



Transport for NSW

Boating trauma and compliance in NSW

Report for the 10 year period to 30 June 2019



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1 Introduction

This report examines boating incident¹ patterns and trends based on NSW Maritime operational incident data, for the 10 year period 2008–09 to 2018–19.² It also examines trends related to boating compliance undertaken, and boating complaints received, by NSW Maritime.

NSW continues to experience a significant long-term decline in the rates of fatal recreational and commercial boating incidents as well as in the corresponding rates of overall boating incidents. As at 30 June 2019, the state also remains on track to achieve the target of a 30 per cent reduction in both total boating fatalities and total boating serious injuries³ by 2020–21, as outlined by Transport for NSW's Maritime Safety Plan 2017–21 (the Plan).⁴

This is against a backdrop of increasing boating participation. General vessel registration and driver licence numbers have experienced annual growth rates of 1.4 and 1.1 per cent respectively in recent years, while Personal Watercraft (PWC) licences and registrations have had annual growth of up to 8.1 and 9.4 per cent respectively.⁵

There are now more than 500,000 people who hold a licence to drive a powered vessel, and nearly 250,000 registered vessels in the state. Almost 1 in 5 NSW households own a boat or watercraft,⁶ and it is estimated 2 million people go boating each year on the state's waterways.⁷

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

Lifejacket wear rates in NSW have recently been much higher than in the past, and this is reflected in the drop in the rate of recreational boating fatalities due to drowning. However, non-drowning related fatalities, such as those due to speed or not keeping a proper lookout, have not changed significantly. There is also no sign of any significant long-term decline in the rate of serious injury incidents in recreational boating.

While compliance rates reported by NSW Maritime are generally high,⁸ some issues remain a concern, particularly safety equipment (both lifejackets and other equipment), speed and other safety behaviours. Complaints data shows that the behaviour of PWC operators remains a concern in some parts of the state—with speed, distances off and irregular riding being the issues most commonly reported.

1 Boating incidents in NSW are defined in line with national guidelines, and include all incidents related to the operation of a vessel, but exclude situations such as unrelated medical episodes, deliberate intent or unrelated activities such as SCUBA diving.

2 Maritime Eagle database records, based on fatality, serious injury and total incident counts and associated records as at 31 October 2019 unless otherwise stated. Incident numbers may be subject to subsequent change as the result of coronial findings or other investigations.

3 Serious injuries are those injuries which result in admission to hospital.

4 As measured against the long-term (10 year) average up to and including 2014–15, the Plan's base year.

5 Based on analysis of NSW Maritime licence and registration data.

6 *Recreational Boating Behaviour Report* prepared for Transport for NSW. October 2019

7 Boating Industry Association

8 Roads and Maritime Services Annual Report 2018–19: Volume 1, Appendix 4

While incidents resulting in trauma on the waterways have decreased, preventable fatalities and serious injuries continue to occur. Transport for NSW's maritime business units, which includes the Centre for Maritime Safety and NSW Maritime, continue to strive Towards Zero fatalities and serious injuries on the state's waterways in support of the corresponding goal outlined in *Future Transport 2056*. To continue the effort to eliminate fatalities and serious injuries, Transport for NSW (TfNSW) has adopted the holistic Safe Systems approach to maritime safety.⁹ 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, developed by the Centre for Maritime Safety in 2017, identifies 10 priority issues for boating safety in NSW. These represent the main safety concerns identified through analysis of long-term incident data. Subsequent analysis has led to the identification of an additional priority issue, boater age. This report focusses on these 11 priority issues and provides an indication of how each is tracking in terms of the number of fatalities and incidents, as well as compliance and customer feedback data (where relevant).



⁹ Transport for NSW, Maritime Safety Plan 2017-21.

2 Executive summary

There were 11 confirmed recreational and commercial boating fatalities in 2018–19, which is statistically similar to the long-term annual average (approx. 14). At the end of 2018–19, total boating fatalities remained strongly on track¹⁰ to meet the target of a 30 per cent reduction by 2020–21 compared to 2014–15 levels.

The total number of serious injuries¹¹ in 2018–19 associated with recreational and commercial vessel activity (60) was statistically similar to the long-term annual average (66.8). Total serious injuries in boating are currently tracking close to where they need to be to meet the target of a 30 per cent reduction by 2020–21 (compared to 2014–15 levels).

Long-term downward trends remain evident for both recreational boating fatal incident rates and total incident rates. There were 224 boating incidents¹² overall in 2018–19, which is significantly below the long-term annual average (297).

There were 114 recreational fatal incidents over the last 10 years. In relation to these incidents:

- the most common incident types recorded were capsizing (30.3 per cent), falling overboard (29.6 per cent) and injury related to towing incidents (7.7 per cent);
- the primary contributing factors were: weather conditions (11.8 per cent), excess alcohol and excessive speed (both 9.0 per cent), lack of judgment (8.3 per cent) and hazardous waters (6.9 per cent);
- Open runabouts accounted for 45.9 per cent of all vessels involved in these incidents, followed by sailing vessels (10.7 per cent), cabin runabouts (9.8 per cent) and paddle craft (primarily canoes or kayaks; 9.0 per cent).

In terms of the priority safety issues examined in this report, promising results were recorded for:

- Lifejacket wear—the drowning fatality rate for recreational boating incidents has fallen by more than 60 per cent since 1992–93, without any significant change in the corresponding non-drowning fatality rate;
- Weather conditions—weather-related incidents are trending downwards at a significantly faster rate than overall boating incidents. In addition, the total number of weather-related incidents in 2018–19 (23) was significantly below the long-term (10 year annual) average (38);
- Proper lookout—the number of lookout incidents in 2018–19 (25) was significantly below the long-term average (40);

¹⁰ At the time of writing, preliminary data from 2019–20 (22 fatalities as at 30 April 2020) indicates that total fatalities will exceed the intermediate MSP target for 30 June 2020 (<13 fatalities).

¹¹ The serious injuries referred to in this report do not include boating serious injuries treated in NSW hospitals but not reported to RMS. Examination of recent NSW Health records suggests that a large number of such 'unreported' serious injuries occur each year. However, the characteristics of the serious injuries reported to RMS do broadly match those only captured in the Health records, meaning the former are still a useful indicator of overall serious injury trends related to boating.

¹² This figure is likely to be an underestimate of the true number of incidents, due to under-reporting of not only serious injuries (see previous footnote) but also minor incidents. Nevertheless, patterns and trends related to reported boating incidents are still likely to be a valid indicator of actual patterns and trends. Incidents are required to be reported if death or injury has occurred, there has been damage exceeding \$5,000 to vessels or property or if there is a risk of environmental damage. Reporting of other incidents is voluntary.

- PWC—the rate of recreational PWC incidents overall in 2018-19 (100.7 per 100,000 registered PWC) was significantly below the long-term average (176). In addition, the corresponding rate for incidents involving serious injury (26.9 per 100,000) was significantly below the long-term average (66.9); and
- Cold water—cold water-related incidents are trending downwards at a significantly faster rate than overall boating incidents. In addition, the total number of cold water-related incidents in 2018-19 (10) was significantly below the long-term average (17).

For other priority safety issues excessive speed, excess alcohol, lack of judgment, towing, paddle safety and boater age, the results in 2018-19 were consistent with the applicable long-term average.



3 Safety performance highlights in 2018–19

Safety performance in 2018–19 is assessed against long-term trends (10 years or more) and/or long-term averages (over the 10 year period 2009–10 to 2018–19). Overall boating incidents were significantly below the long-term average in 2018–19. In addition, there continues to be a long-term downward trend with respect to both overall boating incidents and fatal incidents.



A long-term downward trend remains evident for the recreational boating fatal incident rate, against a backdrop of increasing vessel numbers.



Weather-related incidents are trending downwards at a significantly faster rate than overall boating incidents. In addition, the total number of weather-related incidents in 2018–19 (23) was significantly below the long-term average (38).



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

The total incident rate for recreational vessels continues to fall.



The rate of recreational PWC incidents overall in 2018–19 (100.7 per 100,000 registered PWC) was significantly below the long-term annual average (176.1). In addition, the corresponding rate for incidents involving serious injury (26.9 per 100,000) was significantly below the long-term average (66.9).



The overall lifejacket wear rate was 43 per cent in 2017–18 (the most recent year surveyed), a similar result as in 2016–17 but nearly a fivefold increase on the 9 per cent in 2007.



Cold water-related incidents are trending downwards at a significantly faster rate than overall boating incidents. In addition, the total number of cold water-related incidents in 2018–19 (10) was significantly below the long-term average (17).



The drowning fatality rate for recreational boating incidents is down by more than 60 per cent since 1992–91.

There were 11 boating fatalities, 60 serious injuries and 224 boating-related incidents recorded in the 12-month period to 30 June 2019 (Table 1). While the number of fatalities was 22 per cent higher than in 2017-18, it was still slightly lower than the long-term average (Table 2). In addition, the recreational vessel fatality rate (per 100,000 vessel registrations) continues to reflect a long-term decline (Section 4).

Compared with the previous year, the number of serious injuries in 2018-19 was up by more than 30 per cent, although the 2018-19 number was still slightly lower than the long-term average (Table 2). Total incidents in 2018-19 were slightly down on the previous year (by nearly 3 per cent) and were significantly lower than the long-term average (Table 2).

Table 1: Fatalities, serious injuries and related incident numbers for the 2018-19 financial year.

Vessel category	Incident category				Total incidents
	Fatalities	Fatal incidents	Serious injuries	Serious injury incidents	
Recreational	10	9	48	38	158
Commercial	1	1	12	11	49
Commercial/ recreational	0	0	0	0	17
TOTAL	11	10	60	49	224
Change vs. 10 yr. av.	-20.3%	-18.7%	-10.2%	-7.9%	-24.6%
10 year average*	13.8	12.3	66.8	53.2	297.0

* 10 year average includes 2018-19. Serious injury numbers are likely to have been significantly affected by under-reporting, and based on NSW Health hospital records, the true number of boating-related serious injuries is likely to be considerably higher than what is shown here.



Table 2: Incident Barometer—comparison of 2018-19 against 10 year period (2009-10 to 2018-19) and summary of long-term trends.

Indicator	2018-19	10 year average	Statistical comparison of 2018-19 with 10 yr avg	Comparative graph	Long-term trend
Total incidents	224	297.0	Lower		Initial increase; now decreasing
Total fatalities	11	13.8	Similar		Fluctuating, but with recent decrease
Total serious injuries	60	66.8	Similar		Generally increasing but with signs of recent decrease**
Fatal incidents (recreational) per 100,000 vessels	3.8	4.9	Similar		Decreasing
Serious injury incidents (recreational) per 100,000 vessels	16.0	17.8	Similar		Fluctuating**

Key:

▲ 2018-19 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.

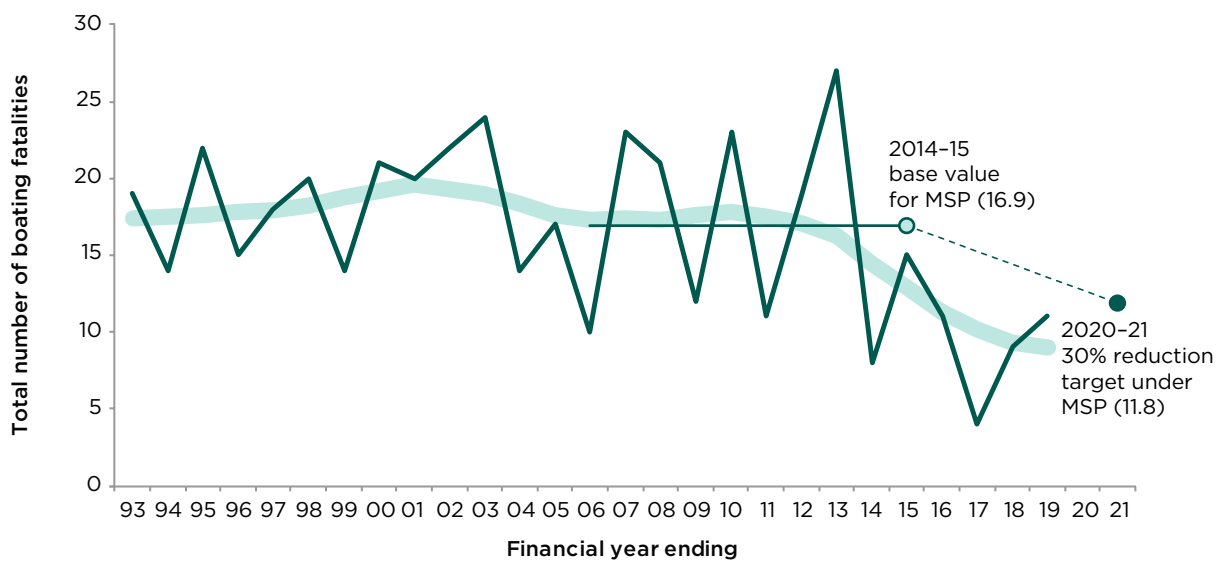
4 Latest incident trends

4.1 Fatalities and fatal incidents

The overall number of boating fatalities has fallen in recent years. Based on data up to and including 2018-19, NSW is on-track to meet the target of a 30 per cent reduction in fatalities by 2020-21.

All five of the financial years completed since 2013-14 have had fatality numbers below the respective targets, and this is reflected in a decisive downturn in the indicative trend shown on Figure 1.

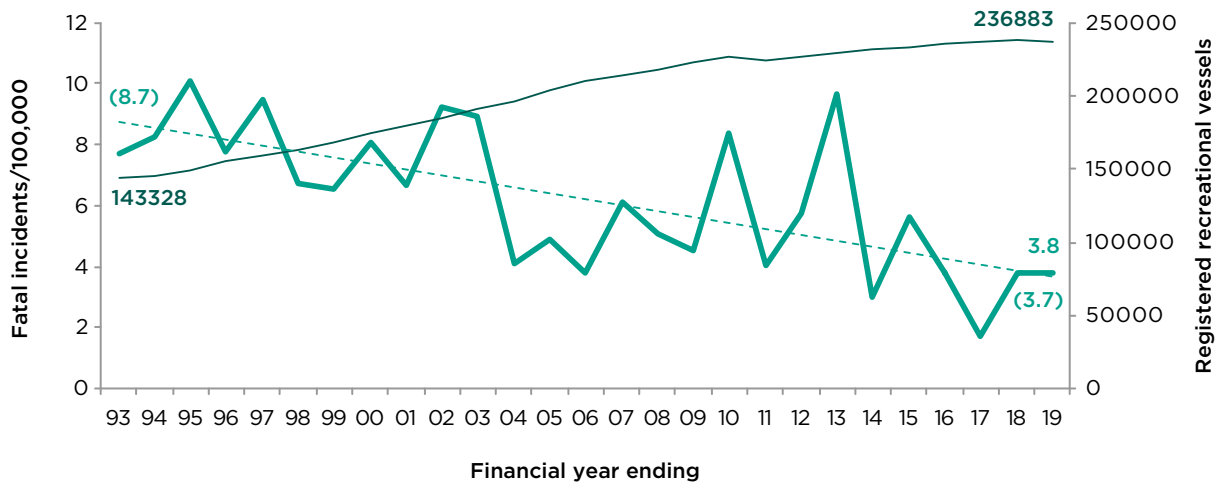
Figure 1: Tracking of total boating fatalities against the Plan's target of a 30% reduction by 2020-21.*



* Base value equals the 10 year average up to and including 2014-15. Pale curve is indicative of medium-term trends and is based on application of five-year moving averages.

There were 3.8 fatal incidents per 100,000 recreational vessels in 2018-19. In trend terms, the recreational boating fatal incident rate has decreased by 58 per cent since the early 1990s (Figure 2).

Figure 2: Fatal incidents per 100,000 registered recreational vessels (thick green line) and corresponding registrations (thin dark green line).*



* Long-term linear trend is shown by the dashed line. Data labels show key values, numbers in brackets are trend values.

4.2 Serious injuries and serious injury incidents

In recent years the overall number of boating serious injuries (based on NSW Maritime operational data) has shown signs of falling, and is now approximately on track to meet the Plan's target of a 30 per cent reduction by 2020-21.

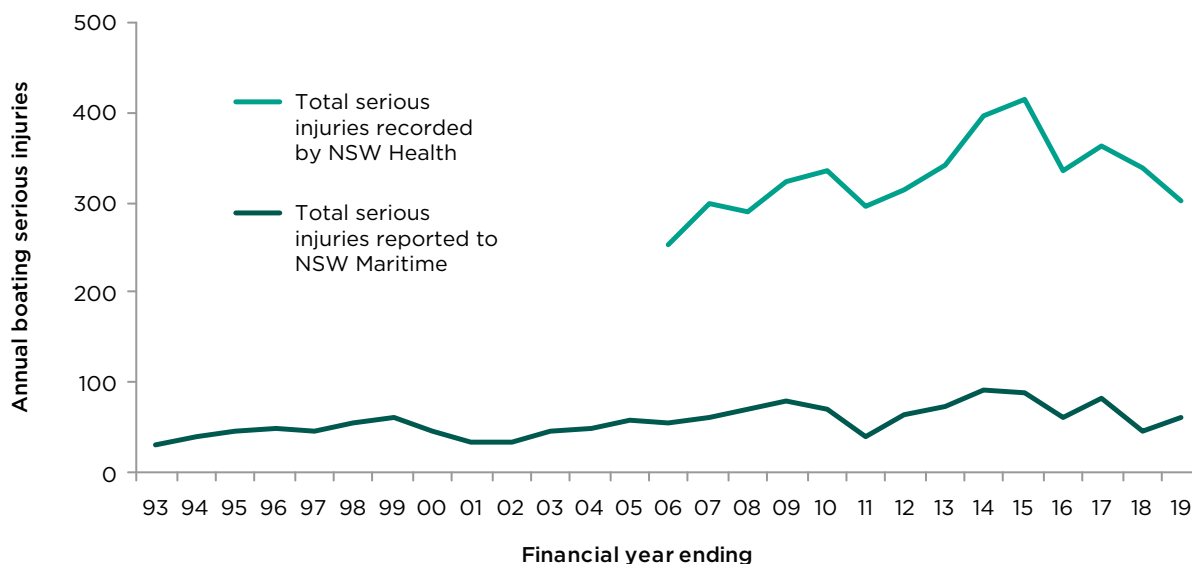
Figure 3: Tracking of total boating serious injuries against the Plan's target of a 30% reduction by 2020-21*



* Serious injury numbers are based only on Maritime incident reporting and are a substantial underestimate of actual boating serious injuries based on recent data from NSW Health. Serious injury numbers may have also been affected by changes in reporting protocols and/or data capture over time. Base value equals the 10 year average up to and including 2014-15. Pale curve is indicative of medium-term trends and is based on application of five-year moving averages.

