

Transport
for NSW

Boating incidents in NSW

Statistical Report for the 10-year
period ended 30 June 2022

Centre for Maritime Safety



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1 Executive summary

Following on from the former Maritime Safety Plan 2017-2021, the NSW Government launched the Maritime Safety Plan 2026 on 26 October 2022. This Plan contains a range of safety measures aimed at reducing boating fatalities and serious injuries, with a long-term vision of zero fatalities and serious injuries on navigable waterways in NSW by 2056. The Plan highlights five focus safety areas for priority and sets targets for reducing boating fatalities and serious boating injuries¹. The Boating Incident in NSW Statistical Report for the 10-year period ended 30 June 2022 presents the latest statistics about each focus safety area. It also provides an update on how NSW is tracking against the Plan's fatality and serious injury targets.

Incidence of fatalities, serious injuries and boating-related incidents

Fourteen boating fatalities and 47 serious injuries were reported to Transport for NSW² in the 12 months to 30 June 2022. These arose from 388 boating-related incidents, a relatively high number but representing an overall decrease in boating incidents of 11.2 per cent from the previous year.

- **Total boating fatalities in 2021-22** (14) finished below the Maritime Safety Plan 2022-26 intermediate target of 16.45. The number of reported fatalities was 0.7 per cent below the long-term (10 years) annual average.
- **Total serious injuries**³ in 2021-22 (272) finished slightly above the Maritime Safety Plan 2022-26 intermediate target of 271.59. The number of serious injuries was 19.9 per cent below the long-term average. In trend terms, total serious injuries have declined by 27.4% since 2013-14.

Relatively high incident numbers since 2019-2020 may be linked to an increase in boating activity levels⁴ through the COVID-19 pandemic and the restrictions on travel through this time. While the most obvious impacts of the pandemic appear to be receding, it is not yet clear what long-term effects it might have on boating as a leisure activity.

1 MSP targets for fatalities and serious injuries are based on a 30% reduction in numbers by the end of 2025-26, compared with 3 yr average up to and including 2020-21. The serious injury target is based on serious injury presentations to NSW Health hospitals.

2 Incidents are reported to Transport for NSW through a number of channels, including through Boating Safety Officers or Police, or via self-reporting. The large 'self-reporting' component means that non-fatal incidents, including those causing serious injury, are prone to significant under-reporting.

3 NSW Health Data, admissions to hospital as a result of a boating incident.

4 Transport for NSW, Maritime Safety Plan 2022-26.

Characteristics of fatal incidents and fatalities

The mix of causes and other characteristics associated with the fatal incidents in 2021-22 was similar to that observed across the 10-year period to 30 June 2022⁵. For instance:

- Most fatal incidents in 2021-22 occurred on or were associated with **smaller vessels** (those < 6 metres in length (75%). These include cabin runabouts (25%), open runabouts (25%) and canoes or kayaks (16%). The key contributory causes associated with these incidents were also typical and included **lifejacket not worn/not functional** (75%), **hazardous waters** (58%) and **lack of judgement** (50%).
- The main incident types associated with fatal incidents in 2021-22 were **capsizing** (75%) and **falling overboard** (16%). This combination of incidents represented 91.7 per cent of fatal incidents where the person was forced into the water.
- Only 28.6 per cent of the fatalities in 2021-22 were known to have been wearing a functional lifejacket. Preventable drownings (cases where a person was presumed to have drowned and was not known to have been wearing a lifejacket) accounted for 71.4 per cent of the fatalities. This reinforces the significance of **lifejackets (when worn and functional)** as the most critical safety equipment in preventing a fatality when someone is forced into the water.
- 92.9 per cent of the fatalities in 2021-22 were **male**, a proportion similar to that recorded over the 10 years to 30 June 2022.
- The majority of fatal incidents in 2021-22 occurred during the daytime (83.3%), a proportion similar to the 10 years to 30 June 2022.
- Most fatalities in 2021-22 involved a person aged less than 65 years (71%), a proportion that was similar to that recorded over the 10 years to 30 June 2022. However, older persons (those aged 70 and above) remain over-represented in boating fatalities when long-term data is considered (Section 9.2).

Priority safety areas

2021-2022 saw variable results across the five focus safety areas examined. Key findings for each are outlined below:

Lifejacket wear: The overall number of preventable drownings associated with recreational incidents in 2021-22 (10) was statistically similar to the long-term annual average of 8.1.

Up to (81) lives could have been saved over the last 10 years had all persons presumed drowned in recreational boating incidents been wearing a lifejacket. The lives that could have been saved represent 60 per cent of all recreational fatalities over the period.

Fatalities where lifejacket non-wear was a likely factor were associated with circumstances including tenders and rowing dinghies, being forced into the water, alpine waters, cold water and darkness/low light.

⁵ Given the small sample size (N=12), results in 2021-22-particularly comparisons with the 10-year pictures should be interpreted with caution.

Boater age 65+: Boaters aged 65+ accounted for 25.9 per cent of all recreational boating fatalities over the 10-year period to 30 June 2022. The number of recreational fatalities aged 65+ or greater in 2021-22 (4) was statistically similar to the long-term annual average of 3.5. Boaters aged 70 and above accounted for 17.8 per cent of all recreational boating fatalities, but only 10.1 per cent of boat licences.

Fatalities where the boater being aged 65-plus was a likely factor were associated with circumstances including Hunter region ocean waters, South Coast region ocean waters and open (ocean) waters generally.

Weather conditions: The number of recreational fatal incidents attributed to weather conditions in 2021-22 (4) was similar to the long-term annual average (2.9).

Recreational incidents attributed to weather conditions increased by 27.6 per cent in 2021-22 compared with the previous year. This increase contrasts with the 12.6 per cent decrease in overall recreational incidents over the same period. The total number of recreational incidents related to weather conditions in 2021-22 (37) was statistically similar to the long-term average of 34.2 incidents.

Fatalities where weather conditions were a likely factor were associated with circumstances including Hunter Region ocean waters, large sailing vessels (yachts and catamarans) and the non boating season.

Trauma: Fatal incidents attributed to trauma fell by 100 per cent in 2021-22 (0) compared to 2020-21 (4). The 2021-22 number is significantly below the long-term (10-year) annual average of (2.9).

Most serious injuries are trauma-related, with the most likely exceptions being hospitalisations related to near-drowning, hypothermia or gas inhalation. Examination of the types of serious injury recorded in NSW Health hospital records suggest that at least 198 of the 272 serious injuries recorded in 2021-22 were trauma-related – with the most common types being fractures (36.4%), open wounds (13.2%) and injuries to internal organs (5.1%). The number of trauma-related serious injuries recorded by NSW Health was down by 44 (18.6%) on the previous year and below the long-term yearly average of 242.9. Towing related serious injuries – as recorded by Transport for NSW - are almost invariably trauma-related. There were five such injuries in 2021-22, equal to the long-term yearly average. The number of towing-related serious injuries has shown no overall trend over the last 10 years.

Boaters under 30 were heavily over-represented in serious injuries (and by implication, trauma incidents) – even considering that people under 12 are not eligible for a boat licence. This group accounted for 29.2 per cent of serious injuries as reported to NSW Health but only 14 per cent of boat licences.

Trauma related fatalities were associated with circumstances including towing related activities, race conditions, injuries in towing incidents, persons being hit by a vessel or its propeller and hi-performance ski/wakeboarding vessels.

Open runabouts

The number of recreational fatal incidents involving open runabouts in 2021-22 (3) was slightly lower than the long-term (10-year) annual average of 4.1. These incidents resulted in three fatalities, against a long-term average of 4.6. In the 10-year period to 30 June 2021-22, open runabout recreational incidents accounted for 28.1 per cent of all incidents; however, in 2021-22, the proportion was significantly lower, at 16.0 per cent.

Fatalities involving open runabouts were associated with circumstances including estuaries in the South Coast Region, propeller injuries and the size of the boat (being too small for the conditions/situation).



2 Glossary

Various technical terms or phrases are used in this Report. These are defined as listed below:

Boating incident – an adverse event causing or involving any of the following in connection with the operation of a vessel: death or injury to a person; the loss of a person; the abandonment or presumed loss of a vessel; a collision, the grounding, sinking, flooding or capsizing of a vessel; a fire or explosion; or the loss of stability or structural failure of a vessel.

Commercial boating – boating related to financial or other valuable considerations. Passenger and charter services, boating for work purposes and hire and drive boating.

Commercial incident – boating incident involving only commercial vessel(s).

Commercial/Recreational incident – a boating incident involving recreational and commercial vessels (e.g. a collision).

Fatality – where a person is killed due to a boating incident, dies within 30 days due to the incident or is considered missing at sea.

Incident cause – a factor that is partly or wholly responsible for a boating incident or its outcome. There are three levels of incident cause referred to in this Report: (1) major cause – the primary cause of an incident, as identified in Transport operational incident data; (2) secondary cause – any additional cause(s) identified for an incident in Transport operational incident data; and (3) likely contributory cause – any additional cause(s) identified for an incident in Transport fatality records.

Lifejacket not functional – lifejacket is materially damaged, comes loose during an incident because it isn't secured correctly, or – if an inflatable model – it doesn't inflate (e.g. because of missing or empty CO₂ cylinder).

PWC – Personal Watercraft, also known as a 'jetski'. A small powered vessel with a fully enclosed hull does not retain water if capsized. It is designed to be operated by a person lying, standing, sitting astride or kneeling on the vessel (but not seated within the vessel). Typically propelled and manoeuvred by water jet nozzles.

Preventable drowning – where a person is presumed to have drowned and was not known to have been wearing a lifejacket.

Recreational boating – ordinary boating for pleasure, not involving any financial gain (i.e. not 'commercial').

Recreational incident – boating involving only recreational vessel(s).

Reported incident – an incident reported to Transport for NSW, typically through the agency's Boating Safety Officers or via self-reporting by boat operators. Unless explicitly stated otherwise, these incidents don't include incidents recorded by NSW Health via hospital records but not reported to Transport for NSW.

Serious injury –where a person suffers an injury requiring admission to hospital because of a boating incident.

Statistically significant –refers to an observed change, difference or trend unlikely to have occurred by chance alone. This is determined by an appropriate ‘statistical test’ designed to test the assumption that an observed change, difference or trend is due to chance alone. By scientific convention, if the probability of the result being just due to chance is less than 5%, it is deemed statistically significant. As a result, it is at least 95% likely to be due to some real effect, not just chance.

Wearing a lifejacket –where a person was believed to have been wearing a functional lifejacket (see also “lifejacket not functional”).



3 Introduction

Transport for NSW is striving Towards Zero fatalities and serious injuries on NSW waterways in support of community expectations of reduced trauma across the state's transport network. The state's waterways are an important part of the network, and there are now 546,641 people who hold a licence to drive a powered vessel and 237,289 registered vessels in the state⁶. Almost 1 in 5 NSW households own a boat or watercraft⁷, and an estimated 2 million people go boating yearly on the state's waterways⁸.

Following on from the former Maritime Safety Plan 2017-2021, the NSW Government launched the Maritime Safety Plan 2026 on 26 October 2022. This Plan contains a range of safety measures aimed at reducing boating fatalities and serious injuries, drawing on a holistic Safe Systems approach to maritime safety⁹. This approach has four elements:

Safer People

(the people in the system, including their choices and behaviours);

Safer Vessels

(vessel design and safety equipment can reduce the risk and consequences of serious incidents);

Safe Waterways

(the physical environment and infrastructure in terms of safe navigation, access and storage); and

Safe System

(all the supporting elements behind maritime safety, including data, research, education and partnerships).

The Plan highlights five focus safety areas for priority and sets targets for reducing boating fatalities and serious boating injuries¹⁰: lifejacket wear, trauma, open runabouts, weather conditions and older boaters-65+. These areas represent the main safety concerns identified through the analysis of long-term incident data.

⁶ Open Data Hub Transport for NSW accessed 10 February 2023, Data current as at 01/02/2023.

⁷ Recreational Boating Behaviour. Report prepared for Transport for NSW by IPSOS. October 2019.

⁸ NSW Boating Industry Association.

⁹ Transport for NSW, Maritime Safety Plan 2022-26.

¹⁰ MSP targets for fatalities and serious injuries are based on a 30% reduction in numbers by the end of 2025-26, compared with 3 yr average up to and including 2020-21. The serious injury target is based on serious injury presentations to NSW Health hospitals.

4 About this report

The Boating Incident in NSW Statistical Report for the 10-year period ended 30 June 2022 presents an update on how NSW is tracking against the Plan's fatality and serious injury targets, together with the latest information on each focus safety area.

The analysis of incident¹¹ patterns and trends is based on Transport operational incident data for the 10-year period to 2021-22¹². Boating incident data is inherently volatile. As a result, where possible, findings for 2021-22 are examined in the context of the previous nine financial years and the variations that have occurred year-to-year.

The Report covers commercially and recreationally related boating incidents, with a specific focus on recreational boating incidents.



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- 11 Boating incidents are defined as per the National Marine Safety Data Collection Reference Manual – Data standards and definitions for marine incidents national guidelines, National Marine Safety Committee V1.5:18 December 2007. Boating incidents exclude situations such as unrelated medical episodes, deliberate intent or unrelated activities such as SCUBA diving.
- 12 Transport for NSW Eagle database records, based on fatality, serious injury and total incident counts and associated records as at 9 September 2022 unless otherwise stated. Incident numbers may be subject to subsequent change as the result of coronial findings or other investigations.

5 The impact of COVID on boating participation and safety trends

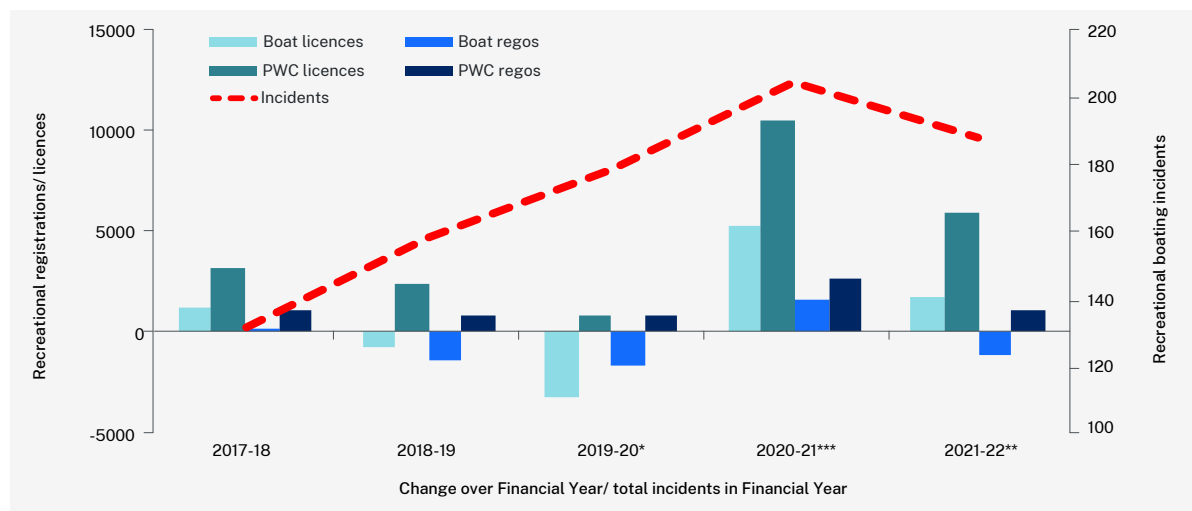
Anecdotally, COVID-19 resulted in elevated levels of boating activity through much of 2020 and 2021 as a result of restrictions on many other types of recreation and travel. In addition, boating was perceived as a 'COVID safe' activity, being outdoor and conducive to social-distancing. This is supported by the results of a recent survey of recreational boaters¹³, which found that overall boating participation in NSW had increased to 22 per cent in early 2023 (compared to 16% in 2018), although there is no data for the intervening years.

