

Transport for NSW

# Boating incidents in NSW

Statistical report for the 10-year period  
ended 30 June 2017



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# 1 Introduction

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Boating is a relatively safe activity for the estimated 2 million people who go boating each year in NSW. Yet, preventable fatalities and serious injuries continue to occur.

NSW continues to experience a significant long-term decline in the rate of fatal boating incidents. Last year there were four recorded boating fatalities which was the lowest number in at least 40 years. This was also more than 70 per cent down on the long term average.

This is against a background of increasing numbers of people boating. Vessel registration and driver licence numbers continue to grow, and there is evidence of growth in the unregistered and unlicensed activities such as paddle craft use.

The reduction in trauma on the waterways can be attributed to multiple factors, from improved standards in vessel design and equipment, through to compliance and education programs such as Wear a Lifejacket.

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## Last year there were four recorded boating fatalities which was the lowest number in at least 40 years.

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Lifejacket wear rates are now at record levels in NSW and this is reflected in the drop in the rate of fatalities due to drowning. Non-drowning related fatalities and serious injuries, such as those due to speed or not keeping a proper lookout, however, are not falling and this leaves room for significant improvement.

The NSW Government is committed to supporting safe, responsible and enjoyable boating. This effort is being delivered by returning boating fees and revenue back to the boating and maritime community through products, services and infrastructure.

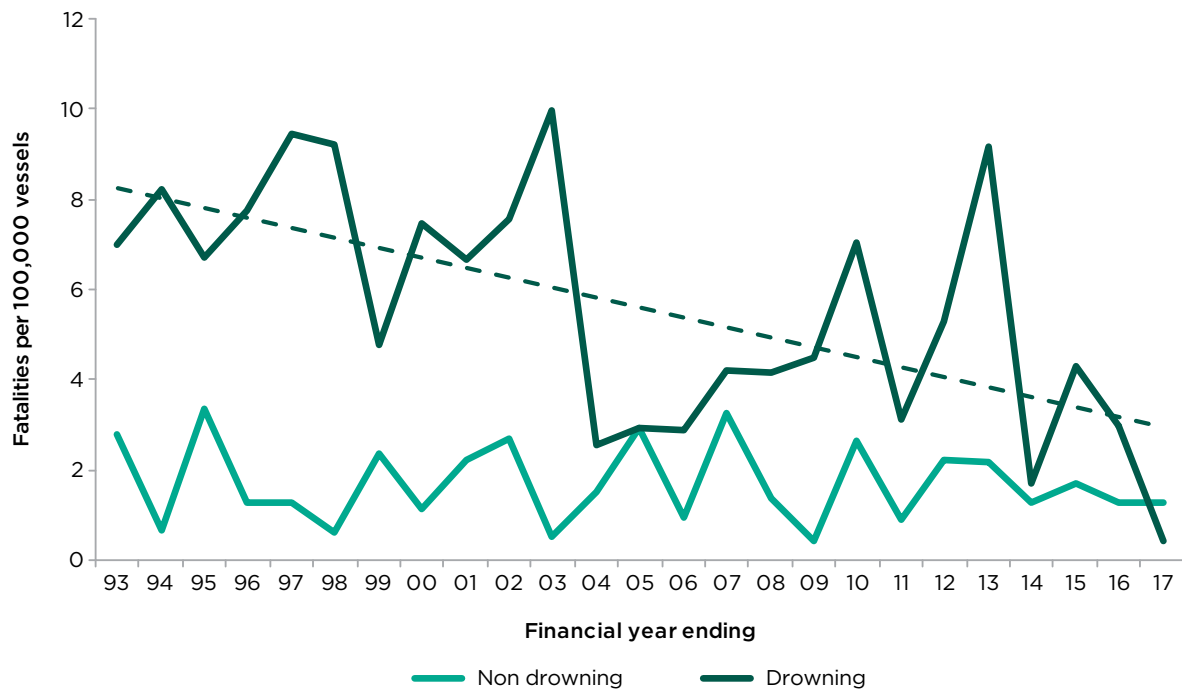


Roads and Maritime provide on-water education and compliance services throughout NSW.

Whilst trauma on the waterways is down, fatalities and serious injuries continue and Transport for NSW is striving Towards Zero. To continue the effort to eliminate fatalities and serious injuries, Transport for NSW is adopting the holistic Safe Systems approach to maritime safety.<sup>1</sup> This approach has four elements:

- Safer People (this focusses on the people in the system, including their choices and behaviours);
- Safer Vessels (this looks at how vessel design and safety equipment can reduce the risk and consequences of serious incidents);
- Safe Waterways (this considers the physical environment and infrastructure in terms of safe navigation, access and storage);
- Safe System (this includes all of the supporting elements behind maritime safety, including data, research, education and partnerships).

### Long term trends in drowning and non-drowning fatality rates for recreational boating incidents\*



\* Lifejacket wear rates are up and the drowning rate is coming down, but there is more work to be done in reducing non-drowning fatalities caused by factors such as speed and not keeping a proper lookout.

<sup>1</sup> Transport for NSW, Maritime Safety Plan 2017-21.

## 2 Executive summary

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There were four confirmed recreational and commercial boating fatalities in 2016–17, which was significantly below the long-term annual average of 15. This was the lowest number of recorded waterway fatalities in at least 40 years.

Long-term downward trends remain evident for both recreational and commercial vessel fatal incident rates as well as for the corresponding total incident rates. The total number of serious injuries on recreational and commercial vessels (79) was similar to the long-term annual average (70.3).

There were 255 boating incidents overall in 2016–17.

There were 117 recreational fatal incidents over the last 10 years. Of these incidents:

- the most common incident types were capsizing (34.2%), fall overboard (28.2%); and injury related to towing incidents (9.4%);
- the main causes were weather conditions (12.8%), excessive speed (9.4%) and lack of judgement (7.7%);
- Open runabouts accounted for 47.2% of all vessels involved in these incidents, followed by sailing yachts (8.8%) and canoes/kayaks (8.0%);
- 48.7% of vessels on which person(s) were killed were less than 4.8 metres of length;
- 60.7% occurred during the middle of the day and afternoon;
- 45.3% occurred on a weekend;
- 65.0% occurred during the warmer months of October to March; and
- 73.5% occurred on what were presumably sheltered waters – i.e. rivers, lakes, estuaries and bays.
- 86.4% of the 132 fatalities recorded over the 10 year period were male.

There were 13 fatal incidents involving only commercial vessels recorded over the last 10 years, with no such incidents in 2016–17.



Safe and accessible boating facilities are included in the Safe Waterways element of the overall Safe Systems approach now being adopted on NSW waterways.

### 3 Safety performance in 2016-17

Safety performance in 2016-17 is assessed by comparing incident statistics for the year against corresponding long-term averages (the 10 year period 2007-08 to 2016-17). Both boating fatalities and overall boating incidents were significantly below the long-term average in 2016-17. In addition, both recreational and commercial fatal incident rates continue long-term downward trends.



The total number of recreational and commercial boating fatalities (4) was significantly below the long-term annual average (15). All four fatalities were recorded on recreational vessels.

A long-term downward trend remains evident for both recreational and commercial fatal incident rates, against a backdrop of increasing vessel numbers.



The total number of incidents was significantly below the long-term average, suggesting a continuing improvement in overall boating safety.

Total incident rates, both for recreational vessels and commercial vessels, continue to fall.



Overall lifejacket wear rate was 45%, the same result as in 2015-16 but a fivefold increase on the 9% in 2007.



The proportion of vessels in boating incidents, that were involved in organised competition at the time, was significantly up in 2016-17 compared with the whole 10 year period (8.6% versus 4.2%)



The proportion of capsized incidents was significantly down in 2016-17 (5.0%) compared with the whole 10 year period (13.1%).



The proportion of sailing vessels amongst vessels involved in boating incidents was significantly up in 2016-17 compared with the whole 10 year period (34.1% versus 22.1%).



The proportion of incidents caused by weather conditions was significantly down in 2016-17 compared with the whole 10 year period (7.5% versus 12.3%).



The proportion of serious injury incidents in November 2016 (11 incidents, 23.9%) was significantly greater than the 'expected' proportion of 9.9% based on the seasonal trend.

There were four boating fatalities, 79 serious injuries and 255 boating related incidents recorded in the 12-month period to 30 June 2017 (Table 1). The number of fatalities was down by more than 63% compared to 2015-16, and lower than the long-term average (Table 2). In addition, the recreational vessel fatality rate (per 100,000 vessel registrations) continues a long-term decline (Section 6).

Compared with the previous year, total incidents were down slightly.

**Table 1: Fatalities, serious injuries and related incident numbers for the 2016-17 financial year.**

Vessel category	Incident category				Total incidents
	Fatalities	Fatal incidents	Serious injuries	Serious injury incidents	
Recreational	4	4	65	46	160
Commercial	0	0	14	10	71
Commercial/ recreational	0	0	0	0	24
<b>TOTAL</b>	<b>4</b>	<b>4</b>	<b>79</b>	<b>56</b>	<b>255</b>
<b>Change on last year*</b>	<b>-63.6%</b>	<b>-60.0%</b>	<b>36.2%</b>	<b>24.4%</b>	<b>-2.3%</b>

\* The % changes do not exactly correspond to the incident data presented in the 2015-16 Boating incidents report, due to a small number of incidents being added to RMS records subsequent to that earlier report being prepared. Changes in serious injury related numbers are likely to be due to changes in reporting practices rather than changes in actual injury rates.



Cabin runabouts are very popular with anglers.

**Table 2: Incident Barometer – comparison of 2016–17 against 10 year period (2007–08 to 2016–17) and summary of long-term trends.**

Indicator	2016-17	Average last 10 years (10 yr av.)	2015-16 statistical relationship to 10yr av.	Graph* showing 2016-17 vs. 10yr av.	Long-term trend
Total incidents	255	330.6	Lower		Initial increase; now decreasing
Total fatalities	4	15.1	Lower		Fluctuating, but with sign of recent decrease
Total serious injuries	79	70.3	Similar		Increasing in line with vessel numbers**
Fatal incidents (recreational) per 100,000 vessels	1.7	5.1	Lower		Decreasing
Fatal incidents (commercial) per 10,000 vessels	0.0	1.4	Lower		Decreasing
Serious injury incidents (recreational) per 100,000 vessels	19.5	19.0	Similar		Fluctuating**
Serious injury incidents (commercial) per 10,000 vessels	9.7	11.4	Similar		Increasing, partly in line with vessel numbers

\* Key:

▲ 2016-17 value | 10 year average ■ Statistical range of 10 year average

\*\* Trends may have been affected by changes in reporting protocols and/or data capture over time.



## 4 Key numbers – recreational boating incidents

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- There were four fatalities in 2016–17, arising from four recreational vessel incidents. Over the last 10 years there were 132 fatalities arising from 117 incidents.
- There were 65 serious injuries in 2016–17, arising from 46 serious injury incidents and four fatality incidents. Over the last 10 years there were 555 serious injuries and 433 serious injury incidents.
- There were 160 recreational vessel incidents in total in 2015–16 and 2268 over the last 10 years.

## 5 Key findings – recreational boating fatal incidents over the last 10 years

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### **Poor Judgement: the 3rd most important cause for fatal incidents, main cause for both serious injury and overall incidents.**

- Lack of judgement was the third most important cause identified for fatal incidents, accounting for 7.7% of such incidents.
- Lack of judgement was the main cause identified for serious injury incidents, accounting for 14.8% of such incidents.
- Lack of judgement was also the main cause identified for recreational boating incidents overall, accounting for 16.8% of such incidents.
- Human-related causes are known to have accounted for 32.5% of all recreational boating fatality incidents over the last 10 years.



### **Lifejackets: wear rates remain at record levels**

- Overall lifejacket wear rates have increased from 9% in 2007 to 45% in both 2015–16 and 2016–17.
- The rate of drowning fatalities for recreational boating incidents has continued a long-term downward trend, and has fallen by more than 60% since the early 1990s. At the same time, the non-drowning rate has remained steady.
- Fatal bar-crossing incidents have fallen by approximately 63% since lifejacket wear was made compulsory when crossing an ocean bar in October 2003. The corresponding decrease for total bar crossing incidents was just under 10%.



### **PWC: high rate of involvement in serious injury incidents**

- PWC were involved in two out of the four boating fatalities recorded in 2016-17, although their general rate of involvement in boating fatalities is quite low (at just over 3% of all vessels involved in fatal incidents over the last 10 years).
- PWC accounted for 16.4% of all vessels involved in recreational boating serious injury incidents over the last 10 years. This was second behind only open runabouts. As at 30 June 2017, PWC accounted for 5.5% of vessel registrations.
- There were 24 incidents in total involving a recreational PWC in 2016-17, including nine serious injury incidents and two fatality incidents.



### **Towing: the most common incident type for serious injury incidents**

- Incidents described as “towing incidents” accounted for 9.4% of fatal incidents, 15.9% of serious injury incidents and 4.3% of incidents overall.
- Towing incidents, at 15.9%, were the most common incident type recorded for serious injury incidents over the last 10 years.
- 9.6% of vessels involved in fatal incidents were reportedly involved in towing activities at the time. Of these, 75% were involved in waterskiing.
- 18.5% of vessels involved in serious injury incidents were involved in towing activities. Of these, 36.8% were recorded as being involved in waterskiing, followed by aquaplaning (27.4%) and wakeboarding (15.8%).
- 5.7% of vessels involved in incidents overall were reportedly involved in towing activities. Of these, 39.4% were involved in waterskiing, followed by aquaplaning (18.3%) and wakeboarding (13.9%).



### **Cold Water: two-thirds of incidents on alpine waters result in either a serious injury or a fatality**

- Although there were relatively few boating incidents on alpine waters over the last 10 years, two-thirds of these resulted in either a serious injury or a fatality. This is a much higher proportion than for non-alpine waters (24.0%).
- Relatively few fatal incidents over the last 10 years occurred in the cooler months of the year, with 35.0% occurring between April and September.
- Incidents in which a victim was forced into the water (capsize, fall overboard, sinking, swamping or bar crossing incident) accounted for 69.2% of fatal incidents over the last 10 years.



### **Paddle/row: canoes, kayaks and rowing boats are the second most numerous vessel type involved in fatal incidents**

- Canoes, kayaks and rowing boats together accounted for 8.8% of the vessels involved in fatal incidents over the last 10 years.
- This was equal to sailing vessels – and behind only open runabouts.
- However, this group accounted for only 1.0% of the vessels involved in serious injury incidents and 1.7% of vessels involved in incidents overall.



### **Speed: causes a much higher proportion of fatal incidents**

- Excessive speed accounted for 9.4% of recreational boating fatality incidents, 5.5% of serious injury incidents and 3.6% of incidents overall.
- The proportion of fatal incidents attributed to excessive speed (9.4%) was significantly higher than the corresponding proportion for incidents overall (3.6%).



### **Alcohol: causes a higher proportion of serious injury incidents**

- Excess alcohol accounted for 6.0% of recreational boating fatality incidents, 3.7% of serious injury incidents and 1.7% of incidents overall.
- The proportion of serious injury incidents attributed to excess alcohol (3.7%) was significantly greater than the corresponding proportion for incidents generally (1.7%).
- For fatal incidents, the corresponding difference (6.0% versus 1.7%) was just outside statistical significance ( $0.05 < P < 0.1$ ).



### **Weather: the main cause of fatal boating incidents**

- Weather conditions, at 12.8%, was the main cause recorded for recreational boating fatality incidents over the last 10 years.
- Weather conditions were also recorded as the primary cause for 5.8% of serious injury incidents and 12.3% of boating incidents overall over the last 10 years.
- The proportion of overall incidents attributed to weather conditions was significantly lower in 2016–17 (7.5%) than over the last 10 years (12.3%).



### **Proper lookout: the lack of a proper lookout caused a high proportion of serious injury incidents and incidents overall**

- The lack of a proper lookout was cited as the primary cause of 5.1% of recreational boating fatality incidents, 11.1% of serious injury incidents and 11.2% of incidents overall over the last 10 years.



### **Age/gender: older males at greatest risk**

- 86.4% of boating fatalities over the last 10 years were male.
- Amongst people aged 50 years or older, 93.9% were male.
- All nine of the fatalities aged 80 years or older were male.
- The 70-plus age range accounted for 20.5% of fatalities over the last 10 years but only 9.2% of boat licences.

## Fact box – Personal Watercraft (PWC) Update for 2016-17:

In 2016-17 there were (involving a recreational PWC):

- 24 incidents in total;
- 9 serious injury incidents; and
- 2 fatality incidents.

In addition:

- The overall incident rate for recreational PWC (183.7 per 100,000) was statistically similar to the average of the last 10 years (236.3 per 100,000); and
- The serious injury incident rate for recreational PWC (68.9 per 100,000) was statistically similar to the 10 year average of 79.6 per 100,000.

These 10 year averages reflect improvements in the identification of PWC-related incidents since the previous boating incidents report. Nevertheless, these long-term averages have changed little in recent years, and are similar to those given in the report Personal Watercraft Incidents, Compliance and Feedback in New South Wales – Statistical report for the 10-year period ended 30 June 2012.

In relation to boating incidents involving at least one recreational PWC over the 10 years to 30 June 2017):

- More than 80% occurred in the warmer months of October to March.
- More than three-quarters occurred at 12:00 noon or later in the day (and 56% happened at or after 2:00 pm).
- 27% occurred on the Georges River/Botany Bay waterway which has resulted in increased education and compliance efforts in the area.
- Among incident types, collisions with another vessel were by far the most prevalent (49.5% of all incidents). This was followed by collisions with a fixed object (7.7%) and falls overboard (6.8%).
- The most prevalent incident causes were lack of judgement (24.3%), no proper lookout (18.5%) and excessive speed (6.8%).

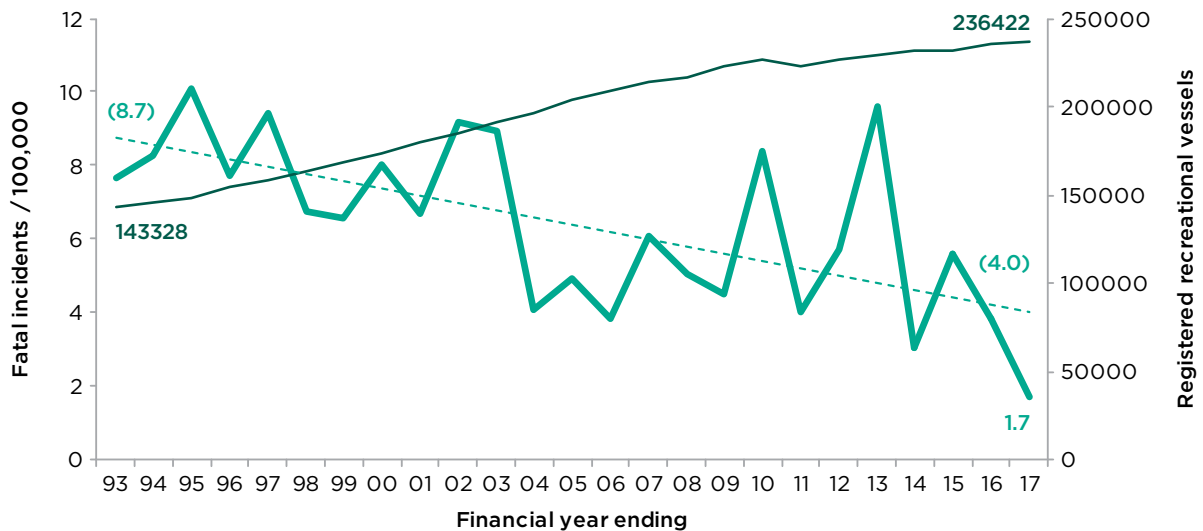


A Boating Safety Officer conducting a safety and licence check on a PWC rider.

## 6 Latest incident trends

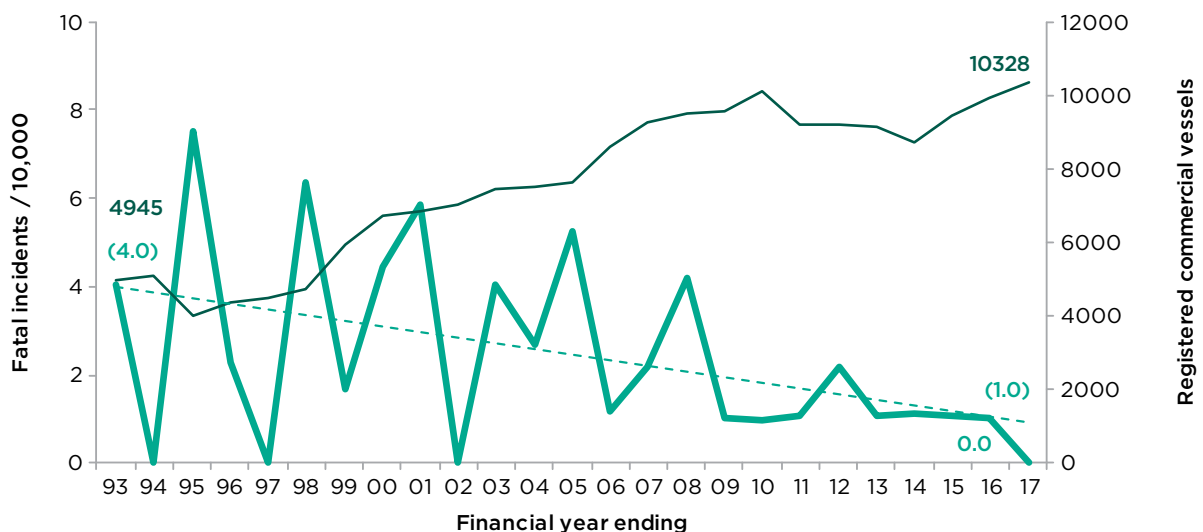
There were 1.7 fatal incidents per 100,000 recreational vessels in 2016-17. In trend terms, the recreational vessel fatal incident rate has decreased by nearly 55% since the early 1990s.

**Figure 1: Fatal incidents per 100,000 registered recreational vessels (green line) and corresponding registrations (dark green line). Data labels show key values, numbers in brackets are trend values.**



There were no fatal incidents involving commercial vessels in 2016-17. In trend terms, the commercial vessel fatal incident rate is estimated to have decreased by more than 75% since the early 1990s.