According to incident data recorded by NSW Maritime, there were 60 boating-related serious injuries in NSW during 2018–19. However, based on long-term hospital records held by NSW Health,¹³ the actual number of boating serious injuries occurring in NSW is considerably higher. TfNSW continues to work with NSW Health to better integrate hospital-based serious injury data into analysis and reporting tools for boating safety.

Figure 4: Annual numbers of boating serious injuries according to NSW Health hospital records versus those reported to NSW Maritime.



According to incident data recorded by NSW Maritime, there were 16.0 recreational serious injury incidents per 100,000 recreational vessels in 2018–19. However, using the greater number of serious injuries recorded by NSW Health, the rate would increase to approximately 80 serious injuries per 100,000 recreational vessels.

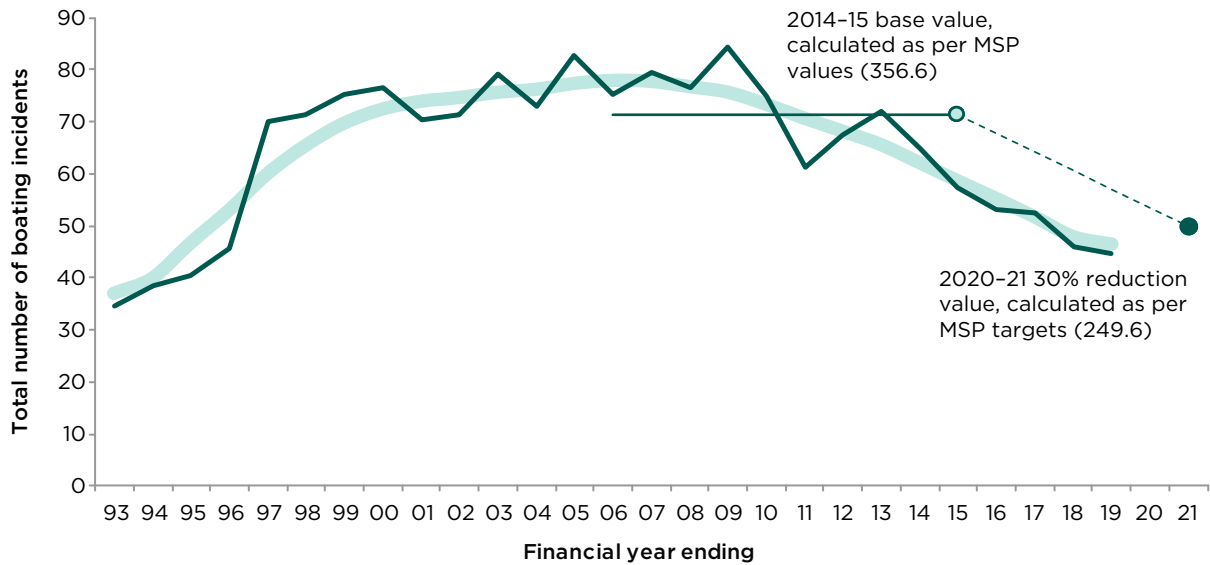
Based on the evidence currently available, there has been no significant long-term trend in the serious injury incident rate for recreational incidents—notwithstanding the signs of a reduction in boating serious injuries in recent years (Figure 3).

4.3 Overall boating incidents

The overall number of boating incidents (based on NSW Maritime operational data) has been declining over the last decade (Figure 5). While the Plan does not include a target for overall boating incidents, Figure 5 shows tracking against a target of a 30 per cent reduction by 2020–2021, mirroring the Plan’s targets for fatalities and serious injuries. Based on data up to and including 2018–19, the overall number of boating incidents is well on track to meet the 30 per cent reduction target shown (Figure 5).

¹³ NSW Health hospital records for the period 2005–06 to 2017–18

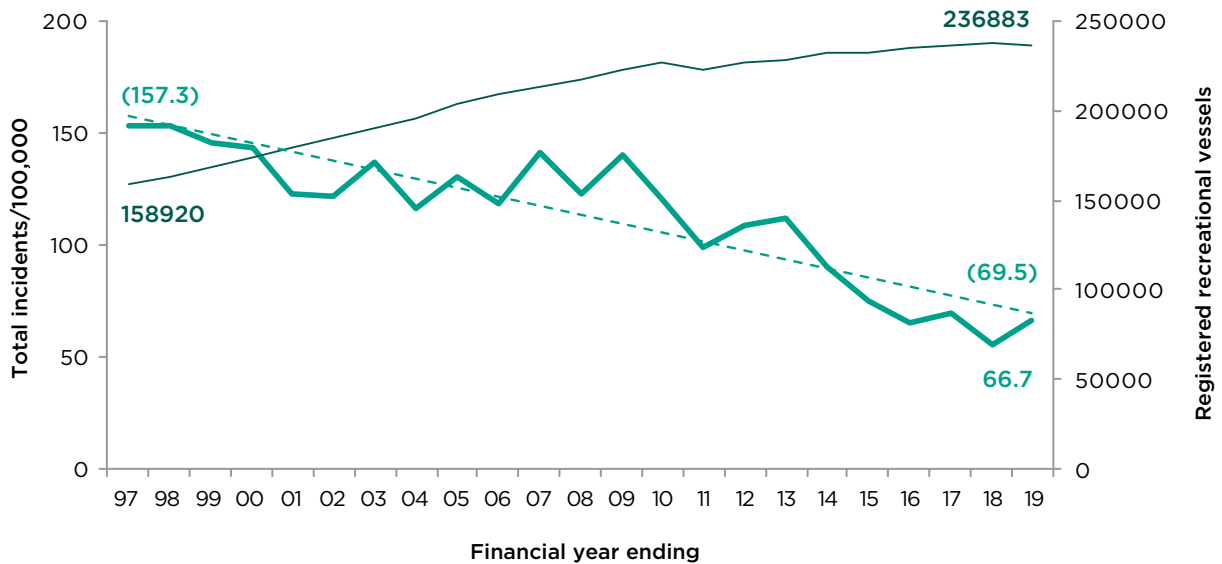
Figure 5: Tracking of overall boating incidents against target of a 30% reduction by 2020–21*



* Base value equals the 10 year average up to and including 2014–15. Pale curve is indicative of medium-term trends and is based on application of five-year moving averages.

There were 66.7 reported boating incidents overall per 100,000 recreational vessels in 2018–19. In trend terms, the overall rate of recreational boating incidents has decreased by nearly 56 per cent since the early 1990s (Figure 6).

Figure 6: Total incidents per 100,000 registered recreational vessels (thick green line) and corresponding registrations (thin dark green line)*



* Data labels show key values, numbers in brackets are trend values.

5 Overview of boating incident patterns

This section examines incident patterns for fatal and serious injury incidents combined over the 10 year period to 30 June 2019. Recreational and commercial boating incidents are considered separately.¹⁴

5.1 Incident type

Figure 7: Tableau dashboard display of reported vessel-incident records for recreational boating serious injury and fatal incidents for the 10 year period to 30 June 2018 by incident type and vessel type*.

	Open Runabout	PWC	Other/Unspecified	Sailing Vessel	Cabin Runabout	Motor Cruiser	Paddlecraft	Inflatable	Punt	Row Boat	Powered catamaran	Sailing multihull	Houseboat	Fishing vessel	Jetboat	**Total Records
Collision with Vessel	30	37	22	16	3	5	2	2	1	4	2					124
Capsizing	39	1	15	1	12	1	8	1		2	2	1			1	84
Injury—Towing Incident	60	4	13	1	2				1							81
Fall Overboard	30	14	8	10	4	4	6		3							79
Collision with Fixed Object	23	11	6	3	5	2		1	1	1		1				54
Injury Onboard	6	3	4	18		4			1		3		1			40
Propeller Injury	29		2		1			3	3			1	1			40
Person Hit by Vessel	18	10	6		1		2	2								39
Fall in Vessel	6	5	5	6	2	1		1			1			1		28
Fire or Explosion (Fuel)	11	3	4	1	1	7										27
Other/Unspecified	6	4	4	4	3	1		2	1	1						26
Bar Crossing Incident	10	1	2		5	2					1					21
Grounding	3	1	1	7	3	1										16
Swamping	4		2	1	3	3	1									14
Collision with Submerged Object	7	1	3	1	1											13
Sinking	7		2	1	2											12
Collision with Floating Object	5		1		1	1										8
Carbon Monoxide Inhalation	1			1		1										3
Fire or Explosion (Other than Fuel)						2										2
Hull Splitting (Structural Failure)	1										1					2
Collision with Overhead Obstruction				1												1
Unique Vessel Totals (Distinct)	250	90	89	63	40	28	17	12	9	7	5	3	2	1	1	617

* The coloured numbers within the 'heat map' display show the numbers of incident records for each vessel—incident type combination (N=714), as some incidents had more than one incident type recorded. Total unique vessels=617. "Other/unspecified" refers to cases where the incident type or vessel type was not recorded or specified in the source data provided by NSW Maritime.

¹⁴ Based on application of Tableau data visualisation software to Maritime Eagle database records as at 31 October 2019.

In terms of vessel-incident type combinations recorded in relation to recreational fatality or serious injury incidents (Figure 7; N=714), the most prevalent specific incident types for the 10 year period were collision with a vessel (124 records, 17.4 per cent), capsizing (84 records, 11.8 per cent), towing injury incidents (81 records, 11.3 per cent), falling overboard (79 records, 11.1 per cent) and collision with a fixed object (54 records, 7.6 per cent). In 2018-19 (N=57) there was a similar pattern of vessel involvement in recreational incidents involving a fatality or serious injury, with collision with vessel (8 records, 14.0 per cent), capsizing (7 records, 12.3 per cent) and towing injury incidents (5 records, 8.8 per cent) all represented. Also present were injuries onboard (6 records, 10.5 per cent) and persons being hit by a vessel (5 records, 8.8 per cent).

In terms of the vessel types involved in recreational fatality or serious injury incidents (Figure 7; N=617), open runabouts accounted for 250 unique vessels involved in such incidents (40.5 per cent) followed by PWC (90, 14.6 per cent), sailing vessels (63, 10.2 per cent), cabin runabouts (40, 6.5 per cent) and motor cruisers (28, 4.5 per cent). These percentages are compared with indicative data on vessel usage in Figure 8, based on survey respondents' recollections of their last boating trip and the type of vessel they were using.¹⁵

Figure 8: Comparison between proportions of vessels involved in reported recreational fatal or serious injury incidents and indicative vessel usage (based on vessel trips¹⁵)

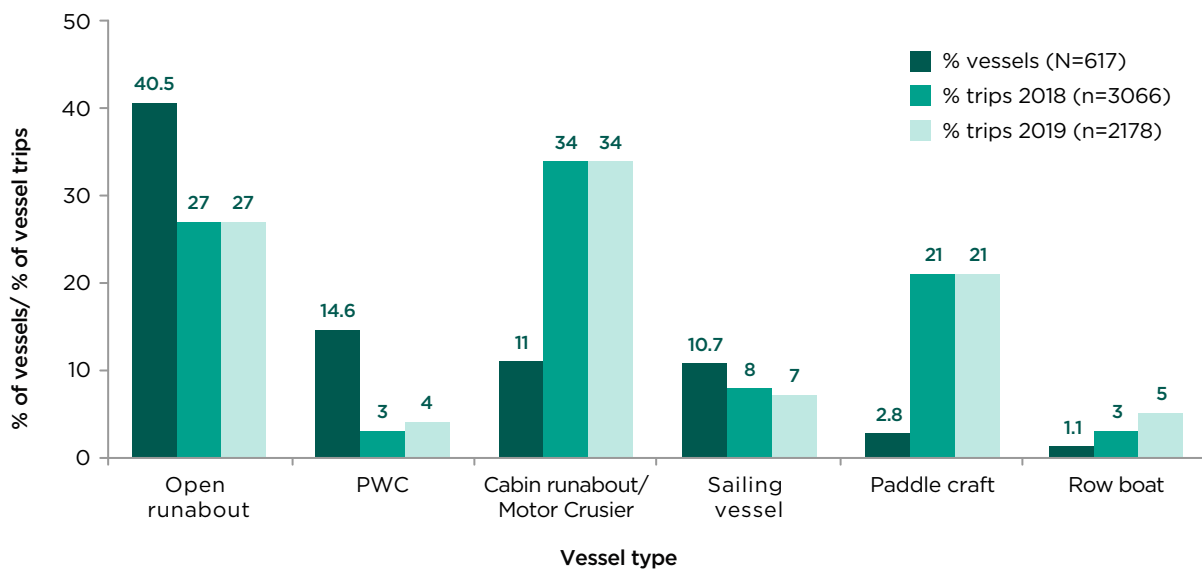


Figure 8 suggests that PWC have been over-represented in relation to fatality and serious injury incidents versus proportion of boating trips—as surveyed in 2018 and 2019—by a factor of about 4.3 (14.6 per cent of vessels involved in incidents versus approximately 3.4 per cent of reported trips). However, it should be noted that this data does not take into account trip length, and therefore might not fully reflect actual usage and risk exposure. The trip data also only covers a small part of the 10 year period over which the incidents occurred and might not be fully representative of the whole period. Figure 8 also suggests a significant degree of over-representation for open runabouts, by a factor of about 1.5 (40.5 per cent of vessels involved in incidents versus 27 per cent of reported trips) and sailing vessels, by a factor of about 1.4 (10.7 per cent of involved vessels versus approximately 7.6 per cent of trips). Conversely, there is strong evidence that paddle craft are under-represented in relation to fatality and serious injury incidents (2.8 per cent of vessels involved in incidents versus

¹⁵ *Recreational Boating Behaviour*. Report prepared for Transport for NSW by IPSOS. October 2019; percentages derived from question about type of boat or watercraft used on most recent trip, taking into account surveys undertaken in 2018 and 2019.

21 per cent of trips), as are larger powered vessels (mainly cabin runabout and motor cruisers) and row boats, though to a lesser degree. Notably, there was very little difference between years in the trip percentages for the various vessel types (Figure 8).

In 2018-19 (N=54) the picture in relation to vessels involved in recreational fatality or serious injury incidents was similar, with the most prevalent vessel types being open runabouts (22 vessels involved, 40.7 per cent), followed by sailing vessels (6 vessels, 11.1 per cent) and PWC (5 vessels, 9.3 per cent).

Figure 9: Tableau dashboard display of reported vessel-incident records for commercial serious injury and fatality incidents for the 10 year period to 30 June 2019 by incident type and vessel type.*

	Other/Unspecified	Powered catamaran	Motor Cruiser	Open Runabout	Inflatable	Sailing Vessel	Fishing vessel	Houseboat	Ferry	Cabin Runabout	Paddlecraft	Pontoon	Punt	Tug	*Total Records
Injury Onboard	12	7	7	3	5	3	5							1	43
Fall in Vessel	8	5	7		3	3	1	1	2						30
Fall Overboard	3	1		3	1	1		1					1		11
Capsizing	1	1	1	3						1	2				9
Other/Unspecified	2	5						1	1						9
Propeller Injury	3		1	1	1			1					1		8
Bar Crossing Incident		2	2												4
Collission with Fixed Object	2	1										1			4
Collission with Vessel	1		1	1											3
Person Hit by Vessel	1		1		1										3
Collission with Floating Object				1						1					2
Injury—Parasailing Incident	1			1											2
Collission with Submerged Object	1														1
Grounding						1									1
Injury—Diving Incident	1														1
Sinking				1											1
Unique Vessel Totals (Distinct)	33	20	16	13	9	8	6	4	3	2	2	1	1	1	119

* The coloured numbers within the 'heat map' display show the numbers of incident records for each vessel-incident type combination (N=132), as some incidents had more than one incident type recorded. Total unique vessels=119. "Other/unspecified" refers to cases where the incident type or vessel type was not recorded or specified in the source data provided by RMS.

In terms of vessel-incident type combinations recorded in relation to commercial fatal or serious injury incidents (Figure 9; N=132), the most prevalent specific commercial vessel incident types for the 10 year period were injuries onboard (43 records, 32.6 per cent), falls in vessel (30 records, 22.7 per cent) and falling overboard (11 records, 8.3 per cent). In 2018-19 there were 11 commercial vessel serious injury incidents involving 11 vessels, and one fatal incident which involved a single vessel. Ten of the incident-vessel records (83.3 per cent) related to an injury on board or a fall in the vessel, mirroring the picture over the whole 10 years.

In terms of the vessels involved in commercial fatality or serious injury incidents (Figure 9; N=119), powered catamarans¹⁶ accounted for 20 vessels involved in such incidents (16.8 per cent) followed by motor cruisers (16, 13.4 per cent), open runabouts (13, 10.9 per cent), inflatables (9, 7.6 per cent) and sailing vessels (8, 6.7 per cent).

Nine vessels were involved in the nine commercial vessel fatal incidents recorded over the 10 years. These included three open runabouts, two houseboats and one each of motor cruisers, powered catamarans and punts. In one case, the vessel type was not specified.

The information in Figures 7 and 9 shows that recreational and commercial vessel incident types—where a fatality or serious injury is involved—are quite different.

Collisions of various sorts, including a person being hit by a vessel or its propeller, accounted for 279 (39.1 per cent) of recreational vessel—incident type records over the 10 year period. With commercial vessel incidents, collision in its various forms accounted for only 21 (15.9 per cent) of the corresponding records.

By contrast, injuries on board a vessel, whether recorded as “injury onboard” or as ‘fall in vessel”, are relatively common on commercial vessels and accounted for more than half commercial vessel fatal or serious injury vessel—incident type records over the 10 year period (73 records, 55.3 per cent). However, these incident types accounted for only 9.5 per cent of the corresponding recreational vessel records. This difference reflects the fact that commercial vessels tend to carry larger numbers of passengers and often have multiple decks, with ramps and stairwells. While these vessels have an excellent overall safety record, the large numbers of passengers, multiple spaces and often complex machinery and equipment means that relatively minor incidents—such as trips and falls, or even injuries from using equipment—are comparatively common.