In the years leading up to COVID-19, vessel licence and registration numbers were relatively steady, with little change year on year (Figure 1). However, there was a general up-tick in recreational vessel numbers and licences over the 2020-21 Financial Year, coinciding with the period of greatest COVID-19 impact, including lengthy lockdowns and major changes in people's behaviour. The increases were particularly notable in relation to Personal Watercraft licences and registrations, which were up by more than 10,000 and 2,500 respectively – representing an increase of more than 16 per cent in both cases.

While reported recreational boating incidents were increasing in the years prior to COVID-19 (Figure 1), the relatively high boater participation rate recently reported (from early 2023), and the increase in boating licences and registrations during 2020-21 suggest that COVID-19 may have contributed to the relatively high number of recreational boating incidents recorded in 2020-21 (up by 14.6% compared with the year before). However, given the inherent volatility in boating incident data, it is not possible to be definitive about this. In addition, we do not yet know what the long-term effects of COVID-19 on boating activity will be, nor the ultimate boating safety impacts.

¹³ NSW Recreational Boater Survey 2023. Report prepared for Transport for NSW by Taverner Research Group.

Figure 1: Changes in boating licences and registrations in relation to COVID-19 and boating incidents*



* Financial Years denoted according to broad COVID-19 impacts: *major impacts including lockdowns, but mainly last quarter of FY; **significant impacts, but easing; ***major impacts including widespread lockdowns.



6 Snapshot of safety performance trends and comparisons for 2021-22

Snapshot of incidents in the 2021-2022 period

Fourteen boating fatalities, 47 serious injuries and 388 boating-related incidents were recorded in the 12 months to 30 June 2022 (Table 1).

- The number of fatalities in 2021-22 (14) was 3 (17.6%) less than in 2020-21 (17) but was less than one per cent below the long-term annual average of 14.1.
- The number of serious reported injuries in 2021-22 (47) was 6 (11.3%) less than the 53 recorded in 2020-21 and was more than 25 per cent below the long-term average of 63.
- The total number of incidents in 2021-22 (388) was 49 (11.2%) less than in the 437 recorded in 2020-21 but 26.8 per cent above the long-term average of 306.1.

Table 1: Fatalities, serious injuries, and related incident numbers for the 2021-22 financial year based on incidents reported to Transport for NSW¹⁴

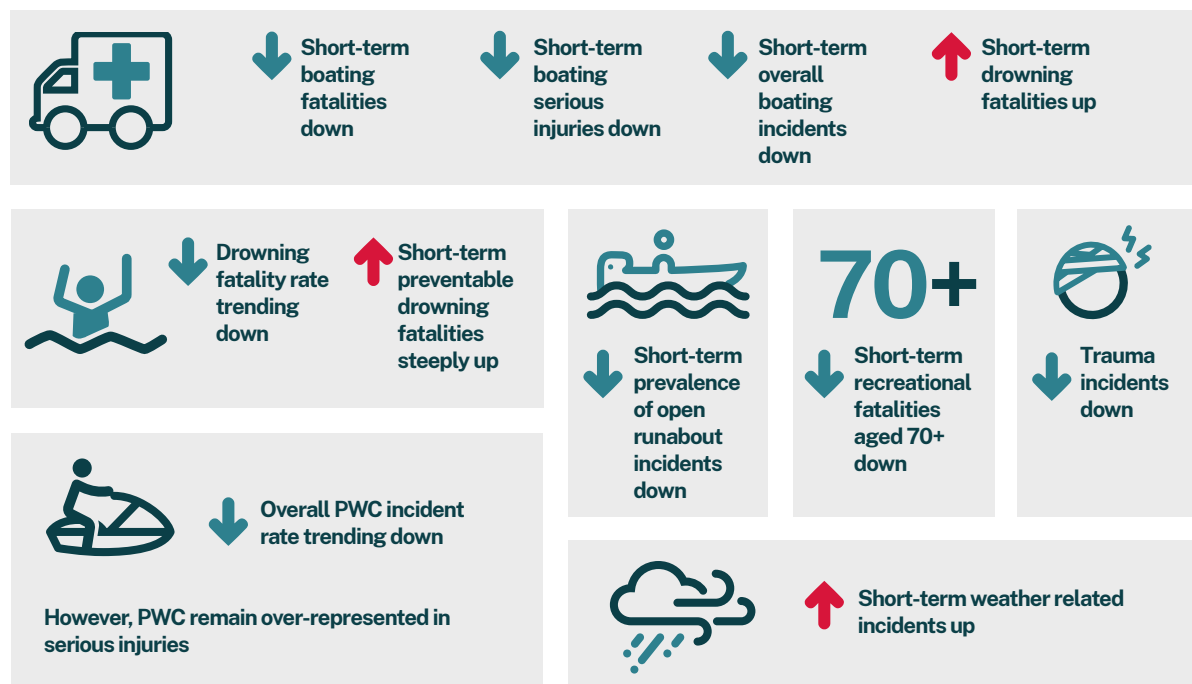
Vessel category	Incident category				Total incidents
	Fatalities	Fatal incidents	Serious injuries	Serious injury incidents	
Recreational	14	12	35	30	188
Commercial	0	0	12	12	164
Commercial/recreational	0	0	0	0	36
TOTAL	14	12	47	42	388
Change on 10 yr. av.	-0.7%	-4.2%	-25.4%	-16.2%	+26.8%
Average last 10 years*	14.1	12.5	63.0	50.1	306.1

* 10-year average includes 2021-22. Serious injury numbers are likely to have been significantly affected by under-reporting, and based on NSW Health hospital records, the actual number of boating-related serious injuries is considerably greater.

¹⁴ Commercial vessel safety is managed by the Australian Maritime Safety Authority.

Key trends

The infographics below highlight key trends in boating safety incidents evident in 2020-2021. Long-term trends refer to significant change over the ten year period to 2021-2022, while short-term trends refer to marked changes for 2020-2021 compared to recent year(s).



Further information related to these infographics is provided in Sections 7-9 of this Report.



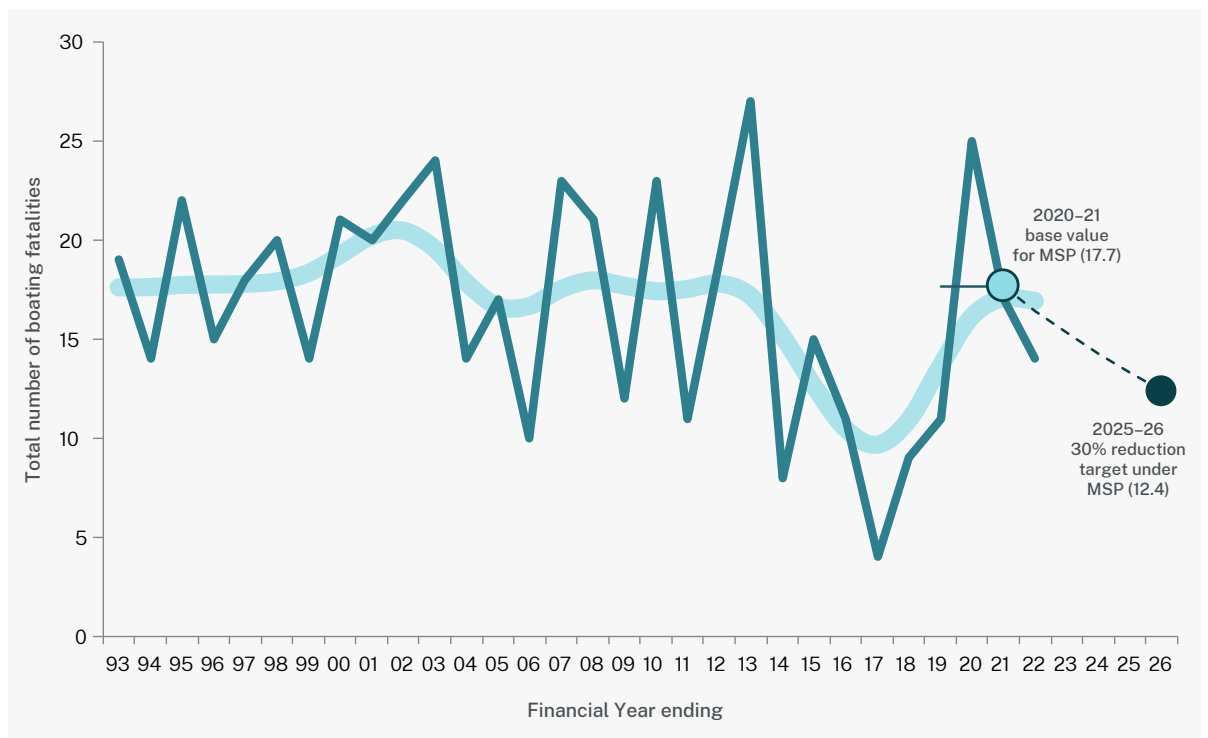
7 Fatality and serious injury outcomes against Maritime Safety Plan targets

This section provides incidence figures for fatalities and serious injuries over 2021-2022 and compares these against Maritime Safety Plan 2022-2026 targets. Findings indicate that fatalities and serious injuries are currently on track to meet final targets.

7.1 Fatalities

There were 14 fatalities in 2021-22 arising from 12 incidents. This means fatalities finished below the Maritime Safety Plan 2022-2026 intermediate target of 16.5 and are currently on track to meet the Plan's overall 30 per cent reduction target by 2025-26 (Figure 2). The number of fatalities in 2021-22 was statistically similar to the long-term (2012-13 to 2021-22) average of 14.1.

Figure 2: Tracking of total boating fatalities against MSP target of a 30% reduction by 2025-26*

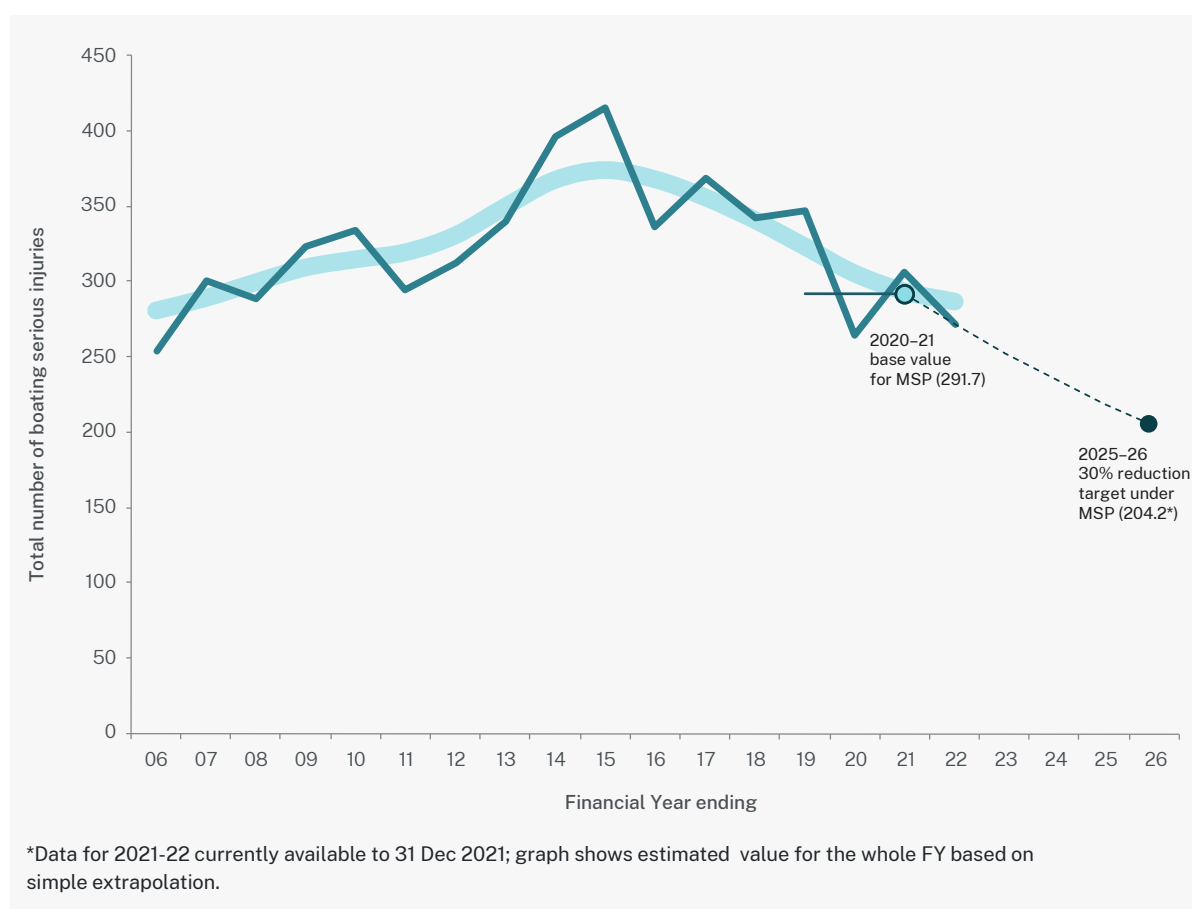


* The dark lines plots each year's fatality total while the pale curve is indicative of medium-term trends and is based on the application of weighted five-year moving averages. The labelled base value equals the 3 year average up to and including 2020-21. The 2025-26 value shown at the end of the dashed line is the final target under the MSP – with the dashed line representing the progressive target trajectory over the life of the MSP.

7.2 Serious injuries

There were 272 serious injuries reported to NSW Health in 2021-22 as at 13 July 2023. In recent years, the overall number of serious boating injuries – based on hospital data – has been on a downward trend. Serious injuries finished slightly above the Plan’s 2021-22 intermediate target (271.6) but are broadly on track to meet the Plan’s overall 30 per cent reduction target by 2025-26 (Figure 3). The number of serious injuries in 2021-22 (272) is significantly below the long-term (2012-13 to 2021-22) average (339.6).

Figure 3: Tracking of total boating serious injuries against MSP target of a 30% reduction by 2025-26*



* Serious injury numbers are based only on hospital data administered by NSW Health. Target calculations are based on the NSW Health data available when the Maritime Safety Plan was being prepared. *The dark lines plots each year’s fatality total while the pale curve is indicative of medium-term trends and is based on the application of weighted five-year moving averages. The labelled base value equals the 3 year average up to and including 2020-21. The 2025-26 value shown at the end of the dashed line is the final target under the MSP – with the dashed line representing the progressive target trajectory over the life of the MSP.