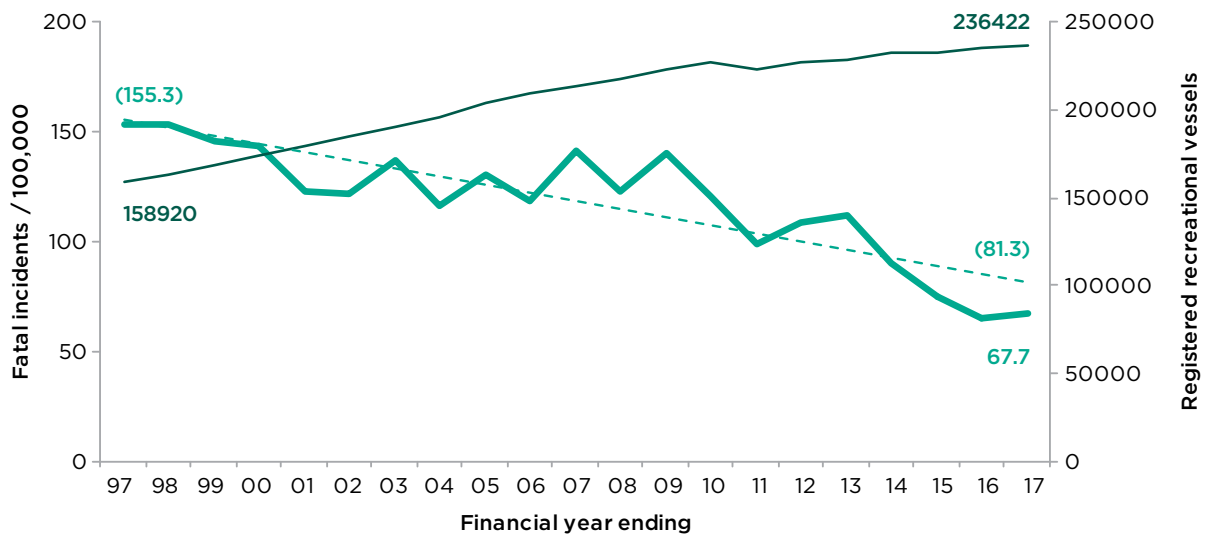
**Figure 2: Fatal incidents per 10,000 commercial vessels (green line) and corresponding registrations (dark green line). Data labels show key values, numbers in brackets are trend values.\***



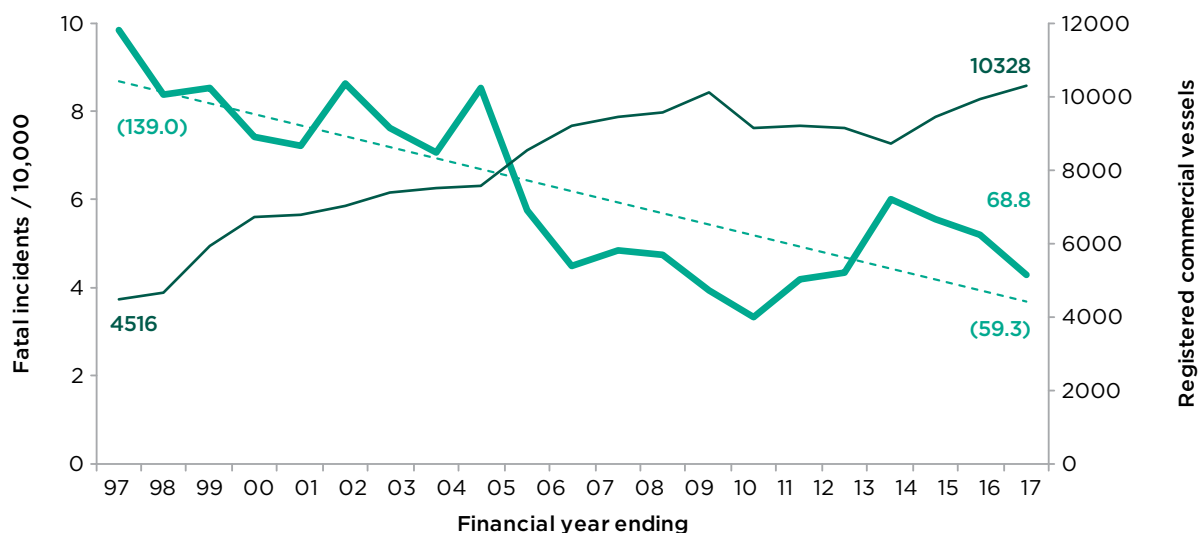
\* While the trend line is statistically significant at  $P < 0.05$ , its precision is affected by the high variability in the fatal incident rate in the earlier years.

Overall incident rates for both recreational vessels (Figure 3) and commercial vessels (Figure 4) have also maintained long-term downward trends. There were 67.7 incidents overall per 100,000 recreational vessels in 2016-17 and 68.8 incidents per 10,000 commercial vessels. In trend terms, the overall recreational vessel incident rate has decreased by nearly 48%, while the corresponding commercial vessel incident rate is estimated to have decreased by more than 57%.

**Figure 3: Total incidents per 100,000 registered recreational vessels (green line) and corresponding registrations (dark green line). Data labels show key values, numbers in brackets are trend values.**



**Figure 4: Total incidents per 10,000 commercial vessels (green line) and corresponding registrations (dark green line). Data labels show key values, numbers in brackets are trend values.\***



\* While the trend line is statistically significant at  $P < 0.01$ , its precision is affected by a high degree of serial autocorrelation in the total incident rate.

# 7 Recreational incident patterns

## 7.1 Incident type

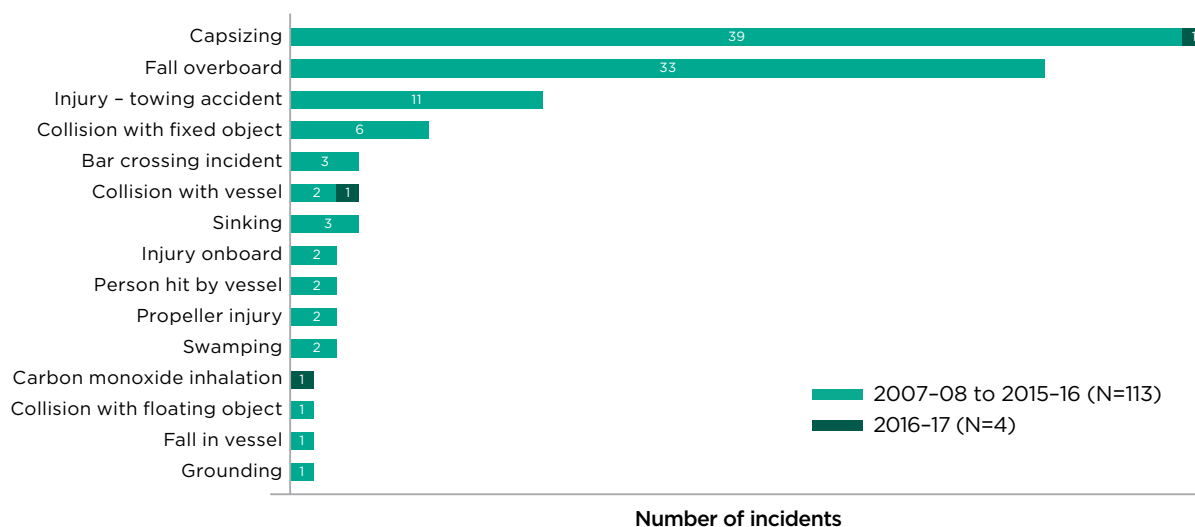
The three most common **fatal incident types** over the last 10 years were:

- capsizing (40 incidents, 34.2%);
- fall overboard (33 incidents, 28.2%); and
- towing incidents (11 incidents, 9.4%).

Incidents where the victim was forced into the water (capsize, fall overboard, sinking, swamping or bar crossing incident) accounted for 81 fatal incidents (69.2 % of the total), while incident types implying some sort of collision accounted for 15 fatal incidents (12.8% of the total) – including persons being hit by a vessel or coming into contact with its propeller. A breakdown of fatal incidents by type for the 10 year period is provided in figure 5 below.

Among the four fatal incidents recorded in 2016-17, one involved a vessel capsize at high speed, one involved a collision with another vessel and one involved carbon monoxide inhalation. The fourth incident, recorded as type “other”, involved a person being ejected from their vessel after crashing into a wave.

**Figure 5: Number of fatal incidents by incident type over the last 10 years (2007-08 to 2016-17), with the 2016-17 fatal incidents shown in dark green.\***



\* There were 7 additional incidents of 'other/unspecified' type recorded over the 10 years, including one in 2016-17. The total number of incidents referred to in this graph (117) includes these 'other/unspecified' incidents.

The three most common **serious injury incident types** over the last 10 years were:

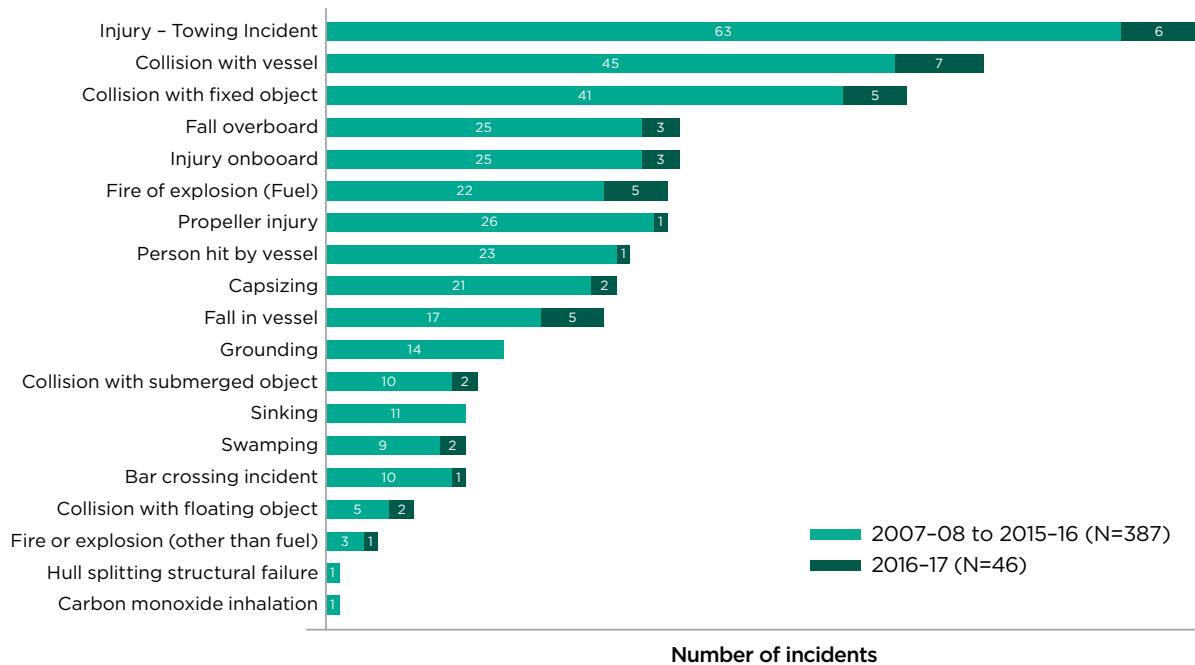
- towing incidents (69 incidents, 15.9%);
- collision with vessel (52 incidents, 12.0%); and
- collision with fixed object (46 incidents, 10.6%).

Incident types implying some sort of collision accounted for 182 serious injury incidents (42.0% of the total) – including persons being hit by a vessel or its propeller. This percentage is much higher than the corresponding proportion for fatal incidents (12.9%).



Among the 46 serious injury incidents recorded in 2016–17, 18 (39.1%) were of a type implying some sort of collision – including those between a person and a vessel and/or its propeller. This proportion is similar to that for the whole 10 years (42%).

**Figure 6: Number of serious injury incidents by incident type over the last 10 years (2007–08 to 2016–17), with the 2016–17 serious injury incidents shown in dark green\***



\* There were 46 additional incidents of 'other/unspecified' type recorded over the 10 years, although none of these occurred in 2016–17. The total number of incidents referred to in this graph (433) includes these 'other/unspecified' incidents.



Lifejackets save lives — but only when worn.

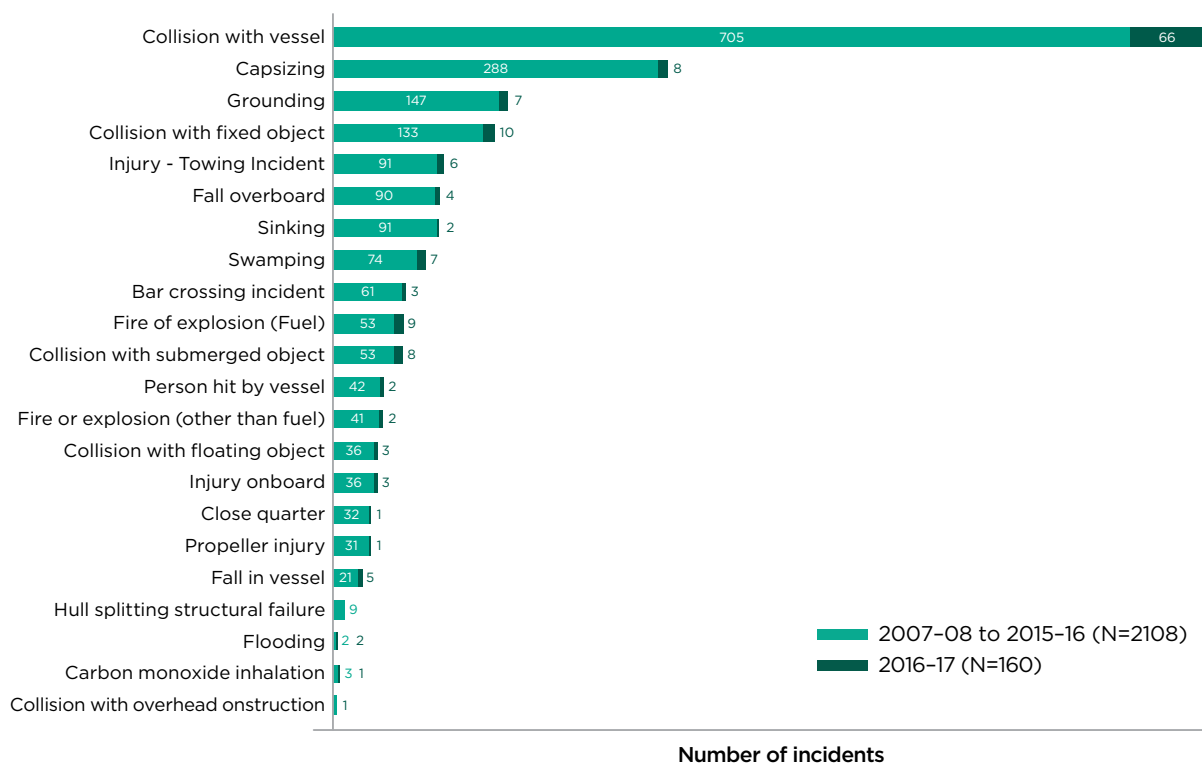
The three most common incident types **overall** during the last 10 years were:

- collision with vessel (771 incidents, 34.0%);
- capsizing (296 incidents, 13.1%); and
- grounding (154 incidents, 6.8%).

Incident types implying some sort of collision accounted for 1246 incidents (54.9% of the total). The corresponding proportion of such incidents in 2016–17 was statistically similar, at 60.6% (97 incidents).

In general, the breakdown of incident types overall recorded in 2016–17 was similar to that for the last 10 years. Nevertheless, the three most common incident types in 2016–17 were different, namely collision with vessel (66 incidents, 41.3%), collisions with fixed object (10 incidents, 6.3%) and fire or explosion involving fuel (9 incidents, 5.6%). The proportion of capsizing incidents was significantly down in 2016–17 compared with the whole 10 year period (5.0% vs 13.1%), while there was some indication of an increase in the proportion of incidents due to collisions with a vessel (41.3% versus 34.0%).

**Figure 7: Number of incidents overall by incident type over the last 10 years (2007–08 to 2016–17), with the 2016–17 incidents shown in dark green\***



\* There were 77 additional incidents of 'other/unspecified' type recorded over the 10 years, including 10 in 2016–17. The total number of incidents referred to in this graph (2268) includes these 'other/unspecified' incidents.

Figure 18 (Section 7.4) provides further detail on incident type – as it highlights the type(s) of vessel primarily associated with each incident type.

## 7.2 Incident cause

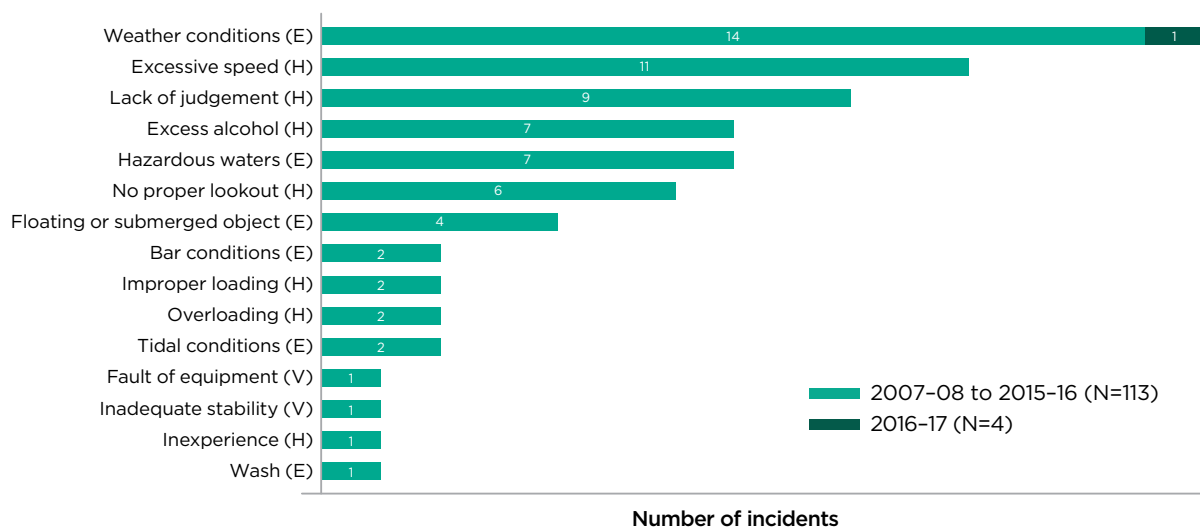
Six incident causes together accounted for 47.0% of all fatal incidents recorded over the last 10 years. These six incident causes were:

- weather conditions (15 incidents, 12.8%);
- excessive speed (11 incidents, 9.4%);
- lack of judgement (9 incidents, 7.7%);
- excess alcohol (7 incidents, 6.0%);
- hazardous waters (7 incidents, 6.0%); and
- no proper lookout (6 incidents, 5.1%).

Given that 39.3% of fatal incidents over the 10 years were classified under “other/unspecified”, the true contribution of these causes was probably even greater.

Fatal incidents directly attributed to human factors (e.g. excessive speed) accounted for 32.5% of all fatal incidents over the last 10 years, while those attributed to environmental factors (e.g. weather conditions) accounted for 26.5%. Fatal incidents attributed to a vessel or its equipment (e.g. fault of equipment) were relatively rare – accounting for just 1.7% of fatal incidents over the period.

**Figure 8: Number of fatal incidents by primary incident cause over the last 10 years (2007–08 to 2016–17), with the 2016–17 fatal incidents shown in dark green\***



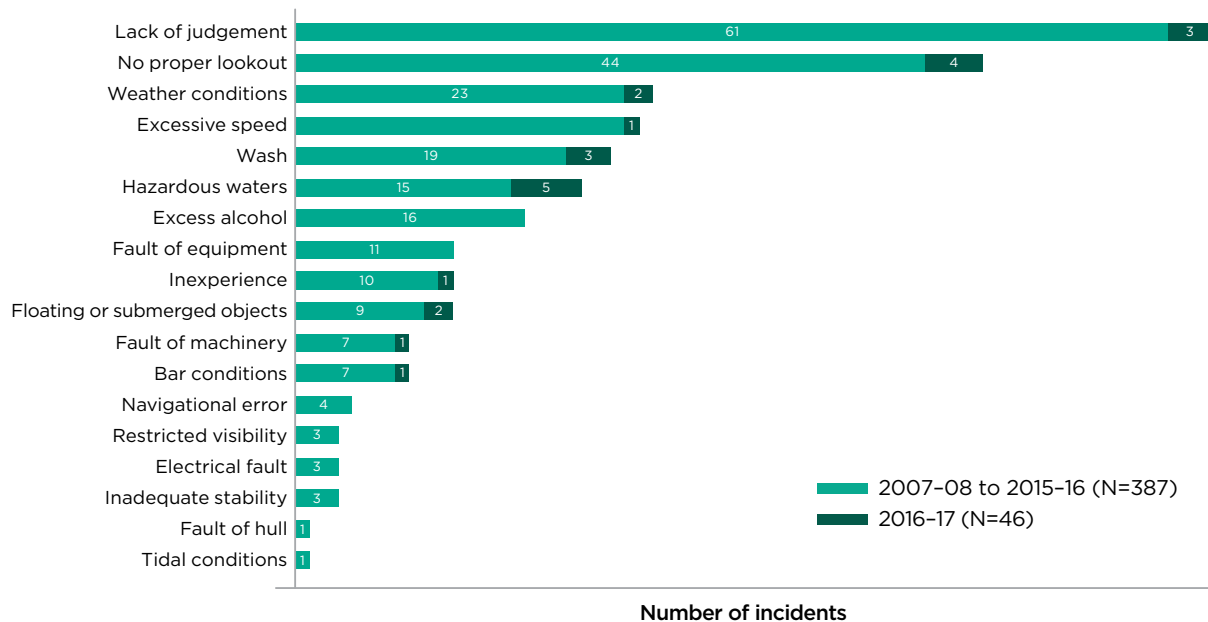
\* There were 46 additional incidents of ‘other/unspecified’ cause recorded over the 10 years, including three in 2016–17. The total number of incidents referred to in this graph (117) includes these ‘other/unspecified’ incidents. Incident causes classified as follows: (H) – human related; (E) – environmental; and (V) – vessel and/or equipment. Causes recorded in the RMS Eagle incident database were, in the vast majority of cases, specifically recorded as primary causes. However, it is possible that for a small number of incidents, the actual primary cause differed from the cause extracted for this chart.

Five incident causes together accounted for 42.3% of all serious injury incidents recorded over the last 10 years. These incident causes were:

- lack of judgement (64 incidents, 14.8%);
- no proper lookout (48 incidents, 11.1%);
- weather conditions (25 incidents, 5.8%);
- excessive speed (24 incidents, 5.5%); and
- wash (22 incidents, 5.1%).

Given that 34.6% of serious injury incidents over the 10 years were classified under “other/unspecified”, the true contribution of these causes was probably even greater.