¹⁶ Powered catamarans are typically larger charter vessels with a twin hull design, and may include some ferries.

5.2 Contributing factors to incidents

Figure 10: Tableau dashboard display of reported vessel-incident records for recreational boating serious injury and fatality incidents for the 10 year period to 30 June 2019 by contributing factor and vessel type.*

	Open Runabout	PWC	Other/Unspecified	Sailing Vessel	Cabin Runabout	Motor Cruiser	Paddlecraft	Inflatable	Punt	Row Boat	Powered catamaran	Sailing multihull	Houseboat	Fishing vessel	Jetboat	**Total Records
Other/Unspecified	82	28	29	31	14	8	9	5	6	3	1	1				217
Lack of Judgment	45	26	20	9	4	4		2		1	1		1			113
Lack of proper lookout	40	19	12	6	5	2	1	1	1	4	1					92
Excessive Speed	31	9	14			1	1				1				1	58
Weather Conditions	9	4	5	14	3		2	2	1	1		2				43
Wash	19	6	5	2	2				1							35
Hazardous Waters	8	4	8	1	4	1	2	1		1				1		31
Excess Alcohol	18	2	2		2	5							1			30
Inexperience	8	6		1			2	2								19
Bar Conditions	8		1		5	2					1					17
Navigational Error	6	2	2	3		1				2	1					17
Fault of Equipment	3	2	2	4	1	3										15
Floating or Submerged Object	10	2	2													14
Fault of Machinery	5	1	2		1											9
Tidal Conditions	4			1	1			1								7
Inadequate Stability	4								1	1						6
Improper Loading	3								1							4
Electrical Fault						3										3
Overloading	2						1									3
Restricted Visibility	1				2											3
Insecure Mooring			1													1
Unique Vessel Totals (Distinct)	250	90	89	63	40	28	17	12	9	7	5	3	2	1	1	617

* The coloured numbers within the 'heat map' display show the numbers of incident records for each vessel–incident cause combination (N=737), as some incidents had more than one incident cause recorded. Total unique vessels=617. "Other/ unspecified" refers to cases where the incident cause was not recorded or specified in the source data provided by RMS. Causes refer to what was reported at the time of an incident, and may not fully reflect actual circumstances in every case.

In terms of vessel-incident factor combinations recorded in relation to recreational fatality or serious injury incidents (Figure 10; N=737), the most prevalent specific incident factors for the 10 year period were lack of judgment (113 records, 15.3 per cent), lack of proper lookout (92 records, 12.5 per cent), excessive speed (58 records, 7.9 per cent), weather conditions (43 records, 5.8 per cent) and hazardous waters (35 records, 4.7 per cent). In 2018-19 (N=62) there was a broadly similar pattern of incident types, with lack of judgment (12 records, 19.4 per cent), wash (5 records, 8.1 per cent) and excessive speed (4 records, 6.5 per cent) being the most prevalent.

Figure 10 shows that different vessel types had different fatality/serious injury ‘contributing factor profiles’ over the 10 year period. For example, fatal or serious injury incidents involving sailing vessels were often attributed to weather conditions (19.4 per cent of 72 records with vessel type equal to sailing vessel), while fatal or serious injuries involving PWC were often attributed to lack of judgment (23.4 per cent of 111 records with vessel type equal to PWC), lack of proper lookout (17.1 per cent) or excessive speed (8.1 per cent). Open runabouts were affected by a wide variety of contributing factors, with the most prevalent being lack of judgment (14.7 per cent of 306 records with vessel type equal to open runabout), lack of proper lookout (13.1 per cent) and excessive speed (10.1 per cent).

Examination of the 114 recreational fatality incidents recorded over the 10 year period shows that there were 144 vessel-contributing factor combinations recorded in relation to these incidents. Based on these records, the most prevalent cause was weather conditions (17 records, 11.8 per cent), followed by excess alcohol and excessive speed (each 13 records, 9.0 per cent), lack of judgment (12 records, 8.3 per cent) and hazardous waters (10 records, 6.9 per cent).

Figure 11: Tableau dashboard display of reported vessel-incident records for commercial serious injury and fatality incidents for the 10 year period to 30 June 2019 by contributing factor and vessel type.*

	Other/Unspecified	Powered catamaran	Motor Cruiser	Open Runabout	Inflatable	Sailing Vessel	Fishing vessel	Houseboat	Ferry	Cabin Runabout	Paddlecraft	Pontoon	Punt	Tug	*Total Records
Other/Unspecified	14	11	4	4	3	2	4		1				1		44
Lack of Judgment	4	3	5	5	3		2	2	1			1			26
Weather Conditions	5		1		1	3									10
Hazardous Waters	1	3	1	1	1						2				9
Excessive Speed	2	1	1	2	2										8
Lack of proper lookout	3		1	1		1		1		1					8
Excess Alcohol	1	1	2					2		1					7
Inexperience	2	1	2			1									6
Bar Conditions		2	2							1					5
Wash	1	1	1			1								1	5
Fault of Hull					2										2
Floating or Submerged Object	1			1											2
Tidal Conditions	2														2
Fault of Equipment	1														1
Fault of Machinery			1												1
Improper Loading				1											1
Inadequate Stability				1											1
Lack of Maintenance									1						1
Overloading				1											1
Unique Vessel Totals (Distinct)	33	20	16	13	9	8	6	4	3	2	2	1	1	1	119

* The coloured numbers within the ‘heat map’ display show the numbers of incident records for each vessel–incident cause combination (N=140), as some incidents had more than one incident cause recorded. Total unique vessels=119. “Other/unspecified” refers to cases where the incident cause was not recorded or specified in the source data provided by NSW Maritime. Causes refer to what was reported at the time of an incident, and may not fully reflect actual circumstances in every case.

In terms of vessel-contributing factor combinations recorded in relation to commercial fatality or serious injury incidents (Figure 11; N=140), the most prevalent specific commercial vessel contributing factors for the 10 year period were lack of judgment (26 records, 18.6 per cent), weather conditions (10 records, 7.1 per cent), hazardous waters (9 records 6.4 per cent) and excessive speed and lack of proper lookout (both 8 records, 5.7 per cent)—Figure 11.

The information in Figures 10 and 11 shows that recreational and commercial vessel incident causes are similar. Both recreational and commercial vessel-incident records have very similarly ranking causes: lack of judgment, lack of proper lookout, excessive speed, weather conditions, wash, hazardous waters and excess alcohol.



6 Overview of compliance and customer feedback data

Compliance and customer feedback data provides a valuable supplement to boating incident data and can help highlight important differences and trends in terms of common boating safety risks.

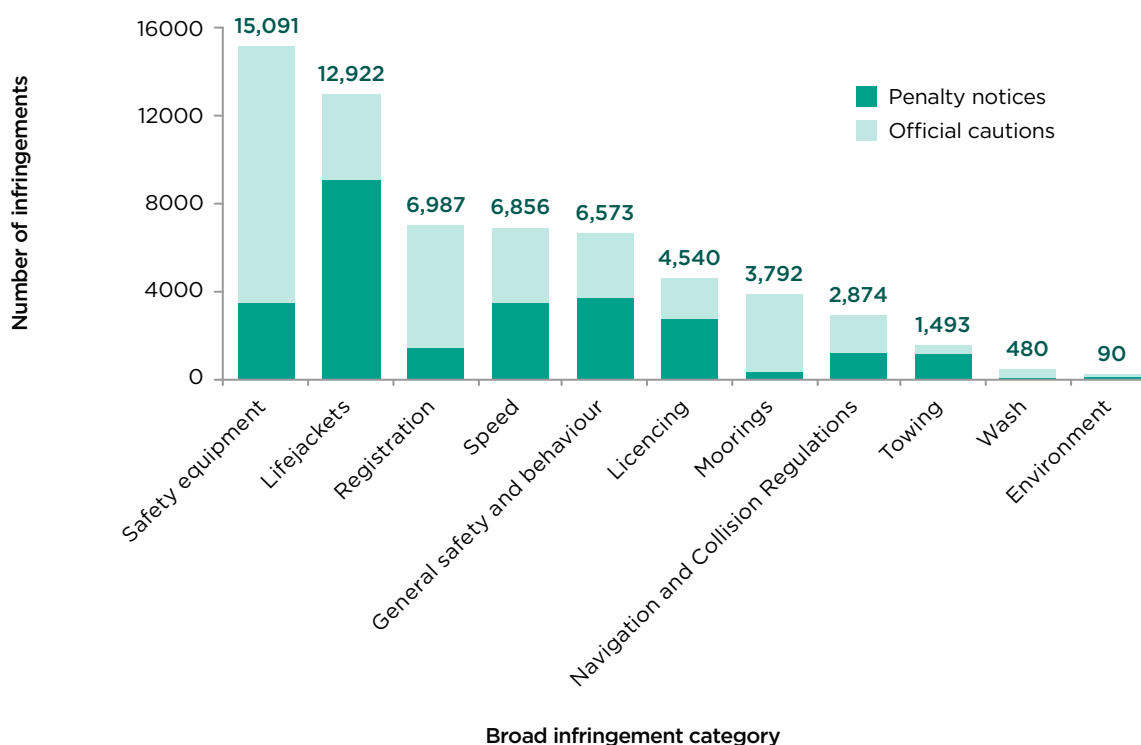
However, compliance and customer feedback data does have limitations. It is not necessary collected in a fully representative manner (e.g. complaints are often ‘clustered’).

6.1 Compliance overview

NSW Maritime Boating Safety Officers (BSOs) patrol the state’s waterways, providing education and compliance services for the estimated 2 million people who go boating each year.¹⁷ These officers focus on education, but where necessary, issue ‘infringements’ (either an Official Caution or a Penalty Notice).

Over the 10 year period to 30 June 2019, NSW Maritime BSOs issued 67,264 infringements—nearly two thirds of these (62.2 per cent) were Official Cautions, while the remaining 37.8 per cent were Penalty Notices. These infringements were issued for a wide variety of reasons, as outlined in Figure 12.

Figure 12: Broad categories of boating infringements issued on NSW over the 10 year period to 30 June 2019, showing Penalty Notices and Official Cautions separately.*



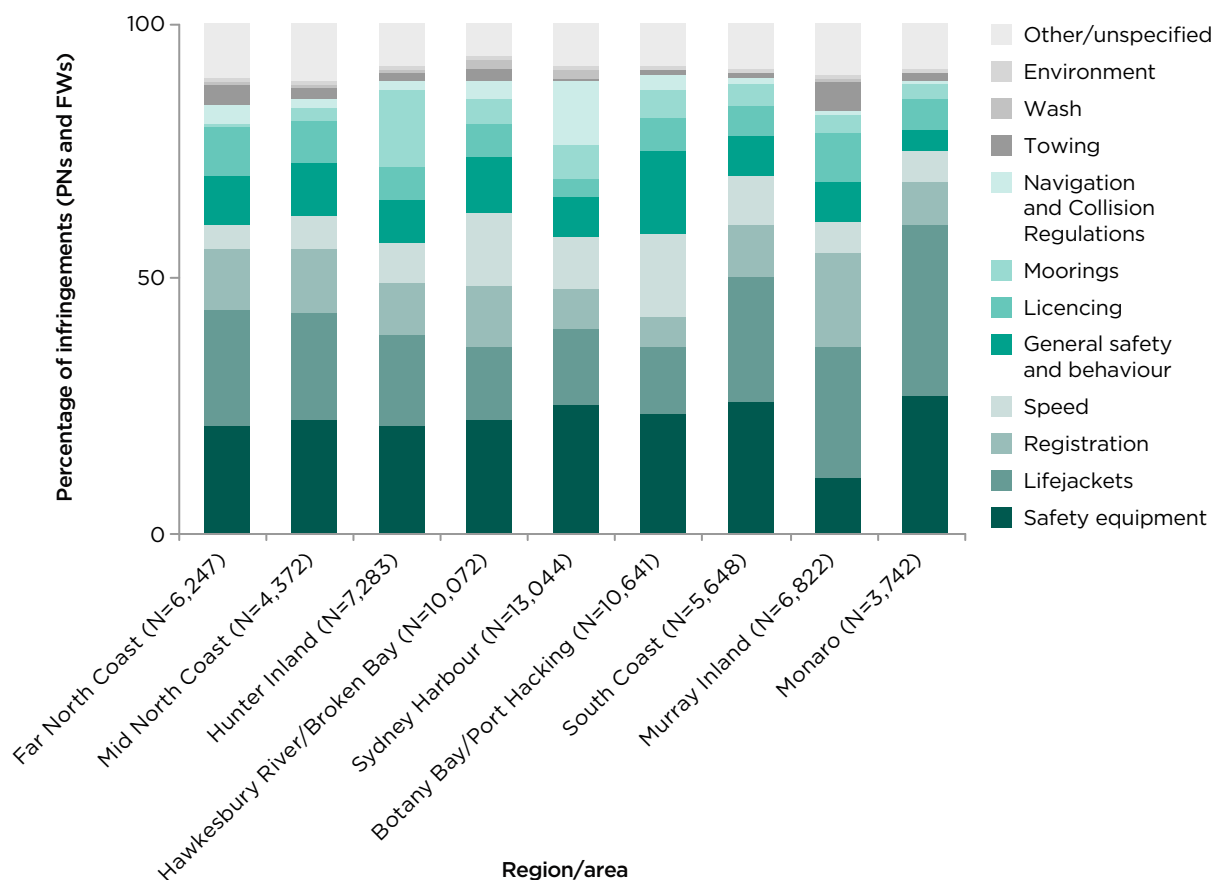
* There were an additional 6173 infringements recorded under other or unspecified infringement categories. A small percentage of infringements related to two broad categories. Where this has happened, the infringement was included in both categories (total instances = 607). The numbers on top of each bar refer to overall infringement totals for each category.

17 Boating Industry Association

The most common reasons for infringements over the 10 year period (Figure 12) were safety equipment (all items of required equipment, except for lifejackets—22.2 per cent), lifejackets (both carriage and wear—19.0 per cent), registration (10.3 per cent), speed (10.1 per cent) and general safety and behaviour (9.7 per cent). The broad infringement categories of towing, lifejackets and speed all had a relatively high proportion of Penalty Notices (between 50.1 and 75.0 per cent of total infringements issued). Conversely, the proportion of infringement notices was much lower for moorings, wash, registration and safety equipment (between 7.5 and 23.0 per cent).

The mix of boating infringement categories was generally similar across different parts of NSW over the 10 year period, although there were some specific differences (Figure 13).

Figure 13: Breakdown of total infringements (Penalty Notices plus Official Cautions) issued in NSW over the 10 year period to 30 June 2019 by region/area and type (category) of infringement.*



* A small percentage of infringements related to two broad categories. Where this has happened, the infringement was included in both categories (total instances = 607). Overall totals for each region/area are shown in the X-axis labelling.

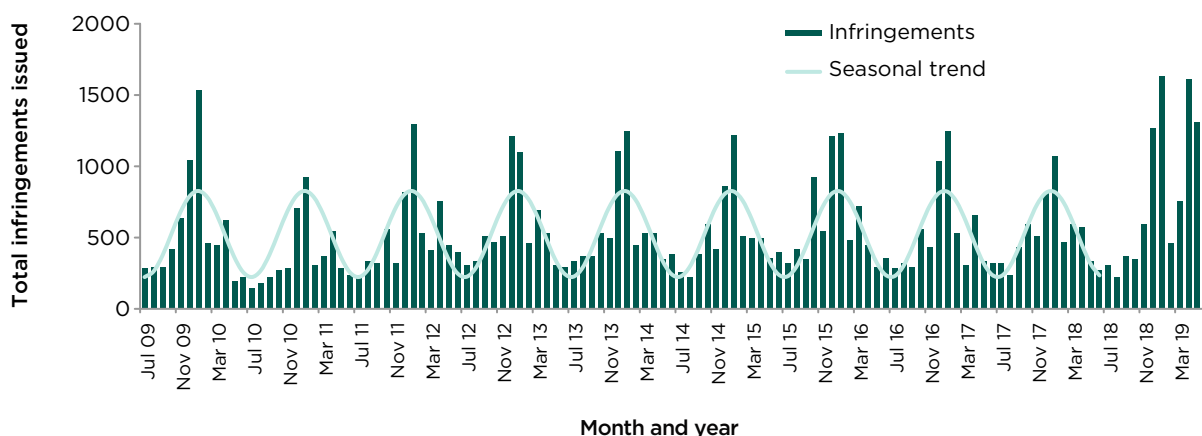
The Murray Inland region was distinct from the other regions to some degree, in having a low percentage of infringements related to general safety equipment (10.9 per cent versus 21.0–27.3 per cent among the other regions). Conversely, infringements related to registration (18.6 per cent versus 5.7–12.9 per cent) and licencing (10.0 per cent versus 6.1–9.2 per cent) were both relatively prevalent in the Murray Inland region compared with elsewhere. The Murray Inland region also accounted for a relatively high proportion of towing infringements (6.3 per cent), as did the Far North Coast (4.6 per cent); the proportions in other regions or areas ranged between 0.6 per cent and 2.5 per cent. These differences reflect, in part, the popularity of the Murray Inland and Far North Coast for towing activities.

Another notable difference between the regions and areas shown in Figure 13 was between the three ‘Greater Sydney’ areas (Hawkesbury River/Broken Bay, Sydney Harbour and Botany Bay/Port Hacking) and the rest of the state. The three Sydney areas had comparatively high proportions of infringements related to speed (10.4–16.1 per cent versus 4.9–9.6 per cent elsewhere) while Botany Bay/Port Hacking accounted for 16.3 per cent of infringements related to general safety and behaviour (versus 3.8–10.9 per cent elsewhere). At the same time, the Greater Sydney areas accounted for comparatively low proportions of infringements related to lifejackets (13.5–15.4 per cent versus 18.1–33.5 per cent elsewhere). In addition, Sydney Harbour had a much higher proportion of infringements related to navigation and collision regulations than elsewhere. This potentially relates to the heavy vessel traffic on this particular waterway, where large numbers of small and large craft often operate in close proximity to one another.

Finally, the relatively high proportions of infringements in the Monaro related to general safety equipment (27.3 per cent versus 10.9–25.8 per cent) and lifejackets (33.5 per cent versus 13.5–25.7 per cent) is noteworthy.