8 Causes and characteristics of fatalities in 2021-22 against the longer-term (10-year) context

This section describes the causes and attributes of boating fatalities in 2021-22 and compares these to long-term (10-year) averages. Overall, findings suggest that the range of causes and characteristics in 2021-22 is broadly consistent with the long-term picture.

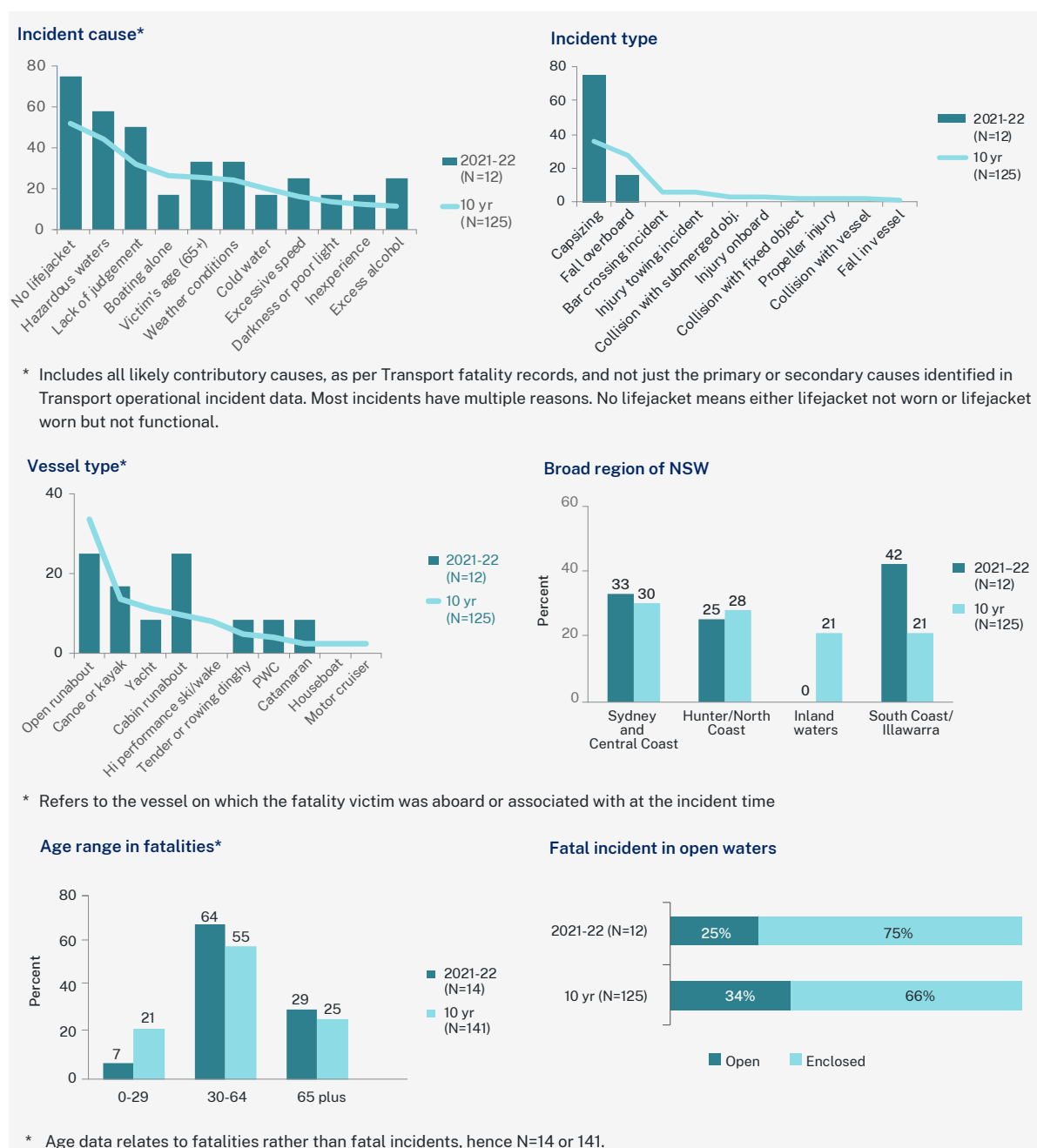
The main incident types associated with the 12 fatal incidents in 2021-22 were capsizing (75%) and falls overboard (17%). Open runabouts and cabin runabouts were the most prevalent vessel types (each 25%), followed by canoes and kayaks (17%). Most fatal incidents (75%) occurred on or in association with smaller vessels, those less than six metres in length.

In addition to the key breakdowns that are highlighted in Figure 4, the following key points apply to the 12 fatal incidents in 2021-22 and the 125 such incidents over the 10-year period to 30 June 2022¹⁵:

- Four of the 14 fatalities recorded in 2021-22 (i.e., 28.6%) were known to have been wearing a functional lifejacket at the time of the incident. The corresponding figure for the 10 years is 35 fatalities (24.8%).
- ‘Preventable drownings’ (cases where a person was presumed to have drowned and was not known to have been wearing a lifejacket) accounted for 10 (71.4%) of the fatalities in 2021-22. Over the 10 years, the corresponding figure was 74 fatalities (52.5%).
- Nine (64.3%) of the fatalities in 2021-22 occurred in circumstances where lifejacket wear was required under current rules. The corresponding 10-year figure is 74 (52.5%).
- One (8.3%) of the fatal incidents in 2021-22 occurred at night, compared with 17 (13.6%) for the 10 years.
- Five (35.7%) of the fatalities in 2021-22 were not skipping the associated vessel at the time of the incident. Skippers were known to have accounted for six fatalities (42.9%). The respective split for the 10 years was 40.4 per cent (57 fatalities) versus 44 per cent (62 fatalities) – with the skipping status not specified for a further 22 fatalities (15.6%).
- 11 (91.7%) of the fatal incidents in 2021-22 involved people being forced into the water due to the incident. The corresponding figure over the 10 years was 104 (83.2%).

¹⁵ Given the small sample size (N=12), results in 2021-22 – particularly comparisons with the 10-year picture – should be interpreted with caution.

Figure 4: Characteristics of fatal incidents and fatalities in 2021-22 and for the 10-year period to 30 June 2022¹⁶. All data is based on percentages. 10-year data is shown in paler shading



Key statistics – fatal incidents and fatalities in 2021-22

- Key contributory factors to fatal incidents were lifejacket not worn/functional (75%), hazardous waters (58.3%) and lack of judgement (50%).
- The mix of causes and other characteristics of the fatal incidents was broadly similar to that applicable over the last 10 years.

16 Given the small sample size (N=12), results in 2021-22 – particularly comparisons with the 10-year picture – should be interpreted with caution.

- However, there is some indication that cabin runabouts were more heavily represented in 2021-22 (25%) than over the last 10 years (9.6%), although the difference was just outside statistical significance¹⁷. In addition, vessel capsizes accounted for a significantly higher proportion of fatal incidents (75% in 2021-22 versus 36% over the last 10 years).
- The broad age distribution of fatalities in 2021-22 was similar to that of the last 10 years. More than 90% of the victims were male, with the long-term trend of fatalities involving mostly males continuing.



¹⁷ Means that the probability of being wrong in saying cabin runabouts were more heavily represented is $\geq 5\%$ but $<10\%$.

9 Trends in Maritime Safety Plan Priority Safety Areas

This section describes and tracks the available incident data on each of the five focus safety areas identified in the Maritime Safety Plan 2026:

Lifejacket wear

Boater age (65-plus)

Weather conditions

Trauma

Open runabouts

Data relating to these priority safety areas is examined over the 10 years to 30 June 2022, with an emphasis on fatality and serious injury incidents. All analyses are based on recreational boating incidents only, in line with the Maritime Safety Plan's focus.

For each focus safety area, a series of graphs are presented. For graphs illustrating seasonal patterns, differences across age groups or more extended-term changes through time, a trend curve or trend line (either dashed or solid) is generally fitted where such a curve or line provides a statistically significant fit to the data¹⁸.

Where applicable, the data related to a particular focus safety area is analysed in the context of all recreational boating incidents – thereby highlighting the extent to which a particular safety issue 'stands out' against the overall background of recreational boating incidents. Similarly, data related to each of the focus safety areas from 2012-22 is considered in the context of the whole 10 year period to 30 June 2022.

¹⁸ (i.e. provides a useful model of the underlying data). If no curve or line is fitted, it means either the graph's data does not follow a statistically significant trend or that the underlying trend is already evident from the graphical presentation used (e.g. licence numbers by age, Section 9.2).

9.1 Priority Safety Area: Lifejacket wear

Lifejacket wear¹⁹ is a critical factor in the survival of a person involved in a boating incident forced into the water. Wearing a lifejacket may reduce drowning deaths among recreational boaters by 50% compared to if a lifejacket is not worn²⁰.

Incidence

Over the ten year period to 30 June 2022, 105 recreational boating fatalities were presumed due to drowning (Table 2).

Of these, only 24 were known to have been wearing a lifejacket (Table 2), meaning 81 lives could potentially have been saved over this period had all persons been wearing a lifejacket. The lives that could have been saved represent 60 per cent of all recreational boating fatalities over the period – meaning that, among the five priority safety areas examined in this report, addressing lifejacket wear would have the greatest potential impact in terms of saving lives.

Of the 81 persons that might have been saved, the vast majority (74) are known to have not been wearing a lifejacket, while for seven victims, it is unclear whether or not they were wearing a lifejacket at the time.

Table 2: Summary of recreational drowning and lifejacket wear statistics for 2021-22, with long-term statistics for comparison.

Period	Total recreational boating fatalities	Fatalities presumed due to drowning		Drowning victims who were wearing* a lifejacket		Drowning victims who were not wearing* a lifejacket		Drowning victims for whose lifejacket wear status was unclear	
		Number	%	Number	%	Number	%	Number	%
2021-22	14	14	100	4	28.6	10	71.4	0	0.0
Last 10 years (2012-13 to 2021-22)	135	105	77.8	24	22.9	74	70.5	7	6.7

*Throughout this report, “wearing” means wearing a lifejacket that is functional and of the correct size/type for the situation. “Not wearing” includes wearing a non-functional lifejacket – e.g. one that doesn’t inflate, is too small or is of the wrong type.

19 Analysis of lifejacket related data, including drowning and non-drowning fatalities, is based on Transport boating fatality records (details in Figure 4).

20 Cummings, P., Mueller, B.A., & Quan, L. (2011). Association between wearing a personal floatation device and death by drowning among recreational boaters: a matched cohort analysis of United States Coast Guard data. *Injury Prevention*, 17(3), 156-159.

Long-term trend (since 1992-93)

There has been a statistically significant long-term decline in the rate of recreational drowning fatalities per 100,000 vessels (Figure 6). In trend terms²¹, the drowning fatality rate has declined from 7.5 per 100,000 vessels in 1992-93 to 3.6 per 100,000 vessels in 2021-22 – a reduction of approximately 52 per cent. By contrast, there has been no decline in the non-drowning fatality rate (Figure 6). Indeed, the non-drowning rate has remained steady, aside from year-to-year fluctuations, averaging 1.6 per 100,000 vessels.

While it is not possible to say definitively what factor(s) have caused the decline in the drowning fatality rate, it is likely that a general increase in lifejacket wear rates²² over the last 30 years, backed by stronger lifejacket wear laws, have played a key role. Improvements in vessel design and safety awareness around issues such as weather and sea conditions may have also contributed.

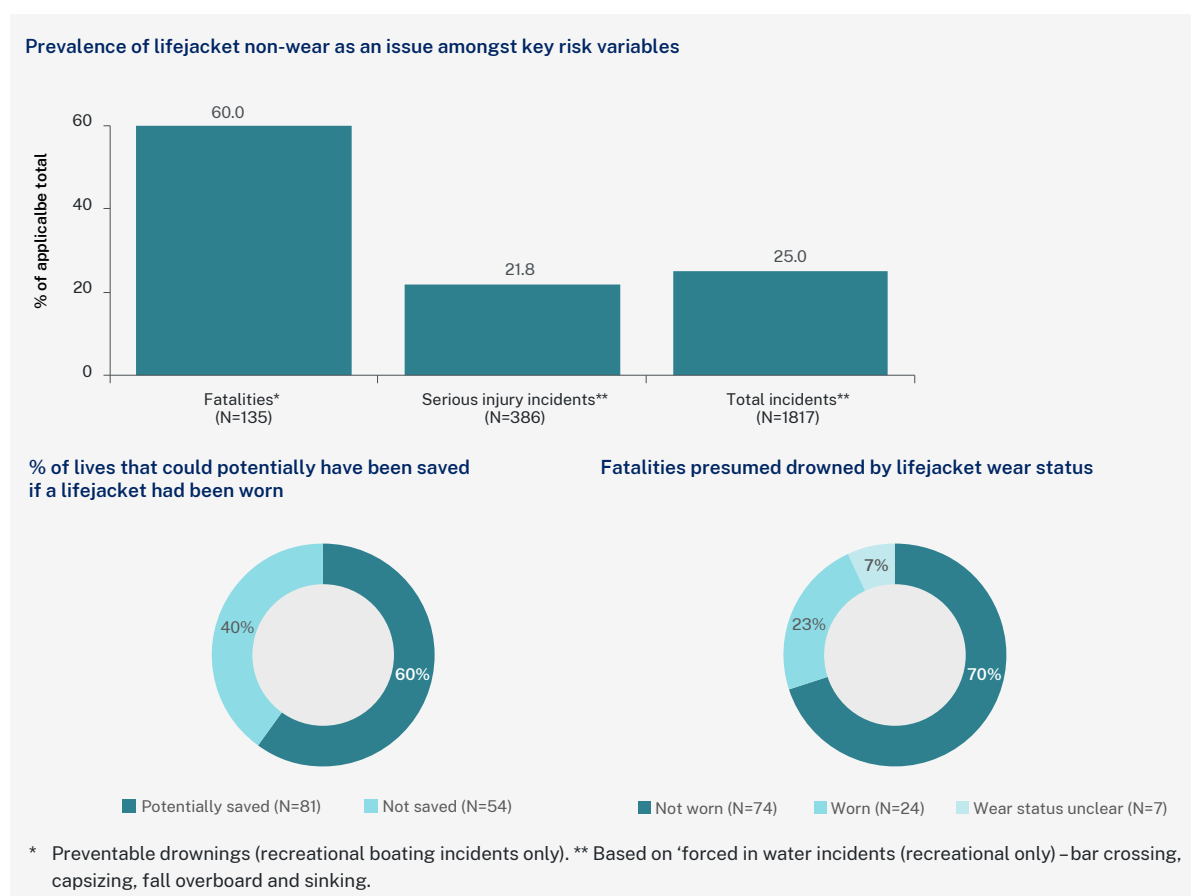
Nevertheless, the number of preventable recreational boating drownings in recent years has varied dramatically, with 17 recorded in 2012-13 and 2019-20 and zero in 2016-17. The overall number of preventable drownings associated with recreational incidents in 2021-22 (10) was statistically similar to the long-term (10-year) annual average of 8.1 drownings.



