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MAPPING OF RECREATIONAL CRAFT ACCIDENTS
PART B
MAPPING OF HISTORICAL ACCIDENTS 2008–2017

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Photo of ferry on the Norwegian west coast: Bente Amandussen

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1. INTRODUCTION

This sub-report forms part of the Norwegian Accident Investigation Board's (AIBN) mapping of recreational craft accidents in 2018.

It includes methods of obtaining information, as well as analyses and results from the work of mapping recreational craft accidents and other relevant incidents involving recreational craft during the 2008–2017 period.

The purpose of the sub-report was to obtain as complete and detailed a picture as possible of the scope and circumstances surrounding recreational craft accidents in Norway.

Chapter 2 concerns the data and the two main sources used by the AIBN in the investigation. Chapter 3 provides a description of methods and the assumptions and limitations that apply. Chapter 4 presents and discusses the results of the AIBN's analysis of the total data set regarding recreational craft accidents during the 2008–2017 period. In Chapter 5, uncertainties in the data set are described. These include uncertainties relating to the use of sources, methods, under-reporting of incidents etc. In light of the uncertainties described in Chapter 5, the AIBN points out that the results presented in this report must be interpreted as trends and not absolute values.

The conclusions are described in chapter 6, together with suggestions for further work.

The work is summarised in the main report. The main report also gives grounds for the mapping.

2. DATA

The AIBN initially identified which sources could hold relevant information about recreational craft accidents in Norway. Table 1 shows a list of the data that were evaluated and how they were further used in the mapping process.

Table 1: List of data

Sources			
Main sources	Supplementary	Quality assurance / comparison	No further use made
- JRCC - RS	- Telenor Maritime Radio - JRCC log of fatal incidents - Norwegian Maritime Authority (fatalities)	- TØI report from 2017 - Statistics from JRCC and RS - Media searches	- Norwegian Red Cross - Norwegian Institute of Public Health - Emergency fire service in Oslo - Insurance - Police / Marine services

2.1 Evaluation of the data

The Northern and Southern Joint Rescue Coordination Centres (JRCC-N and JRCC-S) and the Norwegian Society for Sea Rescue (RS) were deemed to be the sources with the most extensive and structured information about recreational craft accidents in Norway. This is mainly because the parties use case handling systems that not only register

relevant information but also allow the application of filters to show only incidents involving recreational craft. This was not the case for parties such as insurance companies, which do register recreational craft accidents, but have relatively limited information about individual incidents, or the police, where it was only possible to look up individual cases if the identity of at least one of the people involved was known. These sources were therefore regarded as supplementary sources, but no further use was made of them in the work.

Telenor Maritime Radio also holds relevant information about recreational craft accidents, but most of these incidents were covered by the JRCC or RS, so this was used as a supplementary source. The Norwegian Maritime Authority has information about fatal recreational craft accidents, and this was used as a supplementary source.

The Institute of Transport Economics (TØI) published a report about recreational craft accidents in 2017. The objective of the report was to map the use of recreational craft in Norway, as well as safety behaviour and accident involvement. The survey was based on responses from 11,122 recreational craft owners obtained in August/September 2015, and 173 field interviews. This report was used as a reference for results comparison.

Based on the Red Cross report of incidents in 2016, they have very few marine / water-related operations each year, compared with the figures from other parties such as the JRCC and RS. Additionally, the incidents are not recorded in a central register, and it was also not possible to search only for recreational craft accidents in the existing registers. No further use was therefore made of this source in the work, but supplementary use was considered.

The port police had no more information available about the incidents than the police in general. No further use was therefore made of this source in the work.

The AIBN also contacted the Norwegian Institute of Public Health, which has previously performed work on mapping accidents and injuries in Norway. It was explained that the process of obtaining information from the health sector regarding recreational craft accidents would be extremely challenging. This is because the accidents would be recorded as recreational accidents, and it would be almost impossible to separate out accidents involving recreational craft. No further use was therefore made of this source in the work.

2.2 Main sources

Relevant information about recreational craft accidents from the JRCC's and RS's incident management systems was extracted and passed on to the AIBN. Information about a total of approximately 64,000 incidents was obtained from the JRCC and RS (ten-year period), and many of these incidents were the same, since both parties had been involved in them. Facts about the data sets are summarised in the following paragraphs.

It must be noted that the information stored in the JRCC's and RS's incident management systems was customised to their respective social missions. The information cannot therefore be used directly in order to generate statistics for the detailed mapping of recreational craft accidents. The AIBN has not been informed that registration procedures in the incident management systems have changed during this period, and it is therefore assumed that this has not affected the results to any significant degree.

2.2.1 JRCC

Table 2: Facts about the data set – JRCC

Data set facts	Description	
Data set period	Data available for the period 2001 to present The mapping work has used data from 2008 to 2017	
Number of incidents	29,035	
Number of information parameters	130	
Restrictions	*Covers:* Norwegian territory including Svalbard, the marine and port areas and the airspace above, which is controlled by Norway at any given time. Isolated incidents outside Norwegian territory.	*Does not cover:* - incidents at quay or jetty (moored vessels) - incidents handled by Telenor Maritime Radio (assistance operations or other incidents that are not deemed to be emergency situations) - isolated incidents on inland lakes and rivers
Types of incident	Primarily all search and rescue operations in which the incident is deemed to involve danger to life and health. However, a large number of incidents or situations were also recorded in which it has subsequently been proved that there was never any danger to life or health (e.g. incorrect observations, false callouts).	
Challenges and limitations	- Parameters completed to varying degrees - The parameters provide limited information about the circumstances surrounding a particular incident - Some of the information is not categorised and is stated in free text - No assessment of the criticality of the incidents - The data do not cover all types of waters	

The AIBN had asked the JRCC for data only relating to incidents involving recreational craft, but it was not possible for the JRCC to separate out these incidents automatically. This meant that the data set received from the JRCC contained a large number of incidents involving only commercial parties, including fishing vessels, freighters, vessels associated with the petroleum industry, and diving accidents. Almost a quarter of the incidents only involved commercial parties, and these were removed from the data.

Of the remaining data set, a further 20% of the incidents were removed as not relevant to the investigation, including incorrect observations (mainly from the shore), misuse of pyrotechnic signals, vessels that had been stolen or broken loose from their moorings.

2.2.2 RS

Table 3: Facts about the data set – RS

Data set facts	
Data set period	Data available for the period 2005 to present The mapping work has used data from 2008 to 2017
Number of incidents	35,098
Number of information parameters	103

Area restrictions	*Covers:* - All coastal waters - The inland lakes of Mjøsa and Femunden	*Does not cover:* All other inland lakes and rivers
Types of incident	- Accidents with and without personal injuries, material damage - Salvage operations - Other assignments for members of RS - Other assignments for public and private companies	
Challenges and limitations	- There is a great deal of relevant information in text form, which means that the categorisation of information is limited - Parameters are completed to varying degrees - The parameters provide limited information about the circumstances surrounding a particular incident - The data do not cover all types of waters - Identifying which of the operations overlap with JRCC operations	

In the data set received from RS, there were a large number of operations registered as assistance operations. Examples of these operations are diving operations to search for lost wallets, keys etc., planned tows from port to port due to propulsion problems, assistance retrieving anchors, raising sunken vessels etc. These are not regarded as accidents and were therefore removed.

A significant number of incidents concerned assistance operations involving propulsion problems, e.g. as a result of technical problems with the engine or lack of fuel. Where there was no additional information indicating a potential for these incidents to develop into accidents, these were also removed from the data set.

3. METHOD, ASSUMPTIONS AND LIMITATIONS

After receiving data from the JRCC and RS, the AIBN developed a procedure to sort and extract relevant accidents/incidents and relevant information. The following main tasks were performed:

- Defining relevant incidents, and identifying incidents not relevant to the investigation of recreational craft accidents and removing these from the data set
- Defining relevant information parameters, and identifying parameters not relevant to the investigation and removing these from the data set
- Connecting the two data sets
- Categorising relevant incidents and other significant information

3.1 Definition of relevant incidents

The objective of the mapping work is to establish a better factual basis about the scope and circumstances surrounding recreational craft accidents. A definition of recreational craft accidents based on the Norwegian Maritime Code's definition of marine accidents, cf. Section 472 a fourth paragraph, includes incidents involving recreational craft that result in significant injuries or damage to material assets or the environment. If the

consequences are serious or very serious, marine recreational craft accidents are classified accordingly.

However, the review of the data revealed that a large number of the reported incidents cannot be regarded as marine accidents in the sense of the law, since they did not result in significant injury or damage. In addition, a number of incidents were registered in which a certain risk of injury or damage such as grounding was present in the sequence of events, but which did not result in any noteworthy injury or damage being recorded. A significant number of incidents were also recorded that had no consequences in terms of injury or damage and in themselves cannot be regarded as dangerous, but which because of the circumstances still involve a risk of serious consequences.

In order to gain a better understanding of the scope of such incidents, the risks and to some extent the causes involved, the AIBN decided that incidents resulting in injury or damage and incidents involving risk should be included in the mapping process. This means that all incidents with a potential for negative consequences are included in the definition of recreational craft accidents in this mapping

Relevant recreational craft incidents are therefore:

1) incidents resulting in injury or damage, regardless of the scope,

2) incidents with a high injury or damage potential, for which no injury or damage was recorded,[1] and

3) incidents that in themselves are not regarded as dangerous, but where special circumstances applied that could have involved a significant risk of injury or damage, which did not materialise.[2]

3.2 Parameters

Both data sets contained a large number of information parameters that could be used when registering the incident. These were completed insofar as the information was necessary in order to perform the rescue or assistance operation as well as possible.

Most of these parameters are not relevant for this mapping process, however. This applies to information that was only recorded exceptionally, but was not included in most cases (e.g. details about sea conditions such as sea temperature or current direction and strength, or communication details such as frequency and modulation), and details that were provided in most cases (such as departure and destination locations), but that could not be used for statistical analyses.

Only information parameters providing general information about the circumstances surrounding the recreational craft accidents were considered in the mapping process. These parameters are based both on original parameters in the data sets, and also on new parameters that were established in order to categorise and refine the information provided in the free text. Information about the parameters was only provided where this was available. The main parameters defined were as follows:

[1] Includes all types of incidents apart from propulsion loss and other/unknown
[2] Includes propulsion loss and other/unknown incident types

Table 4: Description of information parameters

Information parameters	Description of parameters
Date and time	Date and time were provided for all incidents recorded by the JRCC and RS. However, it is not the time of the incident that is provided, but the earliest recorded report of the incident. This forms the basis for determining whether the incident occurred during the day or night, since most of the incidents were reported shortly after they occurred. However, it must be pointed out that there may be some discrepancy between the time of the incident and the time it was reported (e.g. where an incident was registered as a result of concerns reported by next of kin), without there being a sufficient basis for differentiating these incidents.
Place	Municipality and county where the incident occurred. The exact position was stated in coordinates for only 75% of the incidents. The information about county and municipality also tended to be based on the RS station that was the starting point of the operation.
Incidents (I1, I2, I3)	The incidents are categorised by type of accident. The following categories were defined: fire, grounding, propulsion loss, collision, contact damage, person overboard, capsizing/foundering, water ingress, personal injury, fall at quay or jetty and other/unknown. One incident could occur as the result of another incident, and it was therefore decided to establish multiple incident categories – I1, I2 and I3 – where I1 is the first incident to occur, I2 is the second etc. Multiple incidents will only be recorded if the data set contained this information. For a more detailed description of incident types, please see section 3.4.1.
Consequence	Consequences include personal injuries and material damage. However, it must be noted that the available information about the scope of injury or damage is very incomplete. For a more detailed description of consequences, please see section 3.4.2.
Causal factors	An attempt was made to categorise causal factors on the basis of information in the original causal categories provided by the JRCC and RS, and from the free text, but these were very incomplete. For a more detailed description of causal factors, please see section 3.4.3.
Risk factor	When reviewing the incidents, it was discovered that several of the incidents – including serious, less serious and essentially non-hazardous incidents – typically involved risk factors that may have affected the outcome of the incident, but that could also have contributed to a different outcome. This will be discussed further in section 4. Please also see section 3.4.4 for a more detailed description of risk factors.
Type of craft	This parameter specifies the type of craft involved. Seven types of craft as well as other/unknown were identified. Since there were limited details about the type of craft within a main category, it was not possible to further categorise types of craft. For a more detailed description of types of craft, please see section 3.4.5.
Time of day	Day (06:00–23:59) or night (00:00–05:59) based on time of notification.

The classification of incidents and the various categories will be discussed further in section 3.4.

3.3 Connecting data sets

The objective of collecting historical data was to establish as complete an overview as possible of the extent of recreational craft accidents in the last 10 years. However, it was not possible to automatically connect the data sets provided by the JRCC and RS, because both parties had been involved in many of the same recorded incidents.

In order to ensure that the complete overview was as accurate as possible, it was necessary to identify duplicate incidents (i.e. incidents that had been recorded by both the JRCC and RS) and combine these.

3.3.1 Identification

A major challenge in connecting the data sets was that only a relatively small number of the duplicates contained the respective JRCC and RS reference numbers. These are rarely used in an ongoing rescue or assistance operation, where the accident location and incident type are more suitable references.

As a consequence of this, an attempt was made to map identical incidents through an overall assessment of the location, time and incident type. Information about the type of craft or number of people involved was also used as a supplement to ensure quality, where this information was available.

3.3.2 Limitations

The data sets do not state when the incident took place, only when it was first reported to the JRCC and RS, respectively. In addition, the notification was normally not made to both parties at the same time, but only to one of them. If the situation is deemed to be an emergency situation, the first notification tends to be to the JRCC, which then involves RS in the operation if it considers this appropriate. Similarly, if a situation requires assistance and is therefore first notified to RS, but then develops into a more dramatic situation, the JRCC may be notified later. Consequently, it is not uncommon for the same incident to be registered with somewhat different notification times.

When a notified incident is registered, the type of incident must be identified, and this is used to evaluate what kind of assistance should be provided. The first registration is not necessarily complete or even correct; it may be made by an external party who does not have a full overview of what has happened, or the notification may be incomplete since those involved may be focused on handling the situation on board or have limited means of communication. As a consequence of this, it is not uncommon for the same incident to be registered with different incident types.

For all incidents, the location of where they occurred is recorded, so that assistance may arrive as quickly as possible. However, it cannot always be assumed that the exact position is known, and it may also change over time, which means that different positions are recorded for different notification times. Positions at sea may also be described in different ways. It is equally common to use coordinates for a position as to describe it on the basis of distance and direction to the nearest landmark, particularly by people who

know the area. It is therefore not uncommon for the same incident to be reported with different positions.

Less information was registered for less serious incidents. It may therefore be assumed that the lower the severity of the incident, the higher the likelihood that a possible duplication has not been identified.

3.4 Categorisation

As previously described, the information received was limited in the form of little categorisation, a great deal of free text and partly contradictory information in the two data sets. The data set was also made up both of accidents and purely assistance operations, as well as other incidents that were not relevant to the mapping work. The incidents were sorted and some were removed. As part of this work, a number of assumptions were made concerning several factors, including cause, sequence of events and consequences. This was in order to achieve a data set consisting of recreational craft accidents and incidents that were considered to have the potential to develop into accidents.

In order to achieve a better understanding of relevant situations and circumstances, significant incident types and other important information were identified and defined in more detail. The available information was then categorised according to these definitions.

3.4.1 Incident types

3.4.1.1 *Identification*

Ten incident categories were defined, in addition to other/unknown. Several of the categories are based on categories in the original data from the JRCC and RS, but some additional categories have been added in order to further refine incident types. A description of the incident categories and the evaluations made in order to categorise incidents are provided in Table 5.

As described in section 3.1, relevant incidents, irrespective of the consequences in terms of injury or damage, were divided into two groups, namely hazardous incidents and incidents that may involve risk under certain circumstances.

Elements in the sequence of events that involve a risk of injury or damage and that thereby mean that the incident is categorised as hazardous are defined as: fire, fall at quay or jetty, grounding, capsizing/foundering, collision, contact damage, person overboard, personal injury and water ingress. Incidents that in themselves are not considered hazardous, but that may be so or at least involve some risk under certain circumstances, constitute a significant proportion of the reported incidents. These mainly concern propulsion loss, as well as a variety of incidents included under the category other/unknown.

A review of the data sets identified a maximum of two separate incidents that formed the basis for a sequence of events. In most of the other cases, there is a connection between the first and the second incident type, e.g. grounding resulting in capsizing/foundering. After the data sets were connected, a few of the incidents had a sequence of events consisting of three separate incidents (approximately 1% of the accidents). Only 12% of

the accidents were registered as two separate incidents, while the majority could be categorised as a single incident.