**Figure 9: Number of serious injury incidents by primary incident cause over the last 10 years (2007-08 to 2016-17), with the 2016-17 serious injury incidents shown in dark green\***

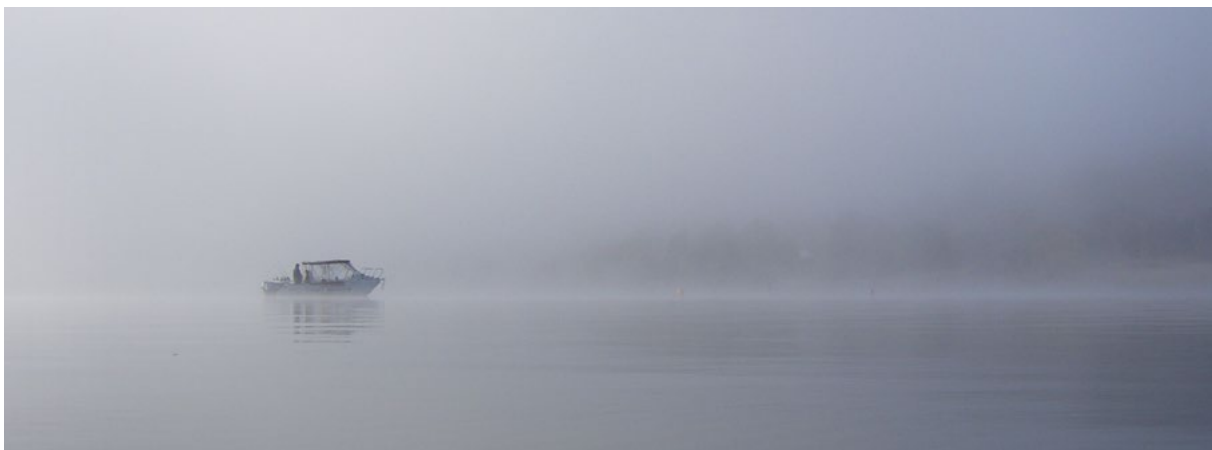


\* There were 150 additional incidents of ‘other/unspecified’ cause recorded over the 10 years, including 23 in 2016-17. The total number of incidents referred to in this graph (433) includes these ‘other/unspecified’ incidents. Causes recorded in the RMS Eagle incident database were, in the vast majority of cases, specifically recorded as primary causes. However, it is possible that for a small number of incidents, the actual primary cause differed from the cause extracted for this chart.

Three incident causes together accounted for 40.2% of all recreational boating incidents recorded over the last 10 years. These causes were:

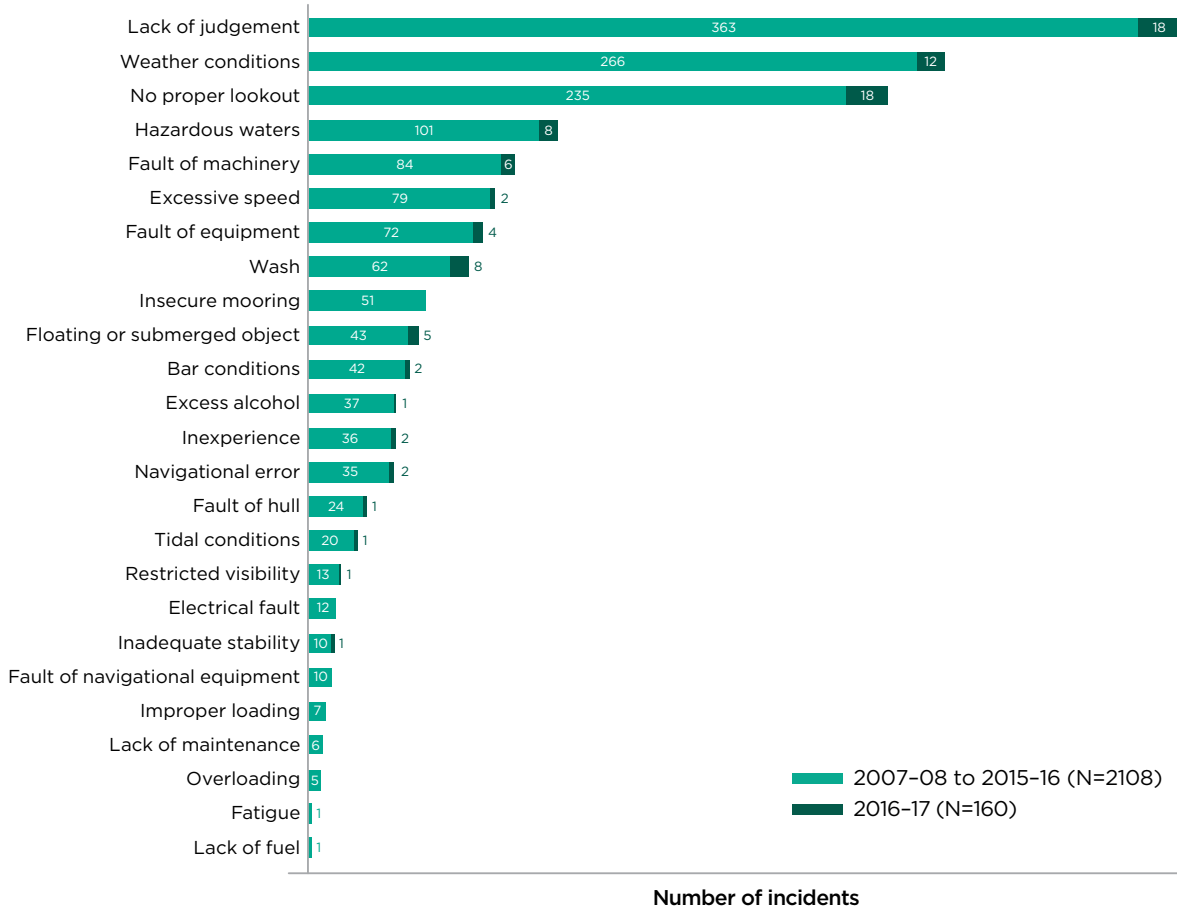
- lack of judgement (381 incidents, 16.8%);
- weather conditions (278 incidents, 12.3%); and
- no proper lookout (253 incidents, 11.2%).

Given that 24.7% of all recreational boating incidents were classified under “other/unspecified”, the true contribution of these causes was probably even greater.



Changeable weather is a key safety consideration when out boating, even on sheltered waters.

**Figure 10: Number of overall recreational boating incidents by primary incident cause over the last 10 years (2007–08 to 2016–17), with the 2016–17 incidents shown in dark green\***



\* There were 561 additional incidents of 'other/unspecified' cause recorded over the 10 years, including 68 in 2016-17. The total number of incidents referred to in this graph (2268) includes these 'other/unspecified' incidents. Causes recorded in the RMS Eagle incident database were, in the vast majority of cases, specifically recorded as primary causes. However, it is possible that for a small number of incidents, the actual primary cause differed from the cause extracted for this chart.

In general, the pattern of incident causes recorded in 2016-17 was similar to that for the last 10 years and the three most common incident cause in 2016-17 were the same, specifically lack of judgement, no proper lookout (both 18 incidents, each 11.3%) and weather conditions (12 incidents, 7.5%). However, the proportion of incidents caused by weather conditions was significantly down in 2016-17 compared with the whole 10 year period (7.5% versus 12.3%), as was the proportion of incidents due to lack of judgement (11.3% versus 16.8%).

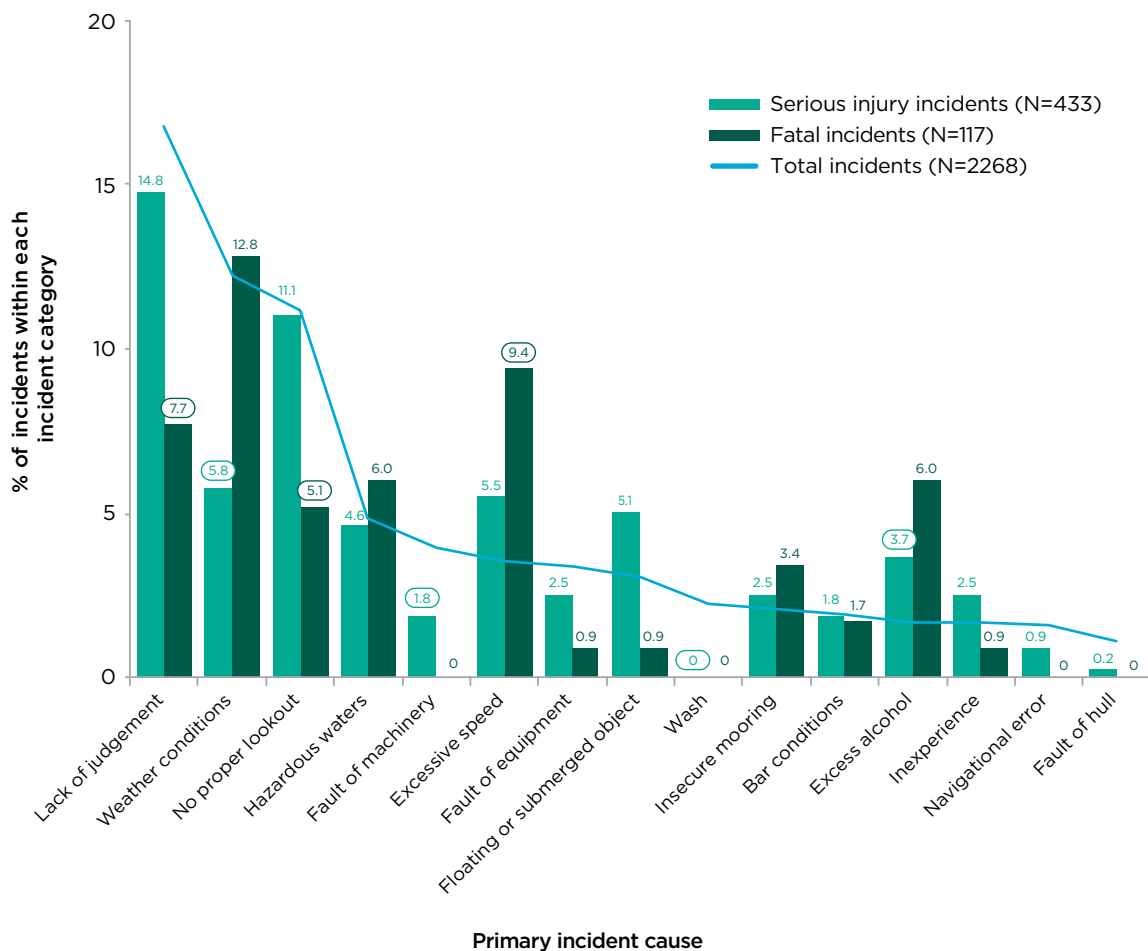
Figure 11 provides a breakdown of incident causes by incident severity, based on data for the last 10 years. The data is sorted by total incidents, which are shown by the blue line for context (The graph includes only those causes which accounted for at least 1% of total incidents). Figure 11 gives an indication of causes that are relatively more (or less) prevalent amongst either fatality incidents or serious injury incidents as opposed to total incidents – based on whether the dark green (fatal incident) or green (serious injury incident) bars are above or below the blue line (total incidents) for a particular cause.

With fatal incidents, excessive speed accounted for a significantly larger proportion of such incidents than of incidents generally (9.4% versus 3.6%), while for excess alcohol the difference (6.0% versus 1.7%) was close to being statistically significant. Conversely, both lack of judgement (7.7% versus 16.8%) and no proper lookout (5.1% versus 11.2%) accounted for significantly lower proportions of fatal incidents than was the case with incidents generally.

With serious injury incidents, excess alcohol accounted for a significantly larger proportion of such incidents than of incidents generally (3.7% versus 1.7%), while for wash the difference (5.1% versus 3.1%) was close to being statistically significant. Conversely, weather conditions (5.8% versus 12.3%) and fault of machinery (1.8% versus 4.0%) all accounted for significantly lower proportions of serious injury incidents than was the case with incidents generally.

It should be noted that the statistical significance of smaller percentage differences with respect to serious injury incidents compared with fatality incidents directly relates to the respective totals of these incident categories (433 versus 117).

**Figure 11: Percentage breakdown of incidents by cause for the last 10 years,\* by incident severity.**



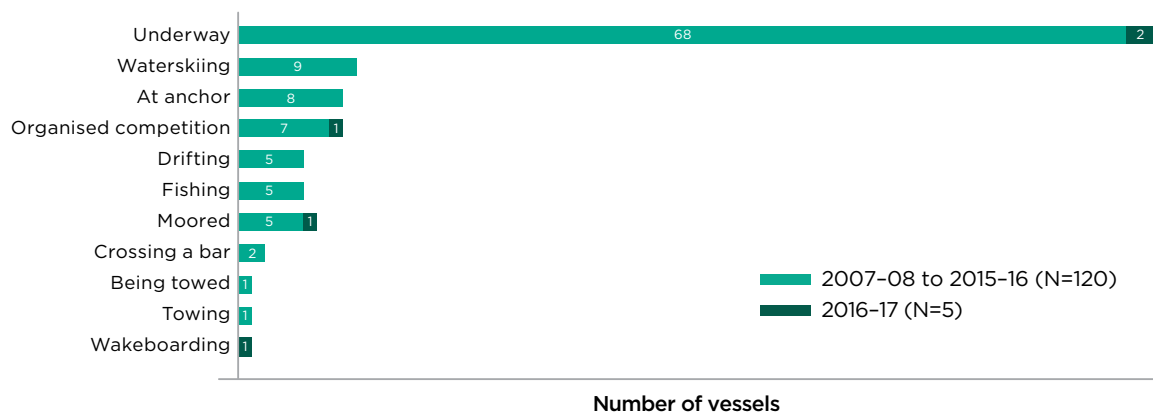
\* Data labels highlighted with an outline indicate where the proportion of fatal or serious injury incidents is significantly different to the corresponding proportion of total incidents for a given incident cause (at  $P < 0.05$ ).

### 7.3 Vessel operation

Waterskiing was the most commonly reported specific vessel operation, accounting for 7.2% of vessels involved in fatal incidents (9 vessels – Figure 12). More broadly, 12 vessels (9.6%) were involved in towing of one sort or another – of which nine were involved in waterskiing, with the remaining three vessels involved in either wakeboarding or towing in general.

Situations in which a vessel was ‘secured’ in some way (i.e. at anchor, moored or berthed) accounted for 11.2% of vessels involved in fatal incidents over the last 10 years (i.e. 14 vessels – Figure 12). Eight of these vessels were at anchor (57.1%), while the remaining six were moored.

**Figure 12: Number of vessels involved in fatal incidents over the last 10 years (2007-08 to 2016-17) by vessel operation. Vessels involved in 2016-17 incidents shown in dark green\***



\* There were nine additional vessels involved in fatal incidents over the last 10 years where the vessel operation was recorded as ‘other/unspecified’, although none of these vessels were involved in the fatal incidents that occurred in 2016-17. The total number of vessels referred to in this graph (125) includes these ‘other/unspecified’ vessels and reflects the fact that some fatal incidents involved more than one vessel.



Modern inflatable lifejackets are stylish and easy to wear all day long.

For serious injury incidents over the last 10 years waterskiing was the most commonly reported specific vessel operation, accounting for 6.8% of all vessels involved in serious injury incidents (35 vessels – Figure 13).

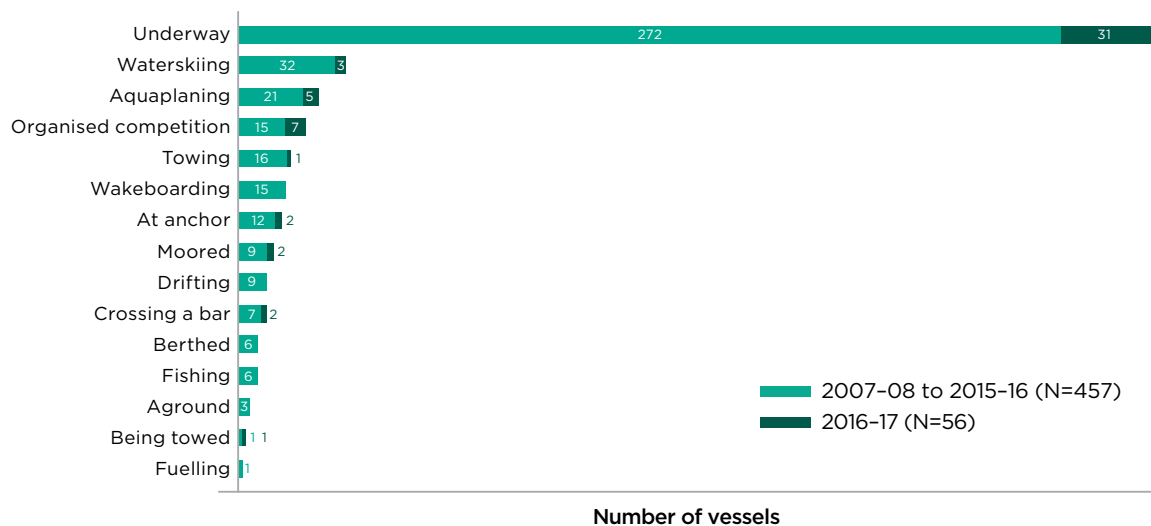
Ninety-five vessels (18.5% of the total) were recorded as being involved in some sort of towing activity:

- 35 (36.8%) were involved in waterskiing,
- 26 (27.4%) involved aquaplaning and
- 15 (15.8%) involved wakeboarding.

The remaining 19 vessels (20.0%) were not recorded against a particular towing activity.

Vessels that were ‘secured’ in some way (i.e. at anchor, moored or berthed) accounted for 6.0% of the vessels involved in serious injury incidents over the last 10 years (i.e. 31 vessels – Figure 13). Fourteen (45.2%) of these vessels were at anchor, while 11 (35.5%) were moored and six (19.4%) were berthed.

**Figure 13: Number of vessels involved in serious injury incidents over the last 10 years (2007-08 to 2016-17) by vessel operation. Vessels involved in 2016-17 incidents shown in dark green\***



\* There were 34 additional vessels involved in serious injury incidents over the last 10 years where the vessel operation was recorded as ‘other/unspecified’, including two were involved in serious injury incidents that occurred in 2016-17. The total number of vessels referred to in this graph (513) includes these ‘other/unspecified’ vessels and reflects the fact that some incidents involved more than one vessel.

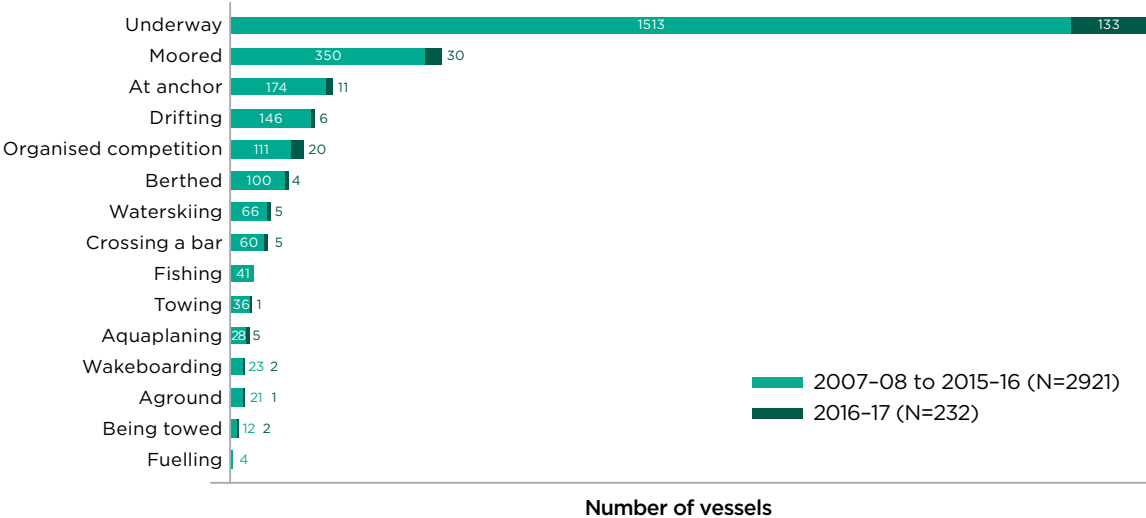
For incidents overall over the last 10 years, being moored was the most commonly reported specific vessel operation, accounting for 12.1% of all vessels involved in fatal incidents (380 vessels – Figure 14).

180 vessels (5.7% of the total) were recorded as being involved in some sort of towing activity: of these vessels, 71 (39.4%) were involved in waterskiing, 33 (18.3%) were involved in aquaplaning and 25 (13.9%) were involved in wakeboarding. The remaining 51 vessels (28.3%) were not recorded against a particular towing activity.

Vessels that were ‘secured’ in some way (i.e. at anchor, moored or berthed) accounted for 21.2% of the vessels involved in all recreational boating incidents over the last 10 years (i.e. 669 vessels – Figure 14). 380 (56.8%) of these vessels were moored, 185 (27.7%) were at anchor and 104 (15.5%) were berthed.



**Figure 14: Number of vessels involved in incidents overall over the last 10 years (2007-08 to 2016-17) by vessel operation. Vessels involved in 2016-17 incidents shown in dark green\***



\* There were 243 additional vessels involved in recreational boating incidents over the last 10 years where the vessel operation was recorded as 'other/unspecified', including seven in 2016-17. The total number of vessels referred to in this graph (3153) includes these 'other/unspecified' vessels and reflects the fact that some incidents involved more than one vessel.

Patterns of vessel operation involved in incidents during 2016-17 were generally similar to those of the whole 10 year period. However, the proportion of vessels involved in organised competition was significantly up in 2016-17 compared with the whole 10 year period (8.6% versus 4.2%), while there was some indication of a decrease in the proportion of vessels that were drifting (2.6% versus 4.8%).



Kayaking has become very popular in recent years — including on coastal waters.

## 7.4 Vessel type

The main vessel types involved in recreational boating fatality incidents over the last 10 years were:

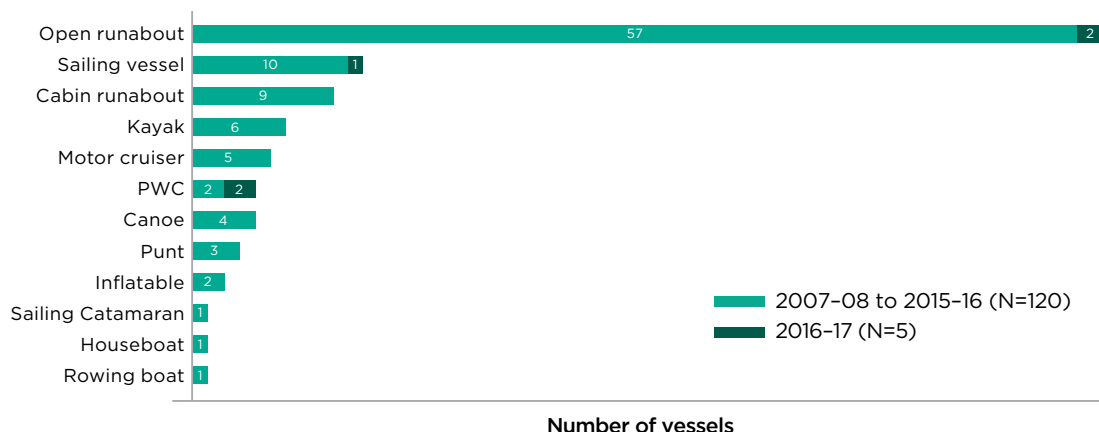
- Open runabouts (59 vessels, 47.2%);
- Sailing vessels (11 vessels, 8.8%); and
- Cabin runabouts (9 vessels, 7.2%)

In addition, canoes and kayaks combined accounted for a further 10 vessels (8.1%).

Two of the five vessels involved in recreational fatality incidents in 2016-17 were PWC, two were recorded as open runabouts and one was a sailing vessel.

In addition to the information in Figure 15, an examination of the incident narratives from the vessel incident database shows that there were 12 fatal incidents over the last 10 years involving high performance towing or racing vessels (i.e. 10.3% of the total) and one such incident in 2016-17.