The issuing of infringements is highly seasonal (Figure 14), reflecting the likely peaks and troughs in boating activity.

Figure 14: Seasonal pattern in total infringements (Penalty Notices plus Official Cautions) issued in NSW over the 10 year period to 30 June 2019*



* Seasonal trend illustrated by sine curve, for data up to and including 2017–18 (r -squared = 0.52, with 103 d.f.; P value is below 0.01). Data for 2018–19 not included in fitted curve due to its clear departure from the seasonality established throughout the remainder of the 10 year period.

Figure 14 shows a very strong seasonal pattern in total infringements up until early 2019. The much higher than usual number of infringements in 2019 relates to a large-scale ‘mooring audit’ carried out by NSW Maritime, for which a large number of Official Cautions were issued during April to June.

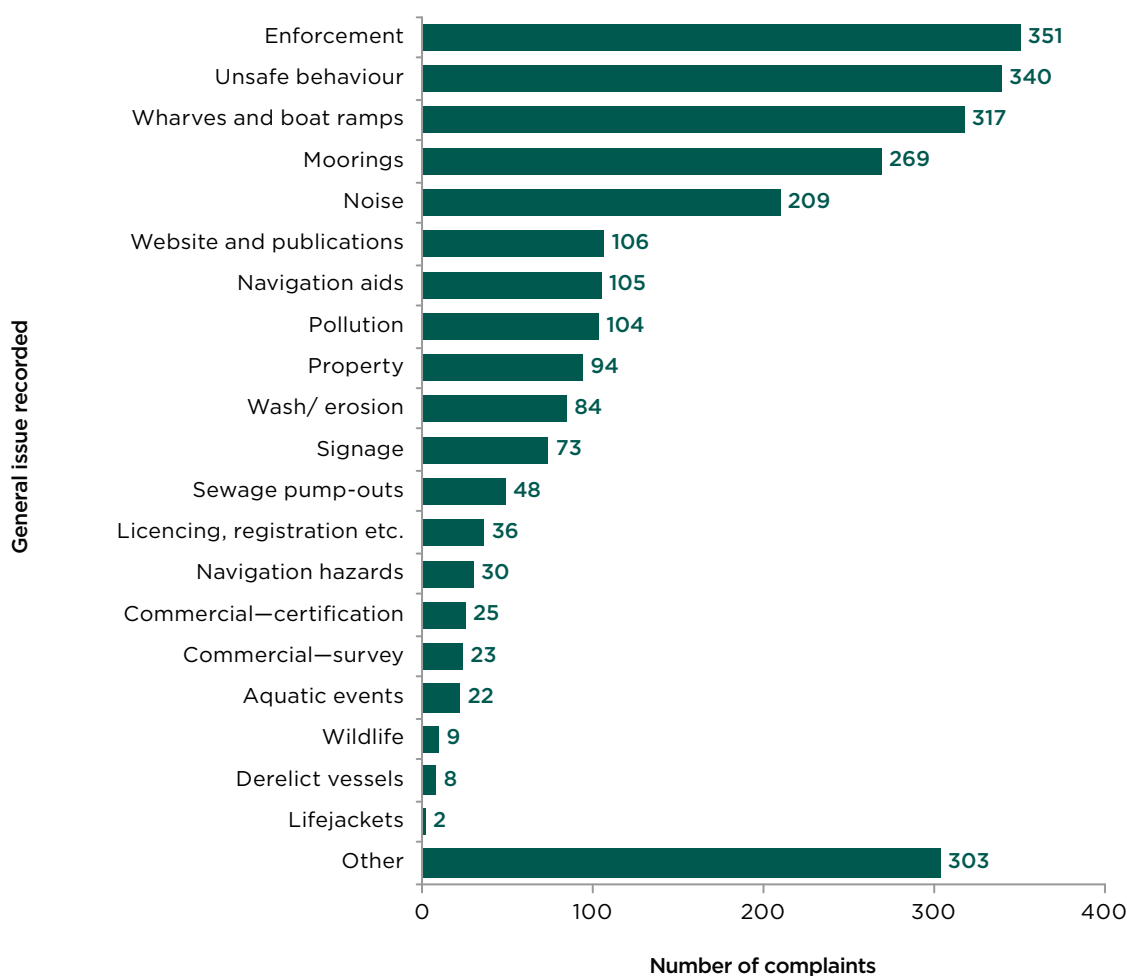
Apart from the increase in 2019, the overall number of infringements remained relatively stable, at around 6,300 per year over the period. However, the number of Penalty Notices did show a slow but significant upward trend—from 1,759 in 2010–11 to 3,068 in 2018–19.

6.2 Customer feedback overview

Customer feedback, including complaints, about boating matters is recorded by NSW Maritime. Data on complaints is available from December 1 2015 to 30 June 2019—a period of just over 3.5 years. Based on the three year period to 30 June 2019, there has been an average of 933 boating-related complaints recorded per year.

Complaints are received on a wide variety of boating-related issues (Figure 15). The most numerous specific categories were enforcement (351 complaints, 13.7 per cent), unsafe behaviour (340, 13.3 per cent), wharves and boat ramps (317, 12.4 per cent), moorings (269, 10.5 per cent) and noise (209, 8.2 per cent). “Enforcement” refers to issues such as the placement of speed zones and the manner in which rules are enforced. “Unsafe behaviour” includes actions such as breaking rules, speeding and navigating too close to people or hazards. “Wharves and boat ramps” covers a range of issues such as the cleanliness of public ferry wharves, behaviour of people using wharves and the condition of boat ramps. Most of the complaints related to “moorings” were about boats dragging or breaking their mooring, with the remainder covering issues such as illegal moorings or moored vessels being in poor condition. “Noise” typically related to either loud music or loud engine noise emanating from a vessel.

Figure 15: Broad categories of boating complaints recorded by NSW Maritime during the period 1 December 2015 to 30 June 2019*

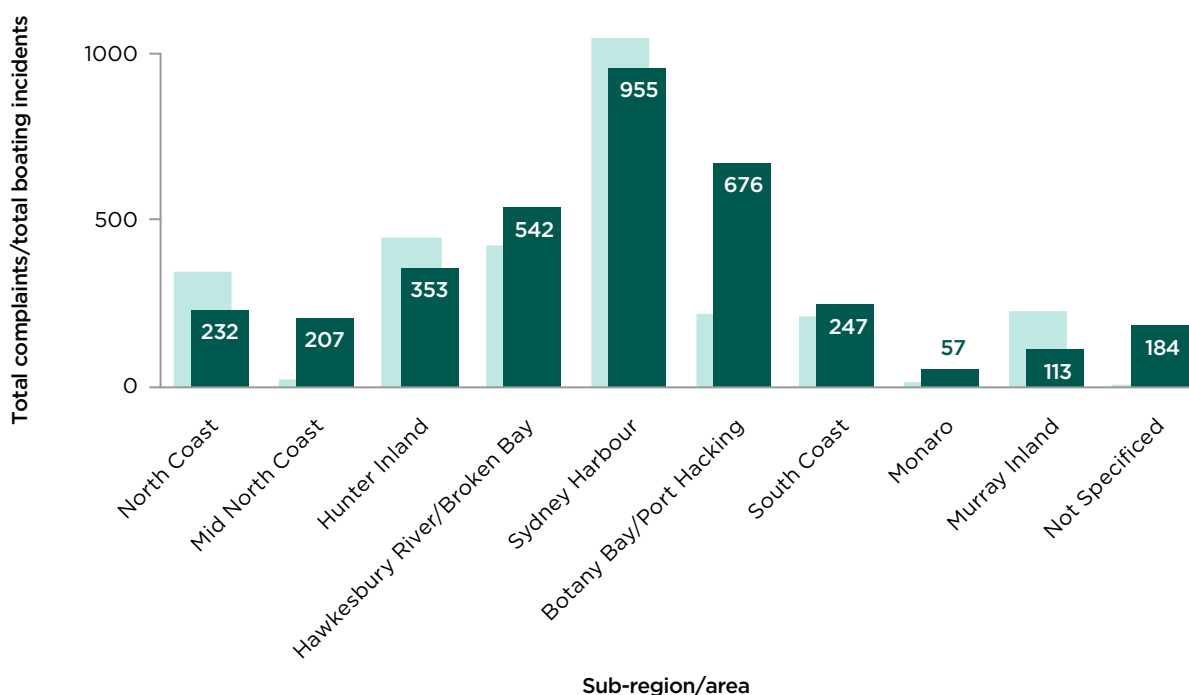


* N=2558; complaints related to PWC not included, but are instead analysed in Section 7.8.

It should be noted that the data in Figure 15 is based on the overall complaint topic recorded by NSW Maritime, and that many complaints actually relate to more than one topic. As such, the data in Figure 15 should be considered as only indicative, and that the profile of various boating issues with customers may be different to what is suggested here. Also, Figure 15 does not include categories related to particular vessel types. Complaints related to PWCs are examined separately in Section 7.8.

The volume of complaints varied considerably between different parts of NSW (Figure 16). The Greater Sydney Region, taking in the Hawkesbury River/Broken Bay, Sydney Harbour and Botany Bay/Port Hacking areas, accounted for more than 60 per cent of the total (2173 complaints, 60.9 per cent). Figure 16 shows a significant correlation between complaints and boating incidents.

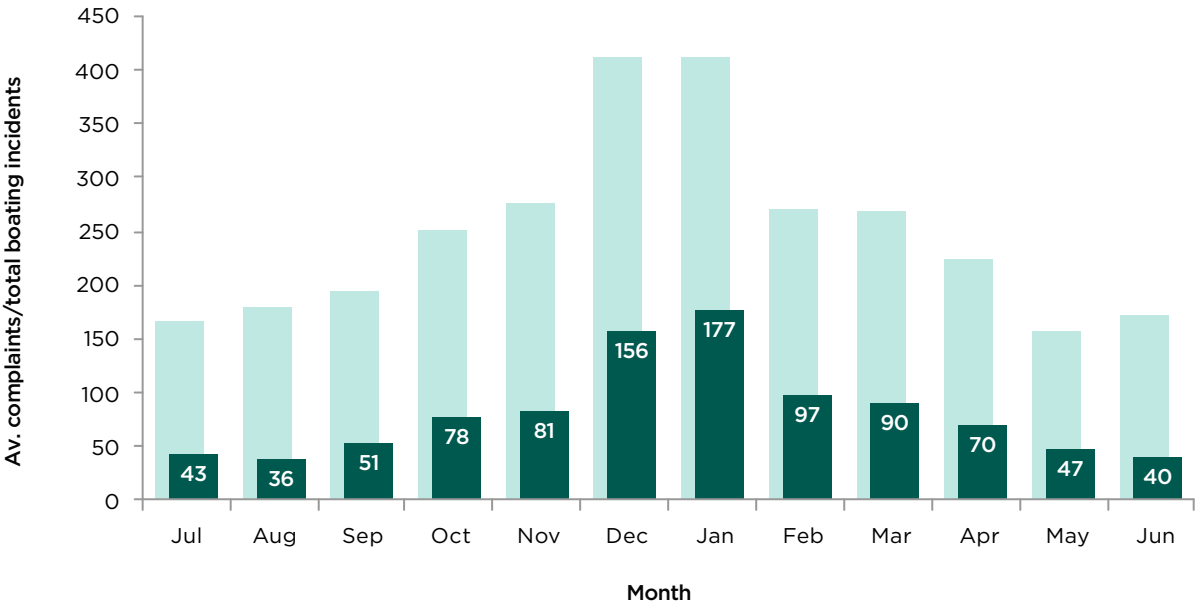
Figure 16: Total complaints recorded by NSW Maritime during the period 1 December 2015 to 30 June 2019 by sub-region/area (dark green) with corresponding total boating incidents over 10 years (light green).



Boating complaints are highly seasonal (Figure 17), reflecting seasonal patterns in boating activity and waterway activity more generally. Nearly three-quarters of all recorded boating complaints over the four year period relate to the warmer months of the year (October to March—2552 complaints, 71.6 per cent). December and January alone accounted for 1330 complaints (37.3 per cent).

Figure 17 shows a very strong correlation between complaints and boating incidents. This is presumably driven by the seasonal pattern of boating activity rather than any direct causal relationship.

Figure 17: Seasonality in boating-related complaints recorded in NSW for the period 1 December 2015 to 30 June 2019 (dark green) with corresponding total boating incidents over 10 years (light green).



7 Trends in priority maritime safety issues

This section examines the available evidence in relation to each of the 10 priority safety issues identified in the Plan, with the emerging issue of boater age. This section provides a summary of how safety performance has been tracking, with an emphasis on fatality and serious injury incidents. Consideration is also given to infringements data and complaints information where relevant.

7.1 Lifejacket wear

Lifejacket wear¹⁸ is a key factor in the survival of boating incidents where persons are forced into the water.^{19,20}

Of the 92 people presumed drowned since 2009–10, only 16 (17.4 per cent) of these people are known to have actually been wearing a lifejacket (Table 3), meaning up to 76 lives could have been saved over this period if all (presumed) drownings had involved lifejacket wear. This represents 59.4 per cent of all recreational boating fatalities since 2009–10. Of these 76 people, the vast majority (70) are known to have not been wearing a lifejacket, while the lifejacket-wear status is not known for 6 fatalities. Over the last 10 years, 76.1 per cent of those presumed drowned in recreational boating incidents (i.e. nearly 8 out of 10) are known to have not been wearing a lifejacket.

Table 3: Summary of recreational drowning and lifejacket wear statistics for 2018–19, 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	%
2018–19	10	9	90.0	1	11.1*
Last 10 years (2009–10 to 2018–19)	128	92	71.9	16	17.4

On a more positive note, overall lifejacket wear rates amongst boating participants have increased by around five-fold since 2007 but have recently plateaued around 40 to 45 per cent (Figure 18).

At the same time, there has been a long-term decline in the rate of recreational drowning fatalities per 100,000 vessels (Figure 18). 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 2018–19—a reduction of more than 60 per cent. However, there has been no such decline in the non-drowning fatality rate (Figure 18). Indeed, the non-drowning rate has remained steady, aside from year-to-year fluctuations, averaging just under two per 100,000 vessels.

¹⁸ Analysis of lifejacket related data, including drowning and non-drowning fatality, is based on CMS boating fatality records and on a lifejacket wear observational study (details in Figure 12).

¹⁹ O'Connor, P. (2008) *National Assessment of Boating Fatalities in Australia 1999–2004*. Report prepared for the National Marine Safety Committee.

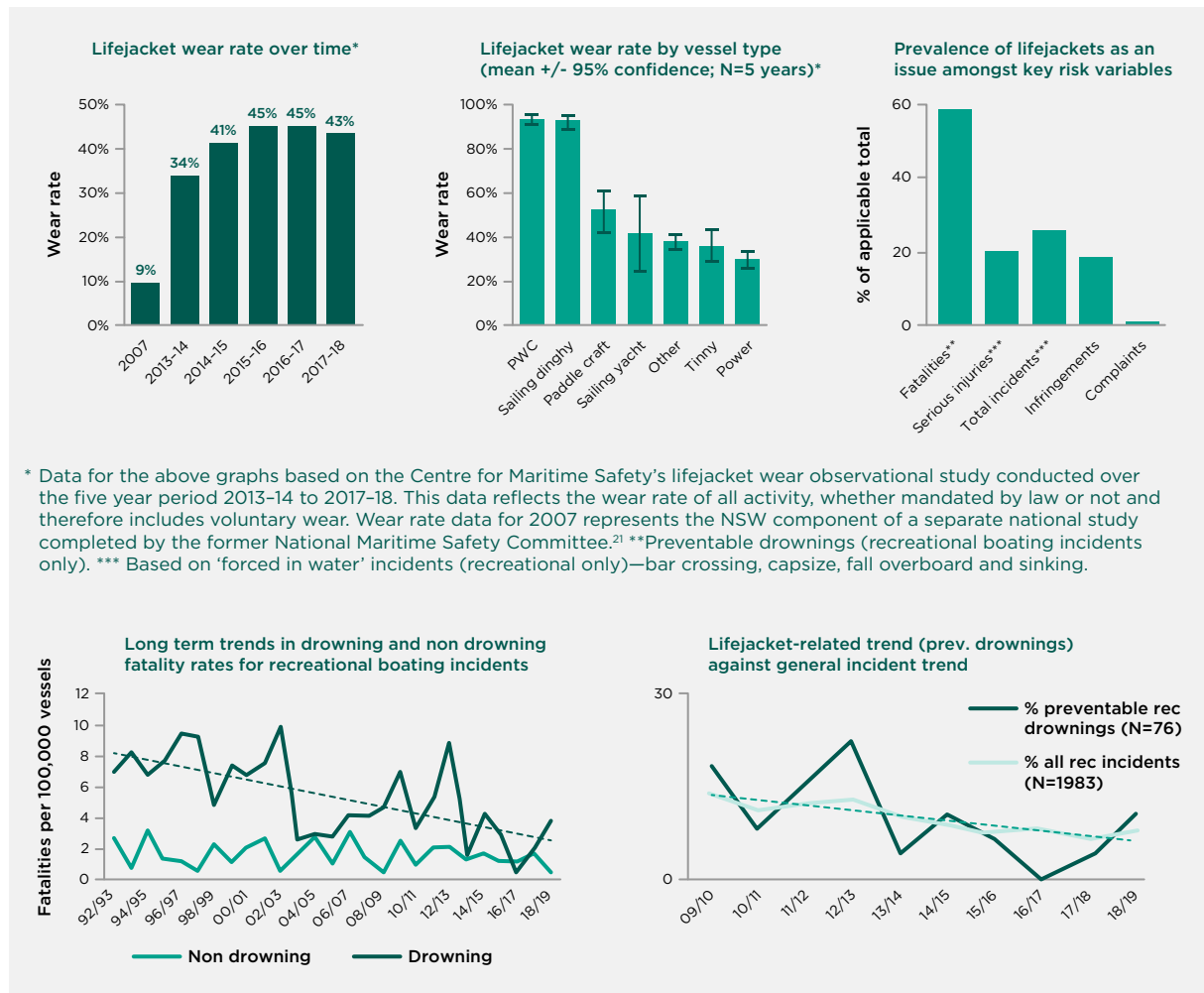
²⁰ Viauroux, C. and Gungor, A. (2015) An Empirical Analysis of Life Jacket Effectiveness in Recreational Boating. Paper published in journal *Risk Analysis*.