Table 5: Description of main categories

Parameter – Incident	
Category	Description of category/incidents included
Hazardous incident	
Fire	- Fire, including incidents in which there was considerable smoke development and indications that a fire could have occurred. - Not all incidents originally registered as fires were deemed to be fires by the AIBN; some of these turned out to be overheated engines and some involved smoke development. These incidents were defined as propulsion loss with the risk factor 'smoke development'.
Fall at quay or jetty[3]	- These are incidents in which people have fallen into the water either while boarding or leaving the craft at quay.
Grounding	- Vessels grounded on islets, skerries, shallows and land.
Capsizing/ foundering	- Incidents in which the craft has capsized or foundered. Since it is not always apparent from the data set whether the incident concerned capsizing or foundering, these two incident types were merged.
Collision	- An incident was categorised as a collision if there was a collision between two vessels. The data sets from both the JRCC and RS contain incidents categorised as collisions involving grounding or contact damage, and these incidents were changed to grounding and contact damage, respectively. Grounding and contact damage are defined as separate categories.
Contact damage	- Incidents in which the craft has hit something in the water, a marker, objects floating in the water, or the quay. In a few cases, the craft may also have become entangled in something (rope, net etc.), but this usually tends to be classified as propulsion loss.
Person overboard	- These are incidents in which there is information that one or more persons have ended up in the water, irrespective of cause (i.e. this does not only apply to falls into the water).
Personal injury	- These are incidents in which a personal injury has occurred on board, without involving damage to the craft.
Water ingress	- Incidents in which the cause was simply stated as leaks were considered to be water ingress by the AIBN (with assumed risk potential), if it was not explicitly stated that the leak was small.
Incidents involving risk	Provided that special circumstances that qualify as risk factors were registered
Propulsion loss	- The operator does not have (full) control of propulsion, which could affect both the speed of propulsion (and thereby also the steering) or only the steering, i.e. if the craft has no/limited propulsion and/or no/reduced control of the steering. - The cause is usually that the engine will not start (including lack of fuel/power or technical problems), or problems with the rudder, but could also be a broken mast, lost oars or problems with the anchor.

[3] Registered quayside falls come mainly from the Norwegian Maritime Authority's database of fatalities. This is because falls from a quay tend not to trigger rescue operations involving the JRCC and RS.

	- The consequence of propulsion loss is usually drifting. Because of this, drifting with persons on board is not recorded as a separate incident type, but is included in the propulsion loss category. - Minor leaks in the engine resulting in propulsion loss, where it was explicitly stated that assistance was required, were categorised as propulsion loss and not water ingress. - Incidents involving limited smoke development, but which did not give any indication that a fire broke out.
Other/unknown	- Covers any kind of assistance not included in one of the other incident categories (e.g. incorrect navigation and uncertainty of position, searches as a result of notifications of concern from next of kin due simply to failure of the operator to return home on time, or assistance required as a consequence of poor weather conditions) - Incidents in which it is not known what happened (in several cases, an I2 incident was categorised as a person overboard incident, but it was not certain what incident I1 had been, e.g. grounding, capsizing etc.) - In themselves, incidents categorised as other/unknown were not deemed hazardous unless injury or damage occurred

3.4.1.2 *Limitations*

Information about the circumstances surrounding recreational craft accidents did not tend to be categorised in detail, which meant that much of the work involved manually reviewing incidents and evaluating whether the incidents were relevant to the work of mapping recreational craft accidents, and identifying the incident type. This categorisation is therefore based on the categorisation and designations used by the JRCC and RS, but also largely on the information provided in the free text.

In this context, it is important to point out that the JRCC's and RS's main purpose of registering the information was to organise the rescue or assistance operation as well as possible. Time is a critical factor, and the information available about the incident usually tends to be limited and sometimes incorrect. At the same time, there was no need to supplement or correct the registered information after the operation was completed.

For example, a grounding with subsequent propulsion loss but with no hull damage would not necessarily be registered as a grounding, because what was relevant is that the vessel needed assistance due to lack of propulsion.

It is most likely that a great many more incidents occurred than those presented in this data set. For example, it is unlikely that all groundings will be reported to the emergency services, particularly when the vessel frees itself or is assisted by other vessels in the vicinity.

In the majority of cases, the identified incident type will be correct, while greater uncertainty is associated with lack of identification of incidents as subsequent or prior (I2 and I3). If there was uncertainty regarding whether an incident was the initial or a subsequent incident, there was no speculation on the probable sequence of events. The incident was registered on the basis of what was clearly stated in the data.

With respect to incidents involving risk, there was some limitation in terms of identifying risk factors; for more information, see section 3.4.4.2. As a consequence of this, it must

be noted that there is a relatively high level of uncertainty regarding the scope of incidents involving risk.

3.4.2 Consequences

3.4.2.1 *Identification*

The basic premise is that the scope of injuries or damage is a major factor in categorising the severity of the incident. It was decided to divide any injuries or damage into three degrees of severity, namely very serious, serious and less serious.

Very serious consequences are fatalities or, on the material side, foundering or total loss of the vessel. Serious consequences are major personal injuries (hospitalisation, long period of recuperation, permanent injuries) and for the craft, major structural damage such as hull damage with water ingress. All other injuries or damage are considered less serious.

3.4.2.2 *Limitations*

As previously mentioned, data are entered into the JRCC's and RS's incident management systems, customised to their respective social missions, and in many cases contain limited information about the consequences of an incident, both for people and the craft involved.

In most cases, there was no information about either material damage or personal injuries, unless this was information essential to the organisation of the search and rescue operation (e.g. the craft has capsized and foundered, or a person has died). This means that the fact that no information is registered about damage or injuries cannot be interpreted to mean that no damage or injury occurred.

In summary, one can be certain that, as a rule, extremely serious consequences (death/foundering) are recorded, while information about serious injuries or damage are not necessarily recorded, and information about minor damage or injuries may only be recorded exceptionally.

3.4.3 Causal factors

3.4.3.1 *Identification*

Both data sets contain relatively unspecified information about potential causal effects. Wherever possible, this was supplemented with information from the free text field in order to eliminate incomplete and inconsistent data as much as possible. However, no analyses were performed to determine causality or confirm typical causal factors for the individual incident types.

A description of the most important causal categories and the evaluations made in order to categorise incidents are provided in Table 6.

Table 6: Description of causal categories

Parameter – Cause	
Category	Description of category/incidents included
Technical	- Unspecified, but technical cause - Related incidents are mainly propulsion loss, but also fire
Fuel	- Out of fuel (diesel/petrol) for various reasons (not including lack of fuel due to faulty gauge) - Refuelling with wrong fuel (e.g. diesel in the petrol tank) - Related incidents are mainly propulsion loss
Tullepassord8Power	- No power (not included if due to technical problems, uncertain causal factor, or when starting assistance was unsuccessful) - Related incidents are mainly propulsion loss
Filters	- Clogged filters, mainly due to lack of maintenance - Related incidents are mainly propulsion loss
Rope in propeller	- Rope, net, chain, plastic or other object stuck in the propeller without the operator having the opportunity or means of fixing it themselves - Related incidents are mainly propulsion loss
Mast/sail/oars	- Includes broken masts, lost oars or torn sail - Related incidents are mainly propulsion loss
Leaks	- Leaks describe major water ingress into the engine compartment as a consequence of technical problems / engine problems - Minor leaks that stopped as soon as the engine was turned off and where the main incident was propulsion loss were only regarded as risk factors (while the cause of the incident is technical) - Related incidents are mainly water ingress
Incorrect navigation	- The person concerned has got lost, does not know or is uncertain of their position, and needs assistance in order to get home
Weather conditions	- Extreme weather conditions where the related incident mainly involved the operator needing help with manoeuvring or getting into port because of the weather - When the weather was explicitly stated as the cause, and no other cause was obvious, poor weather conditions were also deemed a risk factor

3.4.3.2 *Limitations*

The data set contains only limited information about potential causal effects.

The information from the data set was most specific for incidents in which it was important to understand the cause in order to provide adequate assistance. This mainly applied to propulsion loss, where with the right preparations it is often possible to resolve the problem on site (provide fuel, charge battery, replace filter, cut rope away from propeller).

For more serious incidents, however, the information is somewhat more diffuse (technical causes of fire, or leaks that result in water ingress), and the risk factors that could have contributed to the accident were often not known or not registered.

Information about causal factors is therefore not to be regarded as a complete clarification of causal factors and causalities. A maximum of one causal factor per incident was recorded, but most often the cause was unknown.

3.4.4 Risk factors

3.4.4.1 *Identification*

When reviewing the incidents, it was observed that several of the incidents, including serious and less serious incidents, typically involved risk factors that may have affected the outcome of the incident, but that also could have contributed to a different outcome. It is not certain how these factors have affected or could have affected the outcome of the incident. Nevertheless, it was decided to register and include the risk factors in order to provide more information about the circumstances surrounding an incident. Note that risk factors are only stated where these were available in free text or provided in some other way, but that does not mean that these were not present in other incidents.

The risk factors have been summarised under the following categories:

- External circumstances: Weather, sea or visibility conditions.
- Craft: Risk factors associated with the recreational craft's condition or equipment. Examples include inadequate navigation or communication equipment, lack of navigation lights, but also overloading / incorrect weight distribution on the craft or minor leaks in the engine compartment (which do not qualify as water ingress).
- Position: The operator does not have full control of propulsion and the craft is drifting towards land or in a trafficked fairway, or the operator is uncertain of their own position, irrespective of whether propulsion is limited.
- Human factors: The operator's ability to operate the craft under the prevailing conditions is limited. This could be temporarily as a consequence of illness or other medical condition, or because the operator lacks the skills and/or experience, but also conditions involving particular risk, such as consumption of intoxicating substances and/or travelling at high speed.
- Potential human factors: Do not in themselves involve risk, but for (fishing) tourists, there is a certain possibility that local knowledge is limited. If the craft is rented, the operator will probably not be particularly familiar with the craft involved.
- Qualifying circumstances: Various factors such as young children on board or unavailability of lifejackets, but also factors indicating that a hazardous situation has already developed, including smoke development on board (which does not qualify as fire) or the operator having signalled a distress.

3.4.4.2 *Limitations*

It is important to note that neither the JRCC nor RS has ensured that risk factors are recorded, but it is practical to record significant factors such as weather data or other factors relevant to the operation in a separate column, usually in a free text field.

The probability that relevant factors were recorded depends on how important it is to possess and pass on knowledge about the factor during the rescue mission or operation, and how much time the person recording the information has.

The range of risk factors is also based on a discretionary evaluation of the data available. Several factors were identified as potentially relevant, but there was no data available to make further use of them.

Furthermore, some of the risk factors are defined objectively, including weather, in which wind, temperature, wave height etc. are measurable, while other risk factors are more subjective. This applies particularly to subjective factors that are recorded as, for example, 'lack of experience'. In the main, we have no information about the age of the persons involved and their formal or actual skills as boat operators. In the free text, however, there were a number of indications based on an assessment of the person recording the information.

This means that there is a high degree of uncertainty regarding the indication of risk factors in the data, and thus to the extent of incidents in which such risk factors were stated.

3.4.5 Types of craft and sizes

3.4.5.1 *Identification*

Eight categories of craft were defined, and their size was specified in more detail. The division of size and type categories is based on received information about types of craft in the original database.

The following categories were used:

- Board (sailboard, paddle board and kiteboard)
- Dinghy
- Kayak/canoe
- Motorboat
- Sailing boat
- Personal watercraft
- Rowing boat
- Other/unknown

Craft placed in the 'dinghy' category are specifically described as dinghies in the JRCC/RS data set or in the free text description. A dinghy is typically a small open boat, usually 6–12 feet, that is motorised. This actually brings these craft under the category of motorboat 0–26.2 feet, but a separate category was retained because of their size.

Incidents involving craft placed in the 'other/unknown' category are mostly not specified, either by the JRCC or RS, nor is information available from the description in the free text field. This category also includes a small number of craft that do not fit into the other categories, such as rafts or houseboats.

The following size categories were applied:

- 0–8 metres (0–26.2 feet)
- 8–9.99 metres (26.2–32.8 feet)
- 10–14.99 metres (32.8–49.2 feet)
- 15–23.99 metres (49.2–78.7 feet)
- 24–27.99 metres (78.7–91.8 feet)
- Over 28 metres (over 91.9 feet)

3.4.5.2 *Limitations*

There is some uncertainty relating to the stated type of craft. This is because information about the craft is not necessarily relevant to the rescue operation. A number of incidents were also, for example, initially reported by observers who did not have exact information about the craft. When the JRCC and RS were both involved in an incident, there was sometimes conflicting information about the craft. As a general rule, the category chosen was the one registered by the party most closely involved in the incident.

4. RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results from the data set compiled about recreational craft accidents that occurred during the 2008–2017 period. The results are discussed in relation to relevant results from sources such as the Norwegian Boating Survey,[4] conducted in 2011 and 2017.

The Norwegian Boating Survey provides an estimate of the number of recreational craft in Norway. Since there is no compulsory small craft register in Norway, there are no exact figures available for the number of recreational craft in Norway, nor is there a breakdown by geographic area over a ten-year period. It is on this basis that no normalisation was carried out of the number of craft by, for example, county or region. Variations from one geographic location to another in the number of incidents presented could therefore be closely related to the number of craft in an area. The results are stated in absolute figures.

4.2 Overall results

4.2.1 Development in the number of accidents

The number of recreational craft accidents per year for the 2008–2017 period is shown in Figure 1. Figure 1 shows an increasing trend in the number of recreational craft accidents, particularly since the year 2012.

[4] The Royal Norwegian Boating Federation (KNBF), 'Norwegian Boating Survey 2018 – Recreational boating in Norway', 25 January 2018.

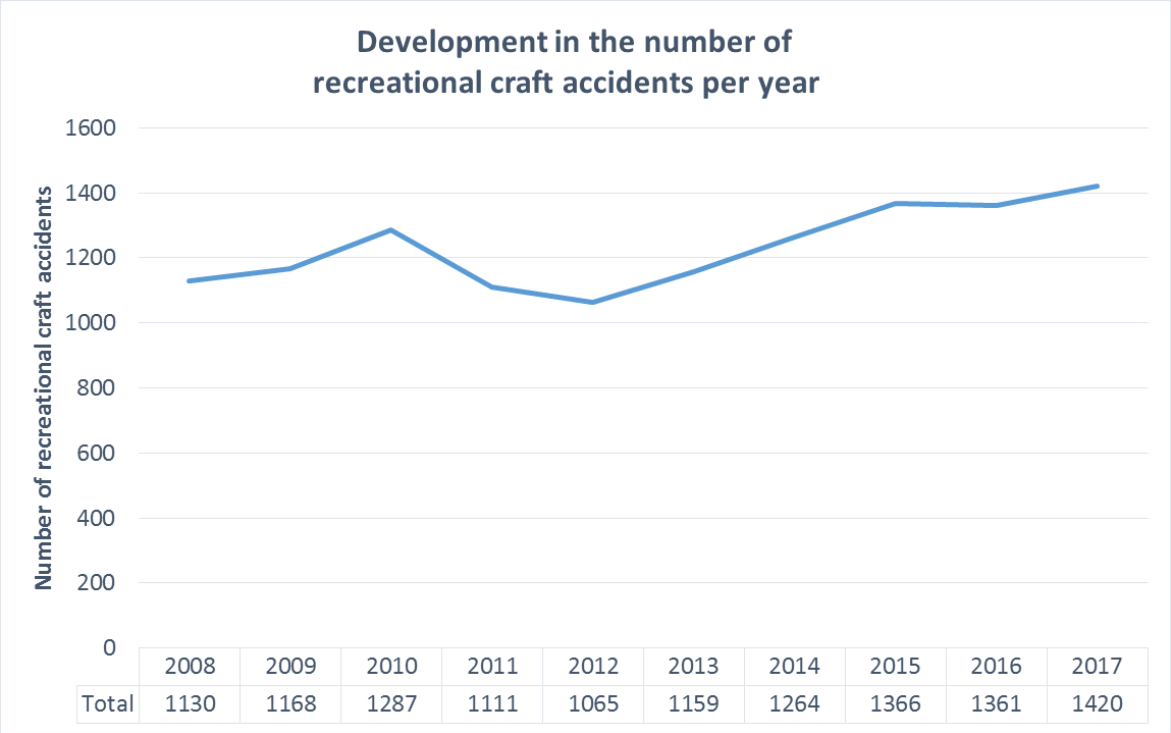


Figure 1: Development in the number of recreational craft accidents per year

Figure 2 shows the development in the number of recreational craft accidents in Norway from 2008–2017, by accident type.

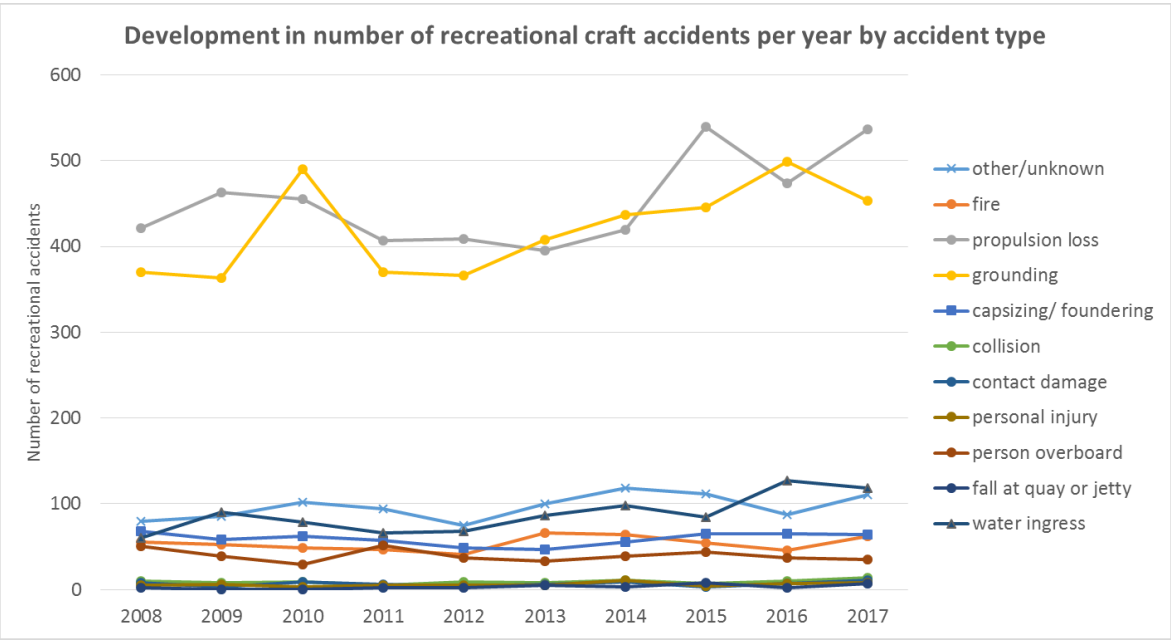


Figure 2: Number of recreational craft accidents in Norway by accident type 2008–2017

The results show the following trends:

- The average number of registered recreational craft accidents/incidents per year in the 2008–2017 period was approximately 1,200. Figure 1 shows an increasing trend.