21 This means the % decline based on the modelled regression line plotted to the data. Due to volatility in the data, there is considerable uncertainty in the true position of the regression line and hence the modelled % decline. Based on the actual data, when the average of the first 10 years is compared to the most recent 10 years, there is a 40.3% decline between the two periods.

22 The first observational study of lifejacket wear in NSW estimated the overall wear rate at 9% in 2007. A subsequent study in 2013-14 estimated the wear rate at 34%, and repeats of the same study found wear rates in the range 41% to 45% between 2014-15 and 2017-18. The most recent study gave an estimated wear rate of 40.5% in 2022-23 – noting that the various studies used different methods and are not fully comparable.

Figure 5: Focus safety area – lifejacket wear - at a glance (10 year period to 30 June 2022)

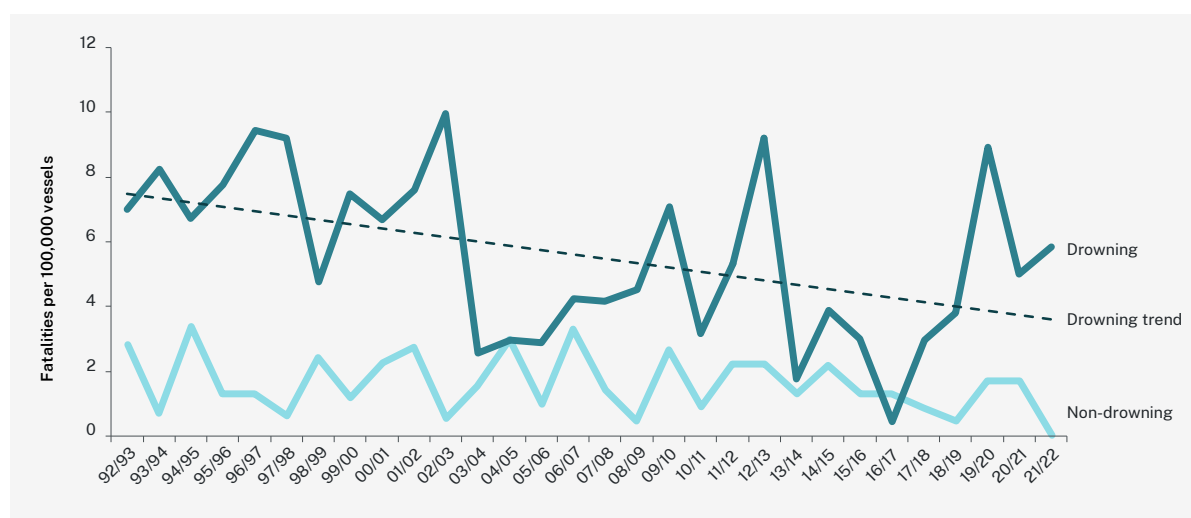


Key statistics – Lifejackets

- 60% of all recreational boating fatalities over the last 10 years (81 lives) could potentially have been saved if all presumed drowning victims had been wearing a lifejacket.
- More than 7 out of 10 people presumed drowned in recreational boating incidents over the last 10 years were not wearing a lifejacket.
- Since the early 1990s, the recreational vessel drowning fatality rate has declined by approximately 52 per cent without any significant change in the corresponding non-drowning fatality rate (Figure 6).
- 9 in 10 recreational drownings where a lifejacket wasn't worn involved a male.
- Among fatalities where a person was forced in the water²³ and was not wearing a lifejacket, more than half (55.4%) were associated with vessels less than 4.8 metres in length.
- There has been a low prevalence of excess alcohol (12.2%) and drugs (1.4%) in recreational drownings where a lifejacket wasn't worn.

²³ 'forced in the water' means related to bar crossings, capsized, falling overboard or a vessel sinking.

Figure 6: Long term trends (since 1992-93) in drowning and non-drowning fatality rates for recreational boating incidents



Characteristics of fatalities in relation to lifejacket wear and drowning

Figure 7 breaks down recreational boating fatalities over the 10 year period to 30 June 2021 by broad incident type, presumed drowning status and lifejacket wear. Overall drowning fatalities (N=98) were mostly related to capsizing/sinking (N=53, 54%) and falling overboard (N=24, 24%), which together accounted for nearly 79 per cent of the drowning fatalities. Among non-drowning fatalities (N=24), capsizing/sinking and falling overboard together accounted for a much lower proportion (21%)²⁴; non-drowning fatalities were more commonly related to collisions, injuries onboard and towing-related injuries.

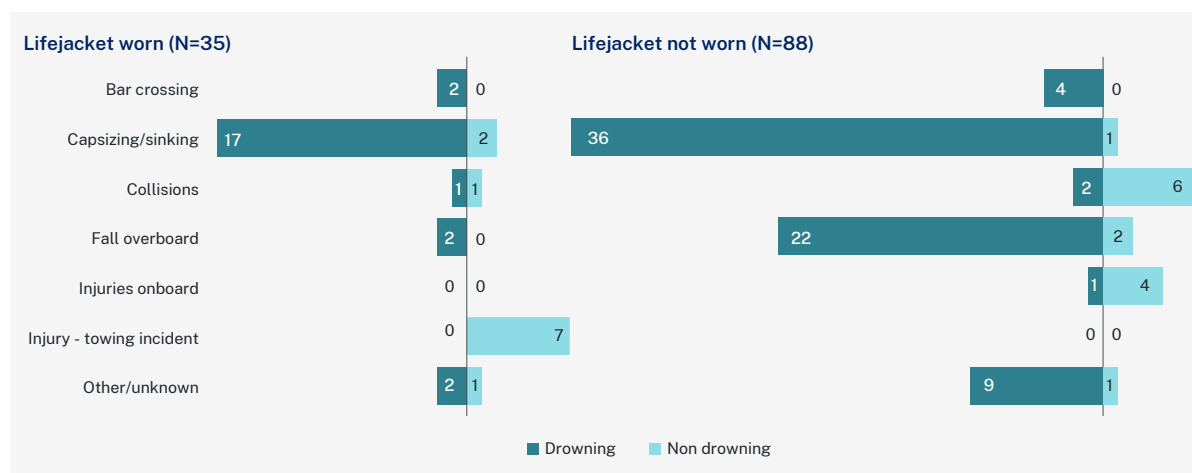
When lifejacket wear is considered (Figure 7), the proportion of fatalities related to capsizing/sinking is quite similar²⁵ between when a lifejacket was worn (54%, 19 in total) and when it was not (42%, 37 in total). However, a more marked difference²⁶ occurred with falling overboard; such fatalities accounted for just two (6%) of all fatalities where a lifejacket was worn but 24 (27%) of all fatalities where a lifejacket was not worn. The difference between capsizing/sinking and falling overboard fatality outcomes in relation to lifejacket wear reflects the likelihood of falling overboard accidents being very sudden, often with no warning and no opportunity to don a lifejacket once trouble strikes. While capsizing and sinking accidents are also often sudden, there may be a little more time to don a lifejacket – for instance, when a vessel encounters large waves or other difficulties prior to the actual capsize or sinking – which may explain the reasonably high prevalence of capsizing/sinking related fatalities even when a lifejacket was worn.

24 P<0.01, Z test of two proportions.

25 P= .218, Z test of two proportions.

26 P<0.01, Z test of two proportions.

Figure 7: Number of recreational fatalities by broad incident type, presumed drowning status and lifejacket wear*** (10 year period to 30 June 2022)



*** Lifejacket wear = “yes” where lifejacket was known to have been worn and functional; all other cases = “no”. Incident type “Injuries onboard” includes falls and CO inhalation. Incident-type “Collisions” consists of collision and persons hit by a vessel or its propeller.

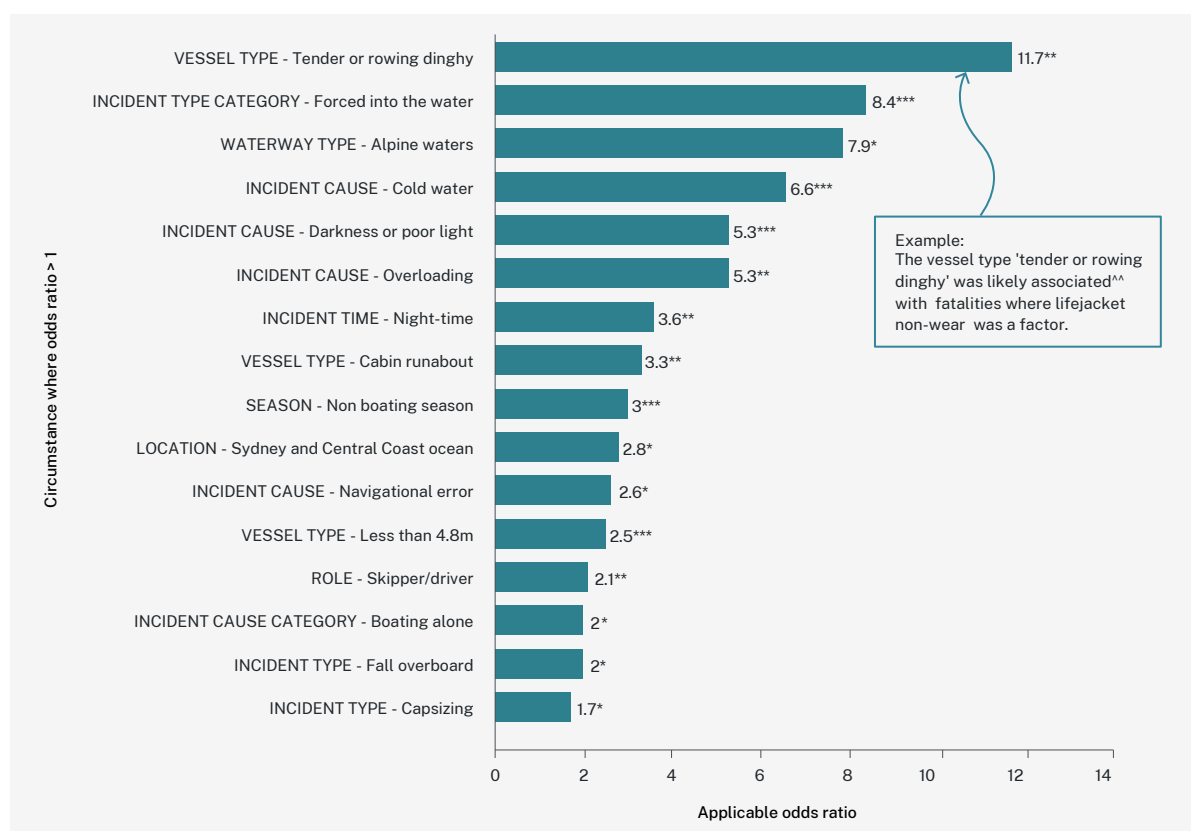
Circumstances associated with lifejacket non-wear among fatalities

A variety of circumstances appear to be associated with fatalities where lifejacket non-wear was a likely factor (Figure 8). These occur across a variety of incident variables, including vessel type and length category, incident type, incident cause and location/region. The degree of association was greatest²⁷ when the vessel type was a tender or rowing dinghy, the incident type was forced in water, or the location was alpine waters.



²⁷ As defined by the applicable odds ratio.

Figure 8: Circumstances statistically associated with fatalities where lifejacket non-wear was a likely factor[^] (10 year period to 30 June 2022)



[^]Length of each bar indicates the degree of association (estimated odds ratio); asterisks indicate the strength of association: *** = strong association ($P < 0.01$); ** = likely association ($0.01 \leq P < 0.05$); and * = possible association ($0.05 \leq P < 0.1$).

^{^^}Applicable odds ratio = 11.7, $0.01 \leq P < 0.05$.

In summary, lifejacket wear is clearly an important issue for boating safety. A field-based observational study undertaken in the 2022-23 boating season²⁸ estimated the overall recreational vessel lifejacket wear rate across NSW waterways to be 40.5%. This shows there is scope for lives to be saved if lifejacket wear rates were raised – whether through education, improved compliance or by strengthening existing mandatory wear laws. Further, it appears that lifejacket wear rates in NSW have plateaued in the low 40s after increasing significantly between 2007 and 2013²⁹. Based on data from the 10 year period to 30 June 2022, the number of recreational boating fatalities could have potentially have been reduced by up to 60 per cent had all persons been wearing a lifejacket.

While significant progress has been made in reducing the rate of recreational drowning fatalities, there is still a way to go to reach zero – and the information presented in this report highlights the various circumstances that will need to be considered when addressing the issue of lifejacket non-wear – including the use of tenders or rowing dinghies, situations where people are forced into the water and cold or alpine waters (Figure 8).

28 NSW lifejacket wear observational study, boating season 2022-23. Study conducted on behalf of Transport for NSW by Taverner Research.

29 Overall lifejacket wear rates in NSW estimated at 9% in 2009, 34% in 2013-14, 41%-45% through 2014-15 to 2017-18 and 40.5% in 2022-23 – noting that the respective studies differed in their methods.

9.2 Priority Safety Area: Boater age (65-plus)

Determining age-related differences in boating safety risk is complicated by the absence of age-based boating exposure or usage data. Licence numbers (Figure 9) provide the best available alternative for likely vessel usage – notwithstanding that not everyone aboard a vessel needs to be licenced and that, in some circumstances, a vessel operator does not need a boat licence.

Incidence

A considerable proportion of recreational boating fatalities are aged 65-plus. This group accounted for 28.6 per cent of the 14 recreational fatalities in 2021-22 and 25.9 per cent of the 135 such fatalities over the 10-year period to 30 June 2022.

When a direct comparison of fatalities and licence numbers is made across all age classes (Figure 9), a broad pattern of under-representation in the middle age groups (30-69) is evident. Conversely, over-representation is noticeable in those aged 70 and over and those aged up to 19 years of age (although the latter is affected by the age requirement for a licence in NSW, being 12 years). Boaters aged 70 and above accounted for 17.8 per cent of all recreational boating fatalities, which is significantly more than their 10.1 per cent share of boat licences. This over-representation among boaters aged 70 and above could be due to higher underlying safety risks associated with this age group, increased access to leisure time (and hence boat usage) or a combination of both. While it is not possible to quantify these factors with the available data, it appears that – on average – older people are another vulnerable user group (alongside inexperienced boaters)³⁰ and may be less able to manage the aftermath of an incident³¹.

NSW Health serious injury data also demonstrates an over-representation of older boaters, but only for those aged 80-plus (4.5% of serious injuries versus 1.6% of licences). However, NSW Health data does not differentiate between recreational and commercial serious injuries - while the vast majority of injuries recorded in the NSW Health data are likely to be recreational, any proportions derived from the NSW Health data and quoted in this report may differ slightly from the true proportion for recreational boating.

While the over-representation of older boaters fatalities is only evident from age 70, it is likely that many of the safety issues potentially affecting this age group (e.g. issues related to strength³², sensory perception³³, cognition³⁴ and general health³⁵) begin to manifest themselves at a considerably younger age, possibly mitigated to a degree by experience and positive safety attitudes. It is likely that the safety of older boat users is an important consideration, at least from age 65³⁶.

30 Transport for NSW, Maritime Safety Plan 2022 – 26. Priority Area 4, page 29.

31 Warr, P. (1993). In What Circumstances Does Job Performance Vary With Ages? *The European Work and Organizational Psychologist*, 3(3), 237–249. <https://doi.org/10.1080/09602009308408593>.