**Figure 15: Number of vessels involved in fatal incidents over the last 10 years (2007-08 to 2016-17) by vessel type. "Sailing vessel" refers to general sailing vessels, and does not include specialised types such as catamarans, which are shown separately. Vessels involved in 2016-17 incidents shown in dark green\***

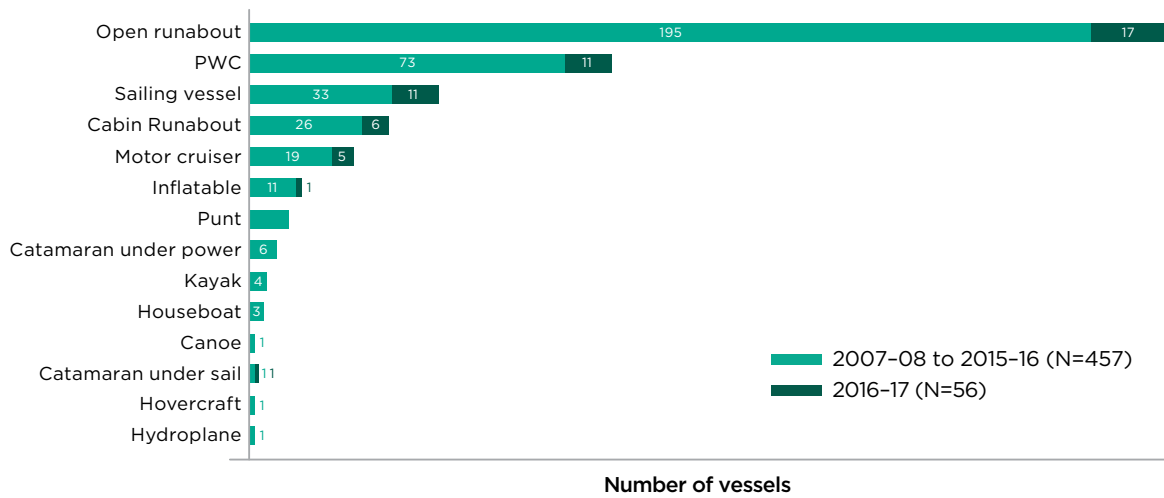


\* There were 19 additional vessels involved in fatal incidents over the last 10 years where the vessel type was recorded as 'other/unspecified', although none of these vessels were involved in the fatal incidents that occurred in 2016-17. The total number of vessels referred to in this graph (125) includes these 'other/unspecified' vessels and reflects the fact that some fatal incidents involved more than one vessel.

The main vessel types involved in recreational boating serious injury incidents over the last 10 years were:

- Open runabouts (212 vessels, 41.3%);
- PWC (84 vessels, 16.4%);
- Sailing yachts (44 vessels, 8.6%); and
- Cabin runabouts (32 vessels, 6.2%).

**Figure 16: Number of vessels involved in serious injury incidents over the last 10 years (2007-08 to 2016-17) by vessel type. Vessels involved in 2016-17 incidents shown in dark green\***



\* There were 78 additional vessels involved in serious injury incidents over the last 10 years where the vessel operation was recorded as 'other/unspecified', including four vessels in 2016-17. The total number of vessels referred to in this graph (513) includes these 'other/unspecified' vessels and reflects the fact that some serious injury incidents involved more than one vessel.

The mix of vessel types involved in serious injury incidents during 2016-17 was generally similar to that of the whole 10 year period. However there was some indication of an increase in the proportion of sailing vessels (19.6% versus 8.6%).

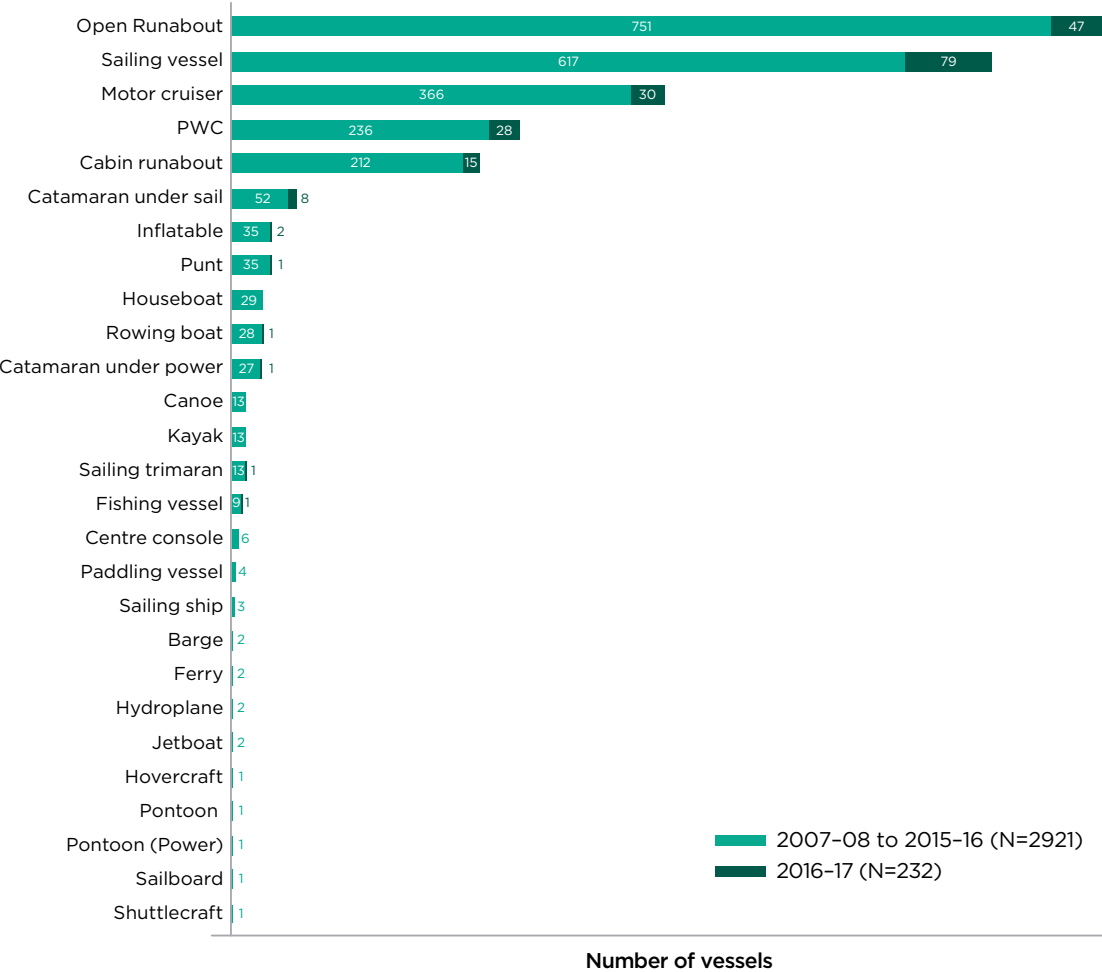
The main vessel types involved in recreational boating incidents overall over the last 10 years were:

- Open runabouts (798 vessels, 25.3%)
- Sailing vessels (696 vessels, 22.1%)
- Motor cruisers (396 vessels, 12.6%)
- PWC (264 vessels, 8.4%) and
- Cabin runabouts (227 vessels, 7.2%).



The Old4New lifejacket van out distributing new lifejackets and spreading the message about care and servicing, especially regarding inflatable models.

**Figure 17: Number of vessels involved in incidents overall over the last 10 years (2007-08 to 2016-17) by vessel type. Vessels involved in 2016-17 incidents shown in dark green\***



\* There were 477 additional vessels involved in incidents overall over the last 10 years where the vessel operation was recorded as 'other/unspecified', including 18 vessels in 2016-17. The total number of vessels referred to in this graph (3153) includes these 'other/unspecified' vessels and reflects the fact that some incidents involved more than one vessel.



Sailing vessels were involved in a relatively high number of incidents during 2016-17.

The mix of vessel types involved in incidents overall during 2016–17 was generally similar to that of the whole 10 year period. However the proportion of sailing vessels was significantly up in 2016–17 compared with the whole 10 year period (34.1% versus 22.1%), while there was some indication of a decrease in the proportion of open runabouts (20.3% versus 25.3%).

Figure 18 provides a 'heat map' of incidents in terms of both incident type (Section 7.1) and vessel type. The numbers shown are the raw totals for recreational boating incidents over the last 10 years. While Figure 18 does not provide information about relative rates or proportions, it highlights the combination of incident types and vessel types that have occurred more often than others. It also shows visual differences in the mix of incident types experienced by different kinds of vessel.

For example, while open runabouts were involved in a wide variety of incident types, sailing vessels were involved in a much narrower range – most notably collisions with a vessel, and to a lesser extent, groundings, collisions with a fixed object and injuries onboard. Motor cruisers had a similar 'incident type profile' to sailing yachts, with the most notable differences being more fire and or explosion related incidents and fewer injuries on board. Cabin runabouts had a profile that shared much with open runabouts – and most notably high numbers of capsizing and collision with another vessel. One notable difference, however, is that open runabouts were involved in far more towing incidents and propeller injury incidents. PWC experienced a relatively narrow range of incident types, focussing heavily on collisions with a vessel, and to a lesser extent, collisions with a fixed object and persons falling overboard.



PWC are involved in a relatively high number of serious injury incidents.

Figure 18: Incident numbers over the last 10 years by incident type and vessel type\*

Incident type/vessel type Last 10 years	Sailing vessel	Open runabout	Motor cruiser	PWC	Cabin runabout	Sailing catamaran	Inflatable	Punt	Houseboat	Row boat	Powered catamaran	Paddlecraft
Collision with a vessel	526	177	225	157	67	39	4	10	16	20	10	5
Capsizing	12	150	2	8	47	3	10	5	1	2	6	12
Collision with a fixed object	30	39	24	17	16	4	0	2	3	2	2	1
Grounding	47	35	29	7	14	4	0	3	0	0	0	0
Towing incident	1	75	0	10	5	0	0	1	1	0	0	0
Fall overboard	9	36	5	15	8	1	3	5	0	0	2	4
Sinking	10	35	18	2	15	1	0	0	1	1	1	0
Swamping	3	37	7	3	11	0	2	2	1	1	0	2
Bar crossing	2	35	3	3	13	0	0	1	0	0	3	0
Collision with a submerged object	7	25	8	5	7	0	1	0	0	1	0	0
Fire or explosion (fuel)	2	32	13	3	0	0	0	0	0	0	0	0
Close quarters	11	17	8	1	2	0	0	1	0	1	0	2
Person hit by vessel	1	21	0	11	2	0	7	0	1	0	1	1
Fire or explosion (other than fuel)	5	6	20	1	5	2	0	0	2	0	1	1
Collision with a floating object	5	14	12	1	5	1	0	1	1	0	0	0
Injury onboard	15	8	4	4	0	1	2	1	1	0	0	0
Propeller injury	0	23	0	0	2	1	4	3	1	0	0	0
Fall in vessel	6	7	0	4	2	0	2	0	0	0	0	0
Hull splitting – structural failure	2	1	1	0	2	0	1	0	0	0	1	0
Flooding	0	1	0	1	0	0	0	0	0	0	1	0
Carbon monoxide inhalation	1	1	2	0	0	0	0	0	0	0	0	0
Collision with overhead obstruction	1	0	0	0	0	1	0	0	0	0	0	0

\* Larger incident numbers are highlighted in orange/red tones. Only the main vessel types are shown, and only for incidents where a specific incident type was recorded. “Paddlecraft” includes canoes, kayaks and unspecified paddlecraft.

Figure 19 shows a similar ‘heat map’, but this time for incident cause (section 7.2) and vessel type. It is clear the lack of judgement, no proper lookout and weather conditions are prominent incident cause across virtually all the main vessel types involved in incidents over the last 10 years. Sailing vessels were very frequently involved in incidents attributed to weather conditions, even more so than open runabout based on these numbers. Open runabouts were affected by a wide variety of incident causes, while PWC were affected by a relatively narrow range – primarily lack of judgement, no proper lookout and excessive speed. The numbers suggest that incidents caused by hazardous waters and bar conditions mainly affect open runabout

and cabin runabouts. Vessel wash incidents mainly involved open runabouts and motor cruisers – the latter presumably more likely causing wash. Insecure moorings mainly affected sailing vessels and motor cruisers, both of which tend to be larger vessels that are often stored on moorings.

**Figure 19: incident numbers over the last 10 years by incident cause and vessel type\*.**

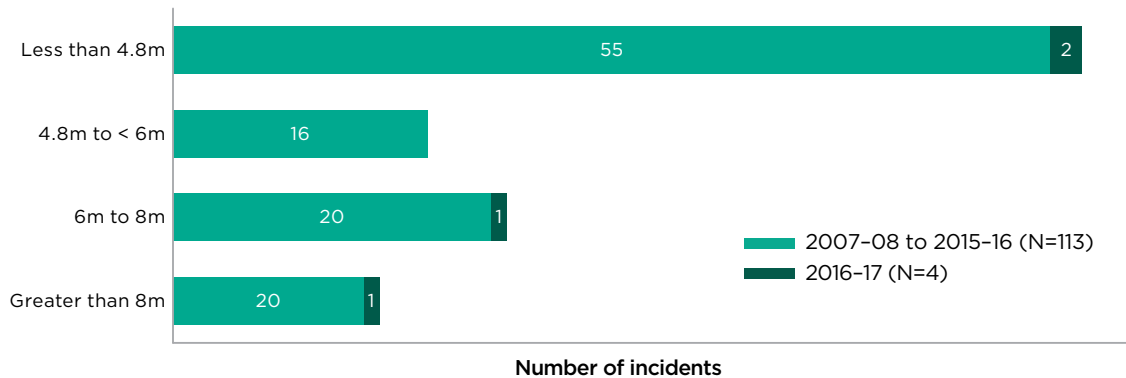
Incident cause/vessel type Last 10 years	Sailing vessel	Open runabout	Motor cruiser	PWC	Cabin Runabout	Sailing catamaran	Inflatable	Punt	Houseboat	Row boat	Powered catamaran	Paddlecraft*
Lack of judgement	176	130	54	74	32	15	5	6	4	6	3	3
No proper lookout	100	99	29	56	34	7	3	8	2	7	1	3
Weather conditions	147	59	55	5	25	12	7	4	3	3	2	4
Excessive speed	5	45	12	21	6	0	1	0	2	0	4	2
Hazardous waters	4	45	3	12	18	0	6	1	0	1	2	2
Fault of machinery	16	26	27	8	14	2	1	0	0	0	0	0
Fault of equipment	29	17	22	4	5	3	0	0	1	1	1	0
Wash	5	37	16	7	4	1	1	2	0	1	2	0
Insecure mooring	43	3	27	0	3	5	0	0	5	0	1	0
Navigational error	16	16	9	1	3	0	0	2	0	2	1	0
Floating or submerged object	4	26	5	7	1	0	0	0	1	1	0	0
Excess alcohol	2	22	13	1	3	0	1	0	1	0	0	0
Inexperience	5	16	4	8	4	0	0	0	1	0	0	5
Bar conditions	1	20	3	1	9	0	1	1	0	0	3	0
Fault of hull	1	11	3	0	6	0	0	0	0	0	1	0
Tidal conditions	3	7	2	1	4	0	1	1	2	1	0	0
Restricted visibility	3	6	2	1	2	0	0	1	0	2	0	0
Electrical fault	0	3	8	0	1	0	0	0	0	0	0	0
Inadequate stability	0	9	0	1	0	0	0	0	0	0	0	0
Lack of maintenance	3	0	1	0	1	1	0	0	0	0	1	0
Fault of navigational equipment	2	4	2	0	1	0	0	0	0	0	0	0
Improper loading	0	5	0	0	0	0	0	1	0	0	0	0
Overloading	0	3	0	0	0	0	0	1	0	0	0	1
Fatigue	0	0	0	1	0	0	0	0	0	0	0	0
Lack of fuel	0	1	0	0	0	0	0	0	0	0	0	0

\* Larger incident numbers are highlighted in orange/red tones. Only the main vessel types are shown, and only for incidents where a specific incident cause was recorded. "Paddlecraft" includes canoes, kayaks and unspecified paddlecraft.

## 7.5 Vessel length

Vessels less than 4.8 metres in length accounted for the greatest share of vessels on which a person was killed in a recreational boating fatal incident over the last 10 years (48.7%, i.e. 57 vessels – Figure 20). This represented 53.3% of all vessels for which a length was recorded. Two out of the four persons killed in 2016–17 were on vessels less than 4.8 metres in length.

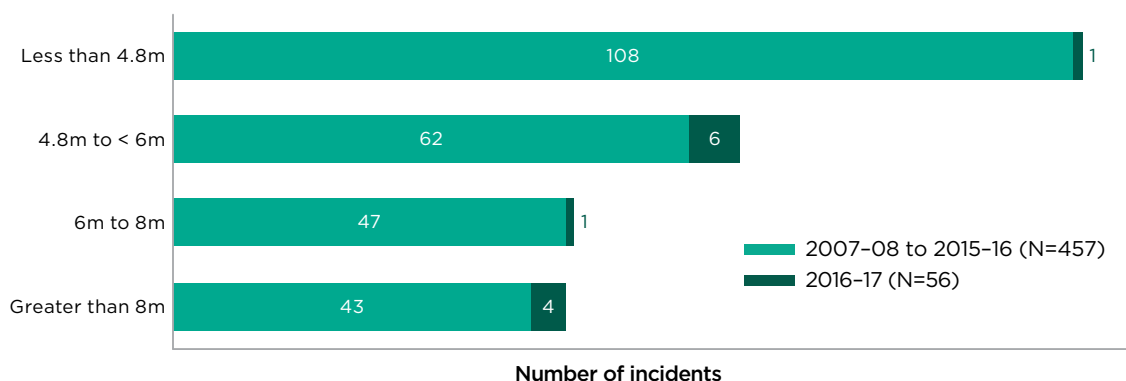
**Figure 20: Number of vessels on which a person was killed in a recreational boating fatal incident over the last 10 years (2007–08 to 2016–17) by vessel length range. Vessels involved in 2016–17 incidents shown in dark green\***



\* Data based on detailed boating fatality records kept by Transport for NSW. There were 10 additional vessels where the vessel length was not recorded, but none in 2016–17. The total number of vessels referred to in this graph (117) includes these vessels.

Vessels less than 4.8 metres in length accounted for the greatest share of vessels involved in recreational boating serious injury incidents over the last 10 years (109 vessels; Figure 21) – which was 21.2% of all vessels involved in such incidents and 40.1% of all vessels for which a length was recorded.

**Figure 21: Number of vessels involved in serious injury incidents over the last 10 years (2007–08 to 2016–17) by vessel length range. Vessels involved in 2016–17 incidents shown in dark green\***

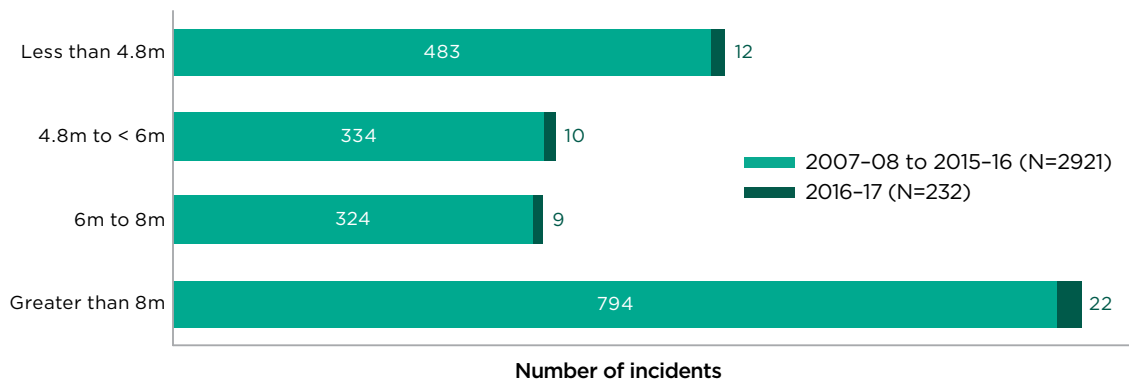


\* There were 241 additional vessels involved in serious injury incidents over the last 10 years where the vessel length was not recorded, including 44 in 2016–17. The total number of vessels referred to in this graph (513) includes these vessels and reflects the fact that some fatal incidents involved more than one vessel.



Vessels greater than 8 metres in length accounted for the greatest share of vessels involved in recreational boating incidents overall over the last 10 years (816 vessels, Figure 22) – which was 41.0% of all vessels involved in such incidents for which a length was recorded. The high proportion of larger vessels in incidents overall is in contrast with fatal incidents and serious injury incidents, where smaller vessels (specifically those less than 4.8 metres) accounted for the greatest share of vessels involved.

**Figure 22: Number of vessels involved in incidents overall over the last 10 years (2007–08 to 2016–17) by vessel length range. Vessels involved in 2016–17 incidents shown in dark green\***

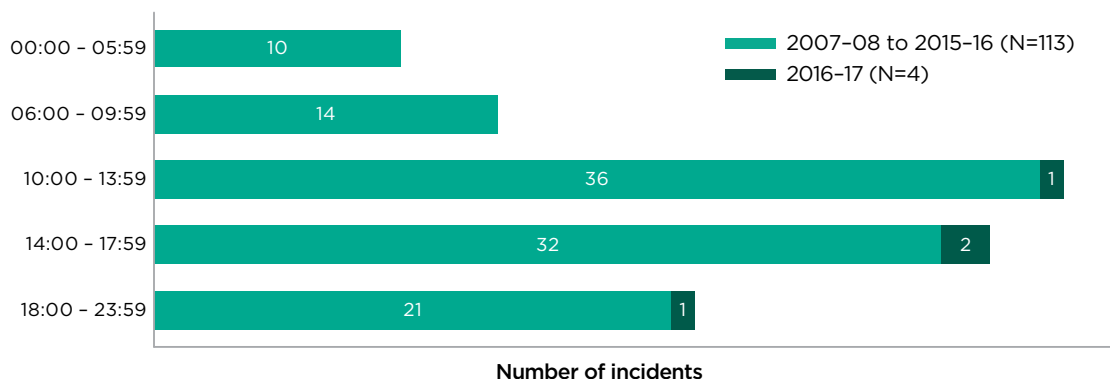


\* There were 1165 additional vessels involved in incidents overall over the last 10 years where the vessel length was not recorded, including 179 in 2016–17. The total number of vessels referred to in this graph (3153) includes these vessels and reflects the fact that some fatal incidents involved more than one vessel.