- Propulsion loss and groundings are recorded as the most frequently occurring accident types, with an average of approximately 450 and 420 accidents, respectively, per year; see Figure 2.

- Water ingress, capsizing/foundering, fire and person overboard accidents have an average frequency of approximately 40–90 per year, depending on accident type.

- The least frequent accident types are collisions, contact damage and personal injuries, with an average of approximately 6–9 incidents per year.

- There is also an average of approximately 100 incidents per year for which there is no information about the accident type.

- The total increase in the number of recreational craft accidents can mainly be related to the increase in the number of propulsion loss incidents and groundings; see Figure 2.

Figure 3 shows the development in the number of recreational craft accidents by type of craft. The results show that motorboats dominate the accident statistics, followed by sailing boats. The results show an increasing trend in the number of accidents involving motorboats.

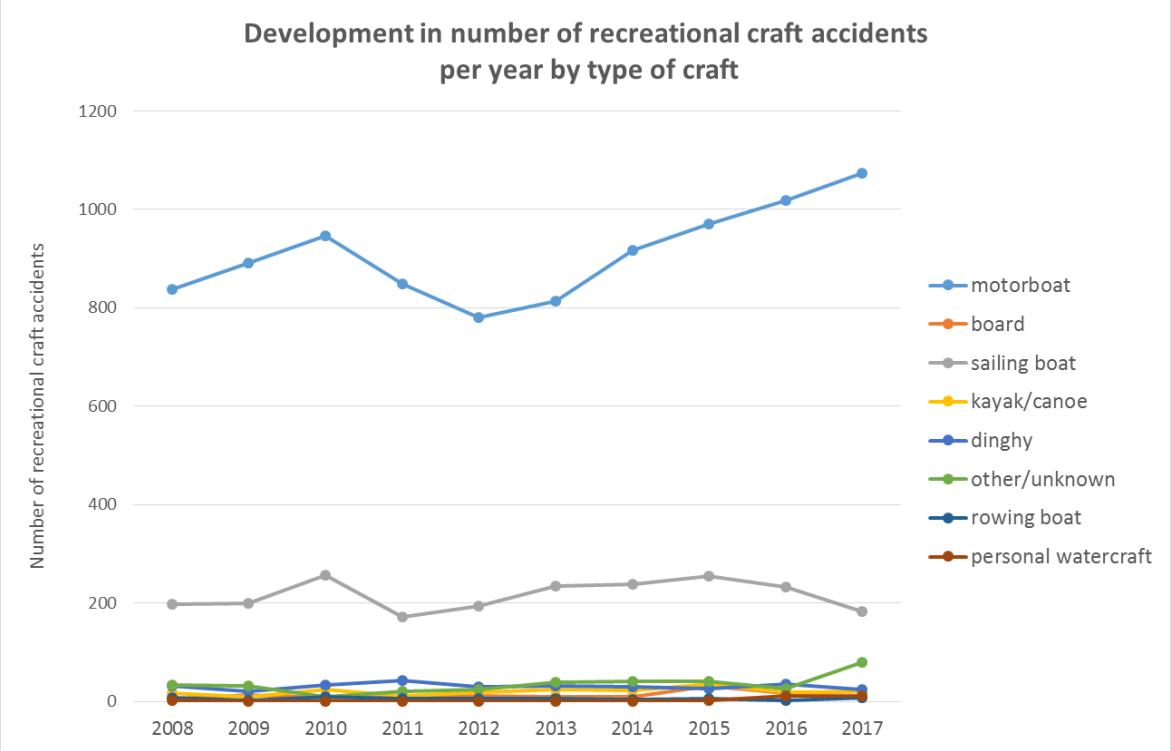
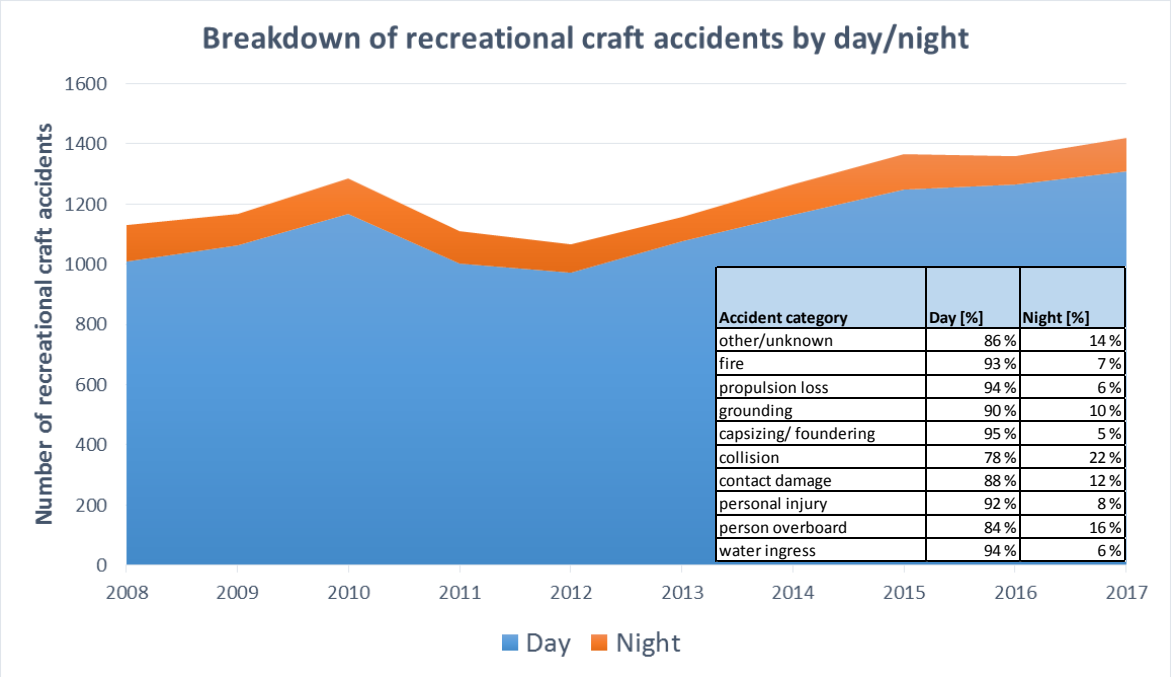


Figure 3: Number of recreational craft accidents by type of craft, 2008–2017

4.2.2 Breakdown day/night

Figure 4 shows the breakdown of recreational craft accidents by day and night. The results show that most accidents occur during the day, which is to be expected as recreational craft are mostly used during the day. The figure shows an increase in the number of recreational craft accidents during the day, while there is a constant trend in the number of recreational craft accidents at night. The results of each accident type are discussed in more detail in section 4.3.



Accident category	Day [%]	Night [%]
other/unknown	86 %	14 %
fire	93 %	7 %
propulsion loss	94 %	6 %
grounding	90 %	10 %
capsizing/ foundering	95 %	5 %
collision	78 %	22 %
contact damage	88 %	12 %
personal injury	92 %	8 %
person overboard	84 %	16 %
water ingress	94 %	6 %

Figure 4: Breakdown of recreational craft accidents day/night[5]

Figure 5 shows the breakdown of accident types by day and night. The figure shows that, out of the various accident types, it is collisions, person overboard accident and contact damage that occur most frequently at night. There are also several incidents in the other/unknown category that occur at night.

[5] Falls at quay or jetty are not included, since we do not have reliable information about the time of these incidents.

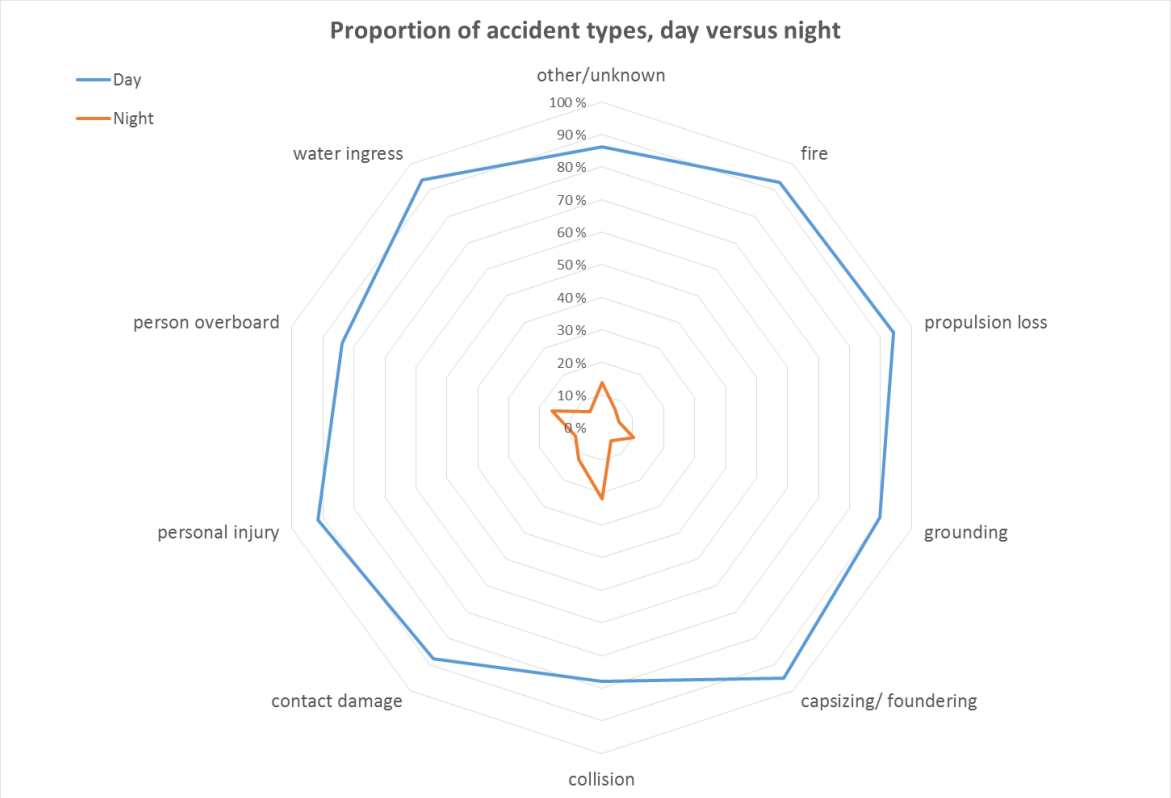


Figure 5: Breakdown of accident types by day versus night[6]

Figure 6 also shows that the proportion of groundings, collisions and person overboard accidents is somewhat higher at night than at other times of the day.

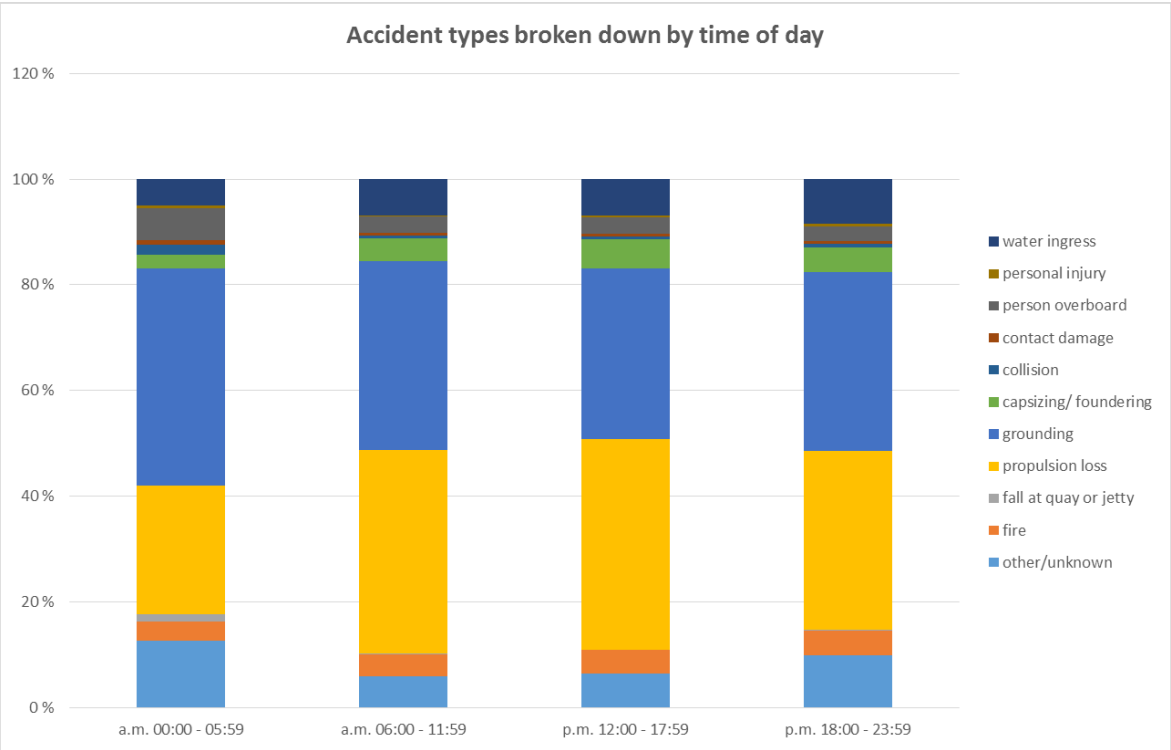


Figure 6: Breakdown of accident types by time of day

[6] Falls at quay or jetty are not included, since we do not have reliable information about the time of these incidents.

4.2.3 Breakdown by season

The results show that most incidents take place in the summer season, from June to August; see Figure 7. This is to be expected, since recreational craft are used more frequently during the mildest period of the year in Norway. Around half of the recreational craft accidents in the summer months occur in July.