32 Keller, K., & Engelhardt, M. (2013). Strength and muscle mass loss with aging process. *Age and strength loss. Muscles, Ligaments and Tendons Journal*, 3(4), 346–350. <https://doi.org/10.11138/mltj/2013.3.4.346>.

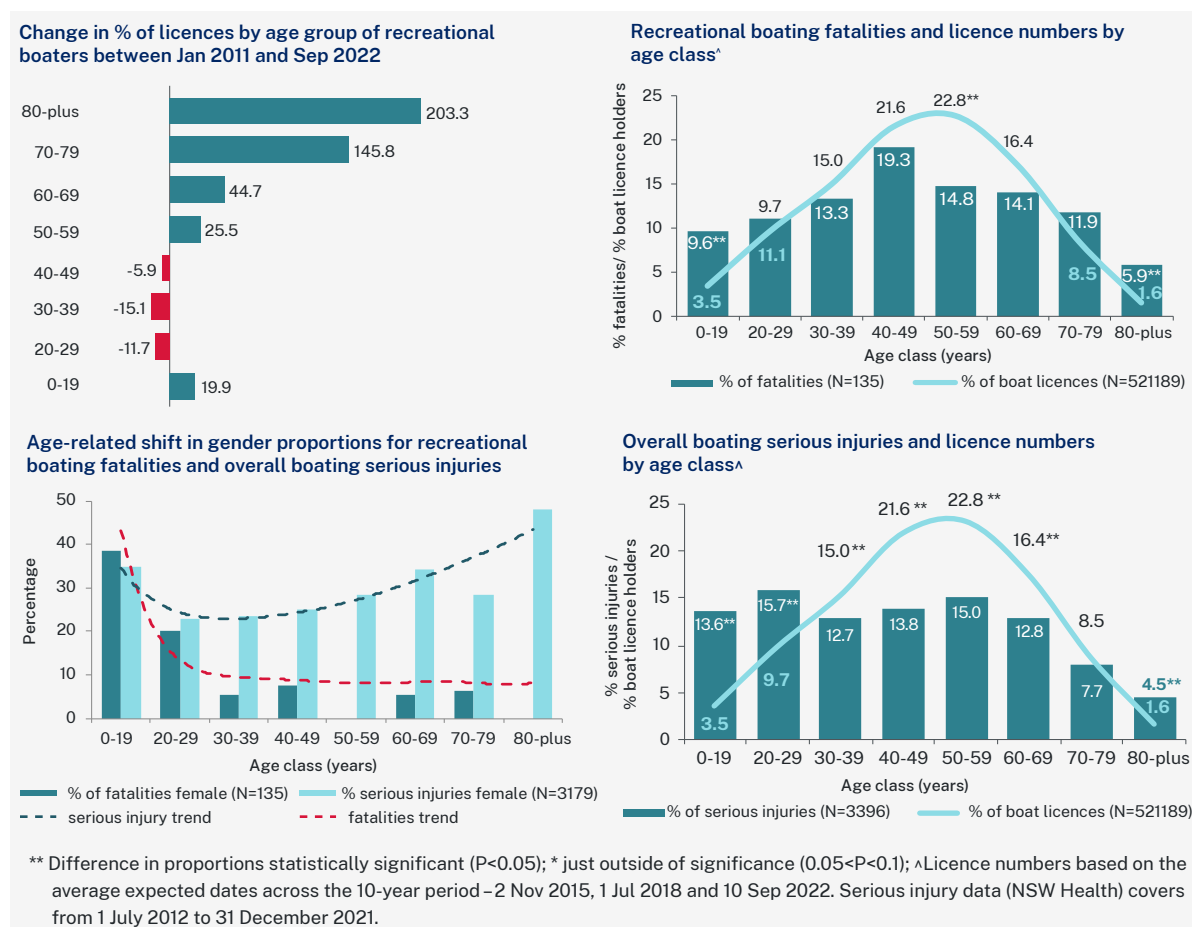
33 Study materials - http://www.rhsmpsychology.com/Handouts/senses_and_age.htm.

34 Boston University School of Public Health (2013) <https://sphweb.bumc.bu.edu/otlt/mph-modules/ph/aging/Aging5.html>.

35 *European Respiratory Journal* 2014(44): 1332-1352.

36 Based on TfNSW's Centre for Road Safety campaign for road users, "On the road 65+".

Figure 9: Focus safety area – Boater age – at a glance (10 year period to 30 June 2022)



** Difference in proportions statistically significant ($P < 0.05$); * just outside of significance ($0.05 < P < 0.1$); ^Licence numbers based on the average expected dates across the 10-year period – 2 Nov 2015, 1 Jul 2018 and 10 Sep 2022. Serious injury data (NSW Health) covers from 1 July 2012 to 31 December 2021.

Key statistics – boater age

- Boaters aged 70 and above accounted for just over 1 in 5 (20.4%) recreational boating fatalities but only about 1 in 12 (10.1%) of boat licences.
- According to NSW Health hospital data, boaters aged 70 and above are also over-represented in serious injuries, accounting for nearly 1 in 8 (12.2%) serious injuries.
- The proportion of licences held by older boaters has increased sharply in recent years – up by more than 200% for boaters aged over 80; nearly 150% for those aged 70-79 and nearly 45% for those aged 60-69. This contrasts with the age range 20 to 49, where the proportion of licences held actually fell.

Long-term (10-year) trend

The long-term trend in recreational boating fatalities of those aged 65 or older shows considerable volatility; a minimum of 2 (2017-18) to a maximum of 9 (2019-20). This volatility is consistent with what has happened with overall recreational fatalities over the 10-year period. The number of such fatalities aged 65 or older in 2021-22 (4) was statistically similar to the long-term (10-year) annual average of 3.5 such fatalities. Similarly, the number of recreational fatalities aged 70 or greater in 2021-22 (2) was statistically similar to the long-term (10-year) annual average of 2.4 such fatalities.

The participation of boaters aged 70 and over appears to have significantly increased. Licensing data demonstrates a shift of over 154 per cent by people aged 70 and above from January 2011 to 10 September 2022. While far smaller changes were evident for the younger age groups, the respective shifts for the age ranges 50-59 (25.5%) and 60-69 (44.7%) point to large future increases for the 70 and over age group, due to the very large number of licences involved (Figure 9). If this expected increase in licence numbers is reflected in actual boat usage, it is likely that the safety of older boaters will require an increased focus in coming years.

Differences by gender

Most recreational boating fatalities are male (88.1% across all ages), and this is especially true of those aged 65-plus (94.3%). For serious injuries, the corresponding percentages are lower, at 70.5 per cent overall and 66.3 per cent for those aged 65-plus. Comparatively few females are killed in boating incidents, with the exception of the younger age groups (less than age 30 – Figure 9). There is some evidence of an increased proportion of females among serious injuries beyond around age 40 (Figure 9), and this is most evident for the age group 80-plus.

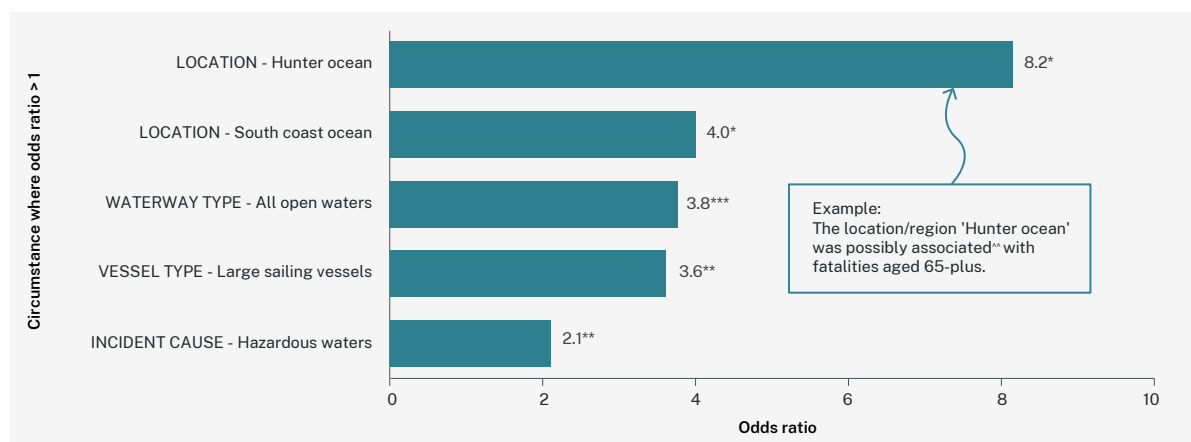
Circumstances associated with fatalities in older boaters (65-plus)

Several circumstances appear to be associated with fatalities where the boater being aged 65-plus was a likely factor (Figure 10). These occur across four incident variables – location/region, waterway category, vessel type and incident cause. The degree of association was greatest³⁷ when the location/region was the Hunter Region ocean waters.



³⁷ As defined by the applicable odds ratio.

Figure 10: Circumstances statistically associated with fatalities where boater age (65-plus) was a likely factor[^] (10 year period to 30 June 2022)



[^]Length of each bar indicates the degree of association (estimated odds ratio); asterisks indicate the strength of association: *** = strong association ($P < 0.01$); ** = likely association ($0.01 \leq P < 0.05$); and * = possible association ($0.05 \leq P < 0.1$).

^{^^}Applicable odds ratio = 8.2, $0.05 \leq P < 0.1$. The circumstance “VESSEL TYPE – large sailing vessels” includes both yachts and catamarans.

In summary, the safety of boaters aged 65-plus is a significant and likely growing issue. Trends in licence numbers point to a growing cohort of boaters aged 65-plus in the years ahead. If these trends are reflected in actual boating usage, an increased focus on the safety of older boaters will be required in future years.

Any future education, compliance or policy initiatives aimed at improving safety in the 65-plus age group should build on the ‘safety strengths’ already suggested by the data, which implies slightly younger boaters (especially those aged 50-59) are actually under-represented in fatalities and serious injuries. The most likely explanation for this is that experience and positive safety attitudes help to reduce fatalities and serious injuries among this cohort – and the benefits of this remain evident in the 60-69 age group, especially in relation to serious injuries. Reinforcing good safety behaviours and habits in boaters in their 50s and 60s should lay a foundation for better safety for the rest of their lives.

The information presented in this report highlights the various circumstances that will need to be considered when addressing the safety of boaters aged 65-plus – including boating on ocean waters, boating in hazardous waters and use of large sailing vessels (yachts and catamarans) – Figure 10.

9.3 Priority Safety Area: Weather conditions

Incidence

Weather conditions that affect boating safety include strong winds, heavy rain, thunderstorms and fog. Of these, strong winds are the most common weather issue affecting boat users – partly because of wind’s direct impact on a vessel (especially sailing vessels) but mainly because strong winds generate large waves, particularly on more exposed waters. Large waves, in turn, give rise to a separate but closely related incident cause – ‘hazardous waters’. The contributory causes ‘weather conditions’ and ‘hazardous waters’ often occur together (e.g. when it is both windy and rough at the time of an incident) but can occur singly (e.g. calm conditions with large ground swell).

Weather conditions³⁸ were reported as a major or secondary cause associated with 15 (12.6%) of the 119 fatal recreational boating incidents recorded in the 10 years to 30 June 2022. Weather conditions were also a likely contributory incident cause associated with a further 15 fatal boating incidents over this period (12.6%) – meaning that weather conditions were at least a likely contributory factor in just over one-quarter of all fatal recreational boating incidents.



³⁸ Analysis of weather conditions based on both Transport fatality records and Transport operational incident data.

When the causes “hazardous waters” and “hazardous waters – bar conditions” – which usually relate to weather conditions at least indirectly – are added, the number of fatal incidents is even higher – 45 incidents (37.8% of the total). If other possibly related causes are also considered – such as cold water and restricted visibility – it is likely that close to 50 per cent of fatal boating incidents are directly or indirectly related to weather conditions.

Weather conditions were also reported as a major or secondary cause associated with 20 (5.2%) of the 386 recreational serious injury incidents recorded over the 10 years and 238 (13.1%) of the 1817 overall recreational boating incidents.

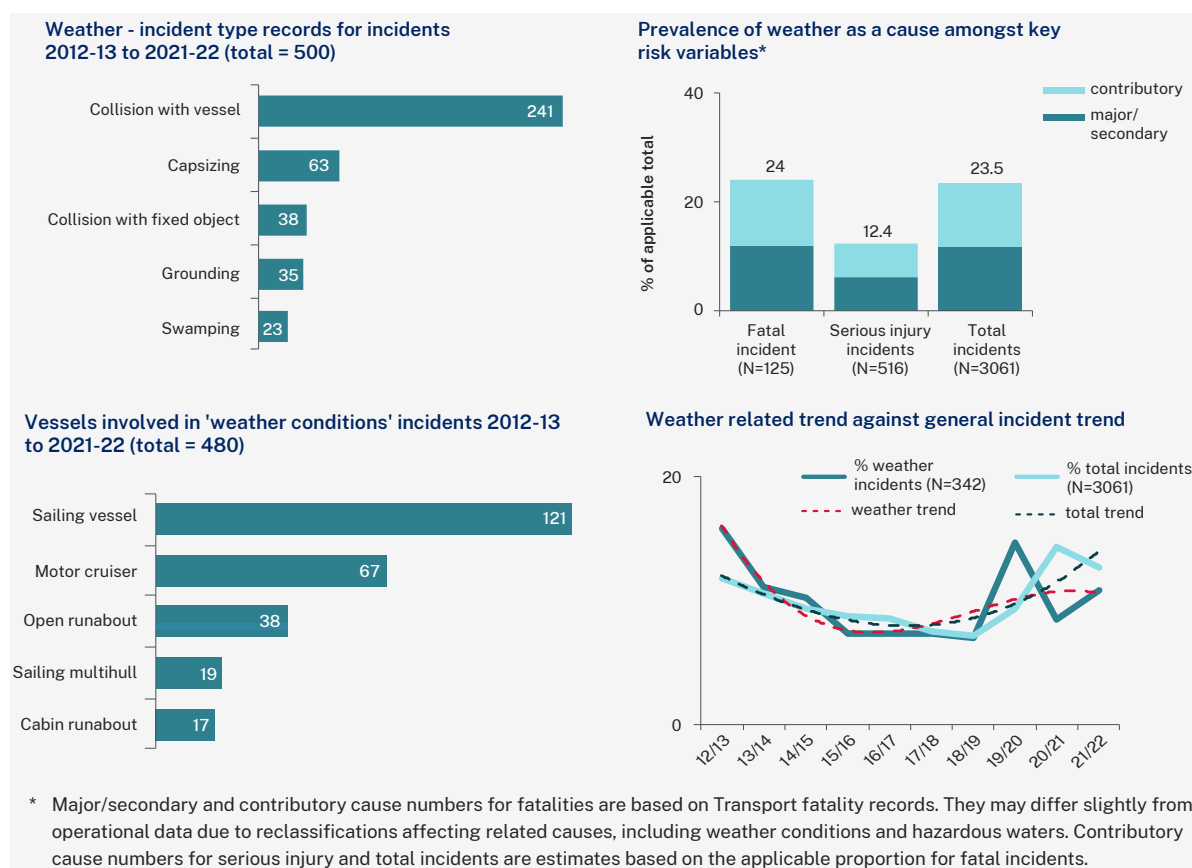
In 2021-22, weather conditions were directly associated with four of the 12 fatal incidents (33.3%).