The overall number of preventable drownings associated with recreational incidents in 2018-19 (8) was statistically similar to the long-term (10 year) annual average of 7.6 drownings.

Lif jackets are a significant issue across a range of key risk variables (Figure 18). In addition to the preventable drownings mentioned above (59.4 per cent of all recreational boating fatalities), lifejacket wear would have been a key issue in 19.9 per cent of recreational serious injury incidents (those where the person(s) were likely forced into the water) and 25.5 per cent of all such 'forced in water' recreational incidents. In addition, lifejackets (in terms of either carriage or wear) accounted for 19.0 per cent of infringements issued statewide by NSW Maritime over the 10 year period to 30 June 2019.



Figure 18: Priority issue at a glance—lifejackets



Key statistics:

- Recent lifejacket wear rates in NSW are around 43% across all boating activities.
- Over the last 10 years, nearly 8 out of 10 people presumed drowned in recreational boating accidents were not wearing a lifejacket.
- Nearly 60% of all recreational boating fatalities since 2009-10 could have been prevented had all presumed drowning victims been wearing a lifejacket.
- Drowning fatality rates for recreational boating incidents continue a long-term downward trend, and have fallen by more than 60% since 1992-93. There has been no significant change in the corresponding non-drowning fatality rate.
- Lifejacket wear rates in recent years have been much higher on PWC (average of 95%) and sailing dinghies (94%) than on tinnies (36%) and larger power vessels (30%).
- Lifejacket wear rates vary greatly between waterways. Observational study data suggests overall wear rates of around 83% in Batemans Bay and 69% on Lake Jindabyne, but only 20% in Sussex Inlet and only 17% on the Clarence River.

21 Personal Flotation Devices Wear Rate Study 2007. National Maritime Safety Committee.

7.2 Weather conditions

Weather conditions²² were reported as a contributing factor with 16 (13.0 per cent) of the 123 fatal boating incidents recorded in the 10 years to 30 June 2019. All of these fatal incidents were recreational boating incidents.

When other contributing factors likely to relate to large waves and strong winds are included (i.e. hazardous waters and bar conditions), the number of fatal incidents related to 'weather conditions' is even higher—28 incidents (22.8 per cent of the total). When considering that 48 fatal incidents (39.0 per cent) did not have a specific cause recorded, it is likely that weather conditions—including in terms of large waves and/or strong winds—were a major cause in perhaps one third of fatal incidents over this period.

Weather conditions were also reported as a contributing factor in 34 (6.4 per cent) of the 532 serious injury incidents recorded over the 10 years, and 381 (12.8 per cent) of the 2970 boating incidents overall. While weather conditions are not directly applicable to compliance data or boating complaints, it is clear that weather conditions are a significant issue across the incident-related key risk variables (Figure 19).

In 2018-19, weather conditions were associated with one out of the 10 fatal incidents (10 per cent).

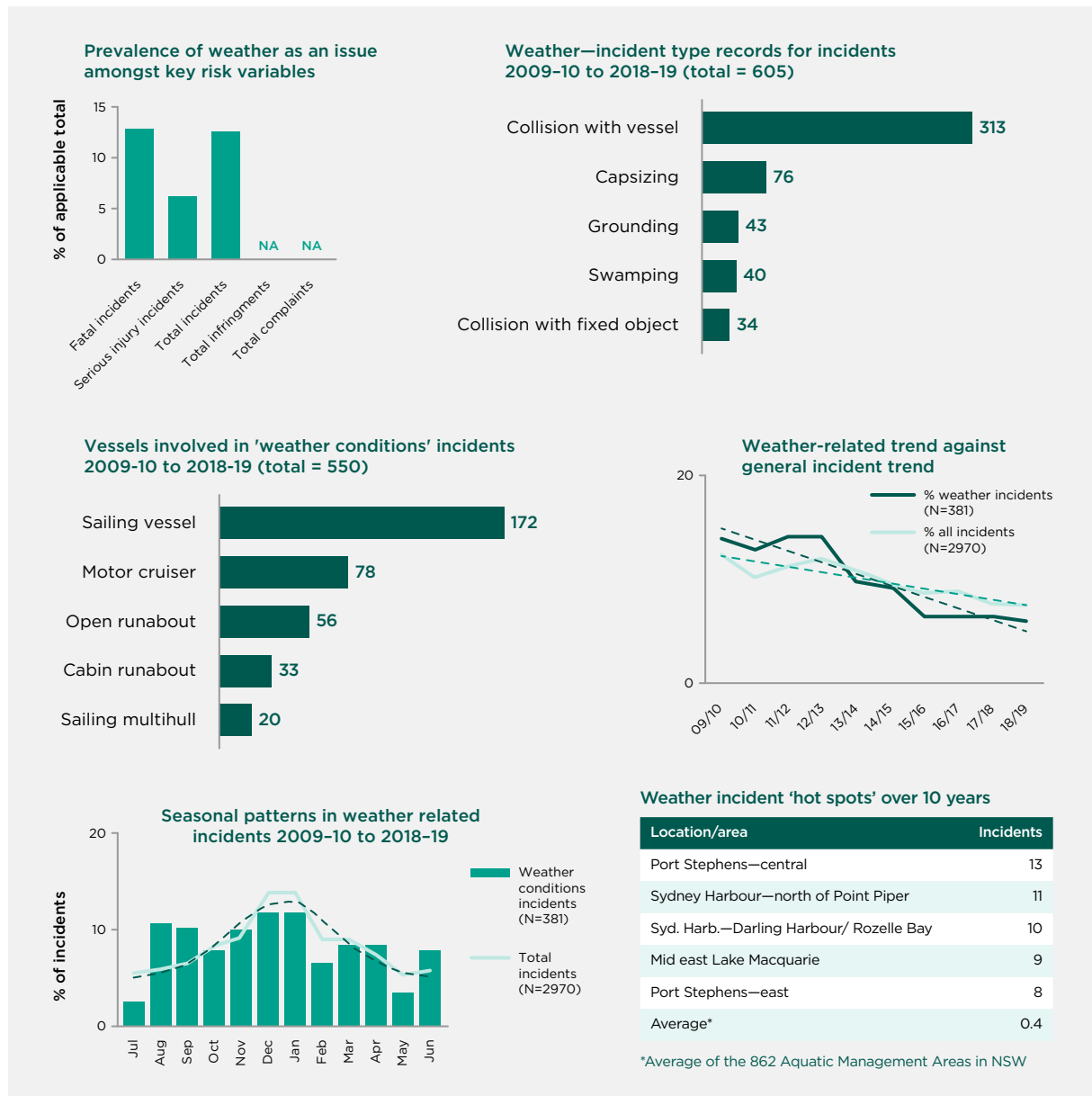
Weather-related incidents are trending downwards (Figure 19), and at a significantly greater rate than for overall incidents.²³ The overall number of incidents related to weather conditions in 2018-19 (23) was significantly below the long-term (10 year) annual average of 38.1 incidents.



22 Analysis of weather conditions based on application of Tableau data visualisation software to Maritime Eagle database records as at 31 October 2019.

23 Analysis of Covariance, slopes significantly different (P=0.007).

Figure 19: Priority issue at a glance—weather conditions



Key statistics:

- About 1 in 8 fatal boating incidents are specifically associated with adverse weather conditions. If sea and wind conditions are also included, the portion may be as high as 1 in 3.
- The overall number of boating incidents related to weather conditions has declined significantly and at a rate exceeding the decline in boating incidents generally.
- More than 50% of incident records related to weather conditions pertained to a collision between two vessels.
- 192 (34.9%) of the 550 vessels involved in incidents related to weather conditions were sailing vessels (including multihulls).
- Incidents related to weather conditions do not show an overall seasonal pattern—unlike boating incidents overall. However, the percentage of weather incidents in August and September (21.0%) was significantly greater than for incidents overall (12.5%).
- Weather-related incidents occur on a variety of sheltered and exposed waterways.

7.3 Excessive speed

Excessive speed²⁴ was reported as a contributing factor in 12 (9.8 per cent) out of 123 fatal boating incidents recorded in the 10 years to 30 June 2019. All of these fatal incidents were recreational boating incidents.

Excessive speed was also reported as a contributing factor in 46 (8.6 per cent) of the 532 serious injury incidents recorded over the 10 years, and 135 (4.5 per cent) of the 2970 boating incidents overall.

Excessive speed was also the subject of 10.1 per cent of infringements issued over the 10 years and was associated with an estimated²⁵ 13.4 per cent of complaints received by NSW Maritime.

In 2018-19, there were no fatal incidents associated with excessive speed.

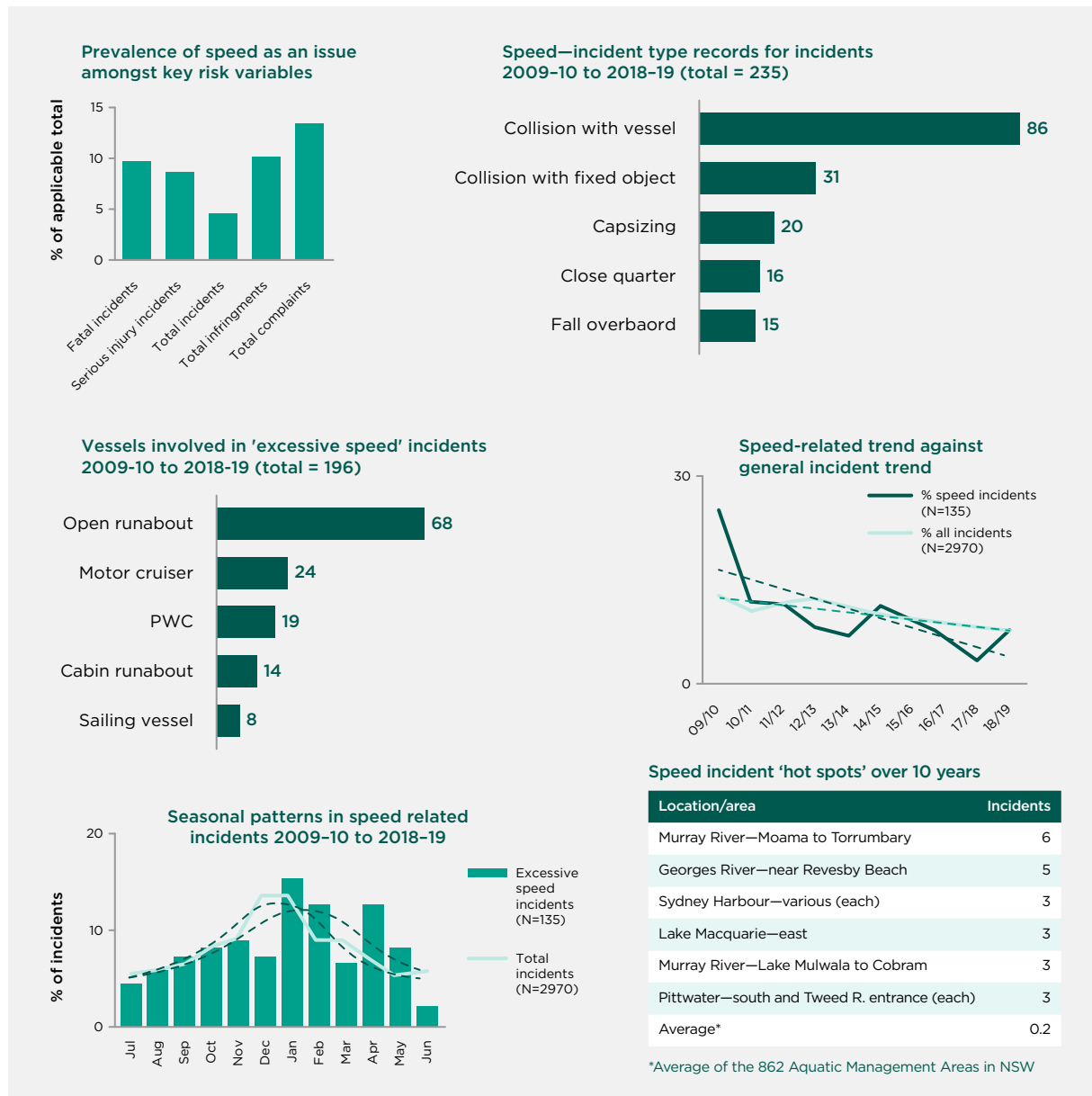
Incidents related to excessive speed are trending downwards (Figure 20) but not at a significantly greater rate than for overall boating incidents. The overall number of incidents associated with excessive speed in 2018-19 (10) was statistically similar to the long-term (10 year) annual average of 13.5 incidents.



24 Analysis of excessive speed based on application of Tableau data visualisation software to Maritime Eagle database records as at 31 October 2019.

25 Analysis of PWC complaints (Section 7.8) shows that excess speed accounted for approximately 1/3 of all complaint issue mentions. This proportion is applied to PWC complaints as well as to 'unsafe behaviour' and 'wash erosion' complaints to obtain an estimated 13.4% of all boating complaints as being speed related.

Figure 20: Priority issue at a glance—excessive speed



Key statistics

- The overall number of boating incidents related to excessive speed has declined significantly, in line with the decline in overall boating incidents.
- About 1 in 10 fatal boating incidents are associated with excessive speed.
- 86 (36.6%) of the 235 incident—vessel records associated with excessive speed involved a collision with another vessel.
- 68 (34.7%) of the 196 vessels involved in incidents related to excessive speed were open runabouts.
- Incidents related to excessive speed occur throughout the year, but with a late summer peak. 28.1% occurred in January or February. A further 12.6% occurred in April.

7.4 Lack of proper lookout

Lack of proper lookout²⁶ was reported as a contributing factor in 6 (4.9 per cent) of the 123 fatal boating incidents recorded in the 10 years to 30 June 2019. All of these fatal incidents were recreational boating incidents.

Lack of proper lookout was also reported as a contributing factor in 67 (12.6 per cent) of the 532 serious injury incidents recorded over the 10 years, and 404 (13.6 per cent) of the 2970 boating incidents overall.

Infringements related to navigation and collision regulations accounted for 4.2 per cent of all infringements issued over the 10 years. Most of these infringements are likely to have involved not keeping a proper lookout. There is no applicable data available in relation to complaints.

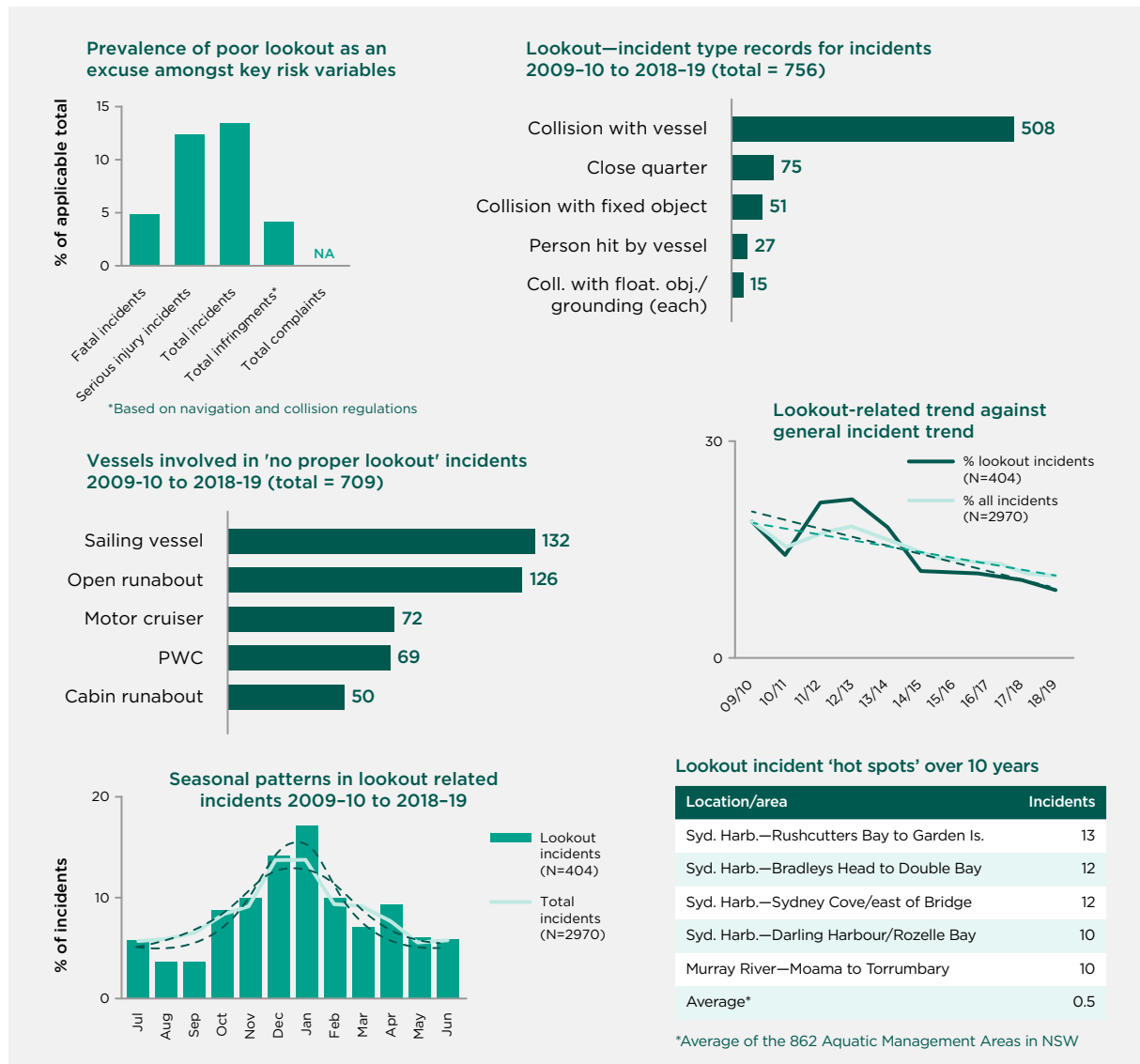
In 2018–19, there were no fatal incidents associated with the lack of a proper lookout.

Incidents related to the lack of a proper lookout are trending downwards (Figure 21) but not at a significantly greater rate than for overall boating incidents. The overall number of incidents associated with the lack of a proper lookout in 2018–19 (25) was significantly below the long-term (10 year) annual average of 40.4 incidents.