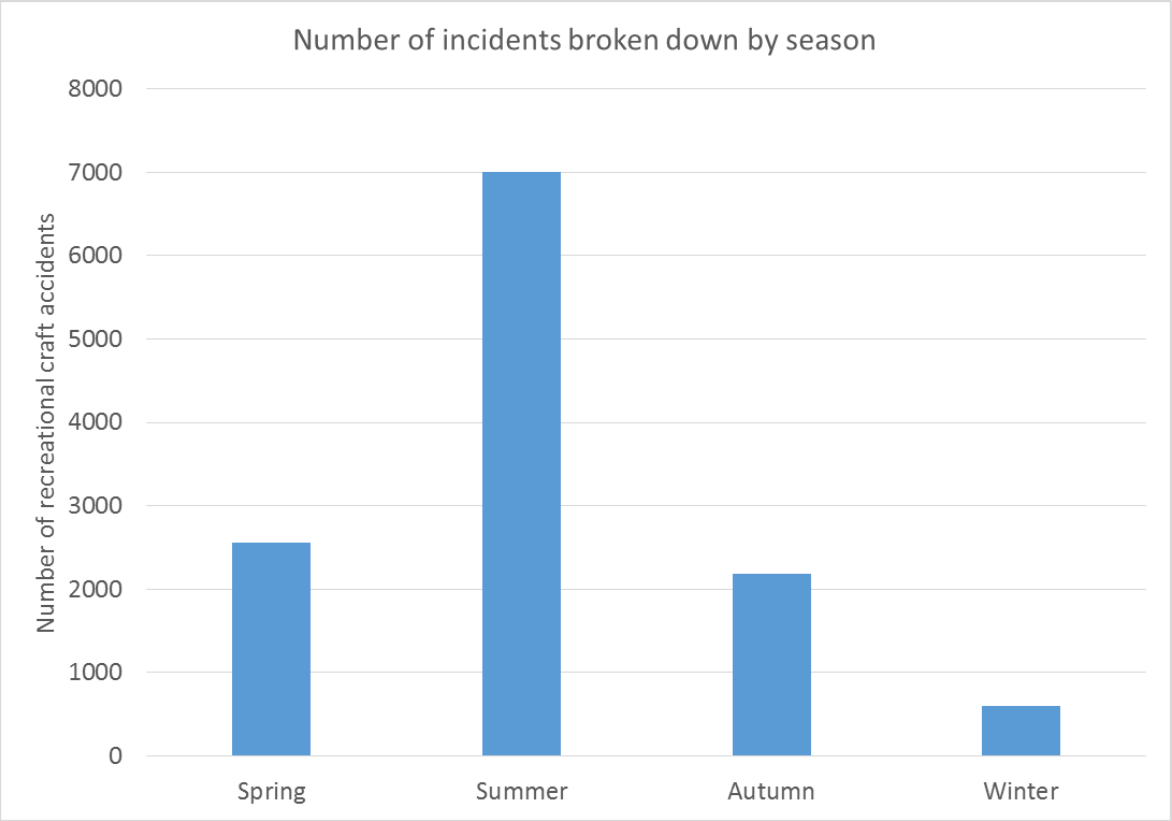


Figure 7: Number of incidents broken down by season, 2008–2017

4.3 Accidents by accident type

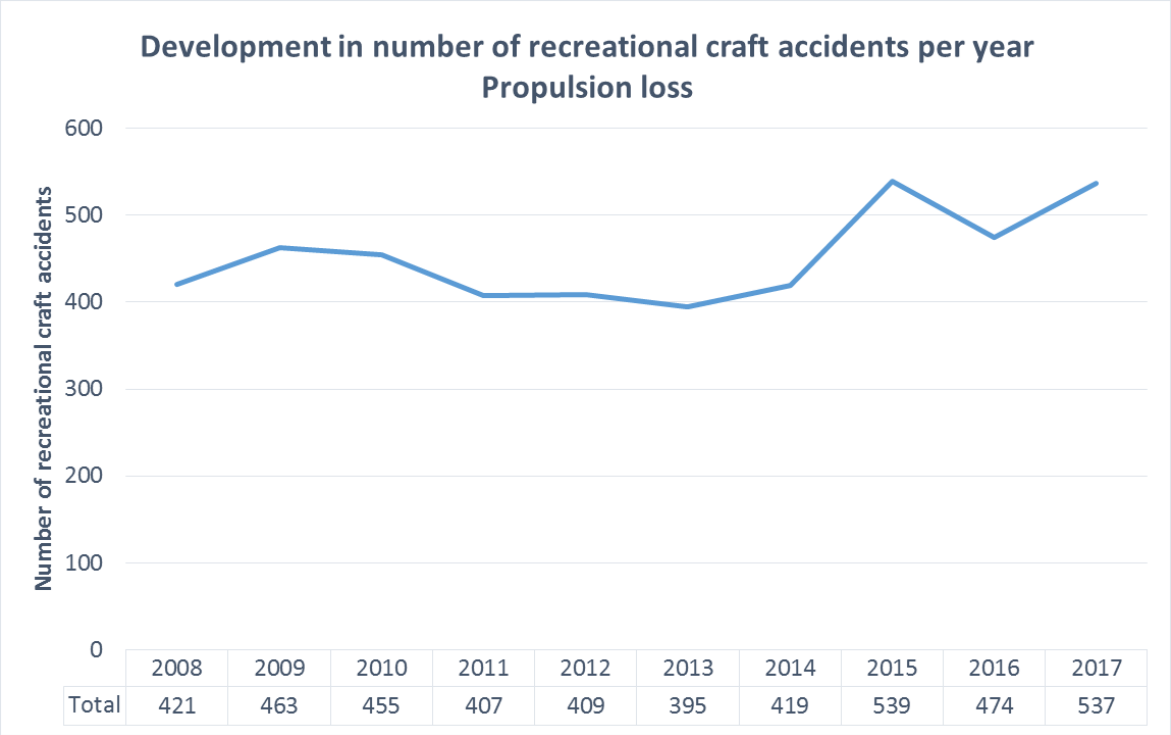
4.3.1 General

Ten different accident types were defined in this mapping work, in addition to the category ‘other/unknown’. In the following sections, the results of the various accident types are presented and discussed. For each accident type, the trend over a ten-year period will be illustrated and the causes described, if these are recorded in the data. Additionally, for each accident type, factors will be presented that could have been significant to the incident. The results presented for the various factors will be uncertain, since this is information stated as free text in the data, which means that there could be a high level of under-reporting of such factors. Nevertheless, these results have been included in order to shed light on relevant recurring factors that were present in the various incidents.

4.3.2 Propulsion loss

4.3.2.1 *Results*

An average of 452 recreational craft accidents involving propulsion loss were reported each year. This represents 37% of the total number of recreational craft accidents in Norway per year. The development in the number of propulsion loss incidents shows an increasing trend, particularly in recent years; see Figure 8. In approximately 6% of the incidents, it was reported that the craft had run aground because of propulsion loss.



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total	421	463	455	407	409	395	419	539	474	537

Figure 8: Development in the number of recreational craft accidents – propulsion loss

The causes of propulsion loss are uncertain, but technical problems were recorded as the cause for approximately 80% of the incidents. It was also reported that around 5% of the incidents involving propulsion loss were due to rope in the propeller or lack of fuel. Other causes recorded are filter problems, leaks, problems with the mast/sail/oars, no power, anchor problems or challenging weather conditions.

The incidents in the data set involving propulsion loss are incidents that were considered to involve a risk of injury to persons and/or damage to the craft, or which resulted in such injury or damage. This means that for many of these incidents, information was provided that was deemed to be potentially significant to the outcome of the incident, while no injury or damage was recorded. The results show that around 75% of the incidents involved challenging weather conditions falling under the category ‘external conditions’. The remaining incidents involved human factors, position and potential human factors. An incident could involve none, one or several of these factors.

4.3.2.2 *Discussion*

An incident involving propulsion loss is not necessarily hazardous in itself, but losing propulsion can quickly lead to a critical situation if other factors are present. For

example, these could be difficult weather conditions in which the craft drifts uncontrolledly towards shallows and skerries, drifting towards trafficked fairways, or difficult wave conditions resulting in severe loads on the craft and in the worst case capsizing.

4.3.3 Grounding

4.3.3.1 *Results*

An average of 420 recreational craft accidents involving grounding were reported each year. This represents 34% of the total number of recreational craft accidents in Norway per year. The development in the number of groundings shows an increasing trend, particularly in recent years; see Figure 9. Approximately 6% of the groundings resulted in subsequent water ingress into the craft, and 9% resulted in propulsion loss.

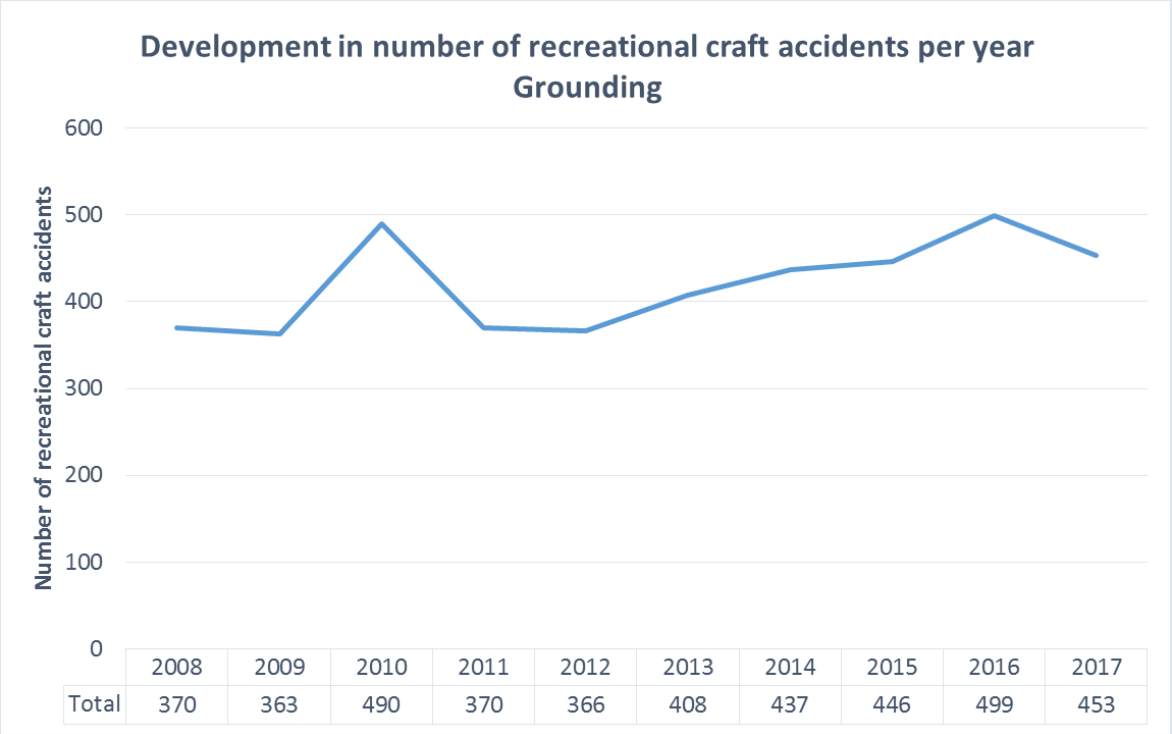


Figure 9: Development in the number of recreational craft accidents – grounding

There is little or no information recorded about the causes of groundings, with the exception of incidents where the grounding was recorded as a consequence of propulsion loss.

The results show that approximately 15% of the incidents involved challenging weather conditions falling under the category ‘external factors’. In addition, some incidents (1–3%) were recorded to involve human factors (e.g. intoxication and speed), position and potential human factors (tourist).

Grounding is one of the accident types that in relative terms occurs more frequently at night than other accident types, cf. section 4.2.2. Although the number of groundings is highest for motorboats (approx. 300 per year), sailing boats (approx. 99 per year) are the type of craft that runs aground most frequently, relative to other vessels listed in the 2018 Norwegian Boating Survey.

4.3.3.2 *Discussion*

As mentioned earlier, there is little information about the causes of groundings, but with such a significant number of groundings recorded per year, these involve not only the use of resources in the form of rescue and assistance, but also considerable costs associated with repair and insurance claims. It should be noted that it is highly likely that a good deal more groundings occur than are included in this data set because it is unlikely that all groundings are reported to the emergency services and because vessels will free themselves or be assisted by other vessels in the vicinity.

4.3.4 Water ingress

4.3.4.1 *Results*

An average of 88 recreational craft accidents involving water ingress were reported each year. This represents 7% of the total number of recreational craft accidents in Norway per year. The development in the number of incidents involving water ingress shows an increasing trend, particularly in recent years; see Figure 10.

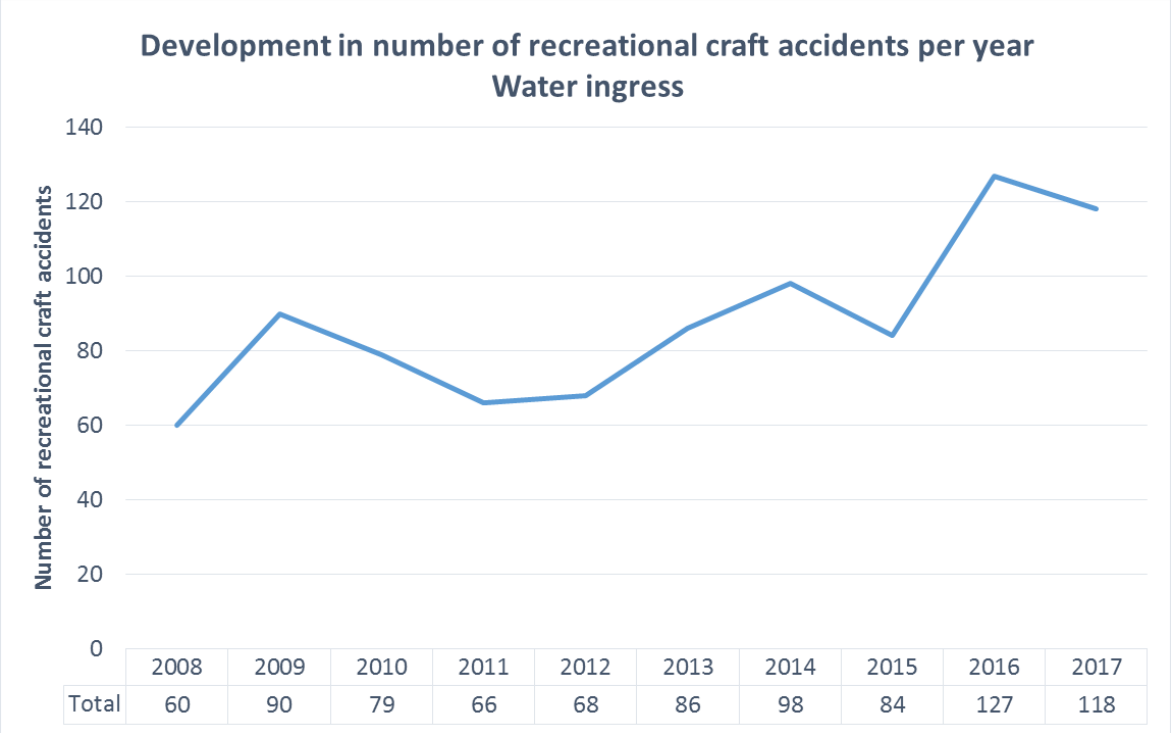


Figure 10: Development in the number of recreational craft accidents – water ingress

The causes of water ingress are uncertain, and there is limited information available. In the data, incidents involving leaks were described both as incidents involving water ingress and major leaks in engine compartments resulting in the need for assistance in order to prevent them developing into critical situations.

Some typical factors relating to water ingress were recorded that may have been significant to the outcome of these incidents. As mentioned earlier, leaks were recorded in approximately 40% of the incidents. In addition, external factors were stated in 15% of the incidents (poor weather / sea / visibility conditions). Human factors (lack of knowledge/experience), potential human factors (fishing tourism / rental) and specific

human factors (intoxication) were also recorded in around 1–3% of the incidents. An incident could involve none, one or several of these factors.

4.3.4.2 *Discussion*

As mentioned earlier, water ingress can be due to major leaks associated with the engine or water ingress from the sea. Leaks in the engine compartment could have a maintenance-related context, but this cannot be confirmed from the information in the data set. Water ingress from the sea could occur as a consequence of weakness/damage in the hull, inadequate maintenance, or water coming over the railings, particularly in challenging wave and weather conditions.

4.3.5 Capsizing/foundering

4.3.5.1 *Results*

An average of 59 recreational craft accidents involving capsizing/foundering were reported each year. This represents 5% of the total number of recreational craft accidents in Norway per year. The development in the number of incidents involving capsizing/foundering shows a slightly increasing trend; see Figure 11.

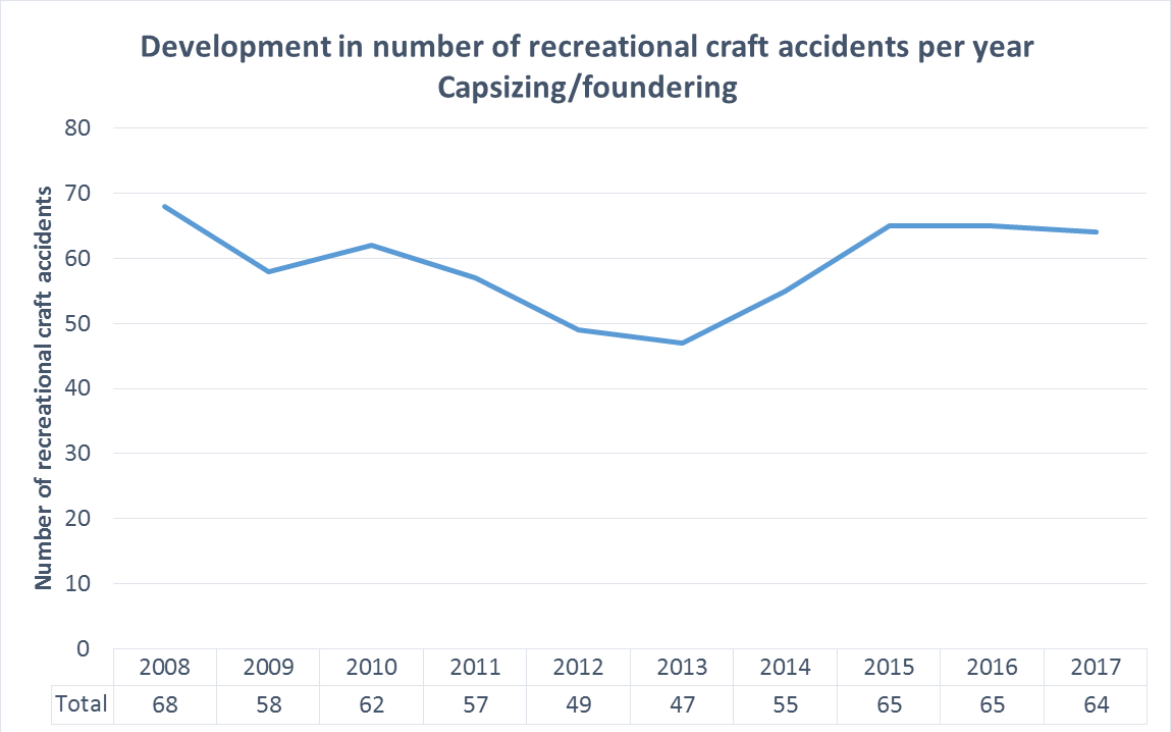


Figure 11: Development in the number of recreational craft accidents – capsizing/foundering

Little or no information is recorded about the causes of capsizing/foundering.

Some typical factors relating to capsizing/foundering were recorded that may have been significant to the outcome of these incidents. In addition, external factors were recorded in 20% of the incidents (poor weather / sea / visibility conditions). Human factors (lack of knowledge/experience), potential human factors (fishing tourism / rental) and specific human factors (intoxication) were also recorded in 3–4% of the incidents. An incident could involve none, one or several of these factors.