## 7.6 Time of day

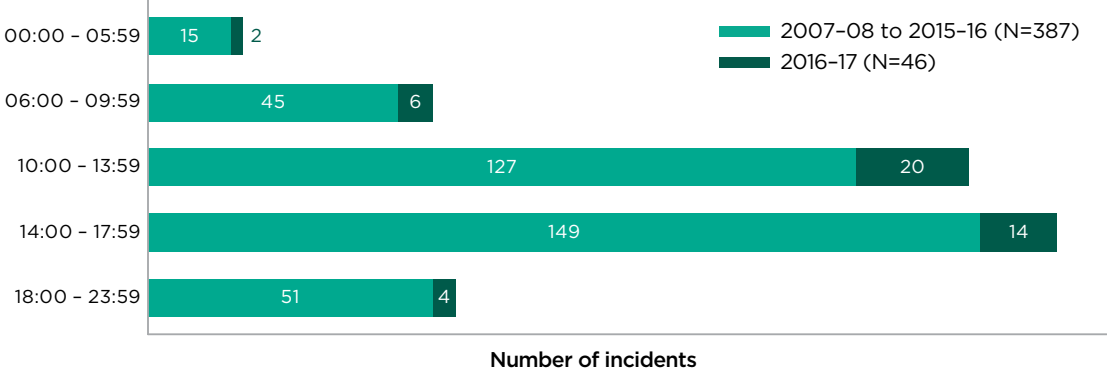
Most fatal incidents occurred around the middle of the day or in the afternoon (Figure 23). The period from 10:00 to 17:59 accounted for 71 of the fatal incidents recorded over the last 10 years (60.7% of the total). Three of the four fatal incidents recorded in 2016–17 occurred during this period.

**Figure 23: Number of fatal incidents by time period over the last 10 years (2007–08 to 2016–17), with the 2016–17 fatal incidents shown in dark green.**



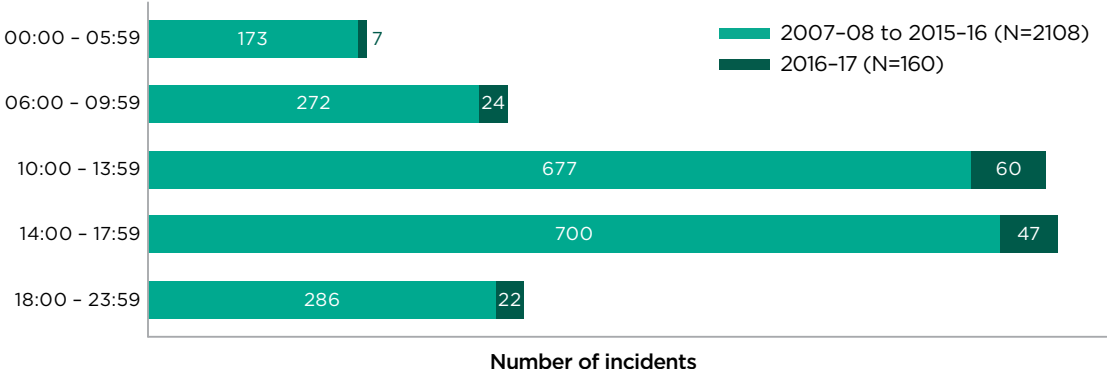
A similar pattern occurred with serious injury incidents (Figure 24), with the period 10:00 to 17:59 accounting for 310 of the serious injury incidents over the last 10 years (71.6% of the total). The distribution of serious injury incidents by time period in 2016–17 was very similar to that of the whole 10 years. 73.9% of serious injury incidents recorded during the year occurred in the 10:00 to 17:59 period.

**Figure 24: Number of serious injury incidents by time period over the last 10 years (2007-08 to 2016-17), with the 2016-17 serious injury incidents shown in dark green.**



The pattern with overall incidents was also similar (Figure 25), with the period 10:00 to 17:59 accounting for 1484 of the incidents overall over the last 10 years (65.4% of the total). The distribution of incidents overall by time period in 2016-17 was very similar to that of the whole 10 years. 66.9% of incidents recorded during the year occurred in the 10:00 to 17:59 period.

**Figure 25: Number of incidents overall by time period over the last 10 years (2007-08 to 2016-17), with the 2016-17 serious injury incidents shown in dark green.**



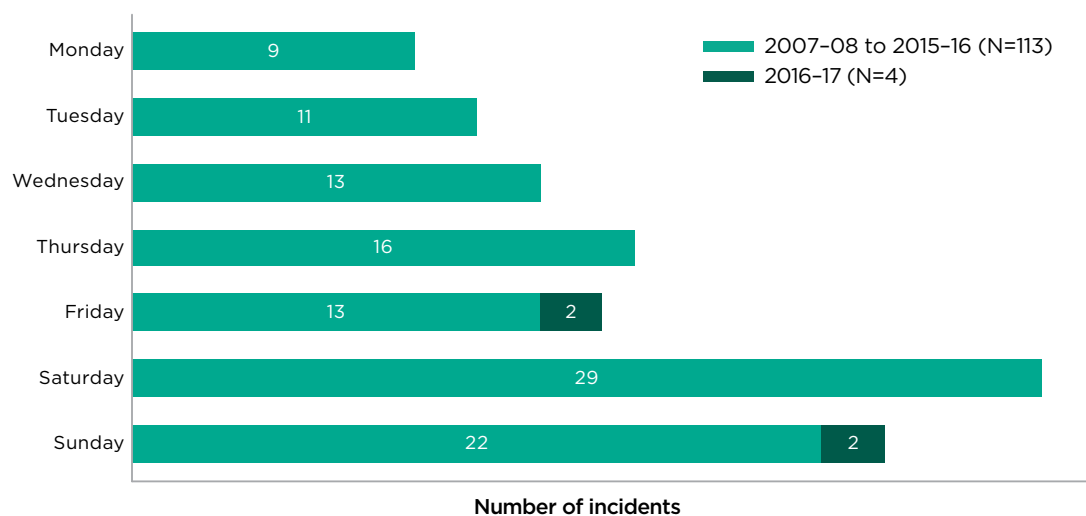
When divers or snorkellers are operating from a vessel, the blue and white alpha flag must be displayed, and a hi-viz addition is a good idea.

## 7.7 Day of week

The highest number of fatal incidents occurred on a Saturday (29 incidents, 24.8%) or a Sunday (24 incidents, 20.5%) – Figure 26. In total, weekends (not including public holidays) accounted for 45.3% of fatal incidents over the last 10 years, which is consistent with the higher levels of recreational boating activity on weekends compared with weekdays. Two of the four fatal incidents recorded in 2016–17 occurred on a weekend.

The proportions of fatal incidents recorded on the other days of the week were all considerably lower, ranging between 7.7% (Monday) and 13.7% (Thursday) over the 10 years.

**Figure 26: Number of fatal incidents by day of week over the last 10 years (2007–08 to 2016–17), with the 2016–17 fatal incidents shown in dark green.**



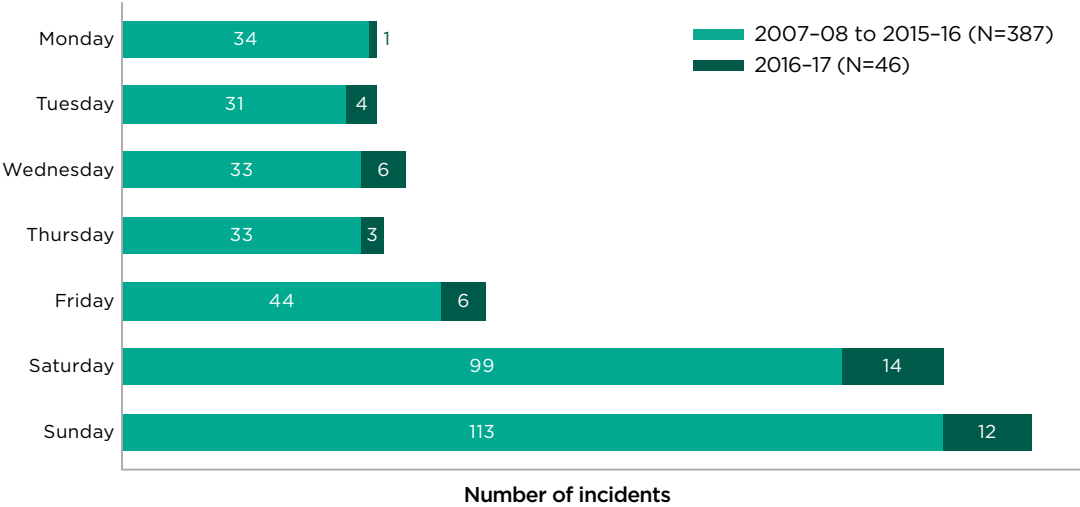
Serious injury incidents followed a similar weekly pattern (Figure 27) to that recorded for fatal incidents (Figure 26). Weekends accounted for 55.0% of serious injury incidents (238 incidents) over the last 10 years and 56.5% (26 incidents) in 2016–17.

The proportions of serious injury incidents recorded on the other days of the week were all considerably lower, although Friday (11.5% over the 10 years) was slightly higher than the remaining weekdays, which ranged between 8.1 and 9.0%.



Small 'tinnies' are relatively vulnerable to sudden capsizes – persons alone on small boats should wear a lifejacket at all times.

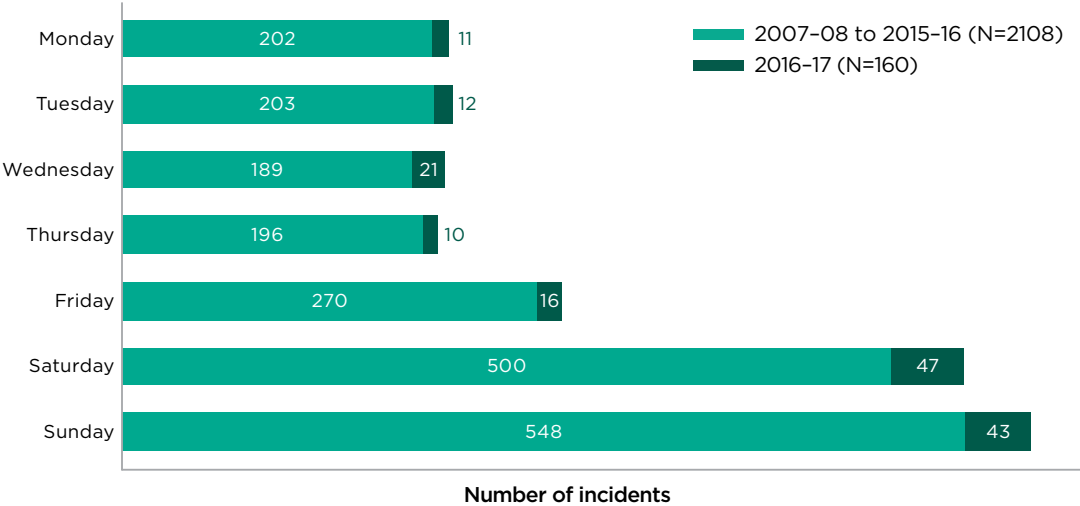
**Figure 27: Number of serious injury incidents by day of week over the last 10 years (2007-08 to 2016-17), with the 2016-17 serious injury incidents shown in dark green.**



Overall recreational boating incidents (Figure 28) followed a similar pattern to that shown for fatal incidents (Figure 26) and serious injury incidents (Figure 27). Weekends accounted for 50.2% of total incidents (1138 incidents) over the last 10 years and 56.3% (90 incidents) in 2016-17.

While the proportions of overall incidents recorded on the other days of the week were all considerably lower, the difference between Friday (12.6% over the 10 years) and the other weekdays (9.1 – 9.5%) was more clear cut.

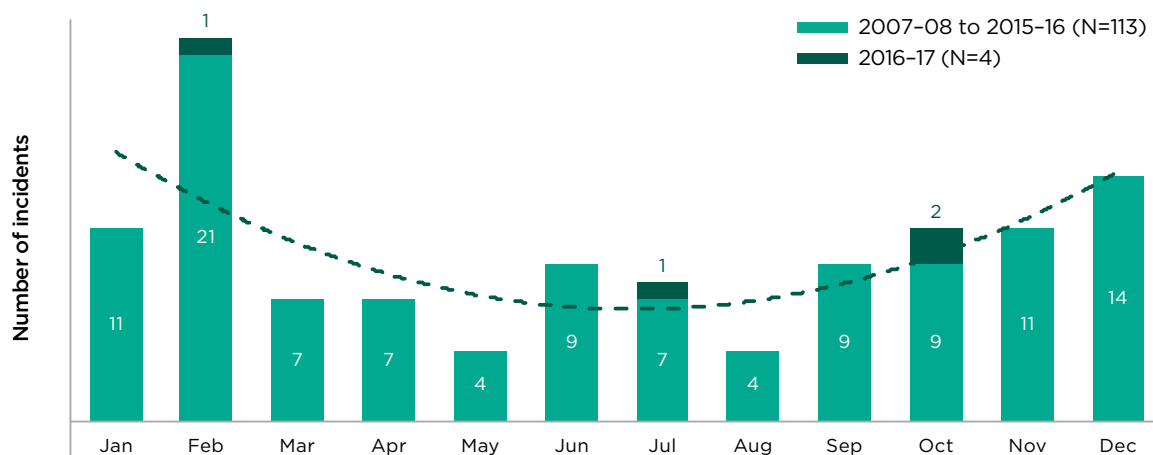
**Figure 28: Number of overall incidents by day of week over the last 10 years (2007-08 to 2016-17), with the 2016-17 incidents shown in dark green.**



## 7.8 Month

Fatal incidents over the last 10 years have shown a statistically significant seasonal pattern, with the highest numbers in the warmer months (Figure 29). This is consistent with the higher levels of boating activity expected during this part of the year. The seasonal pattern is evident despite considerable month-to-month variation. The highest number of fatal incidents occurred in February (22 incidents, 18.8%), while the lowest numbers occurred in May and August (each 4 incidents, 3.4%). The warmer half of year (October to March) accounted for 65.0% of all fatal incidents recorded over the 10 years. Three out of the four fatal incidents recorded in 2016-17 occurred in this period.

**Figure 29: Number of fatal incidents by month over the last 10 years (2007-08 to 2016-17),\* with the 2016-17 fatal incidents shown in dark green.**



\* Dashed curve indicates seasonal trend (2nd order polynomial fitted,  $R^2 = 0.41$ ;  $P < 0.05$ ).

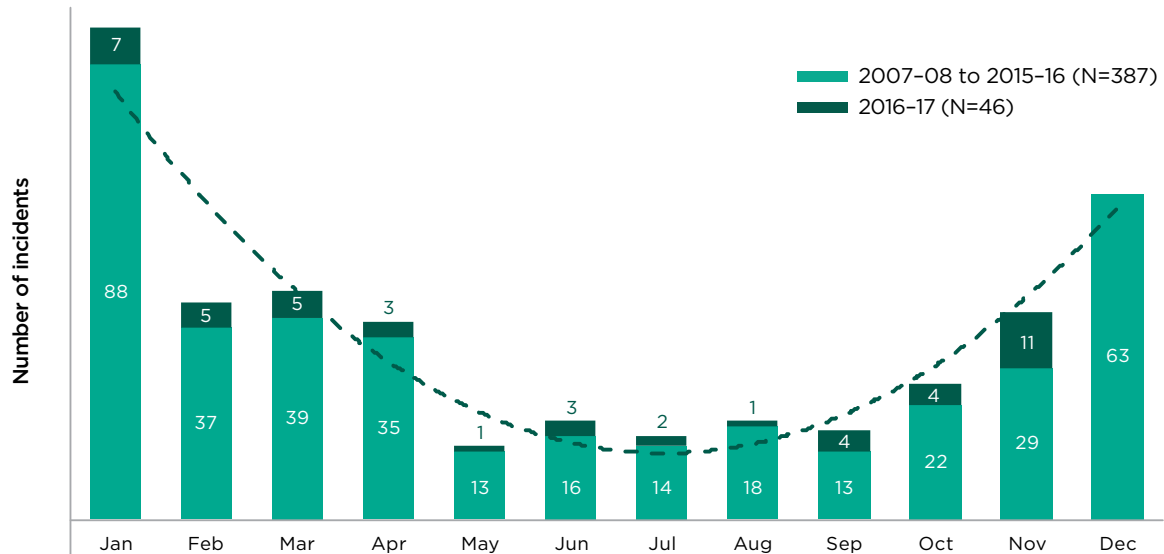
Serious injury incidents over the last 10 years have shown a statistically significant and very pronounced seasonal trend (Figure 30). The highest number of serious injury incidents occurred in January (95 incidents, 21.9%), followed by December (63 incidents, 14.5%). The lowest numbers occurred in May (14 incidents, 3.2%) and July (16 incidents, 3.7%). The warmer half of year (October to March) accounted for 71.6% of all fatal incidents recorded over the 10 years.

Monthly totals in 2016-17 broadly followed the long-term seasonal trend. However the proportion of serious injury incidents in November 2016 (11 incidents, 23.9%) was significantly greater than the 'expected' proportion of 9.9% based on the seasonal trend.



Staying in small groups provides greater safety for kayakers, especially on more exposed or remote waterways.

**Figure 30: Number of serious injury incidents by month over the last 10 years (2007-08 to 2016-17),\* with the 2016-17 serious injury incidents shown in dark green.**

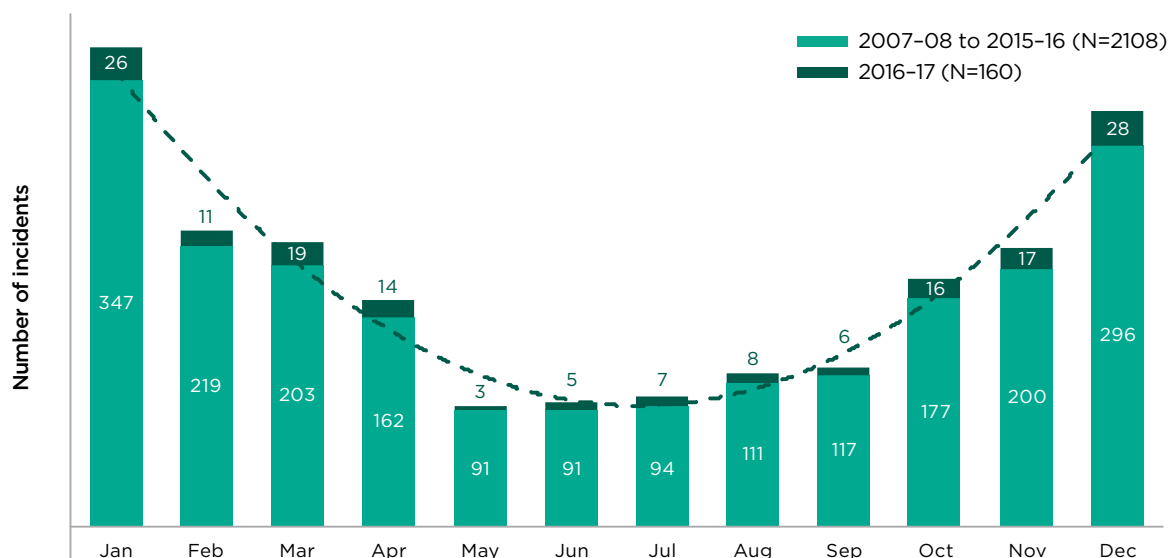


\* Dashed curve indicates seasonal trend (2nd order polynomial fitted, R2 = 0.88; P<0.01).

Recreational boating incidents overall over the last 10 years have also shown a statistically significant and very pronounced seasonal trend (Figure 31). The highest number of incidents occurred in January (373 incidents, 16.4%), followed by December (324 incidents, 14.3%). The lowest numbers occurred in May (94 incidents, 4.1%) and June (96 incidents, 4.2%). The warmer half of year (October to March) accounted for 68.7% of all incidents recorded over the 10 years.

Monthly overall incident totals in 2016-17 broadly followed the long-term seasonal trend.

**Figure 31: Total number of incidents by month over the last 10 years (2007-08 to 2016-17),\* with the 2016-17 incidents shown in dark green.**



\* Dashed curve indicates seasonal trend (2nd order polynomial fitted, R2 = 0.95; P<0.01).

## 7.9 Waterway type

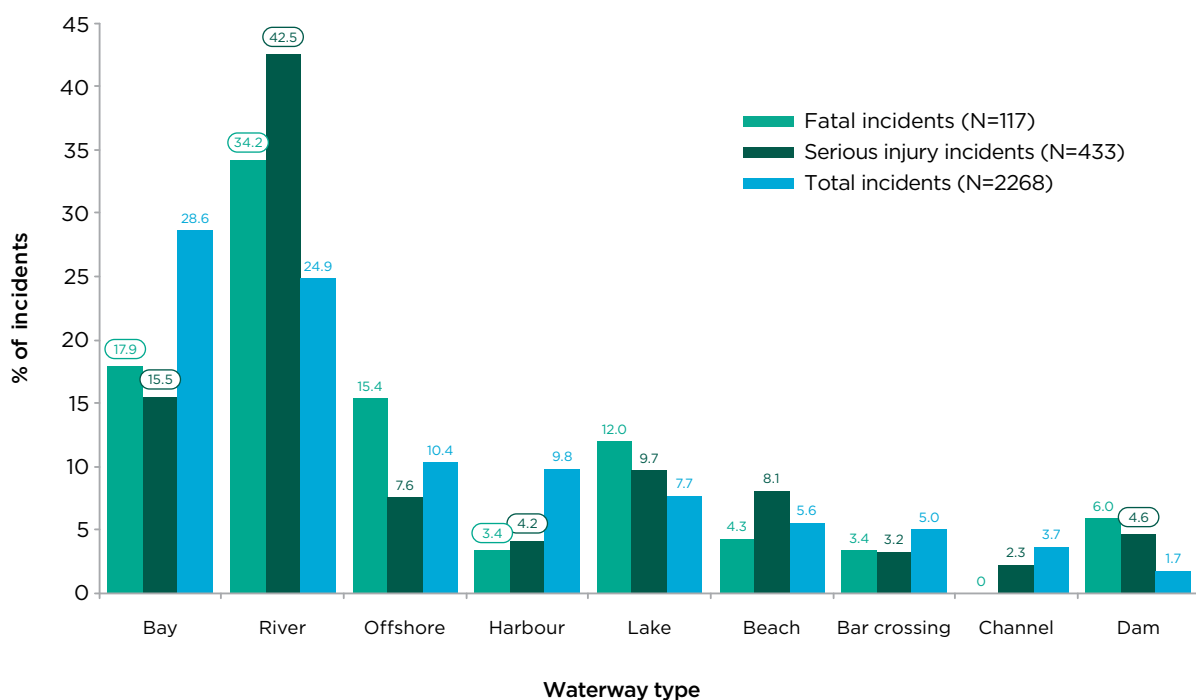
Recreational boating incidents were recorded on a number of different waterway types over the last 10 years, including on bays (28.6% of total incidents), rivers (24.9%) and offshore (10.4%). The majority of incidents occurred on what were presumably sheltered waters – 73.5% of fatal incidents, 76.4% of serious injury incidents and 72.7% of total incidents.

Figure 32 shows the relationship between incident severity and waterway type. While fatal, serious injury and total incidents all had broadly similar distributions among waterway types, there were a number of instances of fatal and/or serious injury incidents being relatively more or less prevalent on particular waterway types.

Both fatal and serious injury incidents were significantly more prevalent on rivers than were incidents generally (34.2% and 42.5% respectively versus 24.9%). A similar pattern was evident on dams (6.0% and 4.6% respectively versus 1.7%), although in this case the difference was statistically significant only for serious injury incidents.