Long-term trend

Weather-related incidents increased in 2021-22 by 27.6% compared to the year before, but have been relatively volatile in the last few years (Figure 11). Despite this increase, weather-related incidents have not trended upwards in recent years in the way that general boating incidents have. The overall number of incidents related to weather conditions in 2021-22 (37) was statistically similar to the long-term (10-year) annual average of 34.2 incidents.



Figure 11: Focus safety area – weather conditions – at a glance (10 year period to 30 June 2022)



Key statistics – weather conditions

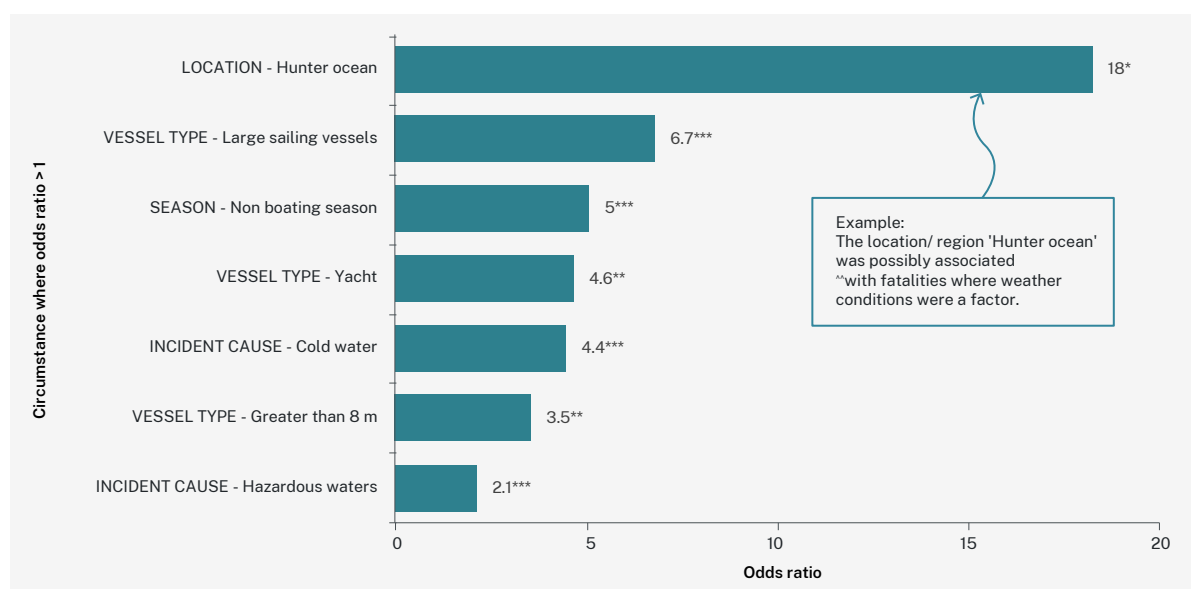
- Weather conditions were a likely factor in just over 1 in 4 (25.2%) fatal boating incidents.
- 29.2% of vessels involved in weather-related incidents were sailing vessels (including multihulls).
- Collisions with another vessel accounted for nearly 50% of all incident type records related to weather conditions.
- Sydney region (44.4%) leads in regions where most weather incidents occurred, followed by Hunter Inland (19.6%) and Hawkesbury River/Broken Bay region (15.8%).
- Weather-related incidents occur all year and 30.7% occurred outside of the October to April 'boating season'.

Circumstances associated with weather-related fatalities

Several circumstances appear to be associated with fatalities where weather conditions were a likely factor (figure 12). These occur across a variety of incident variables, including location/region, vessel type and time of year. The degree of association was greatest³⁹ when the location/region was the Hunter Region ocean waters.

³⁹ As defined by the applicable odds ratio.

Figure 12: Circumstances statistically associated with fatalities where weather conditions were a likely factor[^] (10 year period to 30 June 2022)



[^]Length of each bar indicates the degree of association (estimated odds ratio); asterisks indicate the strength of association: *** = strong association ($P < 0.01$); ** = likely association ($0.01 \leq P < 0.05$); and * = possible association ($0.05 \leq P < 0.1$).

^{^^}Applicable odds ratio = 18, $0.05 \leq P < 0.1$. The circumstance “VESSEL TYPE – large sailing vessels” includes both yachts and catamarans.

While weather conditions are a fundamental safety issue on the water, the data suggest that incidents related to weather conditions fall into two distinct categories: (1) collisions and injuries caused by strong or gusty winds affecting sailing vessels whilst racing or manoeuvring in congested areas – these incidents often occur on sheltered waters and typically involve vessel damage rather than injury; and (2) incidents where adverse weather contributes to a vessel being capsized, swamped or sunk in hazardous waters – these incidents occur in a variety of waterways and often lead to serious injuries, fatalities or persons having to be rescued from significant danger.

Measures to reduce incident rates related to adverse weather therefore need to reach a wide boating audience and be tailored to quite different situations – ranging from sailing vessels being damaged in closely contested races on sheltered waters to people being caught out in dangerously rough waters on exposed waterways or in the ocean.

Incidents caused by weather conditions are usually preventable, if boat users plan their trips to take into account expected weather, remain vigilant for changing conditions and react in a timely manner to any deterioration in conditions. Technology, in terms of new phone apps and improved forecasting services, clearly plays a role in keeping boaters safe from adverse weather. However, education will remain crucial in helping boaters understand how to plan for and react to weather conditions on the water.

Key considerations in minimising weather-related risks include using a vessel that is suitable for the expected location/conditions and checking the weather both before and during a boating trip.

9.4 Priority Safety Area: Trauma

Trauma, in the context of boating incidents, refers to situations where a person is injured or killed primarily by a physical impact rather than by drowning, immersion, hypothermia or exposure to gas. Often, but not always, trauma incidents involve one or more vessels travelling at a high or excessive speed and subsequently being involved in a collision.

Incidence

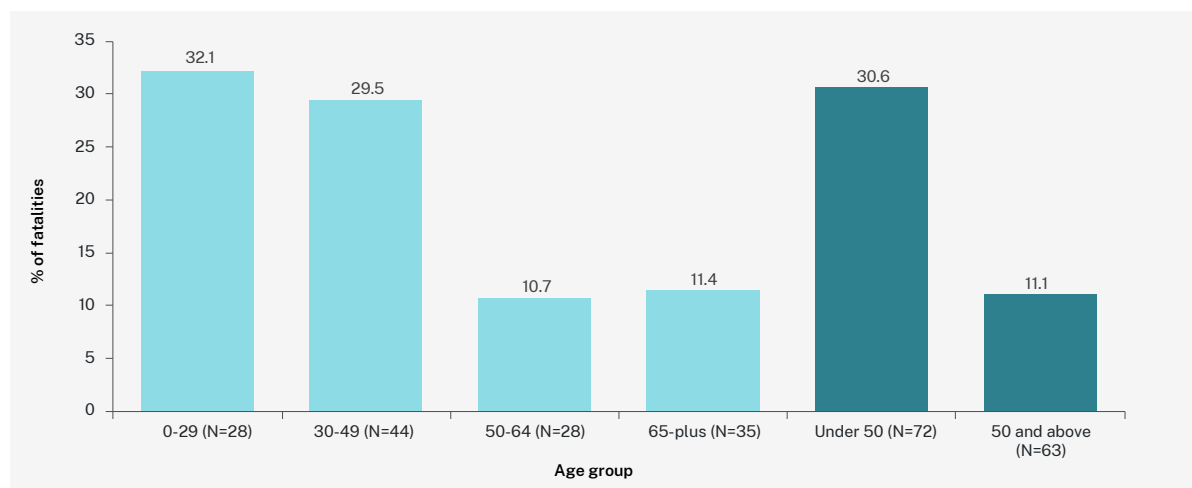
Trauma-related boating fatalities accounted for 29 (21.5%) of the 135 recreational boating fatalities recorded from 2012-13 to 2021-22. However, there were no trauma-related boating fatalities in 2021-22.

The main vessel types involved in trauma-related boating fatalities over the 10 year period were open runabouts (13, 44.8%), hi-performance ski/wakeboard vessels (9, 31.0%) and yachts (3, 10.3%).

Males accounted for 82.7 per cent of all recreational trauma-related boating fatalities.

Trauma fatalities tend to be more prevalent among younger and middle-aged boaters. Among recreational boaters aged less than 50, trauma accounted for 30.6 per cent of the applicable recreational fatalities (Figure 13), a significantly higher proportion⁴⁰ than for boaters aged 50 and above (11.1%).

Figure 13: Percentage of the fatalities with key age groups related to trauma (10 year period to 30 June 2022)



⁴⁰ P<0.01, Z test of two proportions.

The vast majority of boating serious injuries are trauma-related, resulting from impact injuries from events such as collisions and falls onboard. NSW Health hospital data⁴¹ shows that there were 3396 boating serious injuries over the 10 years to 30 June 2022. While the NSW Health data does not distinguish between recreational and commercial boating incidents, it is likely that the vast majority of these serious injuries relate to recreational boating activities⁴². Also, while a small proportion of these serious injuries would have involved situations such as near-drowning, gas inhalation or hypothermia, these figures give an idea of the significant extent of boating trauma on NSW waterways. In 2021-22 there were a total of 272 serious injuries reported to NSW Health, significantly below the 10-year average of 339.6 to June 2022. In 2021-22, males accounted for 69.5 per cent of the total serious injuries.

Long-term (10 year) trend

While there were no trauma-related fatalities in 2021-22, there has not yet been any clear sign of a long-term downward trend in such fatalities, with annual numbers showing high volatility. However, the number of serious injuries reported to NSW Health (which are assumed to be nearly all trauma-related and related to recreational boating) has continued its long-term downward trend in 2021-22 (Figure 14), decreasing by 19.9 per cent compared to 2020-21.

Injury profile

The injury profile of serious injuries reported to NSW Health is characterised by injury types like fractures (39.6%), open wounds (10.4%), injury to internal organs (6.5%) and dislocations/sprains /strains (4.6%). The injury profiles between males and females are significantly different in the proportion of injuries related to fractures and injury to internal organs, with females having a higher proportion of fractures and males having injuries to internal organs. The differences in injury types noted by gender extend to differences in the body location of the injuries. Females have a higher proportion of injuries to the abdomen and males to the shoulder/upper arm, wrist/hand, and ankle⁴³. These differences could be the result of physical differences⁴⁴ or differences in boating activities⁴⁵ between genders.

Age-related differences

Based on NSW Health hospital data, trauma (as indicated by serious injuries – Figure 9) appears to be over-represented among older boaters (those aged 80-plus) and, especially, among younger boaters (those aged under 30). Boaters aged under 30 accounted for 29.2 per cent of the serious injuries but only 13.2 per cent of boat licences. Although this difference is partly explained by people under 12 not being eligible to hold a licence, the pattern is replicated in people aged 20-29. This age group accounted for 15.7 per cent of serious injuries, a much higher proportion than the corresponding percentage of licences held (9.7).

41 Based on NSW Health hospital records for the 10-year period 2012-13 to 2021-22.

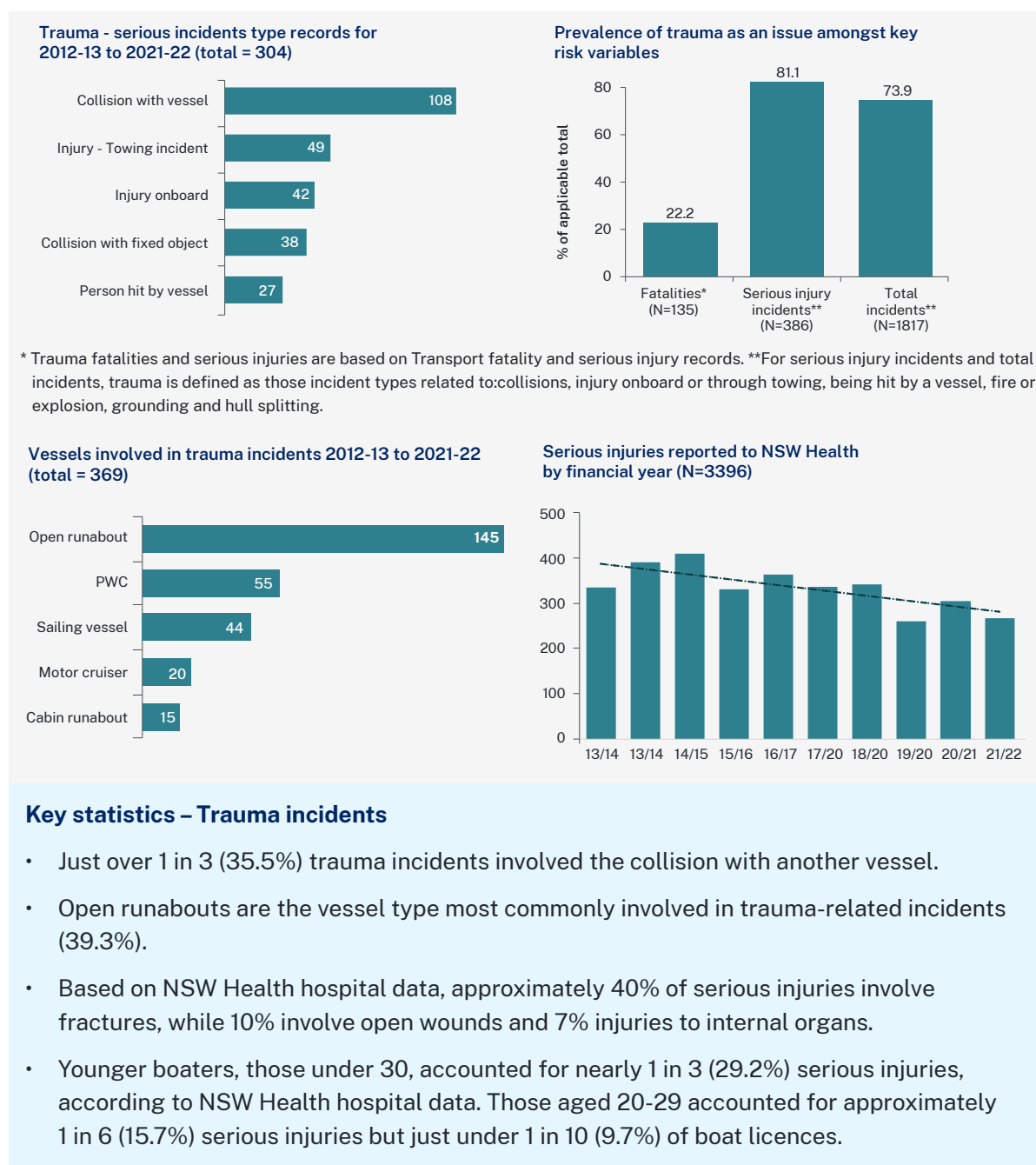
42 There were 127 commercial or recreational/commercial serious injuries reported to NSW Maritime over this 10 year period. Given that serious injuries aboard commercial vessels tend to be well-reported, this total would most likely be close to the actual number of such serious injuries reported to NSW Health.