²⁶ Analysis of lack of proper lookout based on application of Tableau data visualisation software to Maritime Eagle database records as at 31 October 2019.

Figure 21: Priority issue at a glance—lack of proper lookout



Key statistics

- The overall number of boating incidents related to the lack of a proper lookout has declined significantly, in line with the decline in overall boating incidents.
- Nearly 1 in 20 fatal boating incidents are associated with the lack of a proper lookout. The closely-related factor of excessive speed is associated with about 1 in 10 (Section 7.2). These two factors combined were associated with a total of 18 fatal incidents, i.e. about 1 in 7 of all fatal incidents.
- More than two-thirds (67.2%) of the 756 incident—vessel records associated with lack of proper lookout involved a collision with another vessel.
- 132 (18.6%) of the 709 vessels involved in incidents related to lack of proper lookout were sailing vessels. 126 (17.8%) were open runabouts.
- The seasonality of incidents related to the lack of a proper lookout closely mirrored that of overall boating incidents, but with a slightly more pronounced summer peak. December and January accounted for 126 incidents (31.2% of total).
- Many parts of Sydney Harbour recorded relatively high numbers of lookout incidents.

7.5 Excess alcohol

Excess alcohol^{27,28} was reported as a contributing factor in 13 (10.6 per cent) of the 123 fatal boating incidents recorded in the 10 years to 30 June 2019. Eleven (84.6 per cent) of these fatal incidents were recreational boating incidents.

Excess alcohol was also reported as a contributing factor in 22 (4.1 per cent) of the 532 serious injury incidents recorded over the 10 years, and 55 (1.9 per cent) of the 2970 boating incidents overall.

The true prevalence of alcohol as a contributing factor in boating incidents is likely to be underreported as alcohol testing does not always occur for less serious incidents.

In 2018-19, there were no fatal incidents known to have been related to excess alcohol.

While the data suggests some signs of a long-term decline in reported incidents related to excess alcohol, this is not statistically significant. However, the relatively small number of alcohol-related incidents (55 over 10 years) means that demonstrating any long-term trend would always be difficult due to year-to-year volatility in the data. The overall number of incidents related to excess alcohol in 2018-19 (5) was statistically similar to the long-term (10 year) annual average of 5.5 incidents.

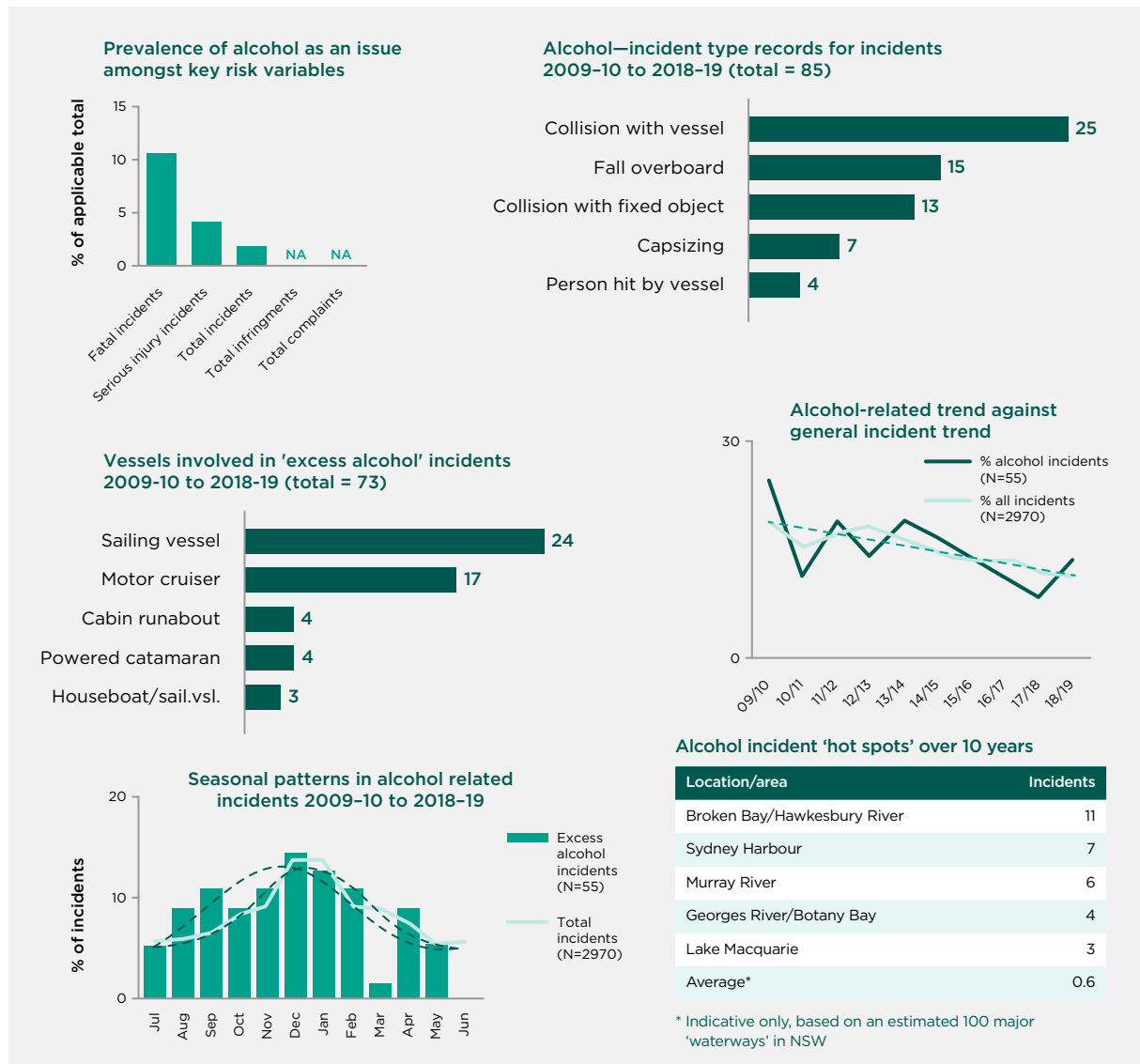
The high involvement of open runabouts (nearly a third of all incident-vessel records related to excess alcohol) dispels to some extent the stereotype of 'big party boats' as being the main source of alcohol-related risk. Whilst motor cruisers did account for more than 23 per cent of incident-vessel records related to excess alcohol, it is clear that the issue of alcohol spans a wide range of vessel types and sizes as well as different boating situations.



27 Analysis of excess alcohol based on application of Tableau data visualisation software to Maritime Eagle database records as at 31 October 2019.

28 An incident will normally have a cause of 'excess alcohol' recorded if a vessel operator involved is known or suspected of having a blood alcohol concentration above the legally prescribed limit (generally < 0.05 grams alcohol in 210 litres of breath or 100 millilitres of blood, but < 0.02 for commercial operators and zero for operators under 18 years of age).

Figure 22: Priority issue at a glance—excess alcohol



Key statistics

- The overall number of boating incidents related to excess alcohol has fluctuated in recent years, without showing any significant trend. The contribution of alcohol to boating incidents is likely to be considerably under-reported.
- More than 1 in 10 fatal reported boating incidents are linked to excess alcohol.
- 24 (32.9%) of the 73 vessels involved in incidents relating to excess alcohol were open runabouts. A further 17 (23.3%) were motor cruisers.
- Alcohol was most often associated with collisions with another vessel (29.4% of records), followed by falls overboard (17.6%) and collisions with a fixed object (15.3%).
- Incidents linked to excess alcohol were highly seasonal, with most in the spring/summer period. The six month period September to February accounted for nearly 7 out of 10 such incidents (69.1%).
- Alcohol-related incidents were prevalent around Sydney, with Broken Bay/Hawkesbury River, Sydney Harbour and Georges River/Botany Bay together accounting for 40% of all such incidents in NSW.

7.6 Lack of judgment

Lack of judgment²⁹ was reported as a contributing factor in 14 (11.4 per cent) of the 123 fatal boating incidents recorded in the 10 years to 30 June 2019. Eleven (78.6 per cent) of these fatal incidents were recreational boating incidents.

Lack of judgment was also reported as a contributing factor in 102 (19.2 per cent) of the 532 serious injury incidents recorded over the 10 years, and 638 (21.5 per cent) of the 2970 boating incidents overall.

While no direct data is available, it is estimated (Figure 23) that lack of judgment—in terms of how it is normally considered in a boating context (see below)—was associated with approximately 10 per cent of infringements and 20 per cent of complaints received by NSW Maritime.

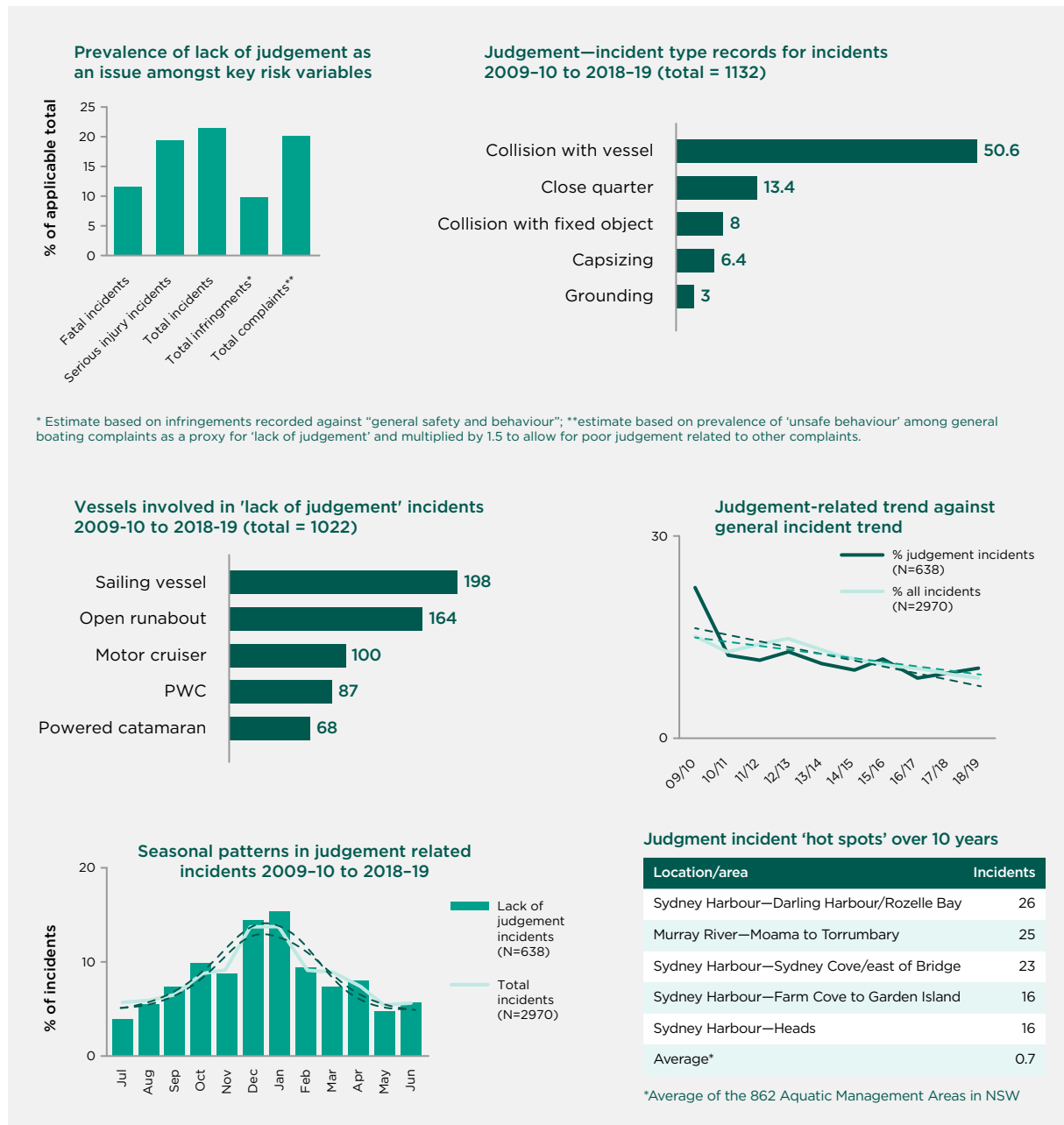
In 2018–19, there were no fatal incidents for which lack of judgment was recorded as a contributing factor.

Incidents related to poor judgment are trending downwards (Figure 23) but not at a significantly greater rate than for overall boating incidents. The overall number of incidents related to poor judgment in 2018–19 (54) was statistically similar to the long-term (10 year) annual average of 63.8 incidents.

In relation to boating incidents ‘lack of judgment’ can mean many things. It is normally recorded as a contributing factor when other more specific causes (such as excessive speed) are not evident. It often relates to cases where a person showed poor ‘seamanship’ in a general sense rather than taking (or omitting to take) a single specific action to cause an incident. Often multiple factors are involved in an incident, and if a skipper failed to manage the factors *collectively*, they might be described as exercising a lack of judgment. Furthermore, most of the specific *individual* causes currently recorded against boating incidents are likely to be based on a degree of poor judgment—for example misjudging changing weather conditions or misjudging the risks associated with a vessel’s speed on a busy waterway.

²⁹ Analysis of lack of judgment based on application of Tableau data visualisation software to Maritime Eagle database records as at 31 October 2019.

Figure 23: Priority issue at a glance—lack of judgment



Key statistics

- The overall number of boating incidents related to a lack of judgment has declined significantly, in line with the decline in overall boating incidents.
- About 1 in 9 fatal boating incidents are associated with 'lack of judgment' as a contributing factor.
- 573 (50.6%) of the 1132 incident—vessel records related to lack of judgment involved a collision with another vessel.
- 198 (19.4%) of the 1022 vessels involved in incidents related to lack of judgment were sailing vessels. 164 (16.0%) were open runabouts.
- Incidents linked to a lack of judgment are highly seasonal, closely mirroring boating incidents generally.
- Several locations on Sydney Harbour and one on the Murray River had the most lack of judgment incidents.

7.7 Towing activities

Towing activities include water skiing, wakeboarding and aquaplaning. Figure 24 provides a snapshot of key data and statistics related to towing incidents.

All of the towing incidents recorded over the 10 years to 30 June 2019 were recreational boating incidents. Towing accounted for 11 (9.6 per cent) of the 114 recreational fatal boating incidents recorded over this period, along with 64 (15.5 per cent) of the 413 recreational serious injury incidents and 86 (4.3 per cent) of the 1983 recreational boating incidents overall.

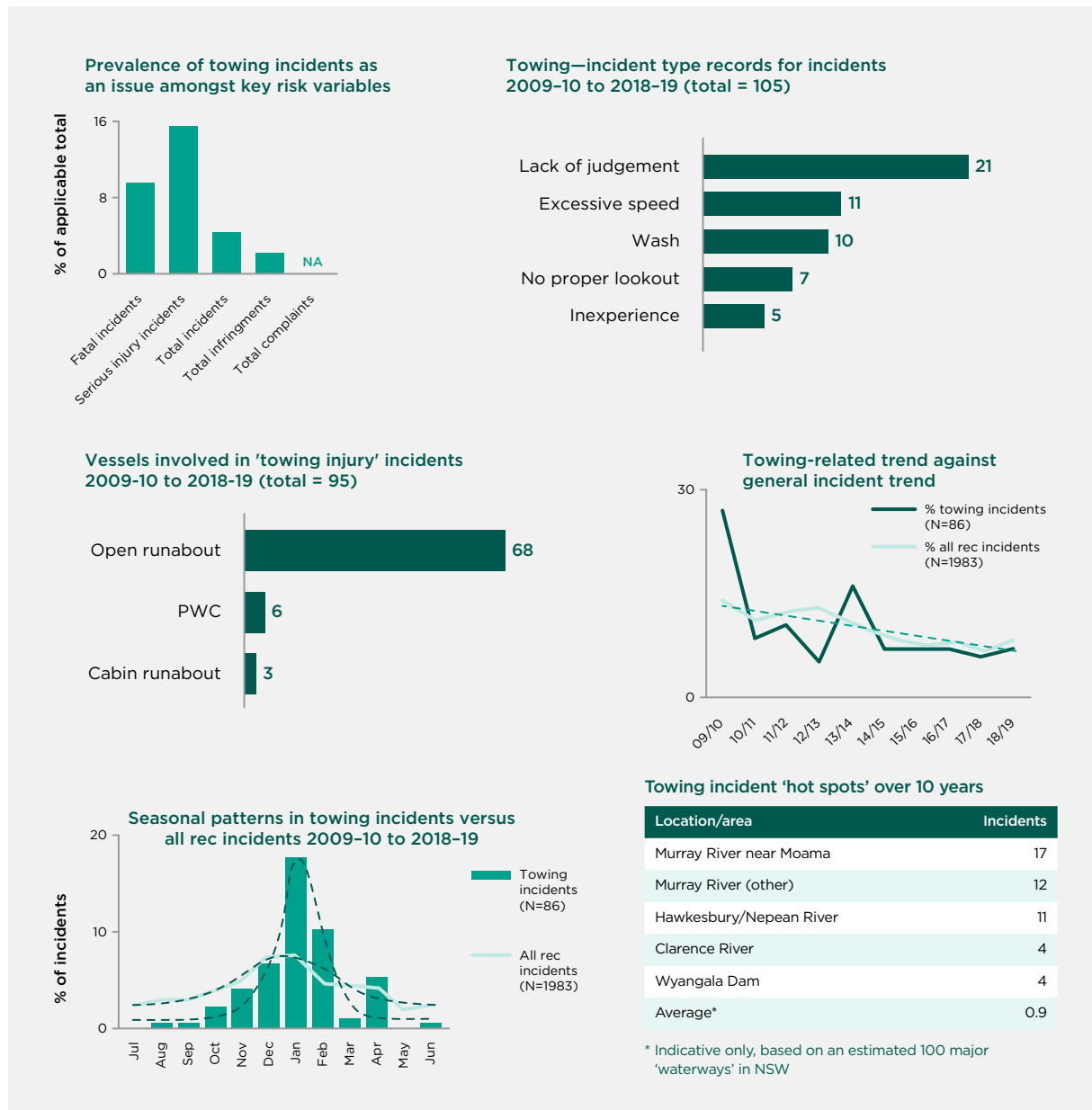
Towing-related issues also accounted for 2.2 per cent of infringements issued statewide over the 10 year period to 30 June 2019. However, the proportion of NSW Maritime complaints received related to towing activities is unclear, as most such complaints were recorded under other categories, such as “speeding” or “wash”.