Conversely, on bays and harbours, both fatal and serious injury incidents were significantly less prevalent than were incidents generally (3.4% and 4.2% respectively versus 9.8%).

**Figure 32: Distribution of fatal, serious injury and total incidents by waterway type for the last 10 years\***



\* Data labels highlighted with an outline indicate where the proportion of fatal or serious injury incidents is significantly different to the corresponding proportion of total incidents for a given waterway type (at  $P < 0.05$ ).

Figure 33 shows that each of the major waterway type had quite different incident type profiles. For example, bays, rivers, harbours, lakes and channels had relatively high numbers of collisions with another vessel, while rivers also had a relatively high numbers of collisions with a fixed object and towing incidents – towing activity being popular on rivers. Capsize incidents were spread across a wide variety of waterways, both sheltered and ocean, but were most numerous offshore. Most incidents where the vessel was recorded as being on a ‘bar crossing’ waterway were – naturally enough – either described as a bar crossing incident (i.e. an incident associated

with waves or currents encountered at the ocean entrance of a river or estuary) or a capsized incident. Incidents involving fire or explosion due to fuel, and incidents involving collisions with a submerged object, were both relatively common on rivers. At the same time, most people hit by a vessel were at a beach or river – both being places where swimmers and vessels are often in close proximity.

**Figure 33: Incident numbers over the last 10 years by incident type and waterway\***

Incident type/waterway type Last 10 years	Bay	River	Offshore	Harbour	Lake	Beach	Bar crossing	Channel	Dam
Collision with a vessel	332	169	19	128	57	17	0	30	1
Capsizing	44	40	71	17	23	28	41	13	4
Grounding	38	27	29	18	6	22	1	6	1
Collision with a fixed object	40	64	2	20	8	0	0	6	2
Towing incident	8	61	0	1	13	2	0	0	8
Fall overboard	24	18	11	4	10	9	2	5	6
Sinking	29	20	20	6	9	3	1	0	2
Swamping	22	11	21	1	7	8	5	1	3
Unknown	16	25	12	6	9	2	3	4	0
Bar crossing	1	0	1	0	0	1	60	0	0
Fire or explosion (Fuel)	6	37	1	1	10	0	0	3	3
Collision with a submerged object	10	30	9	1	7	0	0	2	2
Person hit by vessel	3	11	5	0	1	21	0	0	3
Fire or explosion (other than fuel)	14	10	7	2	5	1	0	2	1
Collision with a floating object	14	12	3	7	0	0	0	1	0
Injury onboard	14	8	6	3	1	3	0	3	0
Close quarter	14	5	3	4	2	0	0	5	0
Propeller injury	9	10	3	0	4	2	0	1	3
Fall in vessel	7	3	4	2	2	6	1	1	0
Hull splitting – structural failure	2	0	5	1	0	1	0	0	0
Flooding	0	0	3	0	0	1	0	0	0
Carbon monoxide inhalation	2	1	0	1	0	0	0	0	0
Collision with overhead obstruction	0	2	0	0	0	0	0	0	0

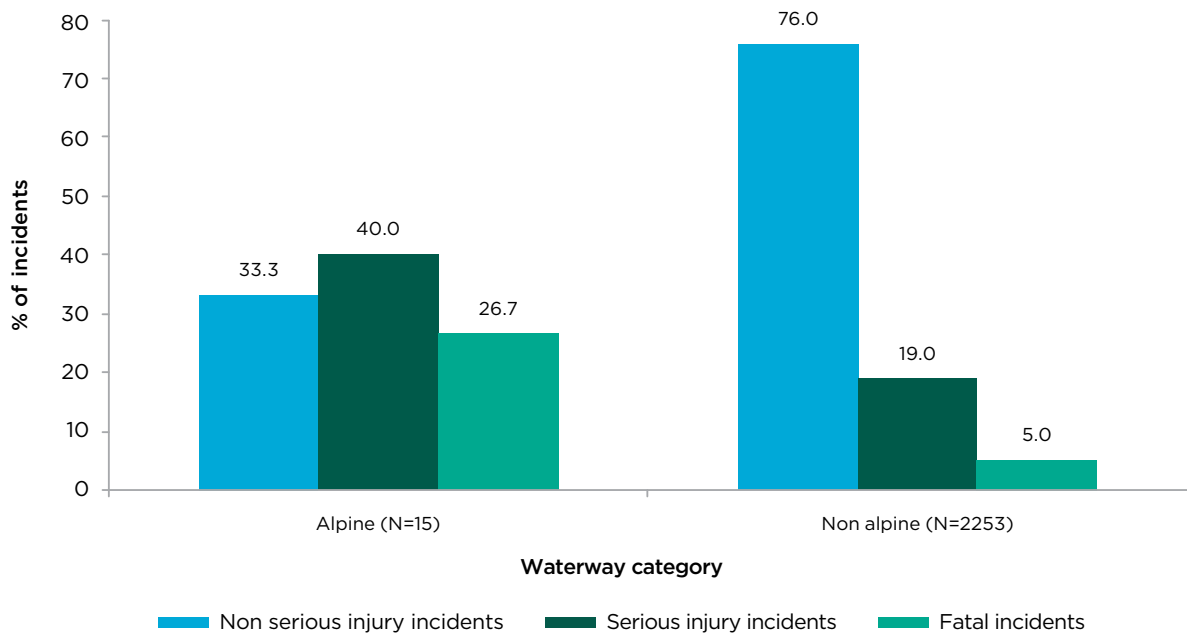
\* Larger incident numbers are highlighted in orange/red tones. Only includes incidents for which a specific incident type was recorded.

In addition to the waterway types recorded in the vessel incident database (Figures 32 and 33), the entire 10 year's incident data was searched for reference to any of the 'alpine lakes' – a set of specifically legislated waterways on the higher parts of the Great Dividing Range and associated tablelands. These waterways mostly consist of dams and lakes, and all have cold water throughout much of the year.



Figure 34 shows there were high percentages of both fatal and serious injury incidents on alpine waters over the last 10 years when compared with the corresponding percentages for non-alpine waters. Fatal and serious injury incidents together accounted for two-thirds of all incidents on alpine waters during this period, which was significantly greater than the corresponding percentage on non-alpine waters (24.0%).

**Figure 34: Percentage of recreational boating incidents by waterway category (alpine and non-alpine) and severity of incident for the last 10 years**



Sailing fleets have been leading the way on lifejacket wear for many years.

## 7.10 Boater age and gender

Fatalities occurred across all age ranges but with some tendency for higher numbers in the young adult to middle age groups (Figure 35) – nearly 52% of all recreational boating fatalities over the last 10 years were between 30 and 59 years of age.

However, when fatalities are considered in the context of boat licence numbers, a different picture emerges, with certain age groups being over or under-represented in terms of fatalities versus licence numbers (Figure 35).

People aged 80 years plus were significantly over-represented in recreational boating fatalities (6.8% of fatalities but only 1.3% of licences), while people aged 60 to 69 years were significantly under-represented (9.8% of fatalities versus 16.6% of licences). There was also some indication of over-representation in the 70–79 age range, but this was not quite statistically significant.

When broader age ranges are considered, a clear trend of under and over-representation emerges due to the larger sample sizes and greater consequent statistical power. Although the 30 to 59 age range accounted for 51.5% of fatalities, this age range is significantly under-represented given that it accounts for 60.9% of licences. Indeed, such under-representation applies across to the even broader 30–69 year age range (61.4% of fatalities versus 77.4% of licences). Conversely, the 70-plus age range is significantly over-represented (20.5% of fatalities but only 9.2% of licences).

**Figure 35: Percentage of recreational boating fatalities by person's age group for last 10 years, along with corresponding percentages of boat licences held in NSW.\***



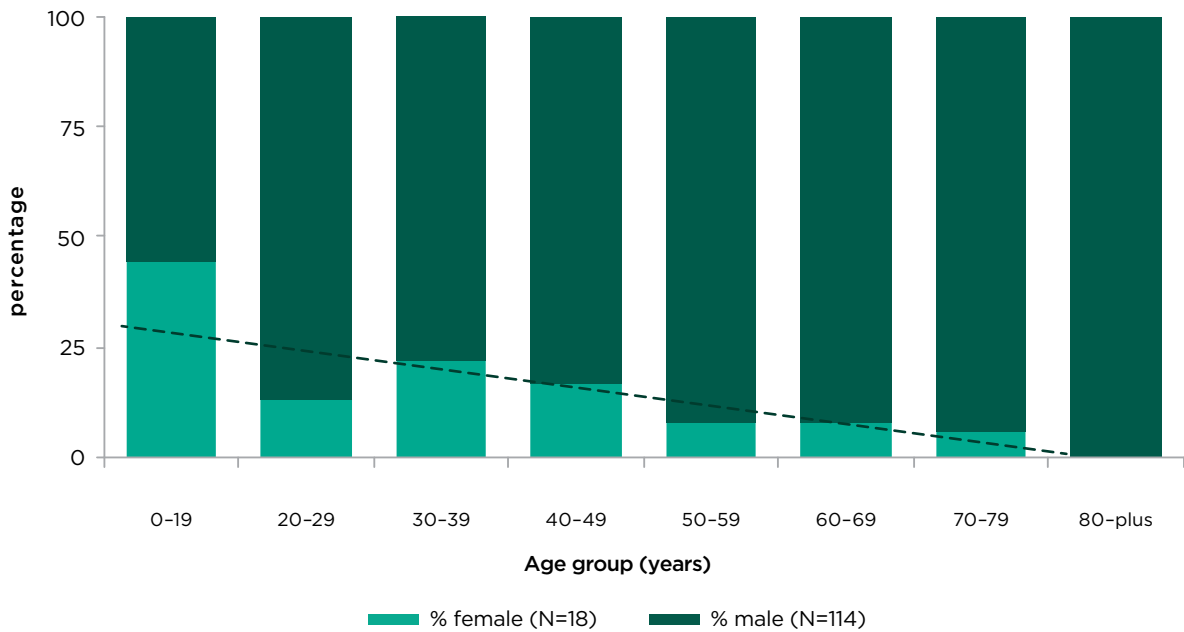
\* Licence numbers as at 1 July 2017. Data labels highlighted in solid colour where fatalities were significantly over-represented (light green;  $P < 0.05$ ) or under-represented (dark green;  $P < 0.05$ ) in comparison to licences. Data labels highlighted by outline only where there was some indication of over-representation (light green), but where the result of associated statistical testing was just outside strict significance ( $0.05 < P < 0.1$ ).

Three of the four fatalities recorded in 2016–17 were aged 50–59. The fourth fatality was aged 20–29. Two were male and one was female.

Of the 131 fatalities recorded over the last 10 years, 114 (86.4%) were male. Three out of the four fatalities recorded in 2016–17 were male.

While the large majority of fatalities over the last 10 years were male, Figure 36 shows that there is a significant age-related shift in associated gender proportions. Among the 66 fatalities recorded for people aged less than 50 years, the split was 78.8% male and 21.2% female. Among the 66 fatalities recorded for people aged 50 years or older, the split was 93.9% male and 6.1% female – a statistically significant shift. All nine of the fatalities aged 80 years or older recorded during the last 10 years were male.

**Figure 36: Gender proportions for fatalities by age group for last 10 years. Position of weighted regression line for % of females also shown\***



\* Linear regression significant at  $P < 0.05$ .  $R^2 = 0.70$ , with regression weighted according to number of observations in each age group.



PWC are increasingly popular on the state's waterways.

## 8 Drowning and lifejacket wear

Three of the four people killed in recreational boating incidents during 2016–17 were believed to have been wearing a lifejacket. Of these three people, two were involved in high speed collisions, where it is unlikely the lifejacket would have improved the outcome – one of the collisions was between two vessels and the other was between an inverted vessel and the water. The third person who was wearing a lifejacket drowned, possibly as a result of injury sustained at the time of the incident.

**Table 3: Summary of recreational drowning and lifejacket wear statistics for 2015–16, with long-term statistics provided for comparison.**

Period	Total recreational boating fatalities	Fatalities presumed due to drowning		Drowning victims who were wearing a lifejacket	
		Number	%	Number	%
2016–17	4	1	25.0	1	100.0*
Last 10 years (2007–08 to 2016–17)	132	97	73.5	15	15.5

\* It is not possible to make any statistical conclusion about the 2016–17 wear rate in comparison to that of previous years.

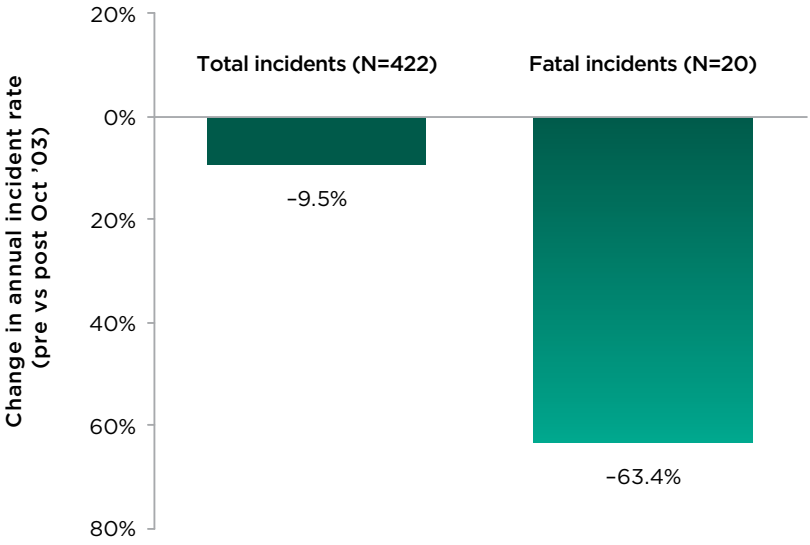
Of the 97 people presumed drowned since 2007–08, only 15 (15.5%) of these people are known to have actually been wearing a lifejacket (Table 3), meaning up to 82 lives could have been saved over this period if all presumed drowning victims had been wearing a lifejacket. This represents 62.1% of all recreational boating fatalities since 2007–08. Of these 82 people, the vast majority (78) are known to have not been wearing a lifejacket, while for four victims, the lifejacket-wear status is unknown. Over the last 10 years, 80.4% of those presumed drowned in recreational boating incidents (i.e. 8 out of 10) are known to have not been wearing a lifejacket.

There were no bar crossing fatalities in 2016–17, and there is a continued trend towards reduced bar crossing fatalities since the compulsory wearing of lifejackets (when crossing ocean bars) was introduced in October 2003 (Figure 37). Since that time (until 30 June 2017), the annual number of bar crossing fatal incidents among both recreational and commercial vessels has declined significantly – falling by 63.4% – from an average of nearly 1.2 per year to less than 0.5 per year. At the same time, the overall number of bar crossing incidents has remained relatively unchanged (17.4 per year before compulsory wear and 15.8 per year since – a decrease of just 9.5%).



Modern lifejackets come in a variety of styles that cater for all body shapes and types of boating activity.

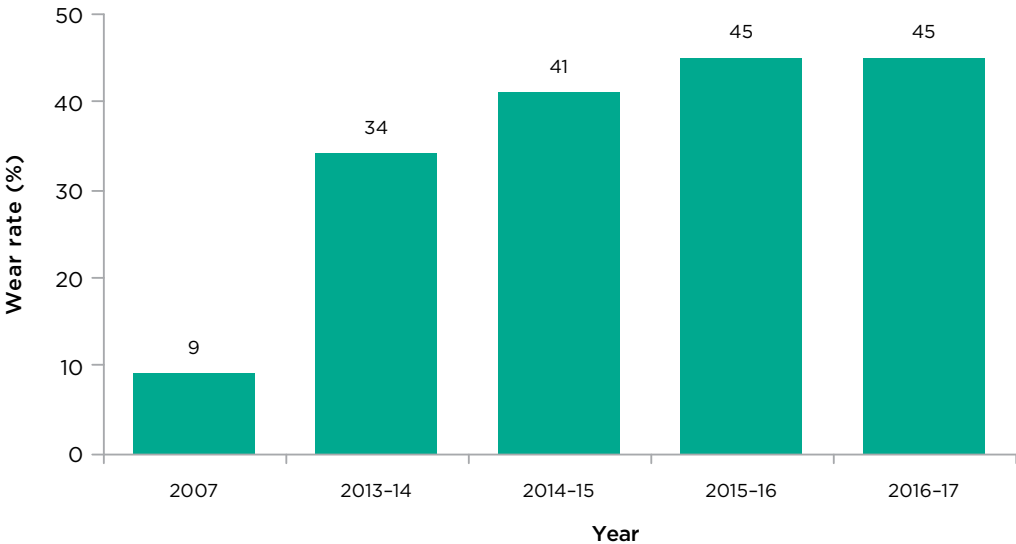
**Figure 37: Change in bar crossing incidents (for both recreational and commercial vessels) following compulsory lifejacket wear for crossing ocean bars.\***



\* The decline in fatal incidents is statistically significant (2 sample Z-test; P=0.018), based on comparison of two sets of annual fatal incident numbers (pre and post 1 October 2003), with partial year totals extrapolated upwards to equivalent whole year numbers where applicable. Based on data for calendar years 1992 to 2017 inclusive.

The overall lifejacket wear rate was estimated at 45% in 2016-17 (Figure 38), which represents a five-fold increase on the 9% recorded in 2007.

**Figure 38: Overall state-wide lifejacket wear rates through time.\***

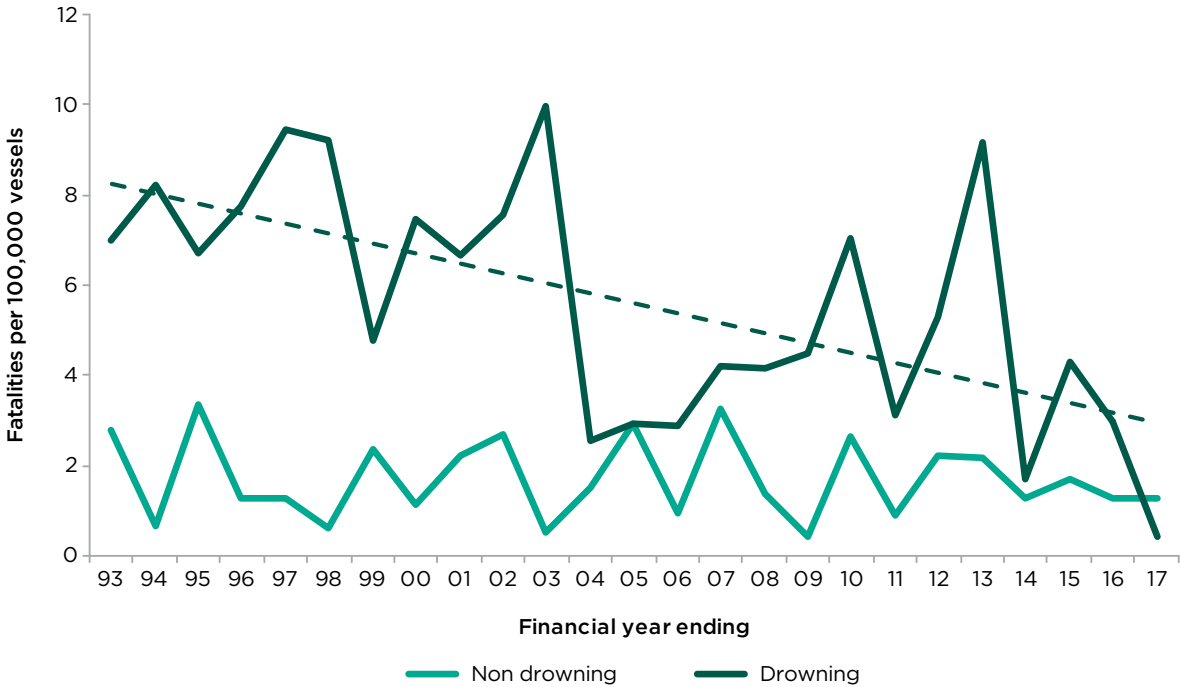


\* Data for 2007 from survey done by former National Marine Safety Committee; more recent data from lifejacket wear observational study conducted by Transport for NSW.

At the same time, there has been a long term decline in the rate of recreational drowning fatalities per 100,000 vessels (dark green line – Figure 39). Despite the large year-to-year fluctuations in the rate, this decline is statistically significant. In trend terms, the drowning fatality rate has declined from more than eight per 100,000 vessels in 1992-93 to approximately

three per 100,000 vessels in 2016-17 – a reduction of more than 60%. However, there has been no such decline in the non-drowning fatality rate (green line – Figure 39). Indeed, the non-drowning rate has remained steady, aside from year-to-year fluctuations, averaging just under two per 100,000 vessels.

**Figure 39: Long term trends in drowning\* and non-drowning fatality rates for recreational boating incidents.**



\* Linear regression for drowning fatality rate significant at P<0.01 (R2 = 0.37).



Dangerous choppy conditions can spring up with little warning even on normally sheltered waterways.

## 9 Commercial vessels

Commercial vessels in NSW are now regulated by the Australian Maritime Safety Authority (AMSA) under the Federal Government's Marine Safety (Domestic Commercial Vessel) National Law Act 2012. RMS acts as delegate of AMSA for commercial vessels within NSW and is responsible for waterway management. Commercial vessels have stringent requirements for crew qualifications, safety procedures and safety equipment. They are not, however, governed by the lifejacket wear rules applicable to recreational vessels – with the exception of the requirement for lifejackets to be worn when crossing an ocean bar.

There was a total of 95 incidents recorded in 2016-17 involving a commercial vessel (71 'commercial' incidents and 24 'commercial/recreational' incidents – Table 1). The vast majority of these incidents were relatively minor; 85 of the incidents (89.5%) resulted in either no injuries or just minor injuries. This proportion of minor incidents involving a commercial vessel is significantly greater than the corresponding proportion for incidents involving only recreational vessels (68.8%).

### 9.1 Incident type

Over the last 10 years, there were 13 fatal incidents involving just commercial vessels. There were no fatal incidents involving a commercial and a recreational vessel. Six of the commercial vessel fatal incidents (46.2%) were of the incident type "fall overboard". While this is greater than the corresponding percentage for recreational vessel incidents (28.2% – Section 7.1), the difference is not statistically significant. Propeller injury accounted for a further two commercial vessel fatal incidents (15.4%), while capsizing, collision with vessel, sinking and fire or explosion (fuel) accounted for one each.

Over the same period there were 108 commercial vessel serious injury incidents and 15 'commercial/recreational' serious injury incidents. Nearly one third (32.4%) of the commercial incidents involved an injury onboard, while a further 27.8% involved a fall in the vessel. Both these proportions were significantly greater than the corresponding proportions for recreational vessel incidents (6.5% and 5.1% respectively) and were far greater than that of the next most prevalent commercial incident type (5.6% for "fall overboard"). The most prevalent incident type amongst the commercial/recreational serious injury incidents was "collision with vessel", which accounted for more than half (53.3%) of these incidents. This proportion was significantly greater than the corresponding proportion for recreational incidents (12.0% – Section 7.1).