43 Based on NSW Health hospital records for the 10-year period 2012-13 to 2021-22.

44 Miller AE, MacDougall JD, Tarnopolsky MA, Sale DG. Gender differences in strength and muscle fiber characteristics. *Eur J Appl Physiol Occup Physiol.* 1993; 66(3):254-62.

45 Australian Institute of Health and Welfare 2021: Pointer SC & Harrison JE. Boating and watercraft-related injury 2017-18. Injury research and statistics series no. 133. Cat. no. INJCAT 214. Canberra: AIHW.

Figure 14: Focus safety area – Trauma – at a glance (10 year period to 30 June 2022)



Vessel types associated with trauma

There are a variety of vessel types that tend to be associated with trauma incidents – including Personal Watercraft, waterski and wakeboarding vessels and open runabouts. The common denominators across these vessel types are high speeds and popularity on very sheltered waterways, including lakes and rivers. The analysis here focuses on PWC because they are heavily over-represented in serious injuries – as outlined below – and have historically been subject to relatively high numbers of complaints and compliance actions⁴⁶. While open runabouts have accounted for a higher proportion of recreational serious injuries over the 10 year period to 30 June 2022 (41.5%), this is against a much higher share of recreational vessel registrations (61.2%). Open runabouts are examined in more detail in Section 9.5.

Personal Watercraft⁴⁷ are fast powerful vessels with minimal protection for the user. Their handling characteristics and modes of use contribute to their relatively high involvement in trauma-related incidents, especially serious injuries. Over the 10 year period to 30 June 2022, PWC were involved in 16.6 per cent of the recreational serious injury incidents recorded, but accounted for an average of only around 5.8 per cent of registered recreational vessels⁴⁸. The overwhelming majority of the serious injury incidents involving PWC are trauma-related, as evidenced by their very high involvement in collisions (Figure 15).

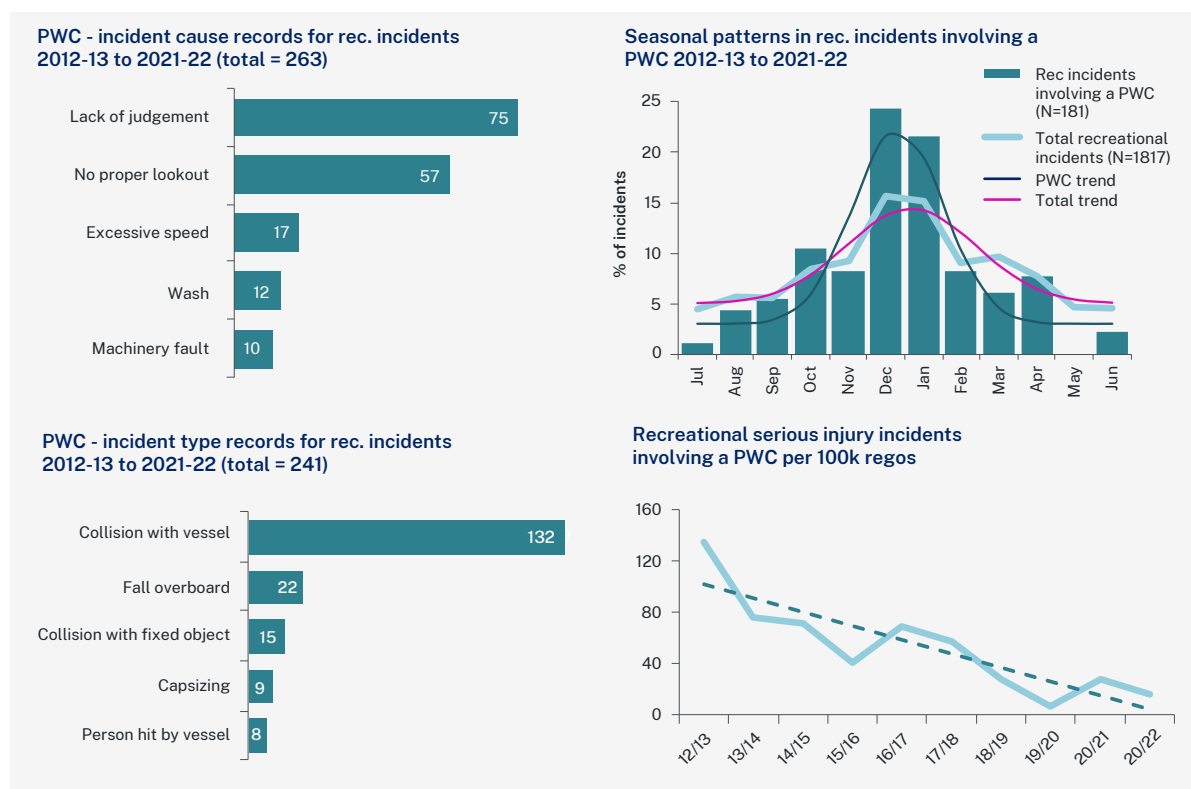


46 Personal Watercraft Incidents, Compliance and Feedback in New South Wales – Statistical report for the 10-year period ended 30 June 2012. Maritime Management Centre, Transport for NSW.

47 Analysis of PWC incidents based on both Transport fatality records and Transport operational incident data.

48 PWC accounted for 4.1% of recreational registered vessels at the end of 2012-13, increasing to 8.0% at the end of 2021-22.

Figure 15: Personal Watercraft (PWC) incidents (10 year period to 30 June 2022)



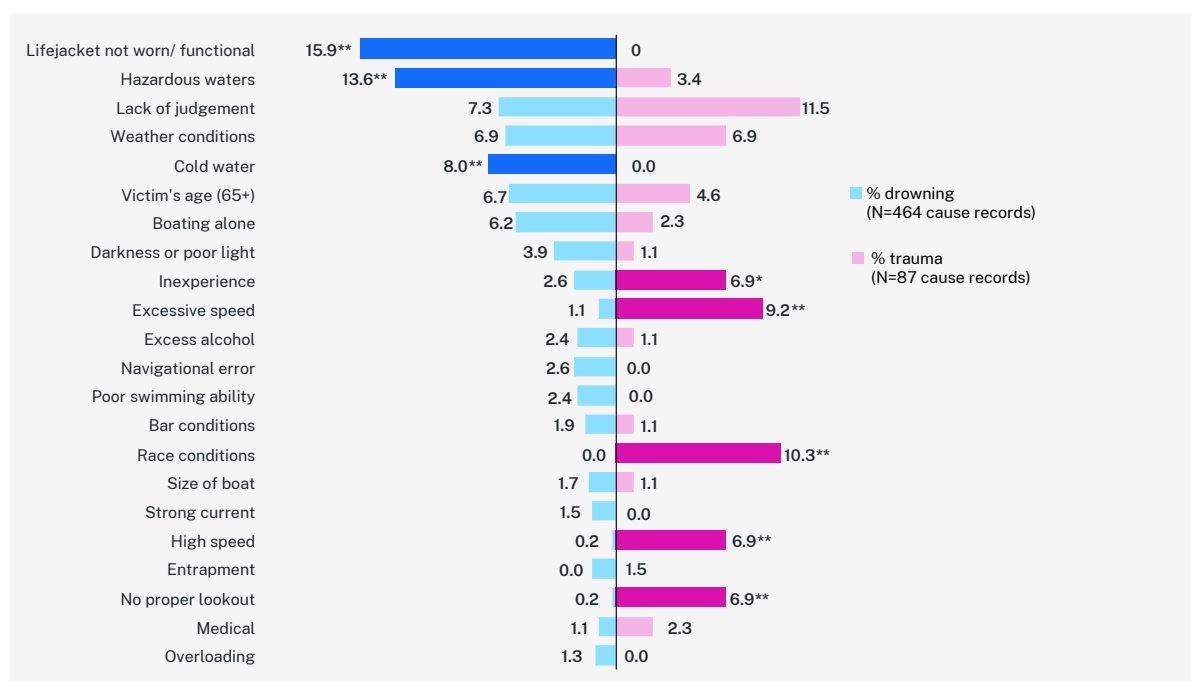
Key statistics – PWC

- While PWC have been over-represented in recreational serious injury incidents over the last 10 years, the rate (per 100,000 registrations) of such incidents is trending down.
- Collision with another vessel was by far the most common incident type associated with PWC, accounting for more than half (54.8%) of associated incident type records.
- The main contributory causes associated with incidents involving PWC were lack of judgement (28.5%) and no proper lookout (21.7%). Together, these accounted for 50.2% of associated incident cause records.
- Recreational incidents involving a PWC are highly seasonal – more so than for boating generally - with a pronounced summer maximum. December and January together accounted for 45.9% of the incidents. This reflects the strongly seasonal usage of PWC.
- PWC-related incidents (state total) are concentrated in four regions; the Botany Bay/Port Hacking (35.9%), the Hawkesbury River/Broken Bay (17.7%), the Murray inland region (16.6%) and the Hunter Inland region (13.8%).

Comparing trauma-related fatal incidents to drowning-related fatal incidents⁴⁹

Trauma-related fatal incidents have a different ‘cause profile’ to drowning-related fatalities (i.e. most other fatalities). Trauma-related fatalities over the last 10 years were significantly associated with racing conditions⁵⁰, excessive or high speed, failing to maintain a lookout and – to a lesser extent – inexperience (Figure 14).

Figure 16: Contributory cause profiles for trauma fatal incidents and drowning fatal incidents (10 year period to 30 June 2022)



The darker bars denote causes for which a statistically-significant association was found with either drowning fatalities or trauma fatalities. Asterisks indicate strength of association: *** = strong association ($P < 0.01$); ** = likely association ($0.01 \leq P < 0.05$); and * = possible association ($0.05 \leq P < 0.1$).

Circumstances associated with fatalities related to trauma

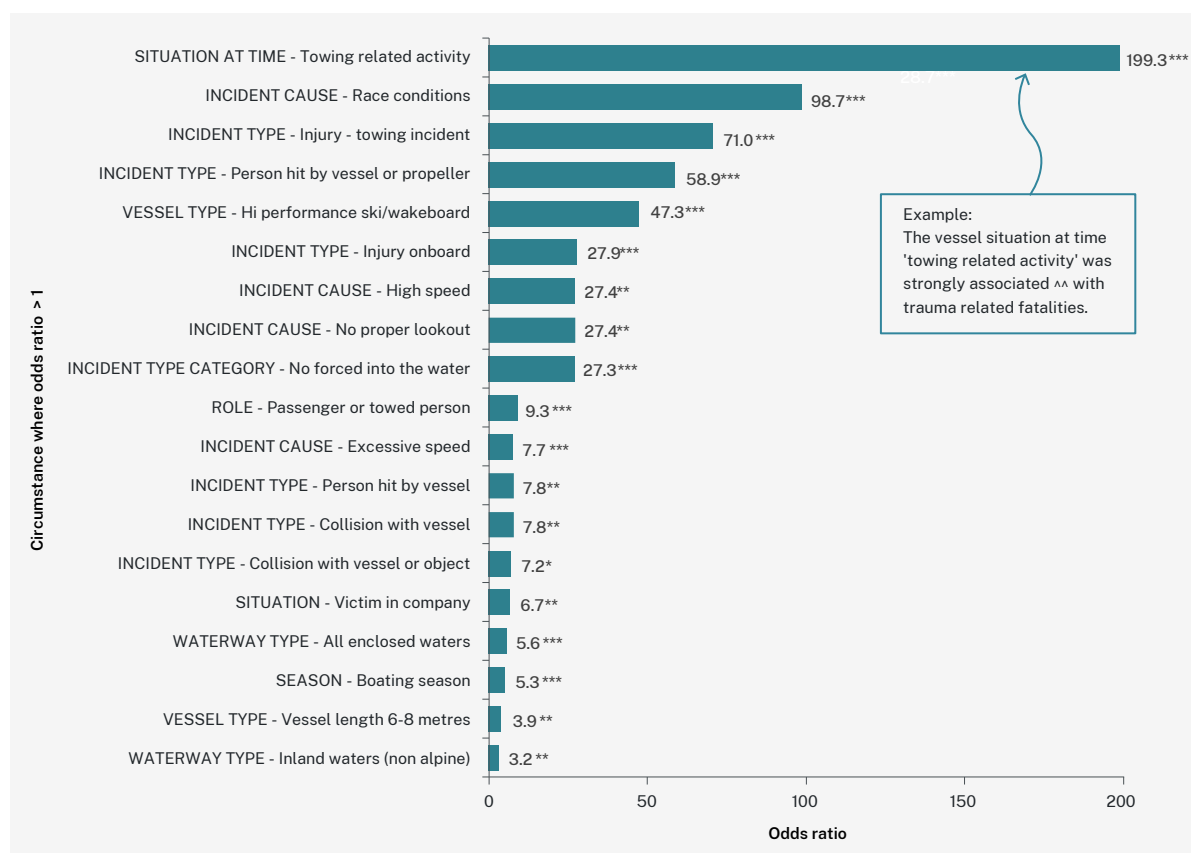
A variety of circumstances appear to be associated with trauma related fatalities (Figure 17). These occur across a variety of incident variables, including type of activity, incident cause, incident type and vessel type. The degree of association was greatest⁵¹ for towing-related activity or incidents or when the incident cause included race conditions.

49 A very high majority of fatalities are either drowning-related or trauma-related.

50 ‘racing conditions’ refers to the competitive high intensity environment faced by race participants, during both competition and training.

51 As defined by the applicable odds ratio.

Figure 17: Circumstances statistically associated with fatalities where trauma was a factor[^] (10 year period to 30 June 2022)



[^]Length of each bar indicates the degree of association (estimated odds ratio); asterisks indicate the strength of association: *** = strong association (P<0.01); ** = likely association (0.01≤P<0.05); and * = possible association (0.05≤P<0.1).
^{^^}Applicable odds ratio = 199.3, P<0.01.

While trauma incidents don't cause as many boating fatalities as drowning incidents, their rate has not declined significantly over the last few decades. Unlike 'non-trauma' fatalities (which are almost always drowning-related), trauma incidents cannot be guarded against as easily 'in advance' by steps such as wearing a lifejacket, checking the weather or by using the right vessel for the conditions. Instead, to minimise the risk of a trauma incident, boat users need to remain alert and 'present in the moment' – by always watching their speed and everything around them.

The relationship between speed and keeping a proper lookout is very important here: if keeping a lookout becomes difficult or stressful, it is a likely sign that one's speed is too high for the conditions – whether that be heavy boating traffic, proximity to fixed hazards or poor visibility. Continuing strong education on this point would help reduce trauma-related boating incidents. In addition, tailored education for certain boat users is needed: for example, PWC users need to appreciate the unique handling characteristics of their vessels and the risks of doing high-speed manoeuvres in close proximity to other waterway users; while tow sport participant need to know about the risks of hidden hazards on inland waterways and the risks associated with 'whipping' a towed person through high speed turns.

9.5 Priority Safety Area: Open runabouts

The term 'open runabout' refers to small open vessels, typically 3 to 5 metres in length. These vessels are exemplified by the so-called 'tinny'. Open runabouts are usually capable of high speeds, due to their small size, light weight and being powered by an outboard motor.