Motorboats and kayaks/canoes are the type of craft that most frequently capsize or sink. The results show that approximately 90% of capsizing/foundering incidents for which the craft size is stated involve craft of less than 26 feet. Note that 41% of the capsizing/foundering incidents involve craft of an unknown size. However, this still indicates that the smallest craft types are most vulnerable to capsizing/foundering.

Capsizing/foundering is one of the accident types that makes the biggest contribution to the fatal incident statistics (on average approx. 7 per year). This represents 23% of fatal incidents recorded as a consequence of capsizing/foundering; see further information in section 4.6.

4.3.5.2 *Discussion*

As mentioned, there is little information in the data set about the causes of capsizing/foundering. Capsizing/foundering can occur as a consequence of several factors. For example, challenging weather conditions could be a significant factor, as well as the size of the craft.

4.3.6 Fire

4.3.6.1 *Results*

An average of 54 recreational craft accidents involving fire on board were reported each year. This represents 4% of the total number of recreational craft accidents in Norway per year. The development in the number of fires shows a slightly increasing trend, particularly in recent years; see Figure 12.

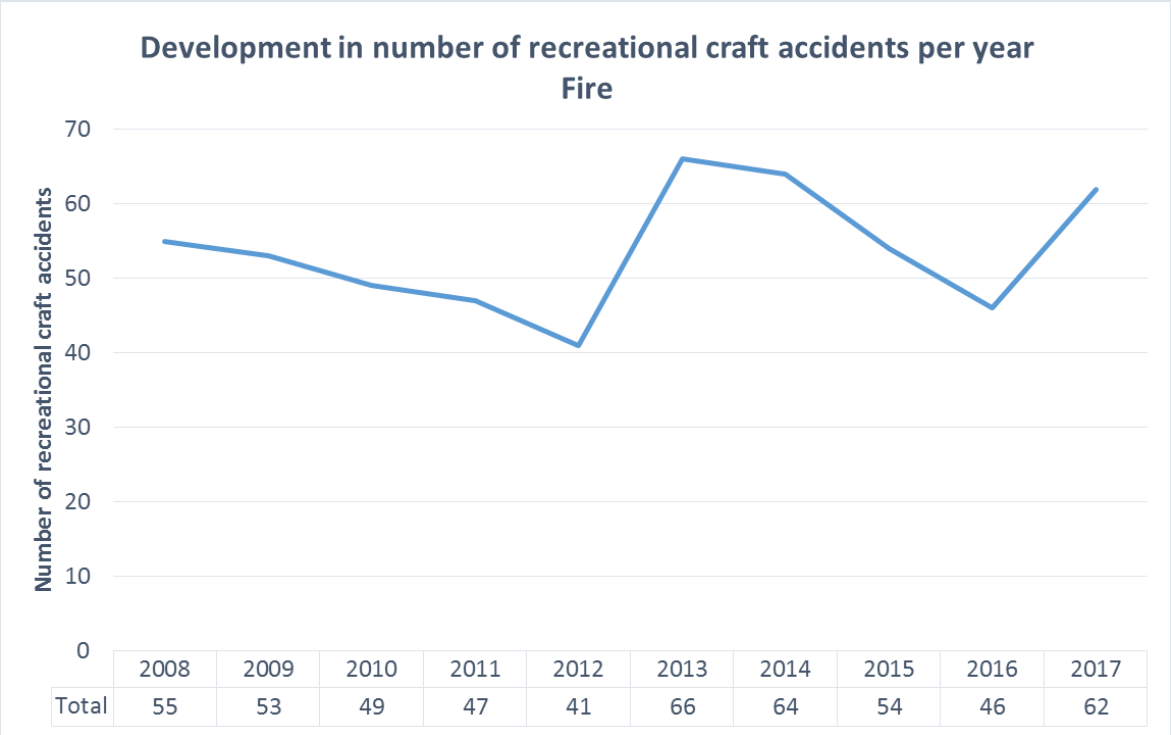


Figure 12: Development in the number of recreational craft accidents – fire

For most of the fires, technical issues are recorded as the cause of the incident, but there is little or no information about which technical components this refers to.

4.3.6.2 *Discussion*

In the information shown in the free text sections about the incidents categorised as fire, there are indications that smoke development / fire development started in the engine compartment. There is no indication from the results that fire occurs more frequently in motorboats than in sailing boats, seen in relation to the number of craft, thought without specification of whether sail or engine was in use at the time of fires on sailing boats.

4.3.7 Person overboard

4.3.7.1 *Results*

An average of 40 recreational craft accidents involving person overboard incidents were reported each year. This represents 3% of the total number of recreational craft accidents in Norway per year. The development in the number of person overboard incidents shows a slightly decreasing trend; see Figure 13.

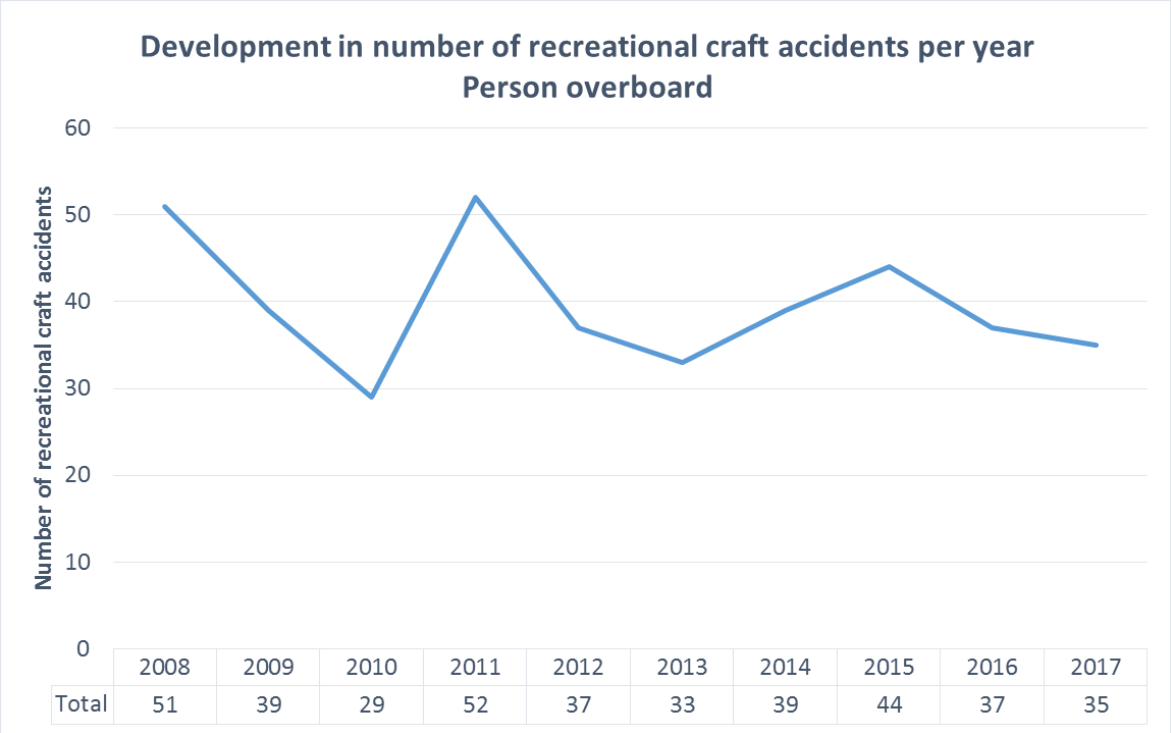


Figure 13: Development in the number of recreational craft accidents – person overboard

Little or no information is recorded about the causes of person overboard incidents. In approximately 13% of the incidents, external factors such as poor weather / sea / visibility conditions were recorded, and in approximately 11% of the incidents, specific human factors (intoxication) were recorded.

Person overboard is one of the accident types that in relative terms occurs more frequently at night than other accident types, cf. section 4.2.2.

Motorboats are the type of craft involved in most person overboard incidents, in addition to kayaks/canoes, dinghies and sailing boats. Based on the number of craft listed in the Norwegian Boating Survey,[4] the indication is that sailing boats are the type of craft involved in most person overboard incidents, relative to the number of craft.

Person overboard is the accident type recorded as resulting in the most fatalities (on average approx. 15 per year); see section 4.6 for more details. Motorboats are the type of craft with most fatalities as a consequence of person overboard incidents, followed by kayaks/canoes.

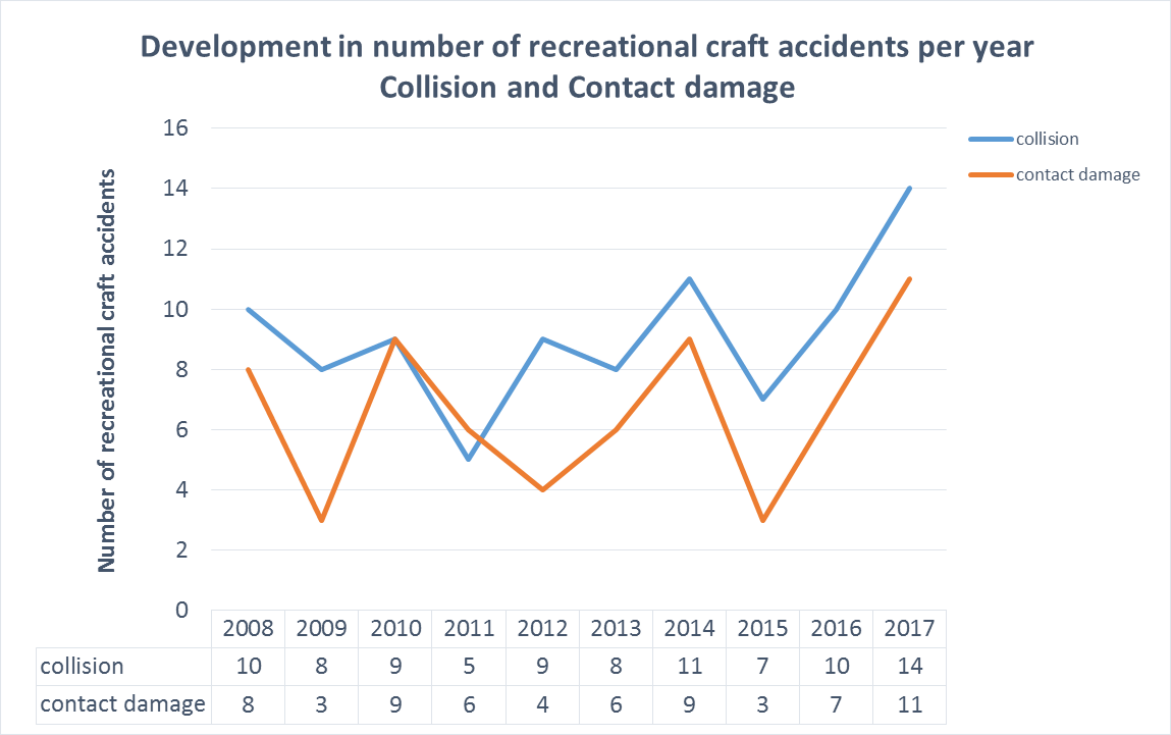
4.3.7.2 *Discussion*

There is little or no information about the causes of person overboard incidents. Incidents in which people end up in the water can often quickly develop into critical situations with serious consequences if the persons involved are unable to notify others of their distress. There is probably some under-reporting of person overboard incidents, since they are not reported if a rescue operation is not initiated, and the persons concerned are assisted by vessels in the vicinity, or manage to get back on board themselves.

4.3.8 Collision and contact damage

4.3.8.1 *Results*

An average of 9 recreational craft accidents involving collision and 7 involving contact damage were reported each year. This represents 2% of the total number of recreational craft accidents in Norway per year. The development in the number of incidents involving collision and contact damage shows a slightly increasing trend; see Figure 14.



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
collision	10	8	9	5	9	8	11	7	10	14
contact damage	8	3	9	6	4	6	9	3	7	11

Figure 14: Development in the number of recreational craft accidents – collision and contact damage

There is little or no information in the data about the causes of these incidents. The results show that 22% of the collisions and 12% of the contact damage incidents occur at night, which is above average for these accident types. For around 10% of the accidents, specific human factors (such as intoxication or speed) were recorded.

Most collisions and incidents involving contact damage involve motorboats, but incidents have also occurred with sailing boats, dinghies and personal watercrafts, although these are relatively rare; see section 4.4 for more details.

Collision is one of the accident types that in relative terms occurs more frequently at night than other accident types, cf. section 4.2.2. Collision is also one of the accident types that, relative to the number of accidents involving collision, results in serious consequences such as fatalities; see section 4.6. However, the number of fatalities occurring as a consequence of collisions is relatively small (on average approx. 1 per year).

4.3.8.2 *Discussion*

Although relatively few incidents involving collision or contact damage are recorded per year, the results show that if these incidents occur, they can result in extremely serious consequences such as fatalities. Intoxication and speed were recorded in several of the incidents, but the data set cannot confirm whether these are factors that contributed to the incidents.

4.3.9 Personal injury

4.3.9.1 *Results*

An average of 6 recreational craft accidents resulting in personal injuries were reported each year. That is a relatively small number in relation to the total number of recreational craft accidents in Norway per year. The development in the number of personal injuries shows a slightly increasing trend; see Figure 15.

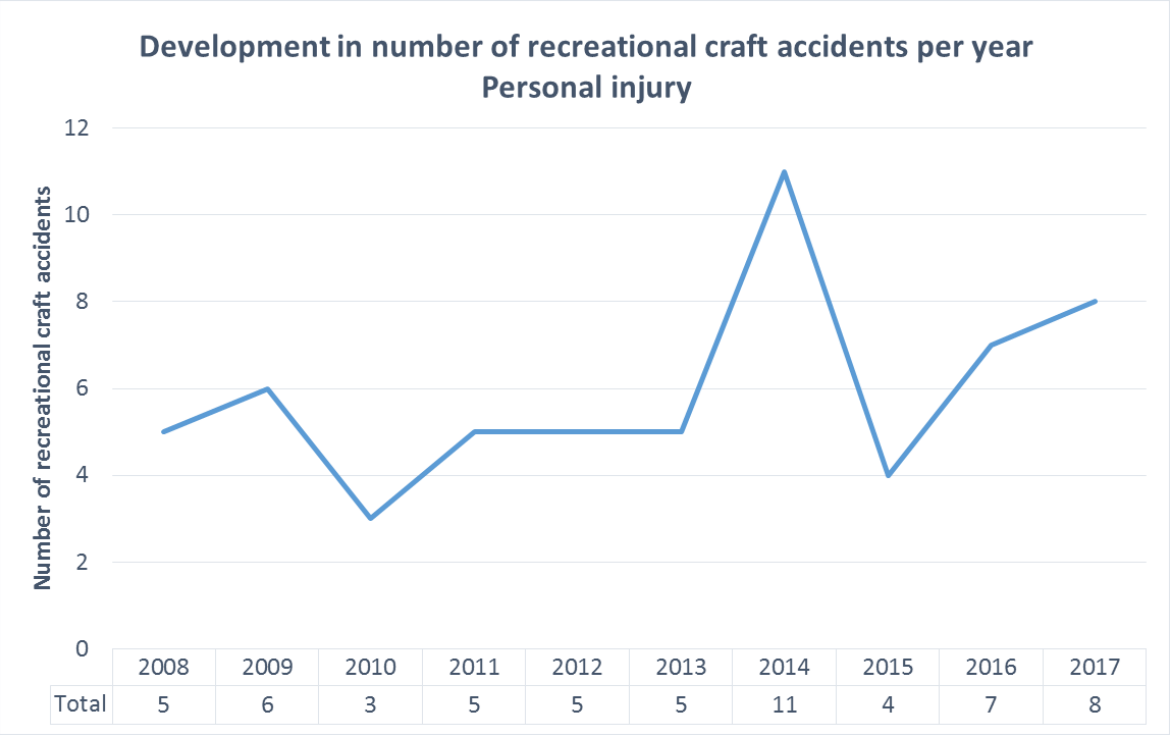


Figure 15: Development in the number of recreational craft accidents – personal injury

There is little or no information in the data about the causes of these incidents.

4.3.10 Fall at quay or jetty

4.3.10.1 *Results*

The information relating to falls at quay or jetty is mainly information about incidents involving fatalities received from the Norwegian Maritime Authority (29 out of 31 incidents). There is little reporting to the JRCC and RS on incidents involving falls at quay or jetty, since this type of incident does not usually involve the same kind of rescue operation as for the other accident types. The results presented for this accident type are therefore mainly incidents involving fatalities; see also more detailed information about these incidents in section 4.6.

The results could indicate that serious accidents involving falls at quay or jetty are seeing an increasing trend, but there is a great deal of uncertainty relating to these figures.

