Bay	0	0	3	2	2	0	0	0	6	3	3	6	4	2	-
TAS	Devonport	3	4	3	1	0	0	1	0	1	0	0	0	0	0	-
TAS	Flinders	0	0	1	0	0	0	0	0	0	0	0	1	1	1	-
SA	Adelaide	13	6	7	16	21	12	18	12	17	19	23	30	34	43	44
SA	Kangaroo I	0	2	2	3	3	2	1	3	7	7	10	16	21	29	30
SA	Port Lincoln	0	0	0	2	3	2	3	1	2	6	4	5	10	15	13
WA	Esperance	1	0	2	3	4	3	4	4	6	10	13	14	6	11	11
WA	Albany	6	4	10	12	11	8	8	7	5	11	11	11	16	16	14
WA	Bunbury	1	3	4	7	9	7	3	0	3	0	2	2	2	2	2
WA	Busselton	0	0	0	0	0	0	0	0	0	6	7	9	11	11	9
WA	Fremantle	21	16	25	28	39	29	40	17	31	43	59	60	24	34	34
WA	Geraldton	0	3	5	4	18	4	16	11	3	10	12	13	7	8	7
WA	Exmouth	7	4	5	6	6	3	7	2	2	3	2	4	6	6	7
WA	Port Hedland	0	0	0	0	0	0	2	4	4	4	3	2	1	0	-
WA	Broome	6	16	15	14	19	14	22	11	14	14	13	18	15	26	15
OT	Christmas Isl	0	0	0	0	1	0	0	1	0	0	0	0	0	0	-
OT	Norfolk Isl	0	0	0	0	5	2	4	4	0	6	5	5	5	5	2
OT	Willis Isl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31
Tot	excl OT	415	420	488	521	577	566	732	687	773	870	1,014	1,183	1,256	1,341	1,259
Tot	incl OT	415	420	488	521	583	568	736	692	773	876	1,019	1,188	1,261	1,346	1,292

Notes: ACLA Australian Cruise Line Association; OT Overseas Territories; Itin estimated from cruise ship itineraries.

Table A2: Average Passenger Port Days per Ship Visit

Average Passenger Port Days per Ship Visit												
Port	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	*18/19*
DAR	478	386	641	876	1,026	871	987	1,049	1,042	1,345	1,277	*1,586*
CAI	361	331	452	1,172	1,106	952	1,025	1,027	1,062	1,205	1,199	*1,564*
BRI	1,146	1,100	1,588	2,304	2,357	2,748	2,894	3,091	3,050	3,367	3,822	*4,603*
SYD	1,370	1,173	2,370	2,367	3,235	3,204	3,116	4,044	3,973	4,224	4,191	*5,523*
MEL	1,320	1,329	1,552	1,739	2,249	1,897	1,683	2,178	2,159	2,503	2,556	*2,870*
HOB	293	463	1,560	1,384	1,262	1,067	1,077	1,701	1,764	1,820	1,957	*2,382*
ADE	1,082	503	1,202	1,058	1,182	996	1,211	1,753	1,660	1,869	2,275	*2,379*
FRE	1,292	604	1,455	1,073	1,348	1,130	2,075	2,932	1,711	2,750	2,605	*3,206*
Big Ports	975	846	1,414	1,791	2,132	2,164	2,311	2,972	2,884	3,209	3,282	*4,212*
Small Ports	857	536	984	1,273	1,244	1,211	1,165	1,276	1,259	1,468	1,167	*1,570*
Australia	956	780	1,318	1,657	1,843	1,908	1,996	2,636	2,531	2,783	2,733	*3,569*

Source ACLA statistics 2005/06 – 2015/16 with extrapolation to 2018/19

Table A3: Average Passenger Spend per Passenger Port Day Visit

Average Passenger Spend per Port Day												
Port	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	*18/19*
DAR	nk	nk	248	248	195	192	191	195	212	284	276	*257*
CAI	nk	nk	224	106	93	93	199	202	213	210	204	*240*
BRI	nk	nk	297	366	282	319	348	361	366	379	395	*421*
SYD	nk	nk	331	355	356	365	362	370	428	432	445	*480*
MEL	nk	nk	171	275	301	275	249	212	229	276	299	*290*
HOB	nk	nk	133	99	112	101	109	113	115	116	120	*115*
ADE	nk	nk	238	290	209	176	317	257	237	241	310	*285*
FRE	nk	nk	96	336	179	220	330	324	219	731	739	*813*
Big Ports	nk	nk	275	304	289	311	328	334	368	402	418	*459*
Small Ports	nk	nk	108	102	90	146	170	148	162	175	149	*201*
Australia	nk	nk	247	264	246	283	303	316	345	373	388	*438*