Incidence

Open runabouts are heavily represented in recreational boating incidents due to their small size, open design and high speed. Open runabouts are vulnerable to both high speed collisions and swamping or capsizing.

Open runabouts were associated with 34.5 per cent of the 119 fatal recreational incidents over the 10-year period to 30 June 2022.

In 2021-22, open runabouts were associated with 25 per cent of the 12 fatal recreational incidents. Nine out of 10 fatalities involving an open runabout over the 10 years were male.

Open runabouts were also involved in 41.5 per cent of the 386 recreational serious injury incidents over the 10 year period and 28.1 per cent of the 1817 recreational boating incidents overall. However, in 2021-22, the proportion for incidents overall was significantly lower, at 16.0 per cent.

Open runabouts were the vessel most commonly associated with both trauma-related fatalities (44.8%) and drowning fatalities (31.4%).

While open runabouts are not over-represented in boating incidents in comparison to their share of recreational vessel registrations (61.2%), the sheer number of these vessels makes them a very important segment of the recreational vessel fleet in terms of addressing safety risks. Furthermore, a recent survey of vessel usage suggests that open runabouts account for about 26 per cent of vessel usage⁵², meaning that their involvement in fatal or serious injury incidents is higher than would be expected on the basis of their estimated usage.



⁵² NSW Recreational Boater Survey 2023. Technical Report prepared for Transport for NSW by Taverner Research Group, September 2023 – estimate based on 'powered vessels less than 4.8m long' used on most recent trip in NSW waters. This category closely corresponds with 'open runabouts'.

Long-term trend

The number of reported open runabouts incidents has not changed significantly over the 10 years to 30 June 2022. However, a significant downward trend has occurred for serious injury incidents involving these vessels (Figure 18). The number of fatal recreational incidents in 2021-22 (3) was statistically similar to the long-term (10-year) annual average of 4.1.

Figure 18: Trend in annual number of serious injury incidents involving an open runabout over the 10 year period to 30 June 2022

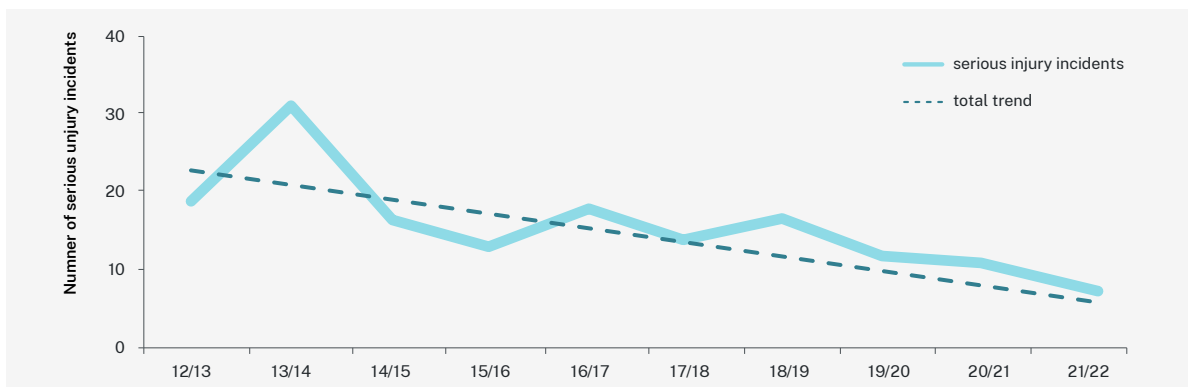
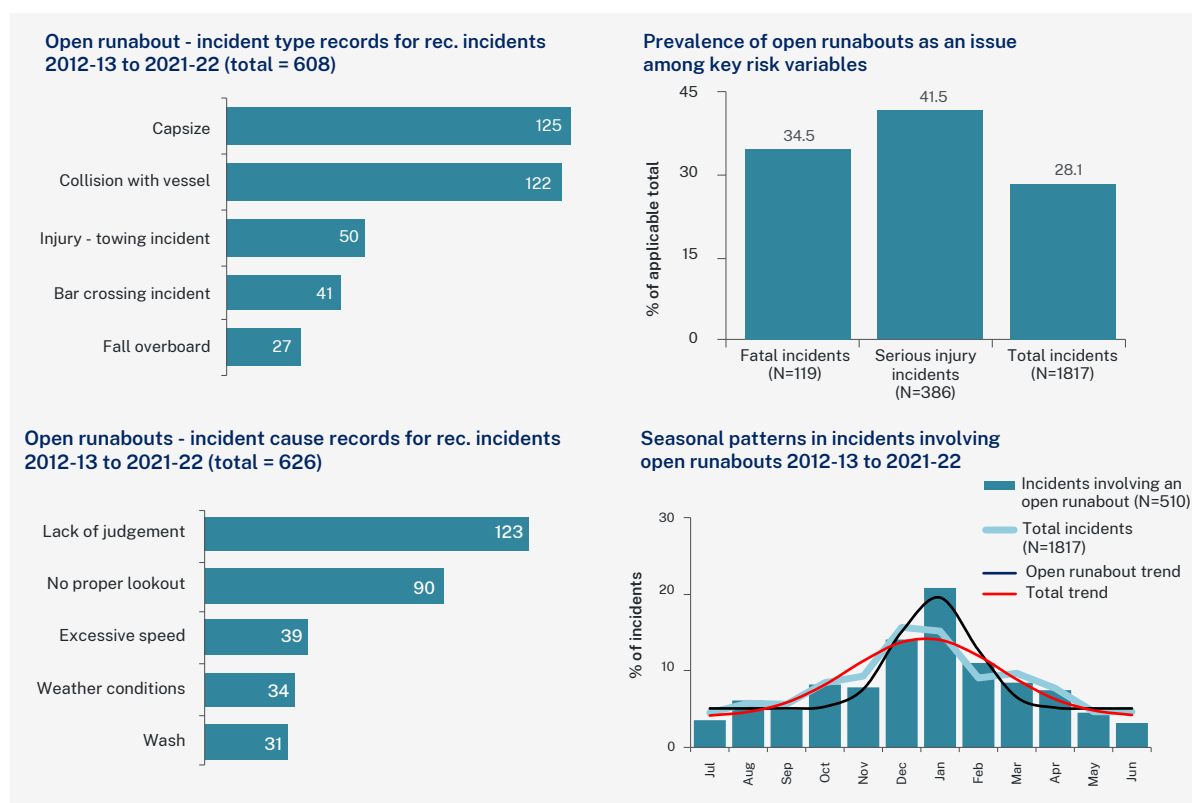


Figure 19: Focus safety area – open runabouts – at a glance



Key statistics – open runabouts

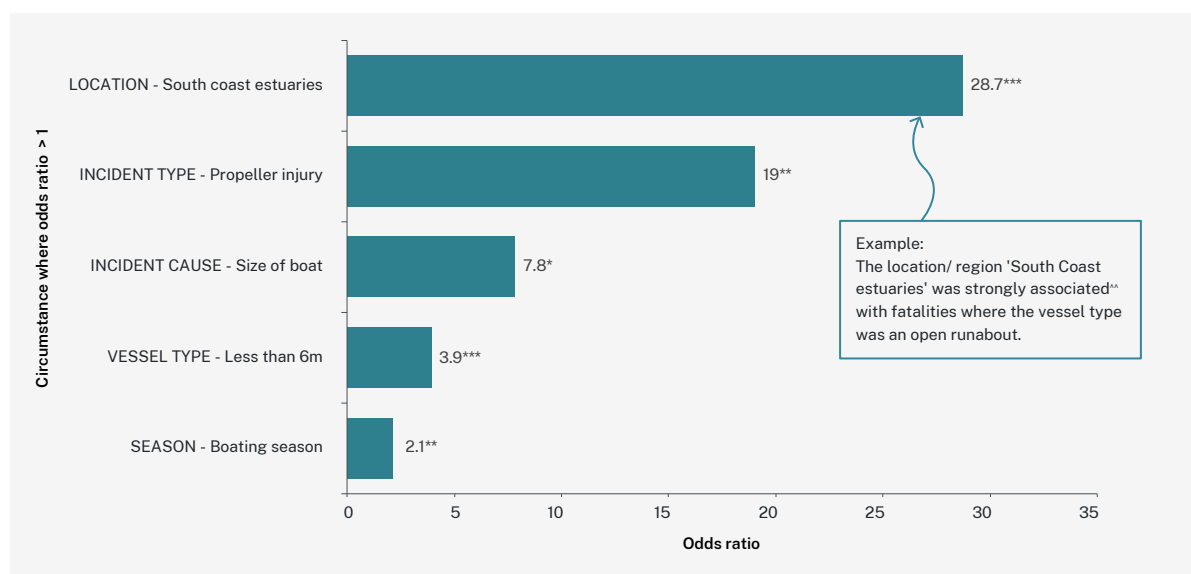
- Open runabouts were involved in 34.5% of recreational fatal incidents and 41.5% of corresponding serious injury incidents over the last 10 years. However, they accounted for only about 26% of vessel usage based on the most recent data⁵³.
- The leading contributory causes of incidents associated with open runabout were lack of judgement (19.6%) and no proper lookout (14.4%).
- Capsizing and collision with a vessel were the most common incident types associated with open runabouts – together accounting for 40.6% of related records.
- Over the last 10 years, open runabouts-related incidents were concentrated in the Hawkesbury River/Broken Bay area (18.4%), the Hunter Inland area (17.1%), the Murray Inland area (15.1%), and the South Coast (13.1%).

⁵³ NSW Recreational Boater Survey 2023. Technical Report prepared for Transport for NSW by Taverner Research Group, September 2023 – estimate based on ‘powered vessels less than 4.8m long’ used on most recent trip in NSW waters. This category closely corresponds with ‘open runabouts’.

Circumstances associated with fatalities related to open runabouts

Several circumstances appear to be associated with fatalities involving open runabouts (Figure 20). These occur across several incident variables, including location/region, incident type and incident cause. The degree of association was greatest⁵⁴ when the location/region was the South Coast estuaries or the incident type was a propeller injury.

Figure 20: Circumstances statistically associated with open runabout related fatalities[^] (10 year period to 30 June 2022)



[^]Length of each bar indicates the degree of association (estimated odds ratio); asterisks indicate the strength of association: *** = strong association ($P < 0.01$); ** = likely association ($0.01 \leq P < 0.05$); and * = possible association ($0.05 \leq P < 0.1$).

^{^^}Applicable odds ratio = 28.7, $P < 0.01$.

Open runabouts are – more than nearly every other vessel type – vulnerable to both drowning/ potential drowning incidents and trauma incidents. This is due to their small size and open design in combination with their high speed capability. Open runabouts are also very popular – meaning that by weight of sheer numbers, they feature heavily in boating incidents.

Open runabouts, especially the smaller ones, are highly vulnerable to capsizing or swamping in rough conditions – even the sorts of conditions that can occur on larger lakes and estuaries. At the same time, their design offers little physical protection in a collision. These vulnerabilities mean that improving open runabout safety requires effort on virtually all key safety fronts: e.g. lifejacket wear, watching the weather, maintaining safe speeds and keeping a proper lookout.

⁵⁴ As defined by applicable odds ratio.

10 Conclusions

This report represents the first findings under the current Maritime Safety Plan (MSP 2026), which covers the five year period from 2021-22 to 2025-26. As such, it presents a ‘baseline’ against which any improvements achieved under MSP 2026 can be compared.

The report presents mixed results for boating safety in NSW. While there have been positive trends regarding some issues, significant challenges remain.

Positive outcomes or trends are evident in relation to:

- a sharp decline in the number and rate of recreational vessel fatal incidents (per 100,000 registered recreational vessels) from 2019-20 to 2021-22.
- a moderate long-term decline in the drowning fatality rate for recreational boating incidents – down by approximately 52 per cent since 1992-93⁵⁵.
- a downward trend in the rate of serious injury incidents related to PWC.
- low impact of drugs in recreational drownings.
- Overall boating fatalities finished in 2021-22 below the applicable intermediate target under the Maritime Safety Plan 2022-26. However, serious injuries finished slightly above their corresponding target.
- Serious injuries reported to NSW Health have continued their downward trend, with a 27.4% decline since 2013-14⁵⁶.

The data suggests challenges remain about:

- **Lifejacket wear rates** - non-improvement in the percentage (70%) of boating fatalities presumed drowned and not wearing a lifejacket.
- **Trauma** – The rate of non-drowning fatalities has fluctuated at lower levels, without showing any significant long-term trend.
- **Older boaters** – the 70 and above segment continues to be over-represented in boating fatalities, considering the number of boat licences held. The 80 and above segment is also represented in boating serious injuries reported to NSW Health.
- **Younger boaters** – the 30 and below segment is over-represented in boating serious injuries reported to NSW Health.
- **Open runabouts** – this segment is heavily represented in both fatal and serious injury recreational incidents.

⁵⁵ Based on the drowning per 100,000 registrations. The decline in the drowning fatality rate is 52%, 95% CI [67.1-33.0].

⁵⁶ The decline in serious injuries reported to NSW Health is 27.4%, 95% CI [56.2-6.5].

- **Collisions with another vessel** – this type of incident remains a concern across a number of the priority safety areas. Collision with another vessel accounted for close to 50 per cent of incident type records related to weather conditions, more than 1 in 3 of trauma incidents and just over 1 in 5 of incidents associated with open runabouts. Collisions with another vessel were particularly common with PWC, where such collisions accounted for 54.8% of associated incident type records.

Reducing risk factors associated with boating fatalities and serious injuries is key to keeping waterway users safe. Still, the effect of not wearing a lifejacket persists as the main prevalent factor in boating fatalities, requiring continuous focus.

The effects of age (70-plus) in fatalities and serious injuries (80-plus) are of concern, especially given that the number of boating participants in this age range is likely to continue growing. While the evidence is limited to over-presentation based on licence numbers, there is a clear need to better understand the risk factors associated with boating by older persons and how these risks can best be managed.

While the most obvious effects of the COVID-19 pandemic on leisure activities appear to be receding, it is not yet clear what the long-term effects may be on the overall popularity of boating. If there proves to be a long-term pivot towards boating as a leisure activity, this may continue to make it difficult to drive down incident rates.



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- Aboriginal Health & Medical Research Council for supporting the ongoing data linkage project.
- Independent Hospital Pricing Authority for providing the International Classification of Diseases, 10th Revision, Australian Modification (ICD-10-AM) electronic code lists.
- The Australian Coordinating Registry provides the Cause of Death Unit Record File (COD URF) for the COD URF on behalf of the NSW Registry of Births, Deaths and Marriages, NSW Coroner and the National Coronial Information System. Source: Cause of Death Unit Record File held by the NSW Ministry of Health Secure Analytics for Population Health Research and Intelligence.

This serious injury research forms part of the routine monitoring activity undertaken by Transport for NSW to improve maritime safety for the community. The following ethics committees approved it –

- Approved by the NSW Population & Health Services Research Ethics Committee on 30th April 2018.
- Approved by the Aboriginal Health & Medical Research Council Ethics Committee on 14th May 2018.

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