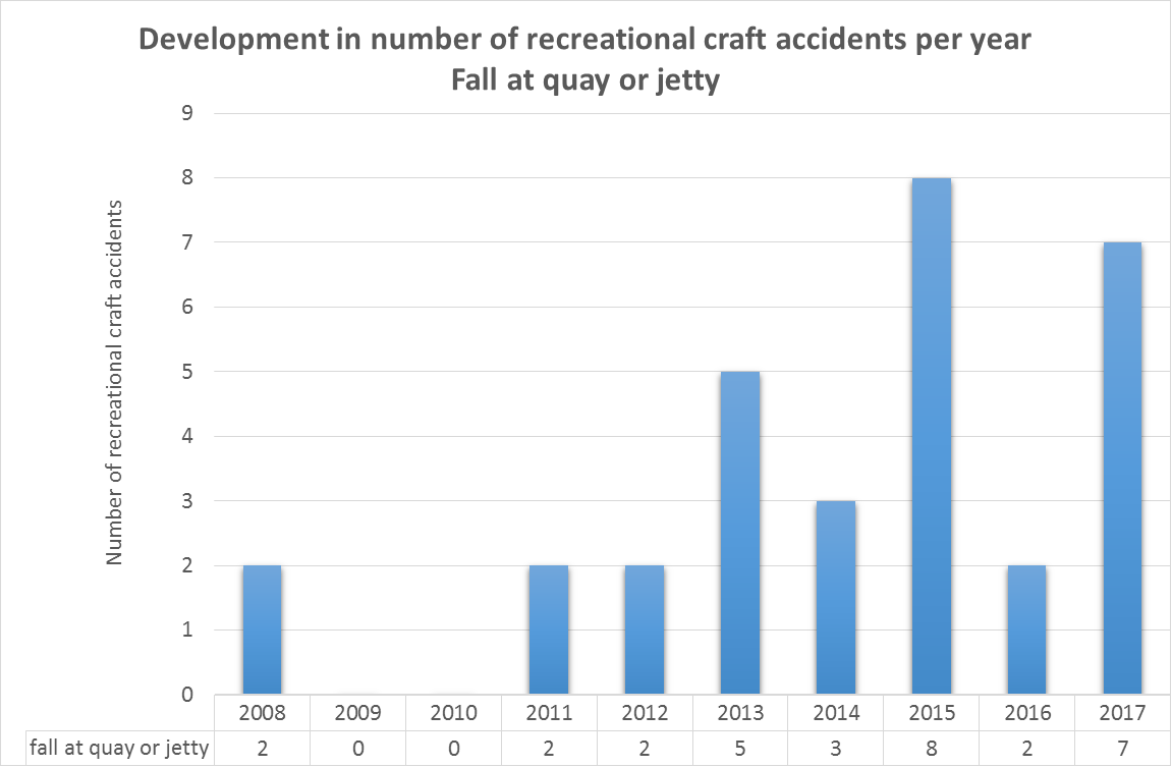


Figure 16: Development in the number of recreational craft accidents – fall at quay or jetty

4.4 Accidents by type of craft

In this section, accidents will be presented by type of craft. Seven categories have been defined in this mapping work, and there are also a number of incidents that had no information about the type of craft involved (approximately 3%). There is a great deal of variation in the number of incidents for the various types of craft, partly because of the difference in numbers of craft in use and partly because of different reporting procedures. For example, one can imagine that small craft do not report a need for assistance in minor incidents, which means that these are not reported and registered. However, it was decided to present the results for all the craft in order to be able to identify differences in accident types for the various types of craft.

The development in the number of recreational craft accidents per year by type of craft is shown in Figure 17.

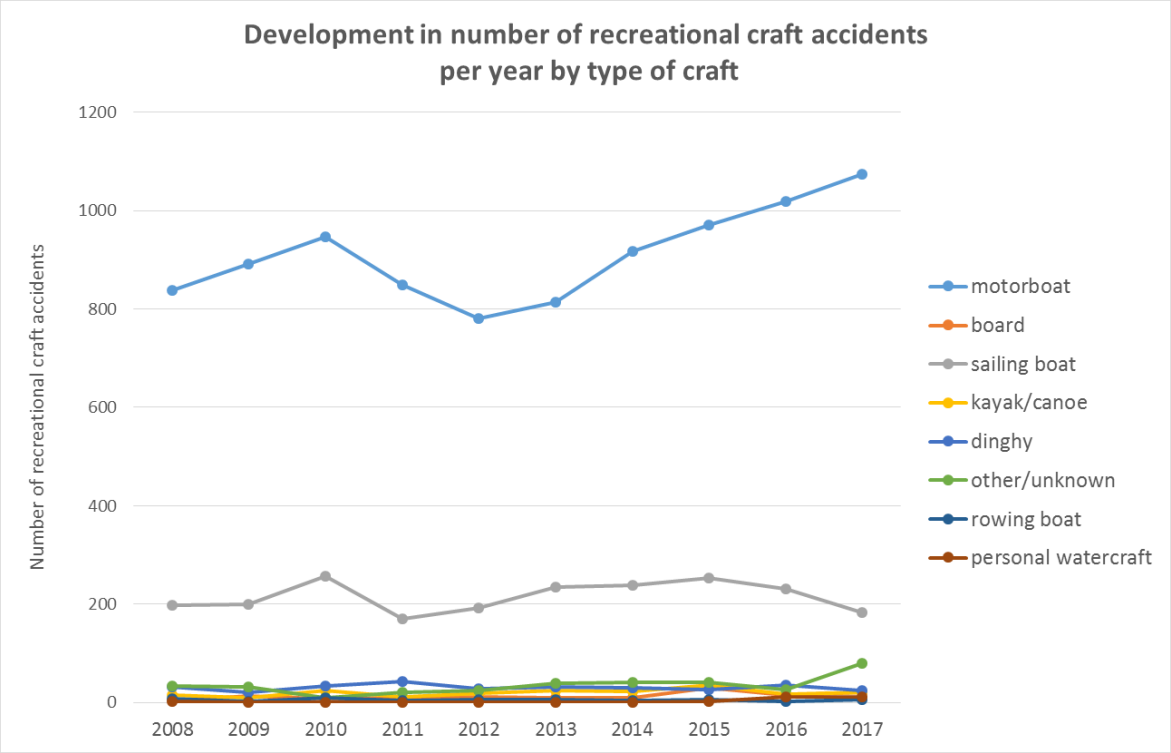


Figure 17: Development in number of recreational craft accidents by type of craft

Figure 17 shows that motorboats dominate the number of recreational craft accidents.

The Norwegian Boating Survey[4] shows that the number of recreational craft has increased by around 200,000 since 2011. Of these, it is mainly motorboats without sleeping quarters that have seen the highest increase (around 110,000), followed by kayaks/canoes (around 90,000). It is also reported that 87% of motorboats without sleeping quarters are less than 26 feet. Around 25% of the accidents in the AIBN's data material are registered as motorboats less than 26 feet. Based on this, it is therefore not possible to conclude that the increase in the number of accidents involving motorboats is due solely to an increase in the number of small motorboats without sleeping quarters (boats less than 26 feet). It should be noted that for 25% of the incidents involving motorboats, the size of the craft is not stated.

The number of recreational craft accidents broken down by type of craft is shown in Figure 18. The figure shows that most accidents involve motorboats, which is to be expected, since motorboats are the type of craft that dominates the recreational craft segment.

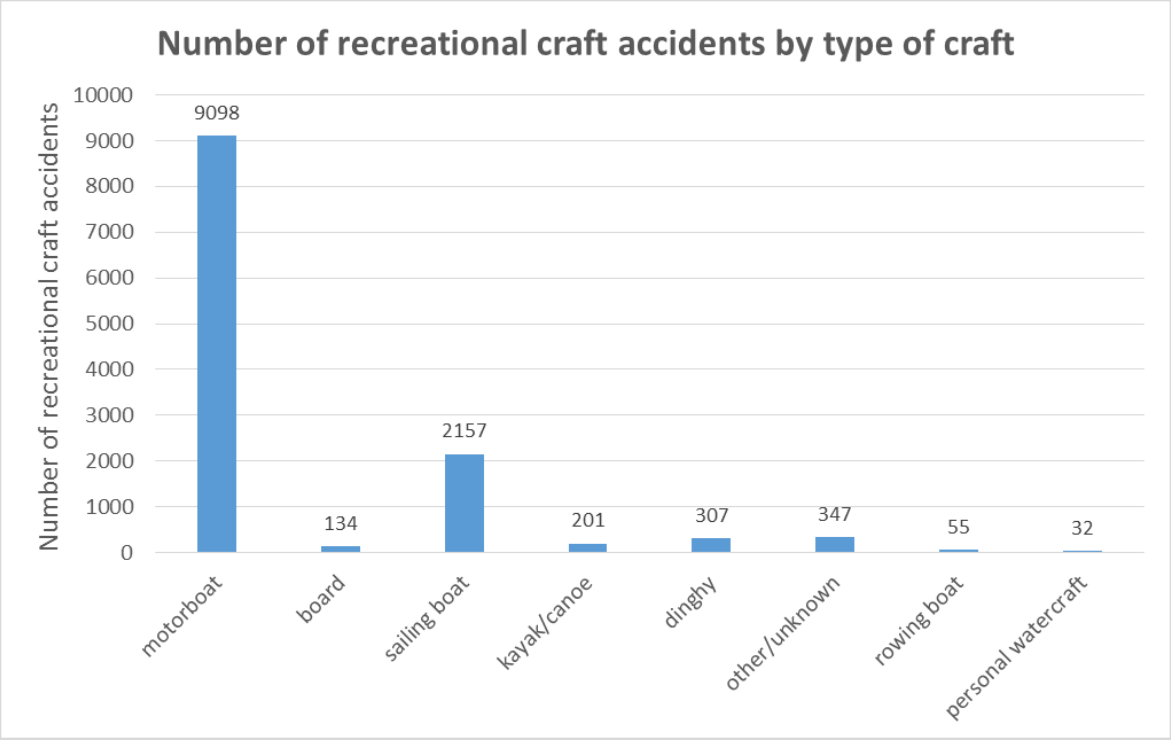


Figure 18: Number of recreational craft accidents by type of craft

4.4.1 Motorboats

Most recreational craft accidents involve motorboats (on average approximately 900 per year). This is to be expected, since approximately 60% of the recreational craft in Norway are motorboats, according to the Norwegian Boating Survey.[4]

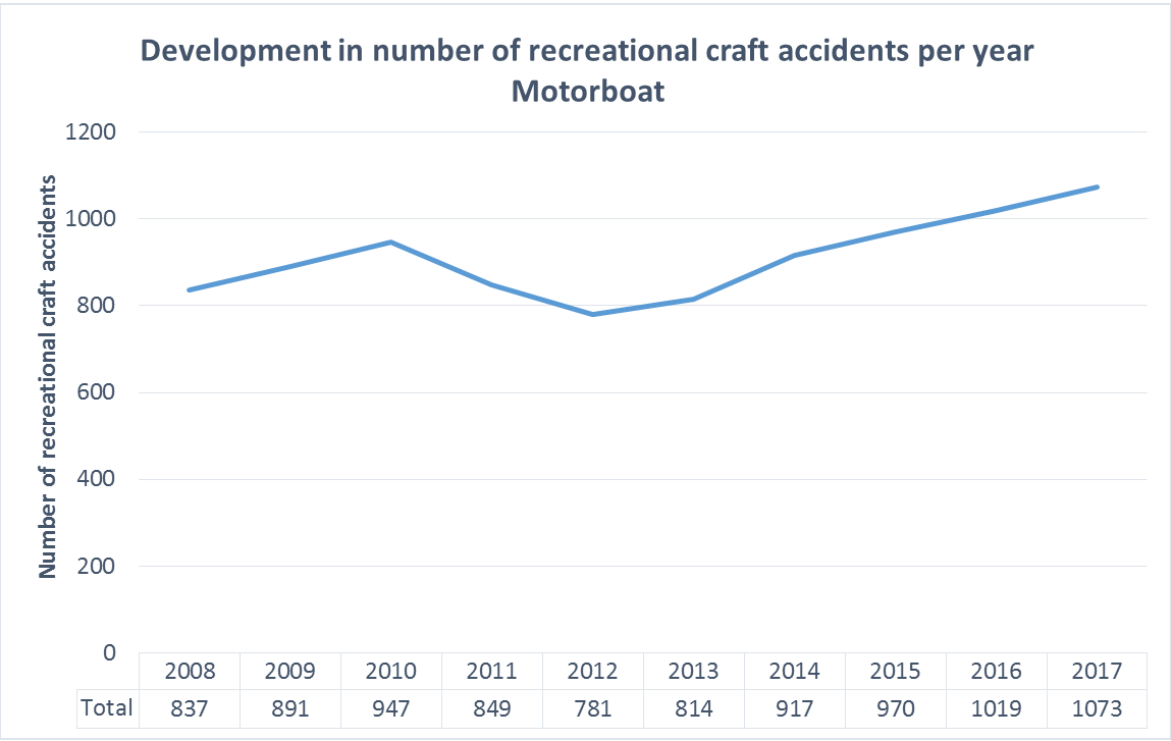


Figure 19: Development in the number of recreational craft accidents – motorboats

The number of accidents involving motorboats is showing an increasing trend. Propulsion loss and grounding are the most frequently occurring accident types for this type of craft.

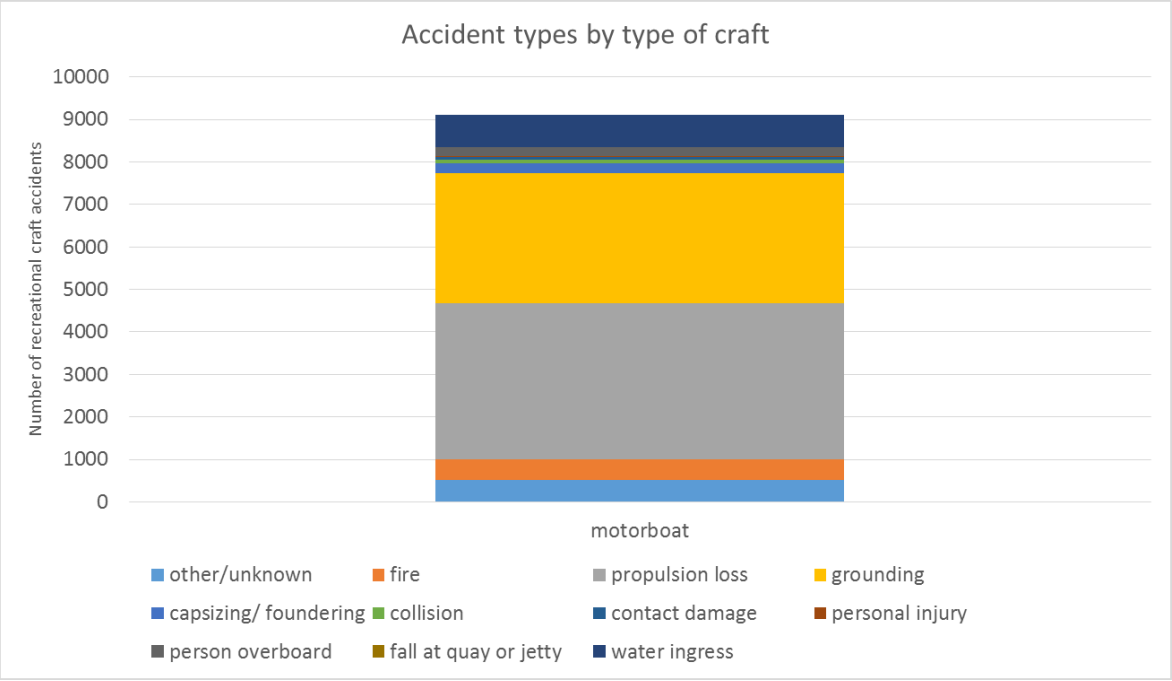


Figure 20: Breakdown of accident type for motorboats – 2008–2017

Accidents involving motorboats occur all over the country, in addition to some in Svalbard (not shown in the figure); see Figure 21.

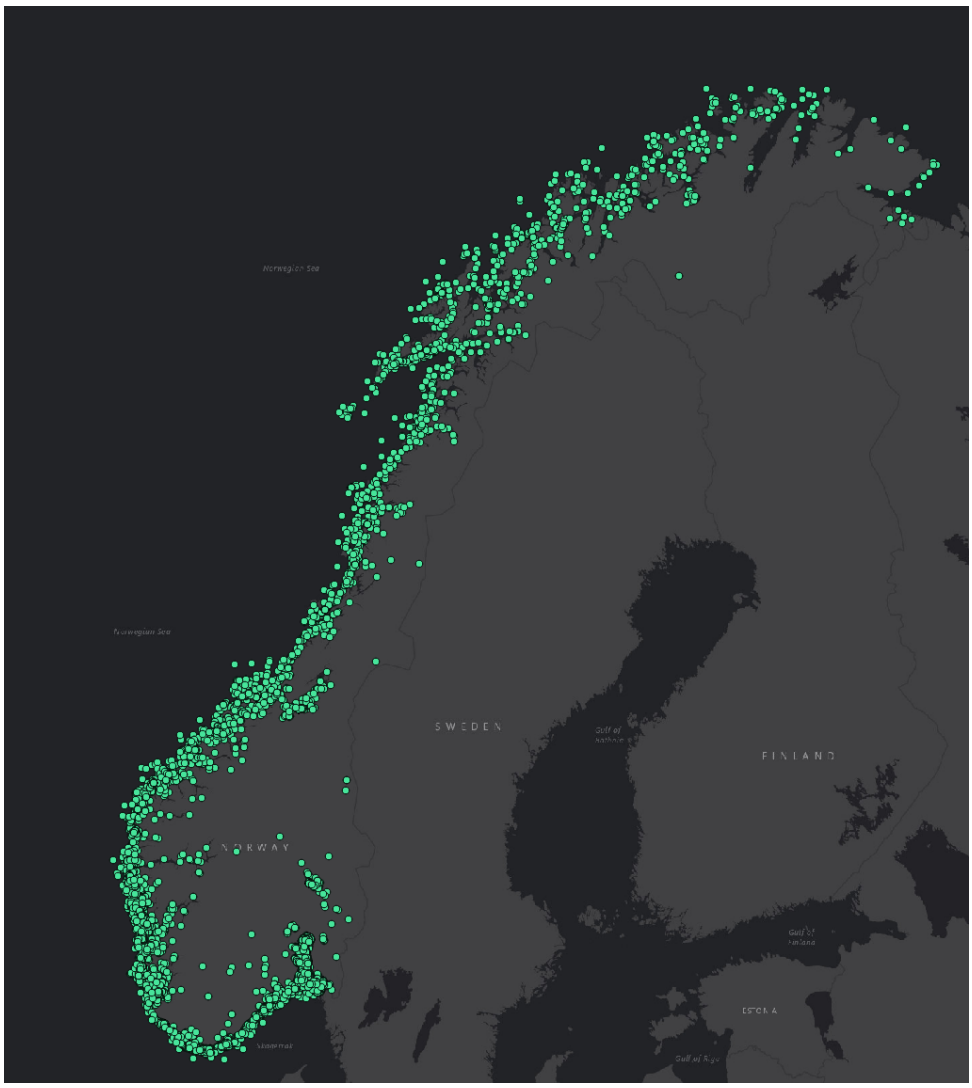


Figure 21: Breakdown of recreational craft accidents involving motorboats, 2008–2017. Source: Illustration created in QGIS

4.4.2 Sailing boats

Sailing boats are involved in the second highest number of accidents per year (approximately 200 per year). The number of accidents involving sailing boats shows a slightly increasing trend up to the year 2015.