In 2018-19, there were no fatal incidents involving towing activities. However, five serious injury incidents were recorded as being towing-related.

The overall number of incidents recorded as towing incidents in 2018-19 (6) was statistically similar to the long-term (10 year) annual average of 8.6 incidents. In addition, the relative number of towing incidents has not fallen significantly over the 10 year period.



Figure 24: Priority issue at a glance—towing activities



Key statistics

- About 1 in 10 (9.6%) of fatal recreational boating incidents relate to towing activities. For serious injury incidents, the rate is just over 1 in 6 (15.5%).
- Lack of judgement was the most common co-contributing factor along with towing over the 10 years (20.0% of such incidents). This was followed by excessive speed (10.5%) and wash (9.5%).
- 68 (71.6%) of the 95 vessels involved in towing incidents were open runabouts.
- The prevalence of incidents linked to towing injuries has not declined significantly.
- Incidents linked to towing were extremely seasonal, even more so than for recreational boating incidents generally. The six month period November to April accounted for 91.9% of such incidents (versus 67.0% for all recreational incidents). January alone accounted for 36.0% (versus 15.4%).
- Towing incidents overwhelmingly occurred on coastal rivers and on inland waterways. The Murray River accounted for 29 incidents (33.7% of total), while the Hawkesbury River accounted for 11 incidents (12.8%).

7.8 Personal watercraft

PWC³⁰ were involved in five (4.4 per cent) of the 114 recreational fatal boating incidents recorded in the 10 years to 30 June 2019.

PWC were involved in 72 (17.4 per cent) of the 413 recreational serious injury incidents recorded over the same period. PWC were also involved in 189 (9.5 per cent) of the 1983 recreational boating incidents recorded overall. In terms of vessels, PWC accounted for 17.2 per cent of the vessels involved in recreational serious injury incidents over the 10 year period.

PWC accounted for 6.9 per cent of all boating infringements issued in NSW over the 10 years and featured in 28.3 per cent of all boating-related complaints received since December 2015.

In 2018-19, there was one fatal incident involving a PWC, which resulted in two fatalities.

There has been no significant long-term trend in the overall number of PWC incidents, despite the downward trend in recreational incidents generally (Figure 25). Also, while the rate of recreational incidents involving a PWC (per 100,000 registrations) has shown some indication of decline, it is not statistically significant. There has, however, been a significant reduction in the rate of recreational serious injury incidents involving a PWC.

In 2018-19, the overall rate of PWC involvement in boating incidents was 100.7 PWC per 100,000 registered PWC, which was significantly below the long term (10 year) average of 176.2. Similarly, the corresponding rate of PWC involvement in serious injury incidents (26.9 PWC per 100,000 registered PWC) was significantly below the long term average of 66.9.

Based on the proportion of registered recreational vessels that were PWC during this period (3.7 per cent in 2009-10, increasing to 6.3 per cent in 2018-19), PWC are over-represented in overall recreational boating incidents and especially in recreational boating serious injury incidents. PWC are also very over-represented in boating complaints.

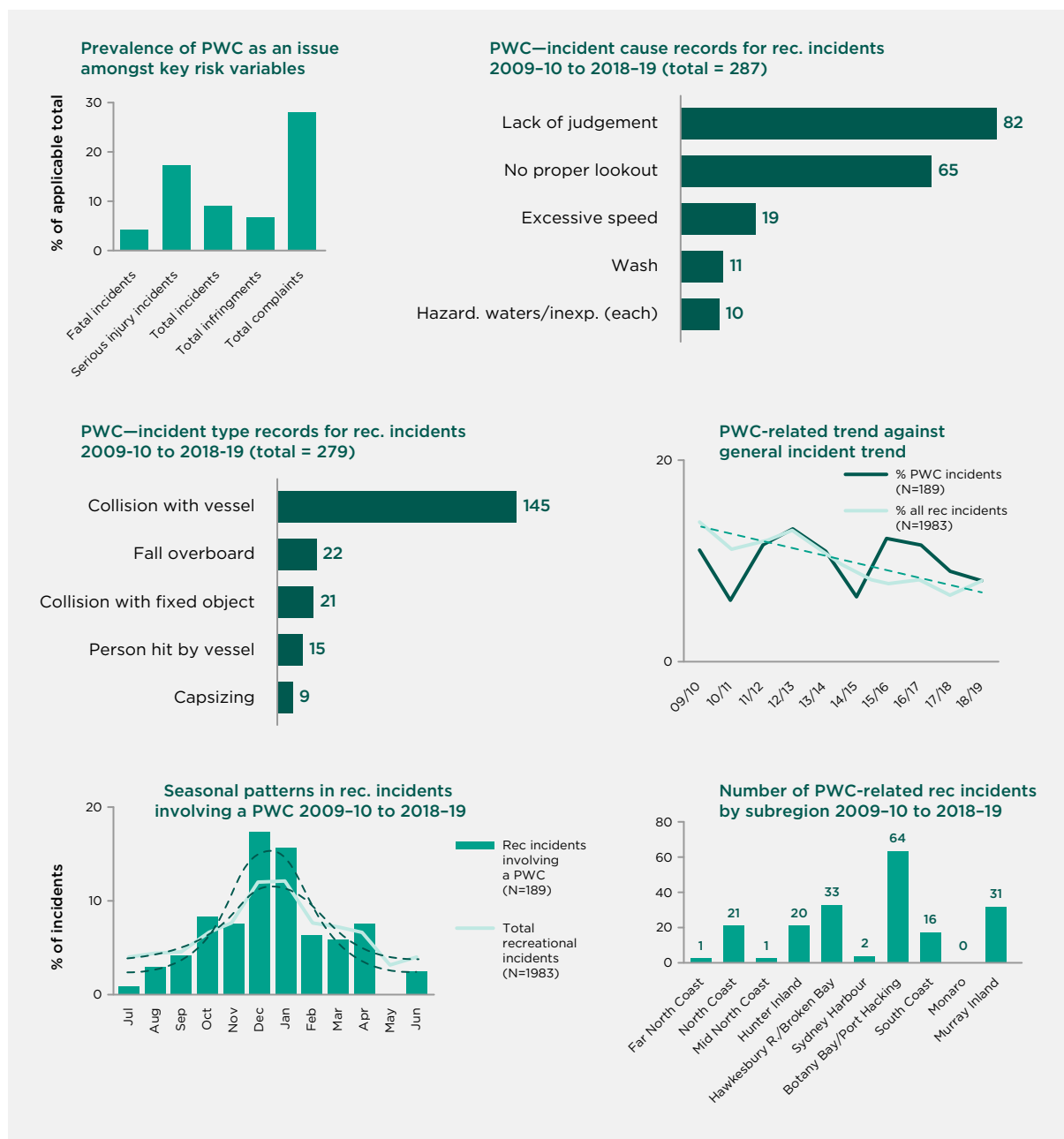
Based on registration and licence numbers, the popularity of PWC is growing at a faster rate than overall boating, although the rate of growth has slowed in the last few years. Since July 2011,³¹ PWC licences have had an average annual growth of 6.5 per cent while PWC registrations have averaged 8.1 per cent annual growth. The corresponding annual growth figures for general boating are 0.3 per cent and 0.4 per cent.



30 Analysis of PWC based on application of Tableau data visualisation software to Maritime Eagle database records as at 31 October 2019.

31 Analysis of licence and registration data provided by Maritime.

Figure 25: Priority issue at a glance—Personal Watercraft



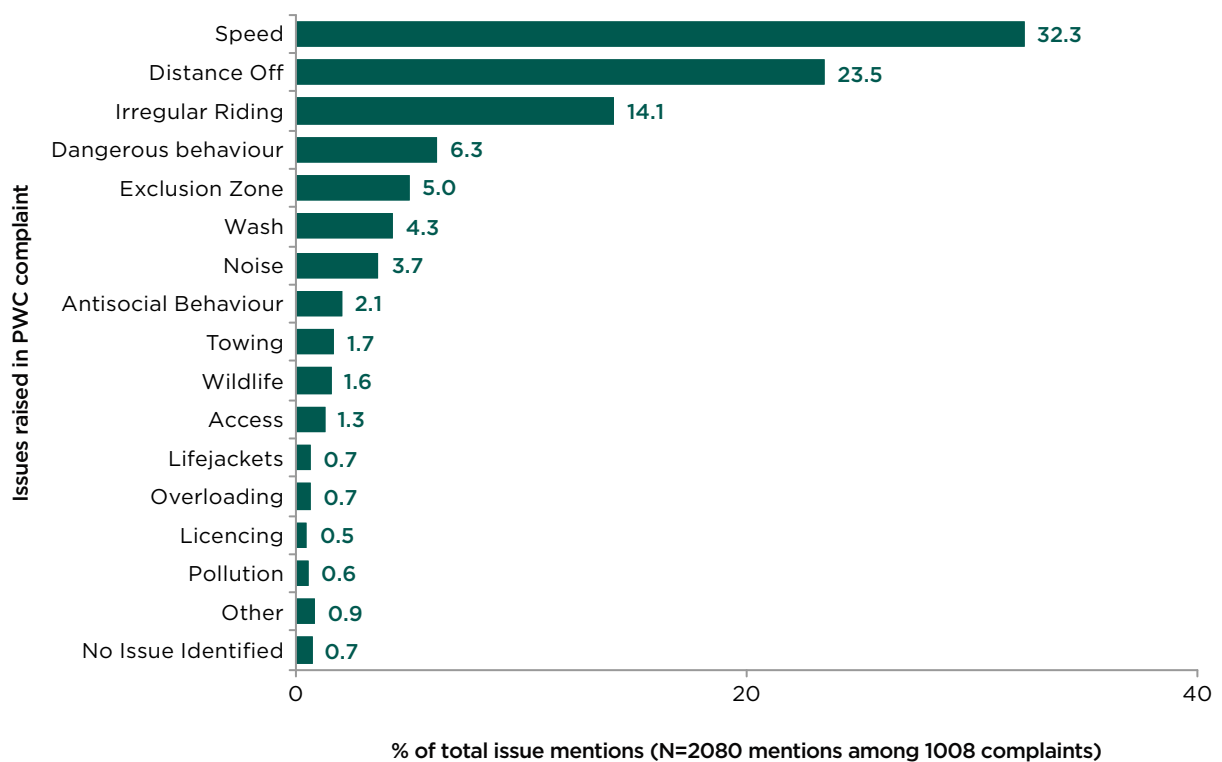
Key statistics:

- PWC accounted for 17.2% of vessels involved in recreational serious injury incidents. This is much greater than their share of recreational vessel registrations, which averaged around 5% during the 10 year period to 30 June 2019. For total incidents, the proportion was 9.5%.
- PWC also featured in 28.3 of boating complaints and accounted for 6.9% of infringements.
- Lack of judgment was the most common contributing factor related to PWC (28.6% of records). The most common incident type was collision with another vessel (55.1%).
- The rate of recreational serious injury incidents involving a PWC has trended downwards over the 10 years.
- Recreational incidents involving a PWC are highly seasonal, with a pronounced summer maximum. December and January together accounted for 41.3% of the incidents.
- PWC-related incidents are concentrated in the Botany Bay/Port Hacking area (33.9% of state total), the Hawkesbury River/Broken Bay area (17.5%) and Murray Inland (16.4%).

Figures 26 and 27 examine PWC-related complaints data more closely. Over a period spanning nearly four years, 1008 complaints partially or wholly related to PWC were recorded by NSW Maritime. Most of these complaints raised more than one specific issue, and there were a total of 2080 issue-mentions among all the PWC-related complaints. The dominant issues, in terms of issue-mentions (Figure 26), were speed (32.3 per cent of mentions), distance off (23.5 per cent) and irregular riding (14.1 per cent). Overall, a wide variety of safety, amenity and environmental issues were raised.

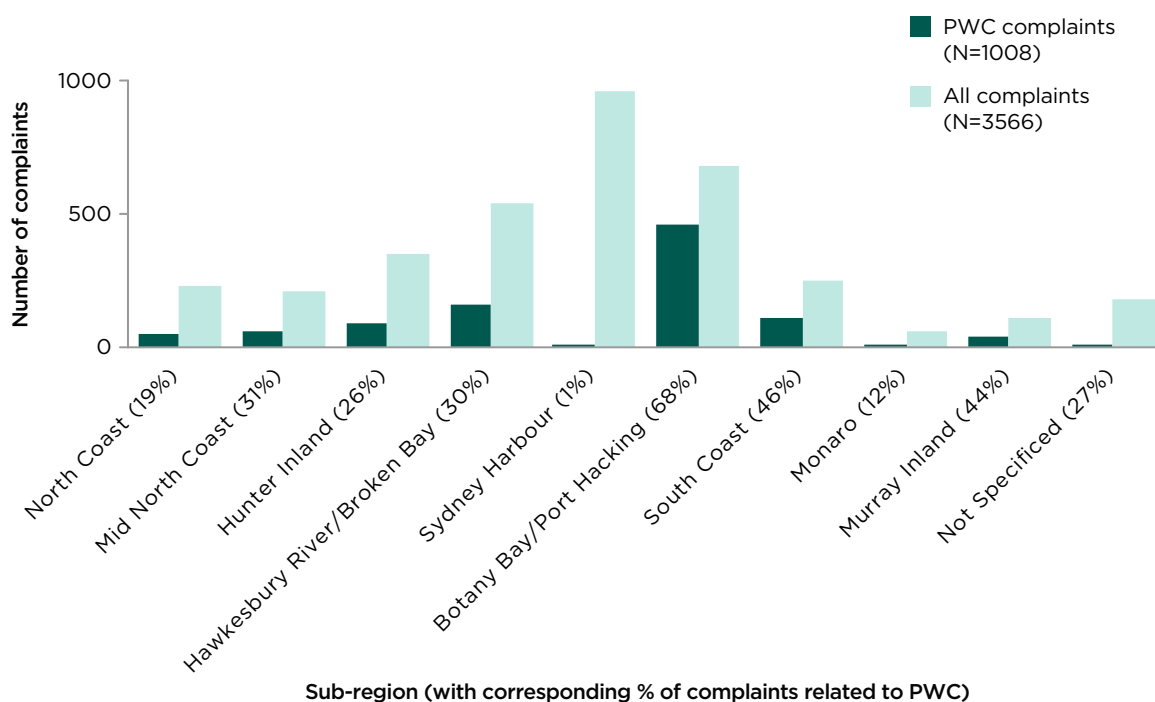
The number of PWC-related complaints, and the portion they made up of total boating complaints, varied greatly between different regions/areas of NSW. The greatest number of complaints came from the Botany Bay/Port Hacking area (Figure 27), which accounted for 45.3 per cent of all PWC complaints received statewide. PWC complaints in this area accounted for more than two-thirds (67.6 per cent) of the total boating complaints received (Figure 27).

Figure 26: Issues raised in PWC complaints by per cent of total issue-mentions (December 1 2015 to June 30 2019).*



* Includes complaints wholly or partly related to PWC.

Figure 27: PWC complaints versus all boating complaints by sub-region/area (December 1 2015 to June 30 2019).*



* PWC complaints are those wholly or partly related to PWC.

7.9 Paddle craft

Paddle craft³² include canoes, kayaks and dragon boat-type craft. They were involved in 11 (8.9 per cent) of the 123 fatal boating incidents recorded in the 10 years to 30 June 2019. All of these fatal incidents were recreational boating incidents. In terms of vessels, paddle craft accounted for 8.4 per cent of the vessels involved in fatal incidents over the 10 year period. Paddle craft were involved in 8 (1.5 per cent) of the 532 serious injury incidents and 48 (1.6 per cent) of the 2970 overall boating incidents recorded over the 10 years.

Paddle craft were not specifically recorded against infringements or complaints data, so the proportion of infringements recorded or complaints received in relation to paddle craft is unknown.

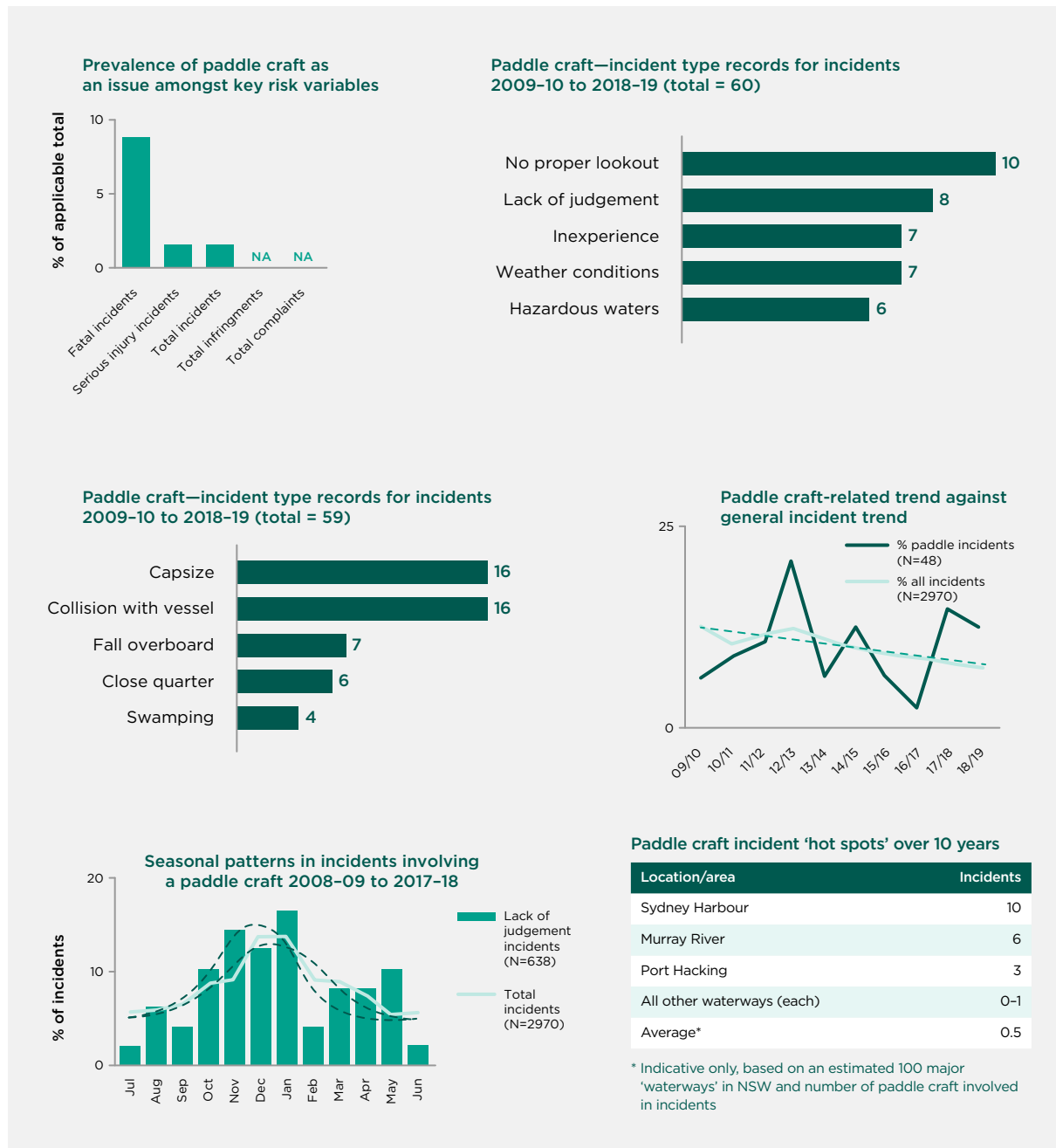
In 2018-19, there was one fatal incident involving a paddle craft.