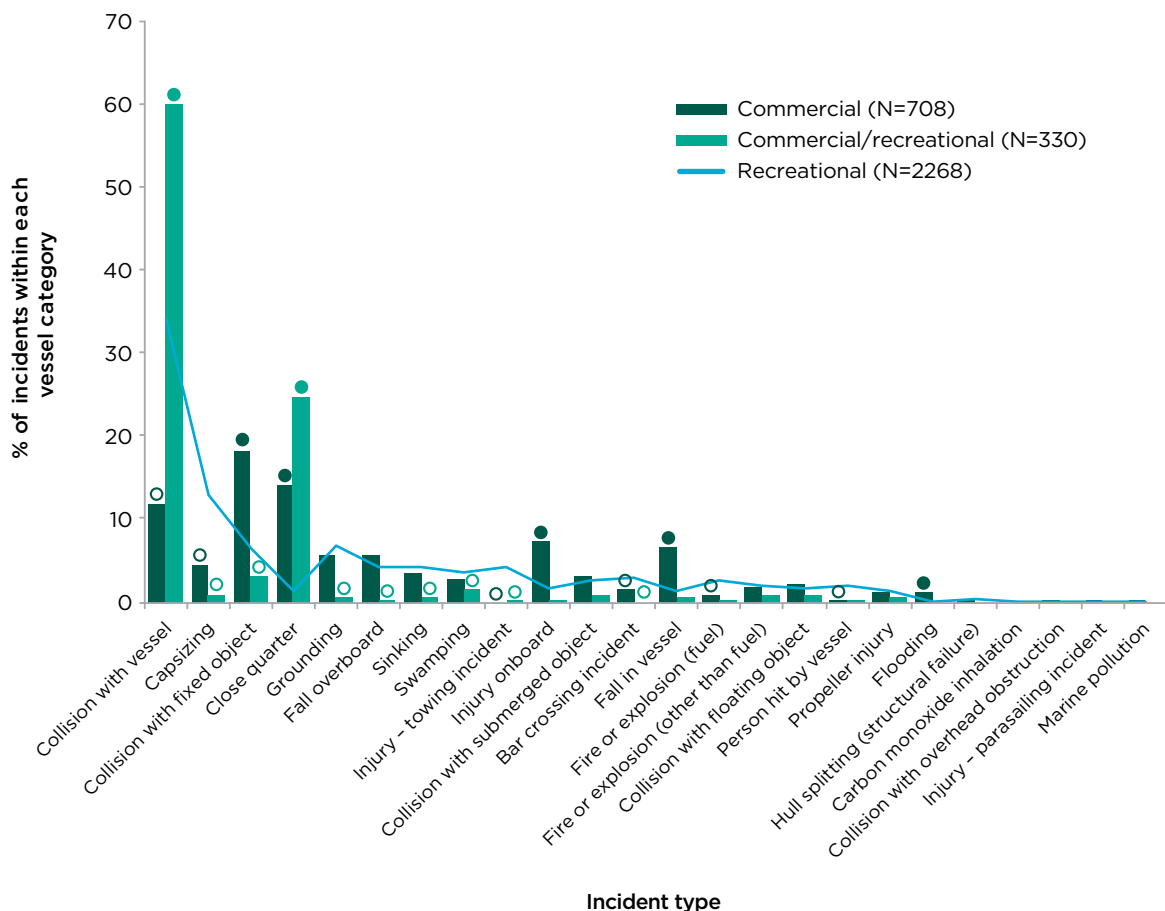
The safety of ferry travel is supported by stringent vessel crewing, operating and survey standards.

In terms of incidents overall, there were 708 commercial vessel incidents and 330 commercial/recreational vessel incidents over the last 10 years. Figure 40 provides a breakdown of incident types by incident category (commercial, commercial/recreational and recreational). The data is sorted by total incidents and recreational incidents are represented by the blue line for context.

Figure 40 shows that commercial and commercial/recreational incidents both have quite different incident type profiles when compared with recreational incidents.

For commercial vessel incidents overall, the incident types collision with fixed object (18.1%), close quarter (14.0%), injury onboard (7.2%), fall in vessel (6.5%) were all significantly more prevalent than was the case with recreational incidents, for which the respective proportions were 6.3%, 1.5%, 1.7% and 1.1%. Three other incident types were also prominent – collision with vessel (11.9%), grounding (5.5%) and fall overboard (5.5%). While collision with a vessel was the third most prevalent incident type recorded for commercial vessel incidents, its prevalence (11.7%) was significantly less than that recorded for recreational vessel incidents (34.0% – Section 7.1). For commercial/recreational vessel incidents overall, the incident types collision with vessel (60.0%) and close quarter (24.5%) dominated, and were both significantly more prevalent than they were with recreational incidents, for which the respective proportions were 34.0% and 1.5%.

**Figure 40: Percentage breakdown of incidents by incident type for the last 10 years,\* by incident category.**



\* Solid circles denote where the proportions of commercial incidents and commercial/recreational incidents are significantly greater than the corresponding proportion of recreational incidents for a given incident type (at  $P < 0.05$ ). Clear circles denote where these proportions are significantly less.



## 9.2 Incident cause

Among the 13 commercial vessel fatal incidents recorded over the last 10 years, no particular incidents causes stood out. Among the 108 commercial vessel serious injury incidents recorded during the last 10 years, the most prevalent causes recorded were lack of judgement (15.7%), weather conditions (12.0%), hazardous waters (7.4%) and bar conditions (5.6%). These proportions were all statistically similar to the corresponding proportions for recreational vessel serious injury incidents (14.8%, 5.8%, 4.6% and 1.8% respectively). Causes apparently related to rough seas, strong currents and/or bad weather (specifically weather conditions, hazardous waters and bar conditions) together accounted for 25% of commercial vessel serious injury incidents over the last 10 years – a significantly greater proportion than that applicable to recreational serious injury incidents (12.2%).

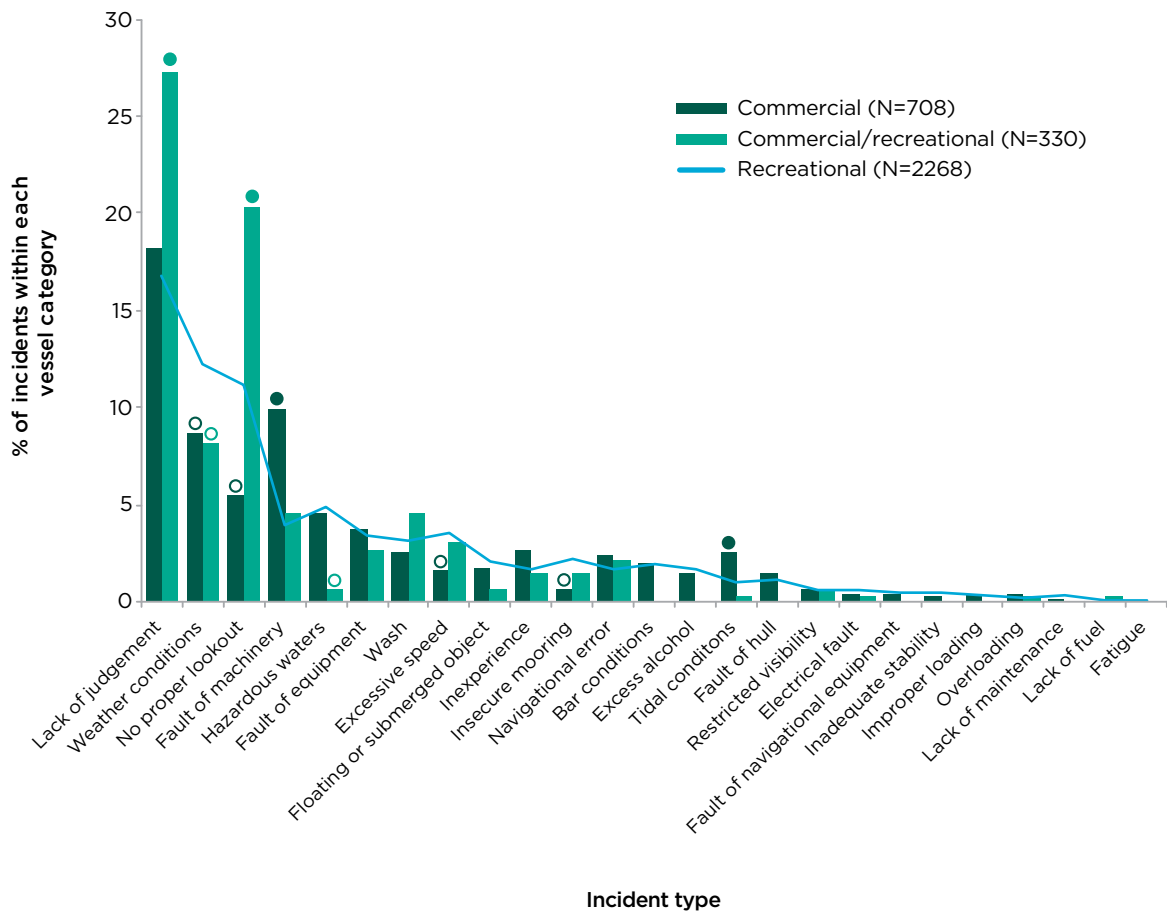
Amongst the 15 serious injury incidents involving both a commercial and a recreational vessel recorded in the last 10 years, the main single cause was no proper lookout. This accounted for six out of the 15 incidents (40%), a significantly higher proportion than that applicable to recreational serious injury incidents (11.1% – Section 7.2).

Figure 41 provides a breakdown of primary incident causes by incident category for all incidents over the last 10 years. The data is sorted by total incidents and recreational incidents are represented by the blue line for context. Figure 41 shows that commercial and commercial/recreational incidents both have quite different incident cause profiles when compared with recreational incidents.



Circular Quay is a major commercial vessel hub in Sydney Harbour, catering for large numbers of commuters and tourists.

**Figure 41: Percentage breakdown of incidents by incident primary cause for the last 10 years,\* by incident category.**



\* Solid circles denote where the proportions of commercial incidents and commercial/recreational incidents are significantly greater than the corresponding proportion of recreational incidents for a given incident cause (at  $P < 0.05$ ). Clear circles denote where these proportions are significantly less.

For commercial vessel incidents overall, lack of judgement (18.2%), fault of machinery (9.3%), weather conditions (8.6%) and no proper lookout (5.5%) were prominent. Of these, fault of machinery (9.3%) was significantly more prevalent than it was in relation to recreational vessel incidents (4.0%). A further incident cause – tidal conditions (2.5%) was also significantly more prevalent than it was in relation to recreational incidents (0.9%).

Amongst the 330 incidents overall involving both a commercial and a recreational vessel recorded over the 10 years, lack of judgement (27.3%), no proper lookout (20.3%) and weather conditions (8.2%) were prominent. Of these, lack of judgement and no proper lookout were both significantly more prevalent than they were in relation to recreational vessel incidents (of which they respectively accounted for 16.8% and 11.2% – Section 7.2).

### 9.3 Vessel type

Open runabouts, houseboats and fishing vessels each accounted for more than 20% of the vessels involved in commercial vessel fatal incidents recorded over the last 10 years (3 vessels each). There were no fatal incidents recorded on ferries or powered catamarans, which are the two vessel types that account for most large passenger-carrying vessels in NSW.

Powered catamarans and motor cruisers accounted respectively accounted for 17.5% and 14.9% of vessels involved in commercial vessel serious injury incidents. Other prominent vessel types with respect to serious injury incidents were inflatables (10.5), open runabouts (9.6%), sailing yachts (6.1%) and fishing vessels (5.3%). Ferries accounted for just 3.5% of vessels involved in commercial serious injury incidents.

Commercial vessel incidents overall were also most prevalent on powered catamarans (18.4% of all vessels involved), followed by ferries (9.7%), motor cruisers (9.1%) and fishing vessels (5.5%).

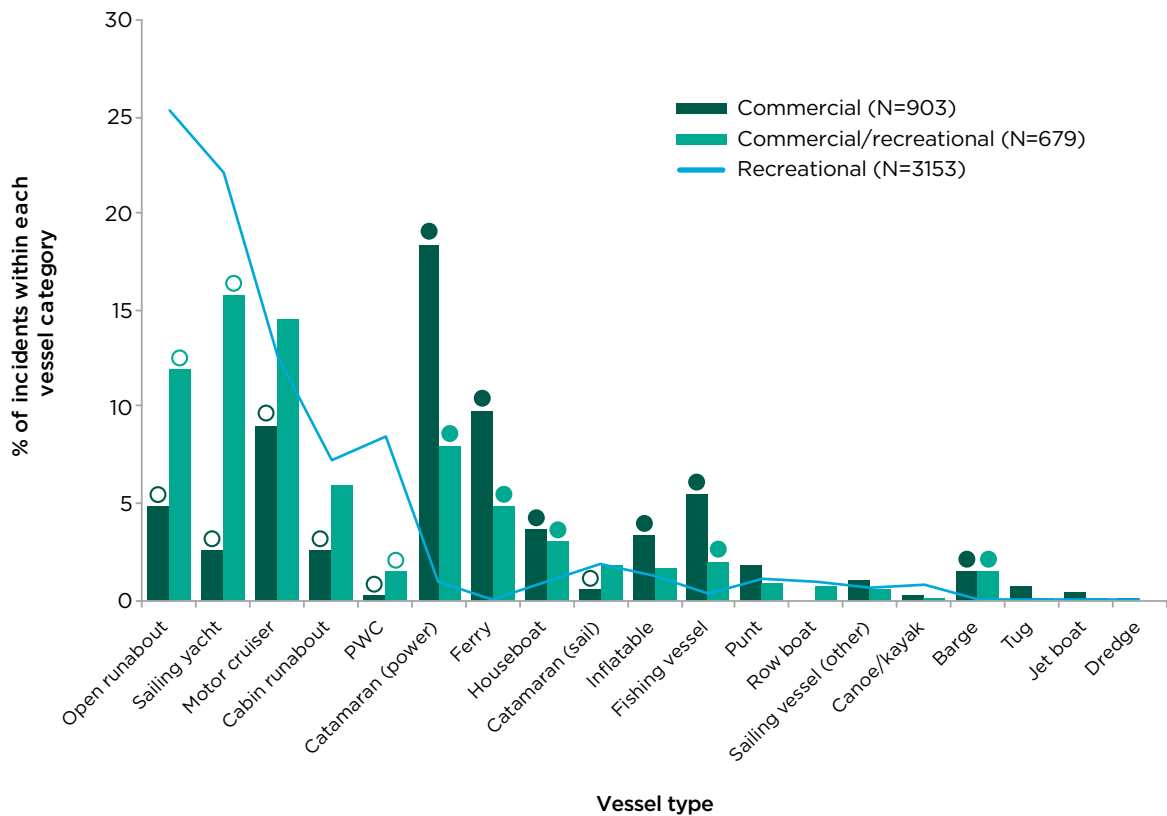


Commercial Adventure Vessels provide customers with a thrilling experience based on high speeds and radical manoeuvres.

Figure 42 highlights the large differences in the mix of vessel types involved in either commercial vessel incidents or 'commercial/recreational' incidents compared with the mix for recreational vessel incidents. Powered catamarans (18.4% versus 0.9%), ferries (9.7% versus 0.1%), houseboats (3.7% versus 0.9%), inflatables (3.3% versus 1.2%), fishing vessels (5.5% versus 0.3%) and barges (1.6% versus 0.1%) were all significantly more heavily represented in commercial vessel incidents than in recreational incidents. With the exception of inflatables, all of these vessel types were also significantly more heavily represented in commercial/recreational incidents than in recreational incidents.

Conversely, many of the main vessel types involved in recreational boating incidents (Section 7.4) were significantly less heavily represented in either commercial or commercial/recreational incidents than they were in recreational boating incidents (Figure 42). For example, open runabouts, sailing yachts, cabin runabouts and PWC respectively accounted for 4.9%, 2.7%, 2.5% and 0.3% of vessels involved in commercial incidents; the respective proportions for recreational incidents were 25.3%, 22.1%, 7.2% and 8.4%.

**Figure 42: Percentage breakdown of vessels involved in incidents by vessel type for the last 10 years,\* by incident category.**

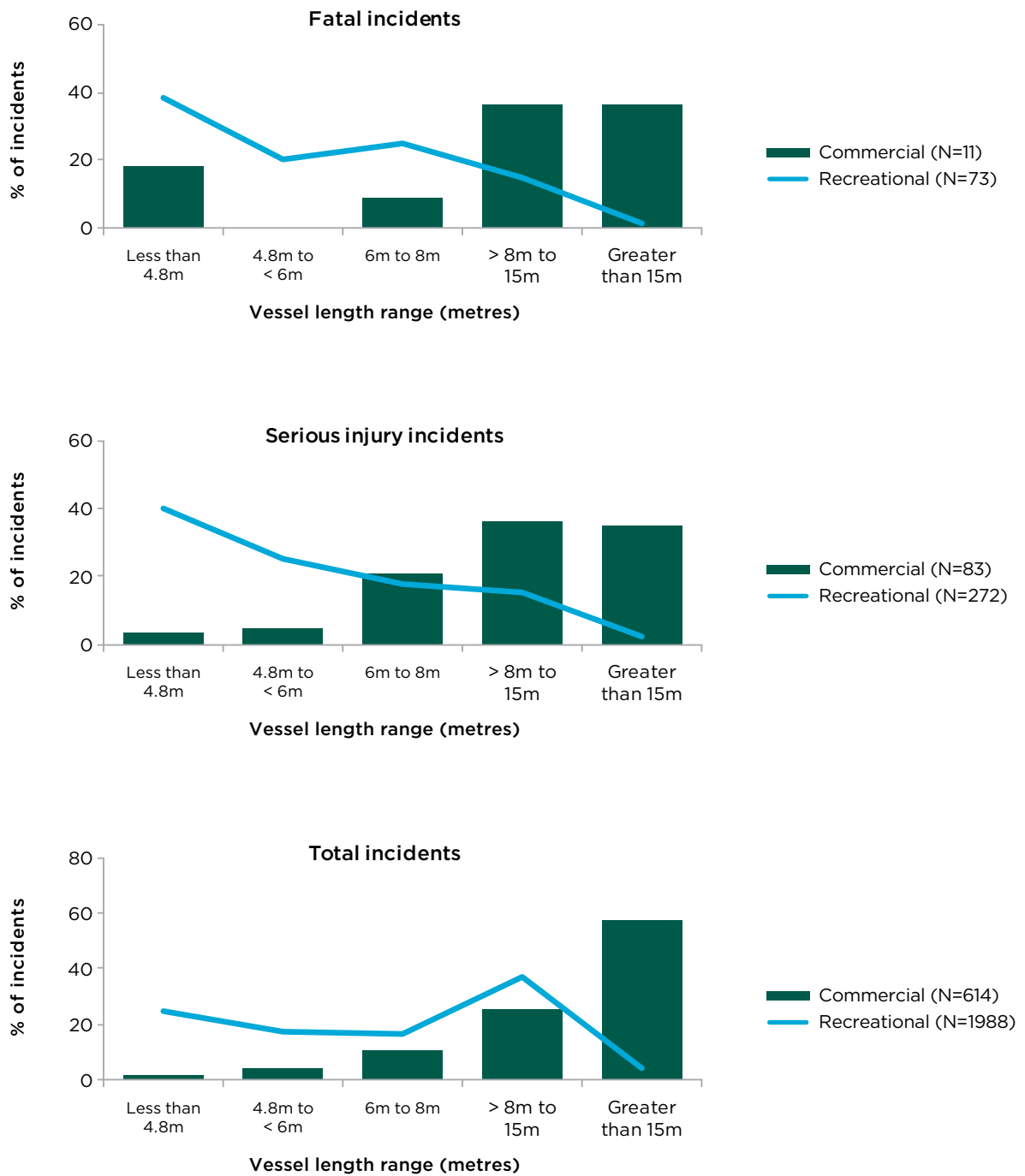


\* Solid circles denote where the proportions of vessels involved in either commercial incidents or commercial/recreational incidents are significantly greater than the corresponding proportion of vessels involved in recreational incidents (at  $P < 0.05$ ). Clear circles denote where these proportions are significantly less. There were 965 additional vessels involved in boating incidents over the last 10 years, where the vessel type was recorded as 'other/unspecified'. The total number of vessels referred to in this graph (4735) includes these 'other/unspecified' vessels and reflects the fact that some incidents involved more than one vessel.

## 9.4 Vessel length

Most commercial vessel incidents involve larger vessels, particularly those greater than 8 metres in length (Figure 43). 72.7% of vessels involved in commercial vessel fatality incidents where vessel lengths were recorded were greater than 8 metres in length. The corresponding proportions were similarly high for serious injury incidents (71.1%) and total incidents (83.2%). For recreational vessel incidents, the corresponding proportions were 16.4% for fatal incidents, 17.3% for serious injury incidents and 41.0% for total incidents. Recreational vessel incidents, especially those involving a fatality or serious injury, are more likely to involve smaller vessels (Section 7.5).

**Figure 43: Percentage of commercial vessels involved in commercial vessel incidents by vessel length range, with corresponding data for recreational vessels shown for comparison. Data is for last 10 years, and only includes vessels for which the length was recorded.**



# 10 Discussion and conclusions

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Towing sports such as wakeboarding are safest when done well away from potential hazards like hidden rocks and fallen trees.

## 10.1 Safety performance and incident trends in 2016-17

The four boating fatalities recorded in 2016-17 was the lowest recorded in at least 40 years. Along with the long-term downward trend in recreational boating fatalities – and especially drowning fatalities – this provides compelling evidence of that improved lifejacket wear rates are saving lives on the water. The continued long-term declines in both fatal and overall incident rates provide strong evidence of continued improvement in the overall safety of both recreational and commercial vessels.

While there have been continuing improvements in overall boating safety, there remains a clear dichotomy between the drowning fatality rate (which has declined significantly since the early 1990s) and the non-drowning fatality rate (which has not changed at all, apart from short-term fluctuations). There is also some dichotomy between the downward trend in recreational and commercial fatal incident rates and the lack of any such trends in relation to serious injuries. While these findings point to the success of the ongoing lifejacket wear campaign work, it also suggests that further work is required around issues like collision avoidance, speed and general boater behaviour.

Non-drowning fatalities as well as serious injuries remain a major concern. Both of these typically stem from collisions of one sort or another. The associated issues – such as speed, judgement, PWC use, towing, alcohol use and keeping a proper lookout – have been identified as key ‘problem definitions’ in the Maritime Safety Plan currently being prepared by Transport for NSW. The findings of this report in relation to each of those issues are examined in Section 10.2 below.

Encouragingly, incidents primarily related to vessel capsize and incidents attributed to bad weather were both proportionately less prevalent in 2016-17 than over the last 10 years. Incidents related to vessel capsize or bad weather are typically associated with drowning risk – through people being directly forced into the water, or through vessels getting into difficulty

during strong winds or large waves and subsequently being swamped, sunk or capsized. Better access to timely and accurate weather information and progressive improvements in vessel flotation and equipment standards may partly explain this reduction in incidents related to capsize or bad weather. Whatever the underlying reason, this reduction – if maintained – would certainly help drive further reductions in boating fatalities, especially those caused by drowning.