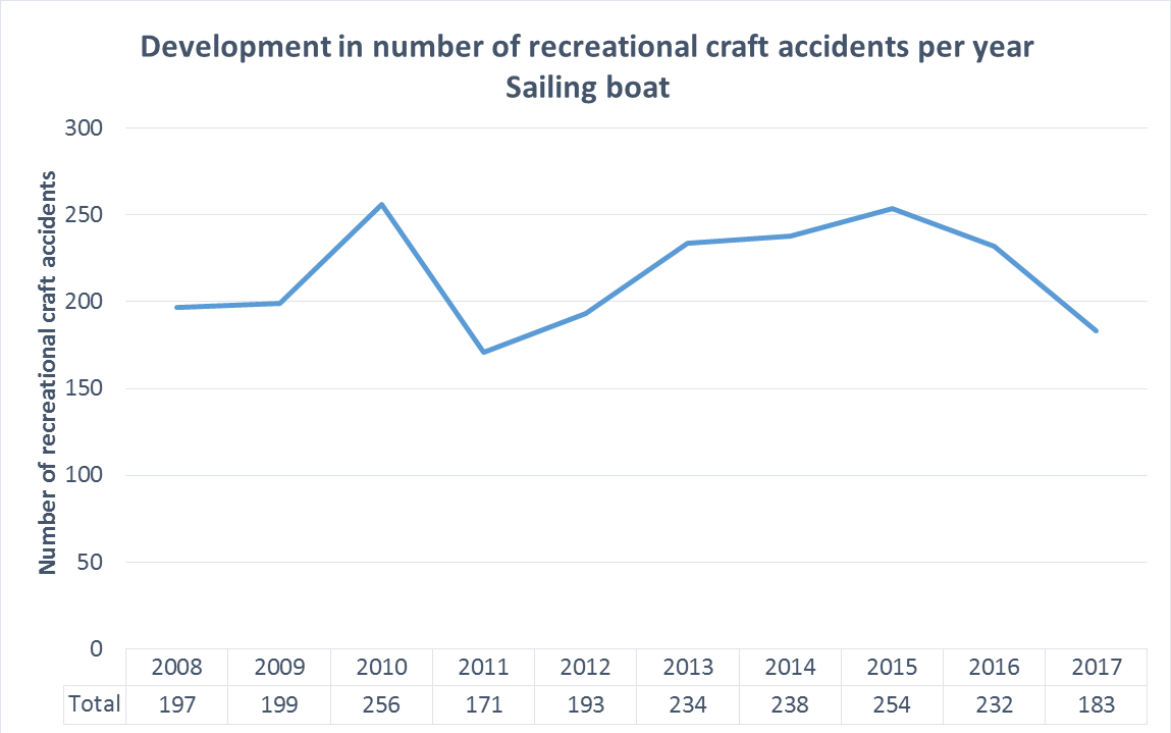


Figure 22: Development in the number of recreational craft accidents – sailing boats

Grounding and propulsion loss are the most frequently occurring accident types for this type of craft.

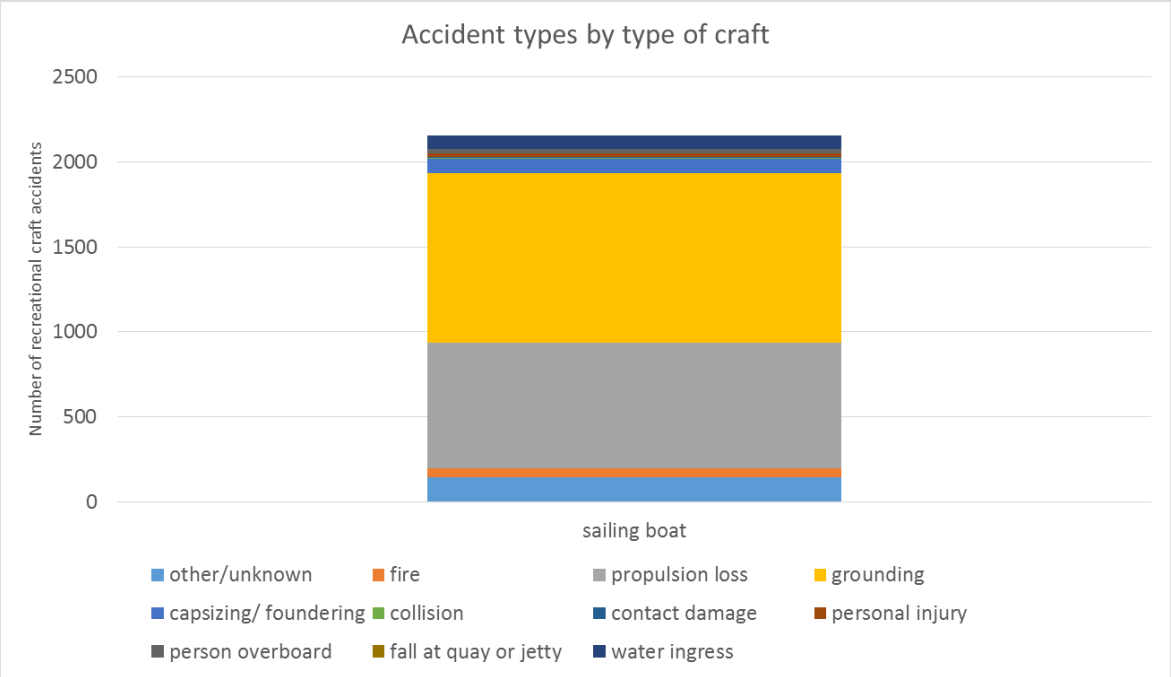


Figure 23: Breakdown of accident type for sailing boats – 2008–2017

Accidents involving sailing boats occur most frequently in southern parts of the country, in addition to some in Svalbard (not shown in the figure); see Figure 24.

Figure 24: Breakdown of recreational craft accidents involving sailing boats, 2008–2017. Source: Illustration created in QGIS

4.4.3 Dinghies

An average of approximately 30 accidents involving dinghies were recorded per year. The number of accidents involving dinghies was relatively stable throughout the period.

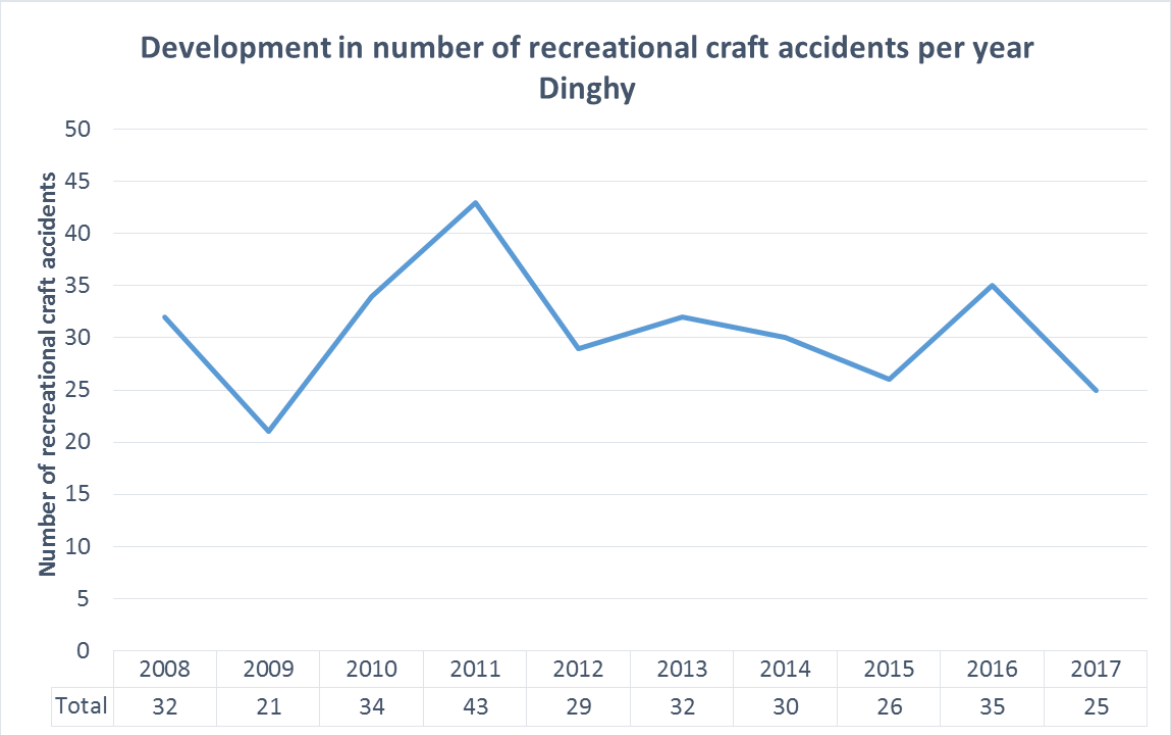


Figure 25: Development in the number of recreational craft accidents – dinghies

Propulsion loss and capsizing/foundering are the dominant accident types for this type of craft.

Accidents involving dinghies occur most frequently in southern parts of the country (mainly Western, Southern and Eastern Norway), in addition to one registered in Svalbard (not shown in the figure); see Figure 26.

Figure 26: Breakdown of recreational craft accidents involving dinghies, 2008–2017. Source: Illustration created in QGIS

4.4.4 Kayaks/canoes

An average of approximately 20 accidents involving kayaks/canoes were recorded per year. The number of accidents involving kayaks/canoes is showing an increasing trend.

Figure 27: Development in the number of recreational craft accidents – kayaks/canoes

Capsizing/foundering is the most frequently occurring accident type for this type of craft, in addition to person overboard accidents. It may be natural to think that all capsizes involving kayak/canoes result in a person overboard situation, but this is only recorded as a subsequent incident where it is explicitly stated in the data. This is in order to avoid speculation about the sequence of events, and because the categories apply to all craft. It is not an equal probability for all craft that capsizing/foundering results in a person in the water. For the same reason, capsizing/foundering was not stated to be the prior incident when it was not specified why a person ended up in the water.

Accidents involving kayaks/canoes occur most frequently in southern parts of the country (mainly Western, Southern and Eastern Norway), in addition to a few in Svalbard (not shown in the figure); see Figure 28.

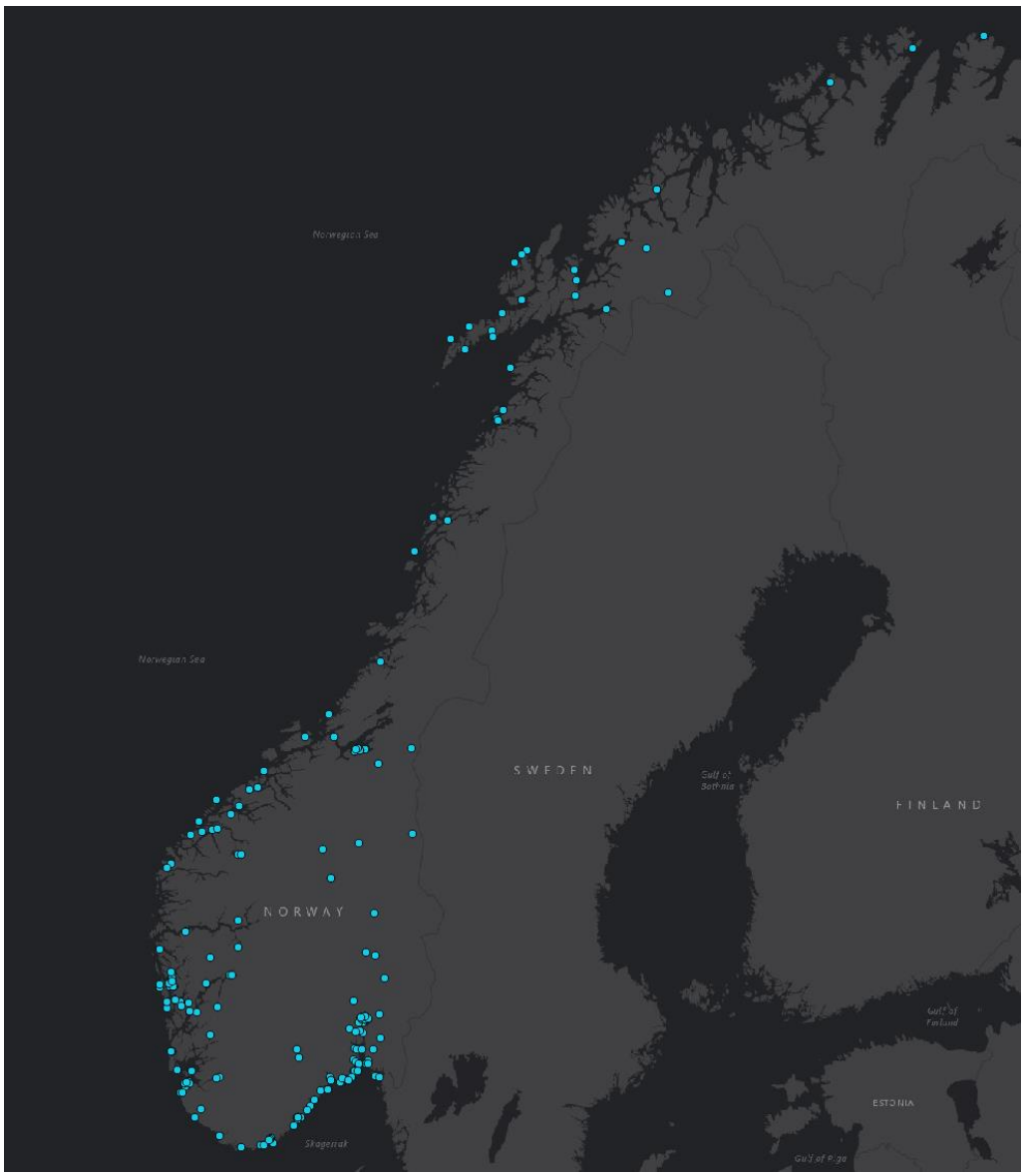


Figure 28: Breakdown of recreational craft accidents involving kayaks/canoes, 2008–2017. Source: Illustration created in QGIS

4.4.5 Boards (sailboards, paddle boards and kiteboards)

An average of approximately 13 accidents involving boards were recorded per year. The number of accidents involving boards is showing an increasing trend. Little information is recorded about the type of incidents, but information in the text indicates that they mainly concern problems with equipment and a person being unable get onto and/or drift away from the board.

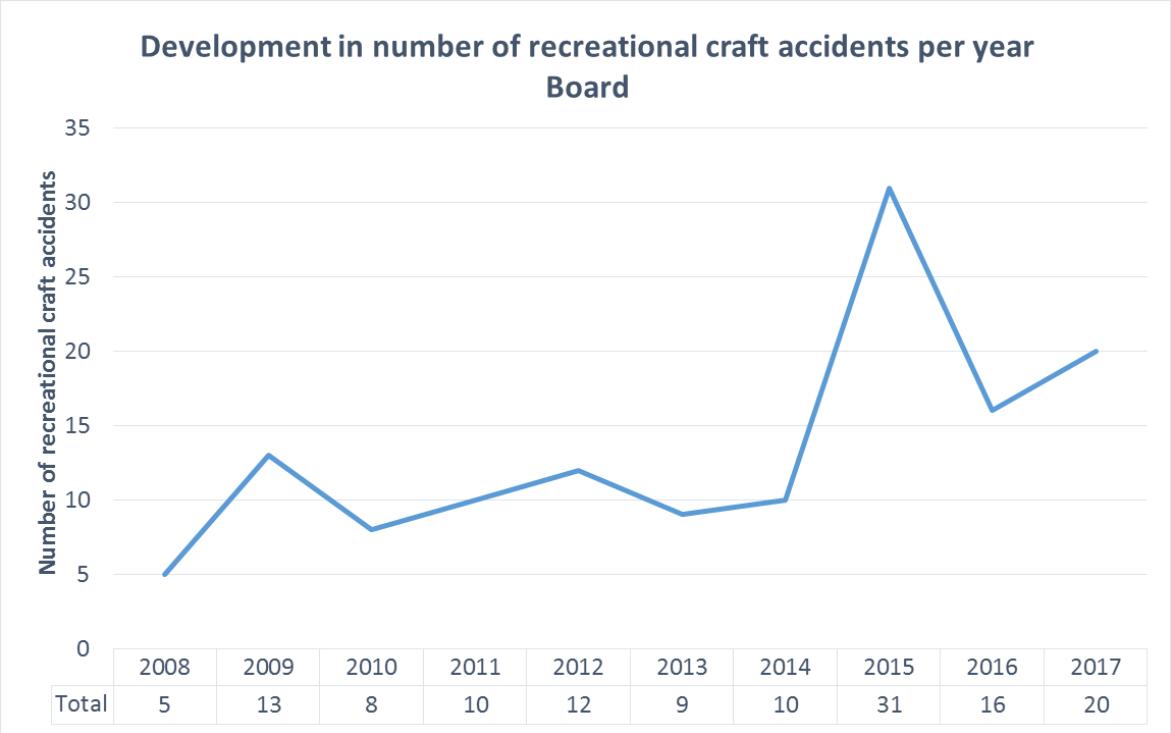


Figure 29: Development in the number of recreational craft accidents – boards

Figure 30 shows that there are relatively few recorded accidents involving boards. These accidents occur most frequently in southern parts of the country (mainly Western, Southern and Eastern Norway).