Source ACLA statistics 2005/06 – 2015/16 with extrapolation to 2018/19

Table A4: Estimated Transit, Embarkation and Disembarkation Passenger Numbers for 2018/19

	Transit Stops^						Embarkation						Disembarkation						
Port	INT	PAC	NZ	DOM	RT	Total	INT	PAC	NZ	DOM	RT	Total	INT	PAC	NZ	DOM	RT	Total	TOTAL
DAR	30,573	6,965	0	183	0	37,721	789	327	0	1,054	0	2,170	0	120	0	1,697	0	1,817	41,708
CAI	16,745	6,383	0	24,173	0	47,301	634	6,338	0	2,218	0	9,189	0	6,144	634	2,218	0	8,996	65,486
BRI	26,792	10,104	0	9,669	0	46,565	7,145	80,791	7,534	72,474	20,400	188,345	7,134	80,998	9,100	71,619	20,400	189,252	424,162
SYD	16,252	1,771	10,085	1,603	0	29,710	31,837	220,855	152,640	124,617	32,418	562,366	31,792	223,925	151,930	123,303	32,418	563,368	1,155,444
MEL	3,413	4,531	59,684	21,603	0	89,232	2,293	10,460	32,921	38,586	8,033	92,294	1,947	12,640	33,528	38,787	8,033	94,936	276,461
HOB	5,523	3,937	54,764	45,937	0	110,161	0	0	0	0	0	0	0	0	0	0	0	0	110,161
ADE	7,126	4,531	9,972	13,828	0	35,458	1,709	0	2,461	10,262	3,326	17,758	0	0	0	11,870	3,326	15,197	68,412
FRE	9,758	4,531	0	565	0	14,854	2,287	2,948	2,665	9,920	1,125	18,945	2,519	1,063	5,483	8,823	1,125	19,013	52,812
SML	69,390	39,273	37,930	375,275	0	521,868	0	120	0	842	0	961	0	0	0	1,655	0	1,655	524,485
Total	185,573	82,026	172,435	492,837	0	932,871	46,695	321,838	198,220	259,973	65,303	892,028	43,392	324,890	200,676	259,973	65,303	894,232	2,719,132

^ assumes 94% of passengers go onshore based on Pacific Island and BREA estimates

Table A5: Estimated Transit, Embarkation and Disembarkation Shares for 2018/19

	Transit Stops^						Embarkation						Disembarkation					
Port	INT	PAC	NZ	DOM	RT	Total	INT	PAC	NZ	DOM	RT	Total	INT	PAC	NZ	DOM	RT	Total
DAR	73%	17%	0%	0%	0%	90%	2%	1%	0%	3%	0%	5%	0%	0%	0%	4%	0%	4%
CAI	26%	10%	0%	37%	0%	72%	1%	10%	0%	3%	0%	14%	0%	9%	1%	3%	0%	14%
BRI	6%	2%	0%	2%	0%	11%	2%	19%	2%	17%	5%	44%	2%	19%	2%	17%	5%	45%
SYD	1%	0%	1%	0%	0%	3%	3%	19%	13%	11%	3%	49%	3%	19%	13%	11%	3%	49%
MEL	1%	2%	22%	8%	0%	32%	1%	4%	12%	14%	3%	33%	1%	5%	12%	14%	3%	34%
HOB	5%	4%	50%	42%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
ADE	10%	7%	15%	20%	0%	52%	2%	0%	4%	15%	5%	26%	0%	0%	0%	17%	5%	22%
FRE	18%	9%	0%	1%	0%	28%	4%	6%	5%	19%	2%	36%	5%	2%	10%	17%	2%	36%
SML	13%	7%	7%	72%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	7%	3%	6%	18%	0%	34%	2%	12%	7%	10%	2%	33%	2%	12%	7%	10%	2%	33%

^ assumes 94% of passengers go onshore based on Pacific Island and BREA estimates