The relatively high proportion of boating incidents in 2016–17 that involved a vessel either participating in or training for organised competition points to some particular risks associated with competition – especially competition involving high speed powerboat racing or ski racing. Both these sports have suffered a number of high-profile fatalities in recent years. Risks related to high-speed competition include a greater potential for trauma in any collision (including with the water’s surface), the risk of sudden loss of control and the incentive for participants to push themselves and their vessels to their absolute limits. At the sort of speeds often attained in competitive powerboat or ski racing, there is very little time to react to (or even see) an unexpected hazard on the water. Even common hazards such as a piece of floating debris or the wash from a passing vessel can cause sudden and catastrophic loss of control in a way that would not normally happen in a general boating situation. For these reasons, the 2016–17 incident data serves as a reminder for the need for highest possible safety standards for vessels and participants in organised competition.

Sailing vessels accounted for a relatively high proportion of vessels involved in boating incidents during 2016–17, which raises several safety considerations. Because they are subject to the vagaries of wind direction and speed, sailing vessels typically have less precise control than do ordinary powered vessels. This can be an important consideration on congested waterways where a variety of boats are operating in a small area. Many sailing vessels are quite large, and do not stop or alter course as easily as some other vessel types. In addition to the demands of sailing per se, skippers of these vessels need to pay extra attention to keeping a lookout and avoiding collisions – especially if they are in close proximity to other sailing vessels (such as during a race). Unlike powered vessels, sailing vessels don’t require operator licencing, regardless of the size of the vessel or the speed at which it is being sailed.

Finally, an unusually high proportion of serious injury incidents in 2016–17 occurred in November. While the precise circumstances behind each of these incidents has not been examined, this result serves as a reminder to ‘start the boating season on a good note’ – and this includes on a number of fronts: checking your vessel and equipment, taking it easy if you haven’t been boating for a while, and taking extra care as the early season crowds hit the water.



When towing, there should always be an observer.

## 10.2 Key findings in relation to recreational vessel problem definition areas

This report makes a variety of findings pertinent to the 10 problem definitions identified in the Maritime Safety Plan. These findings, along with relevant comments, are listed below under each of the problem definitions. A general heading is provided at the end of the section to capture other key findings.

### Problem Definition 1 – Poor judgement

- Lack of judgement was the third most important cause identified for fatal incidents, accounting for 7.7% of such incidents.
- Lack of judgement was the main cause identified for serious injury incidents, accounting for 14.8% of such incidents.
- Lack of judgement was also the main cause identified for recreational boating incidents overall, accounting for 16.8% of such incidents.
- Human-related incident causes are known to have accounted for 32.5% of recreational boating fatality incidents over the last 10 years.
- Lack of judgement is a general description rather than a specific cause. It is most likely to be applied to a boating incident when a specific cause is not readily apparent or where the skipper exercised general poor decision making.
- The term ‘lack of judgement’ is potentially ambiguous, and should be discouraged in preference to more specific cause descriptors. Any incident cause related to human error or poor attitude could be arguably described as a lack of judgment... e.g. “the skipper exercised poor judgement in going out when bad weather was forecast” for which the primary cause (of the incident) might have been recorded as “weather conditions”.



A sudden vessel capsize can easily result in a drowning. However, in this case the wearing of lifejackets helped ensure a favourable outcome.



## **Problem Definition 2 – Lifejacket wear**

- Overall lifejacket wear rates have increased from 9% in 2007 to 45% in both 2015–16 and 2016–17.
- The rate of drowning fatalities for recreational boating incidents has continued a long-term downward trend, and has fallen by more than 60% since the early 1990s. At the same time, the non-drowning rate has remained steady.
- Fatal bar-crossing incidents have fallen by approximately 63% since lifejacket wear was made compulsory when crossing an ocean bar in October 2003. The corresponding decrease for total incidents was just under 10%.
- These two findings strongly suggest, but do not prove, that increased lifejacket wear has strongly contributed to the downward trend in the rate of recreational boating fatality incidents.
- Nevertheless, over the last 10 years, 8 out of 10 people presumed drowned in recreational boating incidents were not wearing a lifejacket.
- Despite recent reductions in the drowning fatality rate, drownings still account for about two-thirds of all recreational boating fatalities – and so there is still scope for reducing fatalities further by increasing lifejacket wear rates.

## **Problem Definition 3 – PWC risk management**

- PWC were involved in two out of the four boating fatalities recorded in 2016–17, although their general rate of involvement in boating fatalities is quite low (at just over 3% of all vessels involved in fatal incidents over the last 10 years).
- PWC accounted for 16.4% of all vessels involved in recreational boating serious injury incidents over the last 10 years. This was second behind only open runabouts. As at 30 June 2017, PWC accounted for 5.5% of vessel registrations.
- There were 24 incidents in total involving a recreational PWC in 2016–17, including nine serious injury incidents and two fatality incidents.
- While PWC are involved in a relatively high number of boating incidents, especially serious injury incidents, the incidents involving PWC tend to occur in specific circumstances:
  - in the warmer months (more than 80% between October and March)
  - during the afternoon (more than three-quarters after midday, and 56% on or after 2pm)
  - on particular waterways (27% occurred on the Georges River/Botany Bay waterway)
  - involving collisions (nearly 50% were collisions with another vessel)
  - involving poor judgement, attention and/or attitude (24% lack of judgement, 19% no proper lookout and 7% excessive speed).

## **Problem Definition 4 – Towing activities**

- Incidents described as “towing incidents” accounted for 9.4% of fatal incidents, 15.9% of serious injury incidents and 4.3% of incidents overall.
- Towing incidents, at 15.9%, were the most common incident type recorded for serious injury incidents over the last 10 years.

- 9.6% of vessels involved in fatal incidents were reportedly involved in towing activities at the time. Of these, 75% were involved in waterskiing.
- 18.5% of vessels involved in serious injury incidents were involved in towing activities. Of these, 36.8% were recorded as being involved in waterskiing, followed by aquaplaning (27.4%) and wakeboarding (15.8%).
- 5.7% of vessels involved in incidents overall were reportedly involved in towing activities. Of these, 39.4% were involved in waterskiing, followed by aquaplaning (18.3%) and wakeboarding (13.9%).
- The high percentage of serious injury incidents in January over the last 10 years (21.9%) likely reflects the popularity of towing activities in the summer school holidays.
- The high prevalence of serious injury incidents (42.5%) on rivers likely reflects the popularity of this type of waterway for towing activities.



Towing can be simple and fun — provided all the proper safety precautions are followed.

### **Problem Definition 5 – Cold water**

- A degree of cold shock can occur, for some people, even in waters warmer than 20 degrees. However, dangerous cold shock becomes likely at temperatures below about 15 degrees.
- Most of the state’s waterways will typically experience temperatures below 15 degrees during the cooler months of the year. Alpine waters may experience these temperatures at any time.
- Although there were relatively few boating incidents on alpine waters over the last 10 years, two-thirds of these resulted in either a serious injury or fatality. This is a much higher proportion than for non-alpine waters (24.0%).
- Wearing a lifejacket greatly mitigates the risks associated with sudden immersion in cold water, such as through a vessel capsize or sinking. Wearing a lifejacket helps an accident victim manage the initial cold shock, and helps to delay the onset of exhaustion and hypothermia.

- Relatively few fatal incidents over the last 10 years occurred in the cooler months of the year, with 35.0% occurring between April and September. When a similar analysis was performed for the 10 years to 30 June 2012, the corresponding percentage was 47.9% (i.e. nearly half)<sup>2</sup>
- The shift towards a more seasonal pattern in boating fatality incidents reflects the positive impact of increased lifejacket wear rates on drowning fatalities (which previously often occurred in the cooler months, when cold water was more of a hazard).
- Incidents in which a victim was forced into the water (capsize, fall overboard, sinking, swamping or bar crossing incident) accounted for 69.2% of fatal incidents over the last 10 years.
- Based on the above figures, it is estimated that 24% of all fatal incidents over the past 10 years occurred in circumstances where cold water was a potentially a major issue (based on 69.2% multiplied by 35.0%).

### **Problem Definition 6 – Paddle and oared craft risk management**

- Canoes, kayaks and rowing boats together accounted for 8.8% of the vessels involved in fatal incidents over the last 10 years.
- As a group, they were equal to sailing vessels – and behind only open runabouts.
- However, this group accounted for only 1.0% of the vessels involved in serious injury incidents and 1.7% of vessels involved in incidents overall.
- Paddle and oared craft are particularly prone to capsizing. Vessel capsize was the main incident type recorded for recreational boating fatality incidents over the last 10 years, accounting for 34.2% of all such incidents.
- The small size and low profile of most paddle and oared craft also makes them prone to collisions and incidents caused by lack of a proper lookout.

### **Problem Definition 7 – Speed**

- Excessive speed accounted for 9.4% of recreational boating fatality incidents, 5.5% of serious injury incidents and 3.6% of incidents overall.
- The proportion of fatal incidents attributed to excessive speed (9.4%) was significantly higher than the corresponding proportion for incidents overall (3.6%).
- Excess speed ties closely with collisions and not keeping a proper lookout.
- Collisions of one type or another accounted for 12.8% of recreational boating fatality incidents, 42.0% of serious injury incidents and 54.9% of incidents overall.
- Not keeping a proper lookout accounted for 5.1% of recreational boating fatality incidents, 11.1% of serious injury incidents and 11.2% of incidents overall.
- Collision risk is a function of two main components, speed (via stopping or manoeuvring distance) and lookout (via available reaction time). Given the key role speed plays in this relationship, and the high percentage of incidents involving some sort of collision, it is very likely that excess speed – one that is excessive for the circumstances at the time – is a contributory factor in a much higher percentage of incidents than the available reporting suggests.

<sup>2</sup> Transport for NSW. Boating incidents in NSW – Statistical report for the 10-year period ended 30 June 2012.



High speeds reduce available reaction times in the event of a sudden hazard.

### **Problem Definition 8 – Excess alcohol**

- Excess alcohol accounted for 6.0% of recreational boating fatality incidents, 3.7% of serious injury incidents and 1.7% of incidents overall.
- The proportion of serious injury incidents attributed to excess alcohol (3.7%) was significantly greater than the corresponding proportion for incidents generally (1.7%).
- For fatal incidents, the corresponding difference (6.0% versus 1.7%) was just outside statistical significance.
- Excess alcohol is well known to significantly impair judgment, decision making, coordination, reaction times and survival abilities in cold water. It increases self-confidence, particularly at moderately high levels of consumption, whilst simultaneously impairing one's actual abilities.
- The fact that alcohol both increases the risk of an incident happening (over confidence, lack of judgement, excessive speed, delayed reactions) as well as the consequences of an accident (poorer ability to cope with cold water, poorer self-rescue and poorer reactions in protecting oneself from injury in an impending collision) means that excess alcohol may be a contributing cause for a large percentage of boating accidents.

### **Problem Definition 9 – Weather conditions**

- Weather conditions, at 12.8%, was the main cause recorded for recreational boating fatality incidents over the last 10 years.
- Weather conditions were also recorded as the primary cause for 5.8% of serious injury incidents and 12.3% of boating incidents overall over the last 10 years.
- The proportion of overall incidents attributed to weather conditions was significantly lower in 2016-17 (7.5%) than over the last 10 years (12.3%).
- Weather conditions are fundamental to the boating environment, particularly on open and more exposed waters. Weather affects sea state, visibility and air temperature – and with some lag, water temperature. Not only do weather conditions affect the likelihood of an

incident occurring, they also strongly affect the consequences of an incident (e.g. ease of rescue) – especially where people are forced into the water or are on a disabled craft.

- It is therefore likely that weather contributes to a higher percentage of boating incidents than the available reporting suggests.

### **Problem Definition 10 – Proper lookout**

- The lack of a proper lookout was cited as the primary cause of 5.1% of recreational boating fatality incidents, 11.1% of serious injury incidents and 11.2% of incidents overall over the last 10 years.
- Given the link between lookout, speed and collision risk, as discussed under Problem Definition 7 above, it is likely that the lack of a proper lookout is a factor in many incidents attributed primarily to excessive speed, or described as a collision of one sort or another.
- It is therefore likely that lack of a proper lookout contributes to a greater proportion of incidents than available reporting suggests.



Keeping a proper lookout is vital at all times when on the water.

### **Other potential issues identified by this report's findings**

There are several areas related to boating safety that are raised in this report but which are not covered under the 10 Problem Definitions outlined above:

- Organised competition, specifically powerboat and ski racing, is an emerging safety issue. 8.6% of vessels involved in incidents in 2016–17 were participating in organised competition or associated training, which is a significantly higher proportion to that over last 10 years.
- Incidents involving sailing vessels were also more prominent in 2016–17 (34.1% of boating incidents) versus 22.1% over the last 10 years. While sailing vessels don't normally travel at high speeds, they are more difficult to control than ordinary power vessels. They are also typically operated in congested areas, often in close proximity other sailing vessels.
- People in the 70-plus age range are significantly over-represented in boating fatalities (20.5% of fatalities but only holding 9.2% of licences). While a definitive assessment of relative risk requires boating usage data, it is likely that a combination of medical issues

and reduced physical abilities increase both the likelihood and consequences of a boating incident for older boaters. This issue is likely to increase in coming years, as greater numbers of 'baby boomers' move into retirement – in many cases participating in boating.

- 86.4% of boating fatalities over the last 10 years were male. Without actual usage data by gender, it is not possible to determine how much this figure is caused by boating being more popular with males, or how much it is due to perceived male behaviours such as greater risk-taking, more ambitious boating journeys etc. Nevertheless, it is clear that males, particularly those in small boats, remain a key target audience for campaigns aimed at improving boating safety.
- Vessel wash accounted for 22 recreational serious injury incidents in the last 10 years (5.1% of the total). Wash is often seen more as a nuisance or an environmental issue rather than a safety issue – however statistics show that wash causes a considerable number of serious injuries. Injuries can result from impacts or falls caused by hitting wash at high speed or can occur when people below decks are caught by surprise by sudden rocking. Wash can also swamp or capsize small vessels.
- Secure does not necessarily mean safe. Vessels reportedly 'secured' in some way (i.e. at anchor, moored or berthed) accounted for 11.2% of all vessels involved in fatal incidents, 6.0% of vessels involved in serious injury incidents and 21.2% of those involved in incidents overall. Moored vessels alone accounted for 12.1% of all vessels involved in recreational boating incidents overall over the last 10 years. Moored vessels can be involved in a variety of incidents, including being hit by vessels underway or being broken adrift during stormy weather.



PWC, with their water jet propulsion, handle differently to most other powered vessels on the market.

## 10.6 Long term incident patterns related to commercial vessels

Commercial vessels are typically used very differently to recreational vessels. They frequently carry large numbers of passengers and are usually used for longer periods and more often. They may undertake demanding and dangerous work (like fish trawling or installing infrastructure) and are often used on busy congested waterways. These factors essentially explain the differences between commercial vessel incident patterns and those related to recreational vessels – even in the absence of comprehensive usage or exposure data.

It is notable that the proportion of commercial vessel fatal incidents where a person falls overboard remains high – at nearly 50%. While these incidents occur in a variety of circumstances, common features that emerge are falling from a houseboat or large charter vessel – moored or at anchor – whilst possibly under the influence of alcohol or drugs, and falling from a moving fishing vessel whilst working alone.



Commercial vessels are required to carry high levels of safety equipment.

For commercial vessel serious injury incidents and commercial vessel incidents overall, both injury onboard and falls in a vessel stand out among incident types. These together accounted for approximately 60% of commercial vessel serious injury incidents and nearly 14% of overall incidents. The high proportion of injuries related to falls and other mishaps onboard reflects the large number of passengers carried on vessels such as ferries and large charter vessels – which make up a large proportion of the commercial vessel fleet. These vessels have heavy operating schedules, can get quite crowded and often have multiple decks with stairways etc. On smaller vessels, such as fishing trawlers and Commercial Adventure Vessels (CAVs), injuries or falls on board are more likely to relate to the specific nature of the vessel's operation – e.g. heavy equipment and slippery pitching decks on fishing vessels and radical and/or high speed manoeuvres with the CAVs.

For commercial/recreational incidents, collisions and close quarter situations dominate, which is to be expected given that these incidents – by definition – involve at least two vessels. While close quarter incidents aren't likely to cause injuries or damage, their reporting can help identify underlying risks. By addressing these risks, more serious incidents can potentially be averted.

Commercial vessels are typically affected by a large number of relatively minor incidents – such as low speed collisions – that would not typically be reported by recreational vessel operators. Based on the likely hours travelled and passengers carried, commercial vessels are relatively safe. While the overall commercial vessel incident rate is trending downwards, as is the corresponding fatal incident rate, the nature of commercial vessel operations and passenger loads means there remains the potential for a heavy casualty count in a given incident.

Among incident causes in commercial vessel serious injury incidents, causes related to rough seas, strong currents and/or bad weather stand out – accounting for more than twice the proportion of incidents than they do on recreational vessels (25% versus 12%). This may point to some tensions between safety considerations around weather or sea conditions and commercial or operational pressures.

With respect to commercial/recreational serious injury incidents, as might be expected, collisions with another vessel dominated. In many cases, the commercial vessel will be the larger vessel in such incidents, and will often have had ‘right of way’. The commercial skipper is also likely to be more experienced than their recreational counterpart. The prevalence of these incidents serve as a reminder that under the international collision regulations, all vessels in a developing close quarter situation have an obligation to keep a proper lookout and to take all necessary steps to avoid a collision – even if they have right of way.

Examination of incident causes amongst commercial vessel incidents overall shows that machinery issues are relatively common. This reflects the large and complex engines and ancillary systems on board many commercial vessels. However, the vast majority of incidents caused by engine or machinery breakdown are relatively minor – typically resulting in delays rather than injury.

Nearly half of the commercial vessel fatal incidents over the last 10 years occurred on houseboats or fishing vessels. This highlights the issue of people falling or jumping from houseboats as well as the various hazards associated with fishing vessels, such as heavy machinery, rough seas and working alone.

While powered catamarans and motor cruisers were both prominent amongst serious injury incidents and incidents overall over the last 10 years, this probably just reflects the prominence of these vessel types in the commercial vessel fleet rather than any specific risks associated with these vessel types. In addition, it is clear that ferries – which are heavily used and carry large numbers of passengers – are relatively safe. There were no fatal incidents on board ferries over the last 10 years, and only a small number of serious injury incidents. This is likely to be due, in part, to the high standards of incident preparedness and response training and drills required under each ferry’s Safety Management System.

The marked differences in length compositions of vessels involved in commercial vessel incidents versus those involved in recreational vessel incidents is likely to reflect the size and usage of the respective fleets rather than any underlying risks with larger vessels per se. The commercial vessel fleet has proportionately far more larger vessels than the recreational fleet, which goes a long way to explaining the relative prominence of large vessels among commercial vessel incidents. In addition, the fact that many of the larger commercial vessels carry large numbers of passengers and are heavily used also contributes to their large share of commercial vessel incidents.



# Appendices

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## A-1 Background of boating activity in NSW

Boating is popular in NSW, where an estimated 2 million people go recreational boating each year (i.e. approximately 25% of the state's population). The state's favourable climate and large range of accessible waterways support a wide variety of activities covering paddle, sail and power craft. Recreational boats typically seen on NSW waterways include canoes and kayaks, small tinnies and rowing dinghies, Personal Watercraft (PWC), half-cabin runabouts, waterski and wakeboard boats, large cabin cruisers and sailing vessels of all sizes. NSW has 2140km of coastline and 12,000 square km of navigable waters extending across coastal waters, estuaries, rivers, lakes and dams with State responsibilities extending to 5.5km offshore.

Boating is becoming increasingly popular, driven by changes to leisure patterns and increasing numbers of people reaching retirement age. As at 30 June 2016, there were nearly 240,000 recreationally registered vessels in NSW – an increase of more than 10% over the last 10 years. In addition, there are an estimated 100,000 unregistered vessels like rowing dinghies, canoes, kayaks and off-the-beach sailing craft. Anecdotal evidence suggests that the popularity of 'paddle craft' such as canoes and kayaks continues to increase. Additionally, large cabin cruisers, wakeboarding boats and PWC (also known as 'jet skis') appear to be increasing in proportion to other vessel types.

A recreational boat driving licence is required to drive a powered vessel at 10 knots or more. A specific PWC driving licence is needed to drive a PWC at any speed. There are approximately 460,000 general boat driving licences held in NSW and 58,000 PWC driving licences. In addition, there are several thousand holders of commercial Certificates of Competency who are automatically deemed to hold a recreational boat and a PWC driving licence.

## A-2 Report Structure and Methodology

This report examines boating incidents recorded in NSW over the 10 year period to 30 June 2017 and will highlight key safety issues. It also summarises boating incidents recorded in the 12 months ending 30 June 2017, and compares these with the longer-term (10 year) period. Using long-term data for comparisons helps overcome statistical uncertainty caused by wide annual fluctuations in incident numbers. This is especially important with respect to fatalities and fatal incidents, for which numbers can change by 50% or more between successive years.

The report considers overall (total) incidents, as well as fatal and serious injury incidents. Consideration of overall incidents provides a more detailed picture of risk patterns than would be possible by examining fatal or serious injury incidents alone – and while the overall total includes a large number of minor incidents, it still points to safety risks pertinent to the more serious incidents. In addition, overall incident numbers and patterns provide context against which to examine patterns in fatal or serious injury incidents. For example, if a particular incident cause is more prevalent amongst fatal incidents than amongst incidents overall it implies that cause is more serious in terms of safety risk than a cause that is not.

The report primarily focuses on recreational boating incidents but commercial vessels are also considered. It should be stressed that the data used throughout this report is based on 'reported' incidents. While the reporting of fatal incidents is likely to be reliable, it is recognised that a large but unknown number of less serious incidents are unreported each year. It is also

recognised that reporting patterns may have changed over time, due to changes in data collection and boating regulations. For example, the boating damage threshold for compulsory reporting increased from \$100 to \$5000 in 2009.

The report is aimed at a wide audience – including Government agencies, peak boating organisations, stakeholders and members of the public. It provides an evidence base for the development of boating policy as well as education and compliance strategies under a Safe Systems approach to reducing trauma on the waterways.

The Safe Systems approach is an internationally recognised and adopted methodology to reduce trauma in a transport system.

Safe Systems focuses on understanding and countering issues that cause trauma. It takes a holistic evidence-based view of the interacting elements and recognises that each part can assist in reducing trauma before and after an incident. The elements of Maritime Safe Systems include safe people, safe vessels and safe waterways. Further details on Maritime Safe Systems are provided in the Maritime Safety Plan.<sup>3</sup>

The Maritime Safety Plan sets the strategic direction for maritime safety agencies over the next four years, i.e. 2017 to 2021. The Plan is evidence-based and targets areas of identified risk to prevent or mitigate the adverse impacts of safety-related events when they occur. Many of those areas of risk are outlined in this report.

This report updates boating safety statistics since the publication of the Transport for NSW reports Boating Incidents in NSW – Statistical report for the 10-year period ended 30 June 2012 and Boating incidents in NSW – Statistical Statement 2015–16.

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<sup>3</sup> Transport for NSW, Maritime Safety Plan 2017–21.

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