There has been no significant trend in the number of paddle craft involved in boating incidents (Figure 28) and the number of paddle craft involved in incidents in 2018-19 (6) was statistically similar to the long-term (10 year) annual average of 4.8 paddle craft. It is likely that the absence of any improving long term trend, would be at least partly due to the increased participation in paddle craft activities in recent years.

The proportion of fatal incidents involving a paddle craft (8.9 per cent) was significantly higher than the corresponding proportion for incidents overall (1.6 per cent). This difference highlights the fact that for paddle craft, incidents tend to be either very serious or minor; minor incidents are often not reported.

³² Analysis of paddle craft based on application of Tableau data visualisation software to Maritime Eagle database records as at 31 October 2019.

Figure 28: Priority issue at a glance—paddle craft



Key statistics

- Paddle craft accounted for 8.4% of the vessels involved in fatal incidents.
- Lack of proper lookout was the most common co-contributing factor to incidents with paddle craft over the 10 years (16.7% of records). This was followed by lack of judgment (13.3%), inexperience and weather conditions (both 11.7%).
- The most common incident types were capsizing and collisions with another vessel (both 27.1%).
- The number of incidents involving paddle craft has been fluctuating, without any discernable trend.
- Incidents involving paddle craft tend to be seasonal, with most in the late spring to summer period. The four month period October to January accounted for more than 54.2% of such incidents.
- Incidents involving paddle craft occurred on both coastal and inland waterways. Sydney Harbour accounted for 20.8% (10 incidents), the Murray River 12.5% (6 incidents) and Port Hacking 6.3% (3 incidents).

7.10 Cold water

'Cold water'³³ means water cold enough to be dangerous to a person who is forced into the water without protective garments (such as a wetsuit). The serious effects of cold shock (rapid uncontrolled breathing, loss of airway control, panic etc.) generally prevail at water temperatures below about 15 degrees.³⁴ At such temperatures, a person without a lifejacket or other form of support is at a high risk of drowning (see also Section 7.1).

NSW straddles a range of climate zones, with boating environments ranging from high alpine areas that have frequent winter snow to sub-tropical coastal waters. Consequently there is a wide range in prevailing water temperatures: the alpine waterways can have dangerously cold water at any time of year, while some northern areas may almost never experience such conditions.



33 Analysis of cold water and related issues based on application of Tableau data visualisation software to Maritime Eagle database records as at 31 August 2019.

34 <http://www.coldwatersafety.org/WhatIsCold.html>

Analysis has been undertaken in relation to the seasonal pattern and long-term trend for incidents where cold water was likely to have been an issue (Figure 29). This was based on three variables: incident type (those incidents in which a person was likely suddenly forced into the water), time of year (month) and incident location (geographic regions). The associated filters used in the Tableau dashboards are set out in Table 4 below.

Table 4: incident types, months and geographic regions used to define ‘cold water’ incidents*

Incident types			
<ul style="list-style-type: none"> • Bar crossing incident • Capsizing • Fall overboard • Sinking 			
Months/regions			
July and August	June and September	May, October and November	All remaining months (December–April)
<ul style="list-style-type: none"> • Hawkesbury/Broken Bay • Hunter/inland • Mid North Coast • Monaro • Murray Inland • North Coast • South Coast • Sydney • Sydney (Botany Bay/Port Hacking) 	<ul style="list-style-type: none"> • Hawkesbury/Broken Bay • Hunter/inland • Monaro • Murray Inland • South Coast • Sydney • Sydney (Botany Bay/Port Hacking) 	<ul style="list-style-type: none"> • Monaro • Murray inland • South Coast 	Alpine waters only: <ul style="list-style-type: none"> • Blowering Reservoir • Burrinjuck Reservoir • Khancoban Pondage • Lake Eucumbene • Lake Jindabyne • Pajar Dam

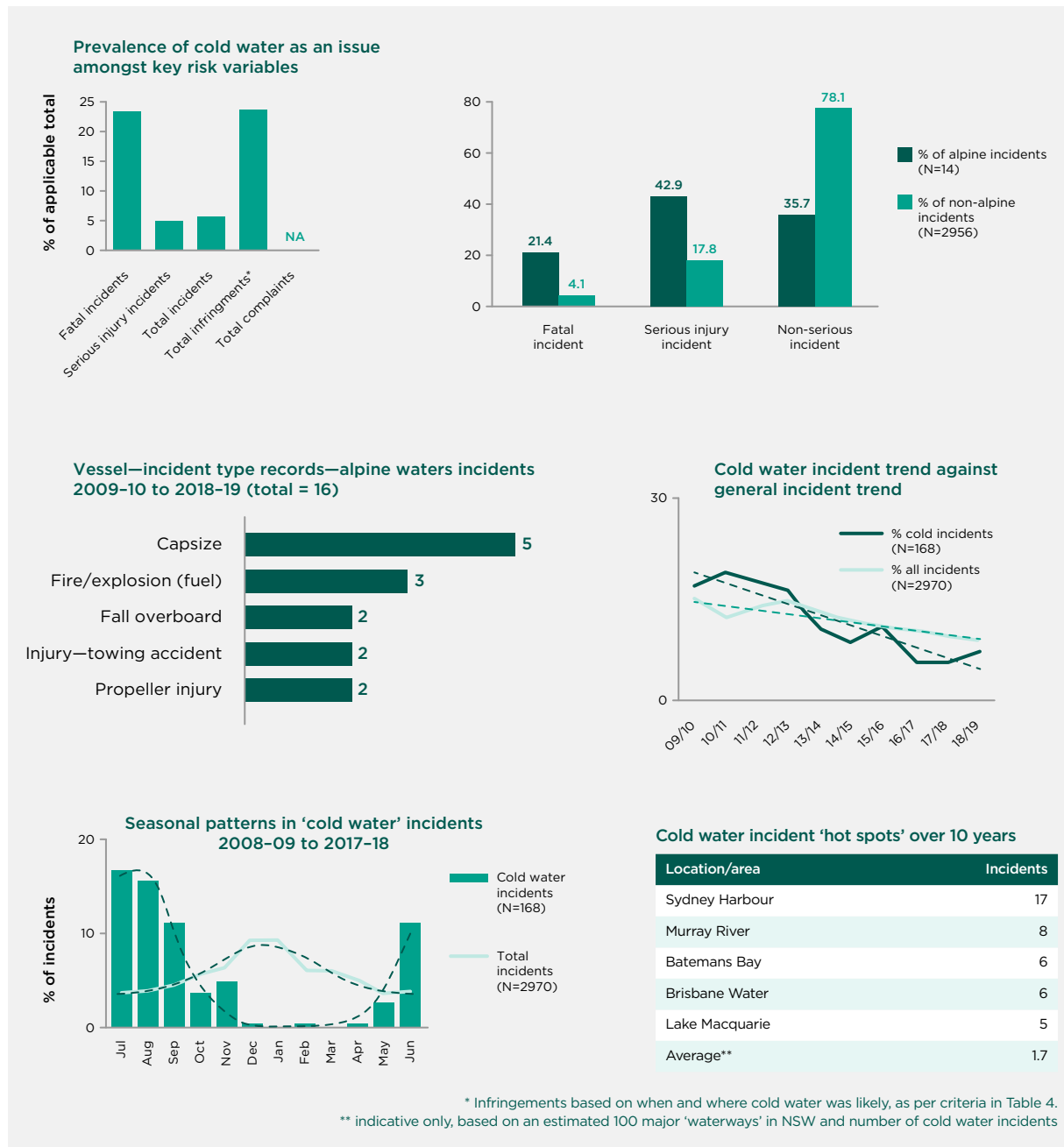
* Incident types based on situations where person likely to be forced into water; months and regions based on likely occurrence of cold water within NSW. “Alpine waters” are those defined under the *Marine Safety Regulation 2016* and which have had at least one boating incident in the 10 years to 30 June 2019.

Cold waters accounted for 29 (23.6 per cent) of the 123 fatal boating incidents recorded over the 10 years to 30 June 2019. They accounted for much lower proportions of serious injury and total incidents (5.3 per cent and 5.7 per cent respectively). Nearly one quarter (23.9 per cent) of boating infringements were issued at times and places where cold water was highly likely to have been present.

Alpine waters accounted for three fatal incidents and six serious injury incidents over the 10 years to 30 June 2019—i.e. 64.3 per cent of all alpine waters incidents, a significantly higher proportion than the corresponding figure for non alpine waters (21.9 per cent).

Incidents in which cold water was a likely issue are trending downwards, and at a faster rate than for boating incidents overall (Figure 29). The overall number of incidents apparently related to cold water in 2018-19 (10) was significantly below the long-term (10 year) annual average of 16.8 incidents.

Figure 29: Priority issue at a glance—cold water



Key statistics

- 'Cold water' incidents have trended strongly downwards over the 10 year period.
- Nearly two-thirds (64.3%) of boating incidents on alpine waters resulted in either a fatality or serious injury. This is significantly higher than the 21.9% for incidents on other waterways.
- The 14 incidents recorded on alpine waters involved seven open runabouts (50% of all involved vessels) and three paddle craft (21.4%). Seven of the vessel—incident records (43.8%) involved either a vessel capsize or person falling overboard.
- Incidents where cold water was a likely issue have occurred across a wide variety of coastal and inland waterways, including waterways outside Southern NSW.
- While most 'cold water' incidents occurred in the winter months (June-August; 64.9%), a considerable proportion occurred in spring (September—November; 29.2%).

7.11 Boater age

Recreational boating fatalities affect all age groups (Figure 30). The largest number of fatalities over the 10 year period to 30 June 2019 involved people in the 50–59 year age class (19.5 per cent) and the 40–49 year age class (18.8 per cent). However, these two age classes also accounted for the largest numbers of boat licence holders.

However, when fatalities and licence numbers are compared across all age classes, evidence of over-representation in boating fatalities is evident amongst those aged 70 and over, and those aged up to 19 years of age (although the latter is affected by the fact that the minimum age for a licence in NSW is 12 years). The over-representation of boaters aged 70 and above is notable: they accounted for 19.5 per cent of all fatalities, which was significantly greater than their 7.9 per cent share of boat licences.

Broadly, across the peak age groups for boating participation (ages 30–69), there was a statistically significant under-representation in terms of fatalities (60.9 per cent) compared with licence numbers (78.1 per cent). This was most pronounced in the 30–39 age class (10.9 per cent of fatalities versus 16.7 per cent of licences).

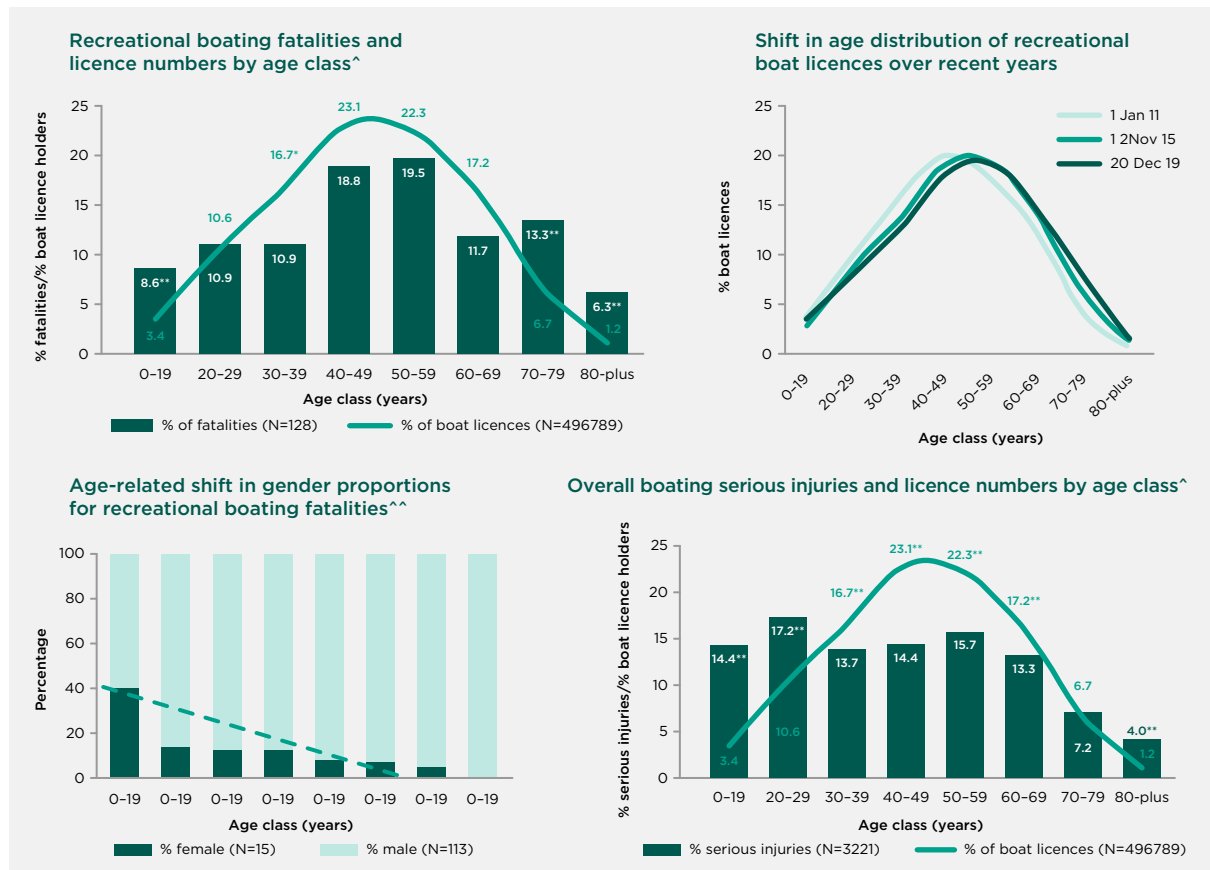
There has been no significant trend in the number of recreational boating fatalities aged 70 or greater over the last 10 years. The number of recreational fatalities aged 70 or greater in 2018–19 (3) was statistically similar to the long-term (10 year) annual average of 2.5 such fatalities.

Most recreational boating fatalities are male. Over the 10 year period to 30 June 2019, 88.3 per cent of such fatalities were male. The high representation of males is even more pronounced in the older age groups: all but one of the 25 fatalities aged 70 or more were male (i.e. 96.0 per cent), and there was a significant downward trend in the proportion of female fatalities with increasing age (Figure 30). Males were also heavily over-represented in boating serious injuries according to NSW Health hospital data (71.5% versus 28.5%).

Over the 10 year period to 30 June 2019, younger people (those under 30) were heavily over-represented in serious injuries, accounting for 31.5 per cent of these injuries but only 14.0 per cent of boat licences. While this difference is partly explained by people under 12 not being eligible to hold a licence, it is noteworthy that people aged 20–29 accounted for 17.2 per cent of serious injuries, a much higher proportion than the corresponding percentage of licences held (10.6). While the NSW Health data does include some commercial vessel injuries, the overwhelming majority of the incidents are recreational.



Figure 30: Emerging issue at a glance—boater age



* Difference just outside statistical significance (0.05<P<0.1); **difference in proportions statistically significant (P<0.05).
[^] Licence numbers based on average of representative dates across the 10 year period—1 Jan 2011, 2 Nov 2015 and 1 Jul 2018.
^{^^}Dashed line based on weighted regression of the % of females against age class; R-squared = 0.667, P=0.015.

Key statistics

- People aged 70 and above are over-represented in recreational boating fatalities—accounting for 19.5% of fatalities but only 7.9% of boat licences held. They are also over-represented in overall boating serious injuries, although this mainly relates to people aged 80 and above (4.0% of serious injuries but only 1.2% of licences).
- People aged under 30 are significantly over-represented in overall boating serious injuries, accounting for 31.5% of serious injuries but only 14.0% of licences. While this is partly due to the unavailability of licences to people aged less than 12, the over-representation is also evident for the 20-29 year age group alone (17.2% of serious injuries but just 10.6% of licences)
- All but one of the 25 fatalities aged 70 and above was male (i.e. 96.0%), highlighting a significant downward trend in the proportion of female fatalities with increasing age. All eight fatalities aged 80 or above were male.
- The number of boating fatalities aged 70 and above has been fluctuating in recent years, without any discernable trend.
- The age-distribution of licence holders has progressively shifted in recent years to reflect an ageing boating population. In the period from 1 January 2011 to 20 December 2019, the number of boat licences held by people aged 70 and above has increased by 110.7%, while the numbers held by younger boaters have remained relatively steady.

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- Centre for Health Record Linkage for conducting the record linkage.
- 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 Cause of Death Unit Record File (COD URF) is provided by the Australian Coordinating Registry 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. It was approved by the following ethics committees:

- 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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