Figure 30: Breakdown of recreational craft accidents involving boards, 2008–2017. Source: Illustration created in QGIS

4.4.6 Personal watercrafts

There are relatively few incidents involving personal watercrafts over the 2008–2017 period. A total of 32 incidents were recorded in the data set for this period, but 24 of these occurred in the last two years.

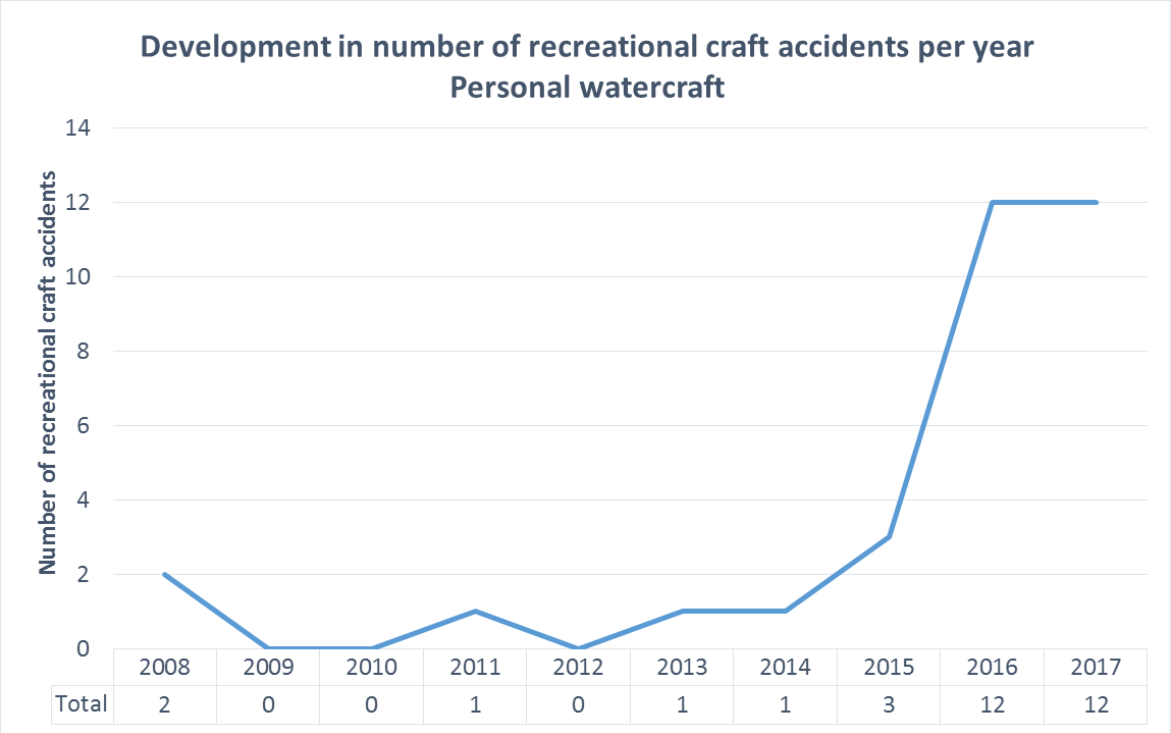


Figure 31: Development in the number of recreational craft accidents – personal watercrafts

The number of accidents involving personal watercrafts shows a strongly increasing trend over the past two years, most probably as a consequence of the Regulations on the use of personal watercraft etc., which defined extensive prohibited areas along shorelines, being repealed with effect from 18 May 2017. After this date, personal watercrafts could be used in the same way as other recreational craft, wherever local regulations do not restrict personal watercraft traffic.

Accidents involving personal watercrafts are mainly due to problems with propulsion and capsizing/foundering. There is relatively little information about the cause of these accidents, but for some incidents, engine problems were stated in the form of leaks, but also problems with steering. Capsizing/foundering accidents are typically incidents where someone has overturned with a personal watercraft and needs assistance in order to get ashore.

Figure 32 shows that there are relatively few recorded accidents involving personal watercrafts. These accidents occur most frequently in southern parts of the country (mainly Western, Southern and Eastern Norway).

Figure 32: Breakdown of recreational craft accidents involving personal watercrafts, 2008–2017. Source: Illustration created in QGIS

4.4.7 Rowing boats

There are relatively few incidents involving rowing boats over the 2008–2017 period. An average of approximately six accidents involving rowing boats were recorded per year. The number of accidents is relatively unchanged throughout the period.

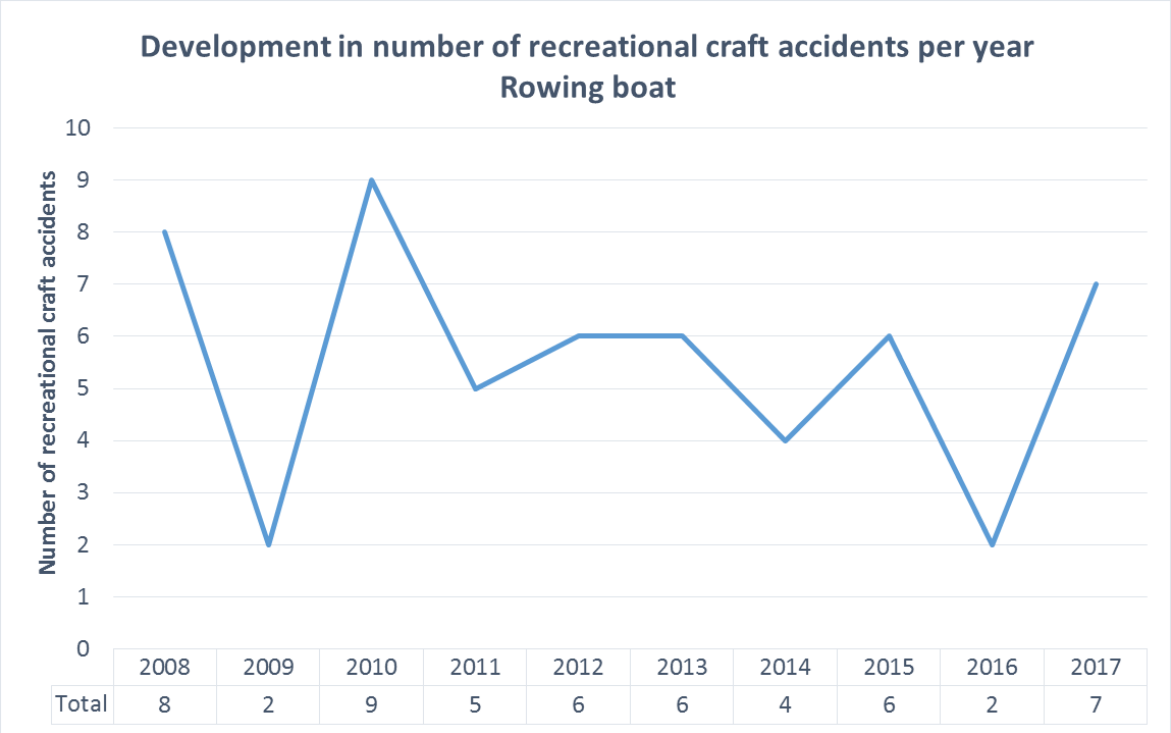


Figure 33: Development in the number of recreational craft accidents – rowing boats

Capsizing/foundering is the dominant accident type for this type of craft.

Accidents involving rowing boats occur most frequently in southern parts of the country (mainly Western, Southern and Eastern Norway); see Figure 34.

Figure 34: Breakdown of recreational craft accidents involving rowing boats, 2008–2017. Source: Illustration created in QGIS

4.5 Accidents by county

This section presents the number of recreational craft accidents by county. The number of recreational craft accidents by county for the 2008–2017 period is shown in Figure 35.

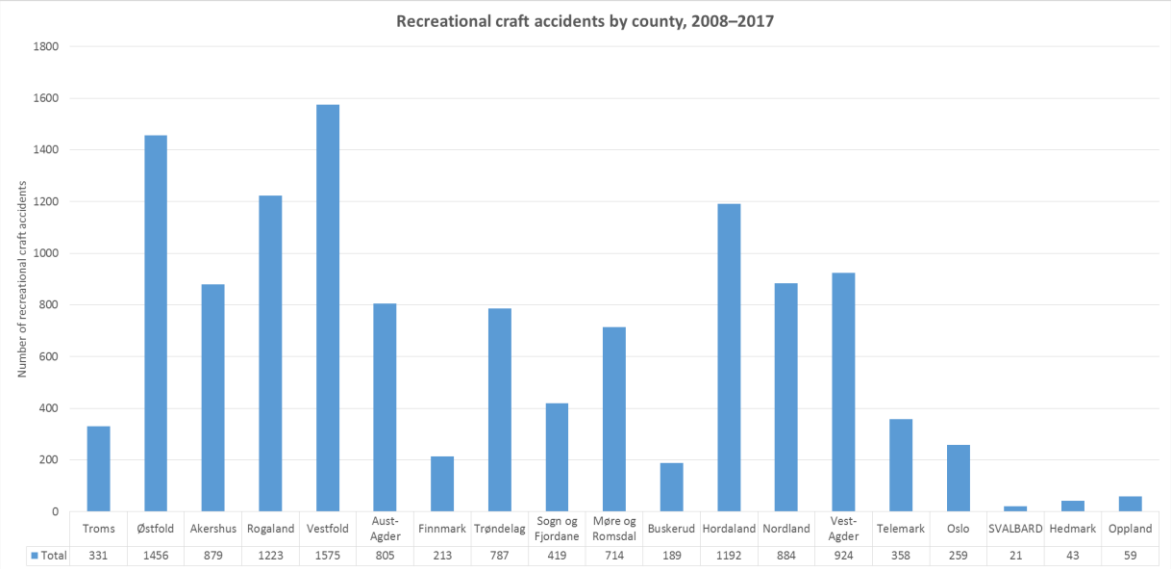


Figure 35: Number of recreational craft accidents by county, 2008–2017

Figure 35 shows that most recreational craft accidents are registered in the counties of Vestfold, Østfold, Rogaland and Hordaland. The reason for this cannot be determined on the basis of the data set, but it is most likely related to the high number of recreational craft in these counties.

Figure 36 shows recreational craft accidents by county, broken down by accident type. The figure shows that grounding and propulsion loss are the dominant accident types for most of the counties. The results show that there is relatively little difference in the proportion of accident types for the various counties, with some exceptions. For example, Svalbard, Troms and Finnmark, and the inland counties of Hedmark and Oppland differ somewhat more from the other counties. The results by county are not specified in more detail, since it is mainly the number of accidents per county that is the most significant difference.

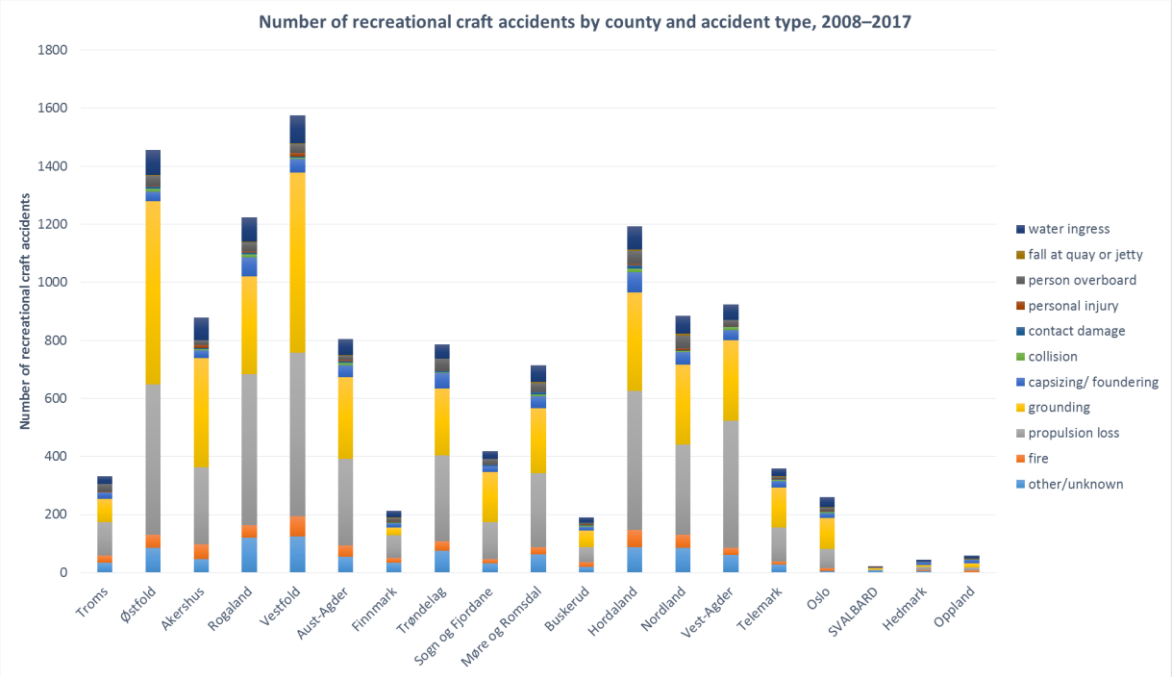


Figure 36: Number of recreational craft accidents by county and accident type, 2008–2017

Figure 37 and Figure 38 show the number of accidents involving recreational craft by county, broken down by type of craft. The results show that motorboats and sailing boats dominate for the vast majority of counties. Not all counties have registered accidents with all types of craft. Boards, personal watercrafts and rowing boats are the types of craft for which incidents have not been registered in all counties.

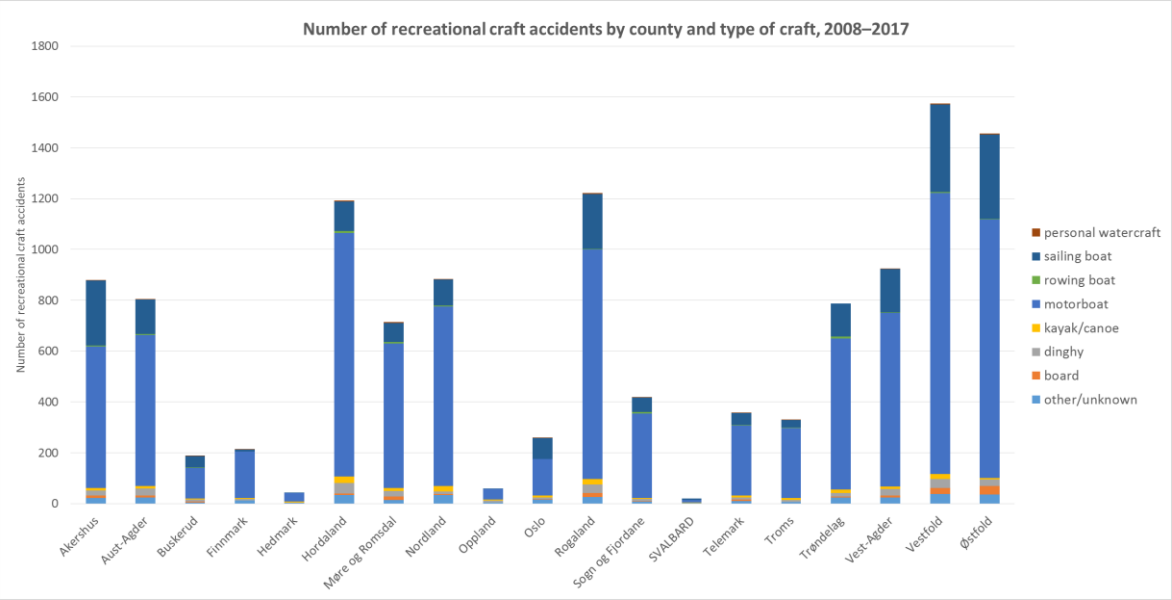


Figure 37: Number of recreational craft accidents by county and type of craft, 2008–2017

Figure 38 shows the number of accidents by county and season. The results show that the various counties do not differ substantially from each other in terms of which time of year the accidents occurred.

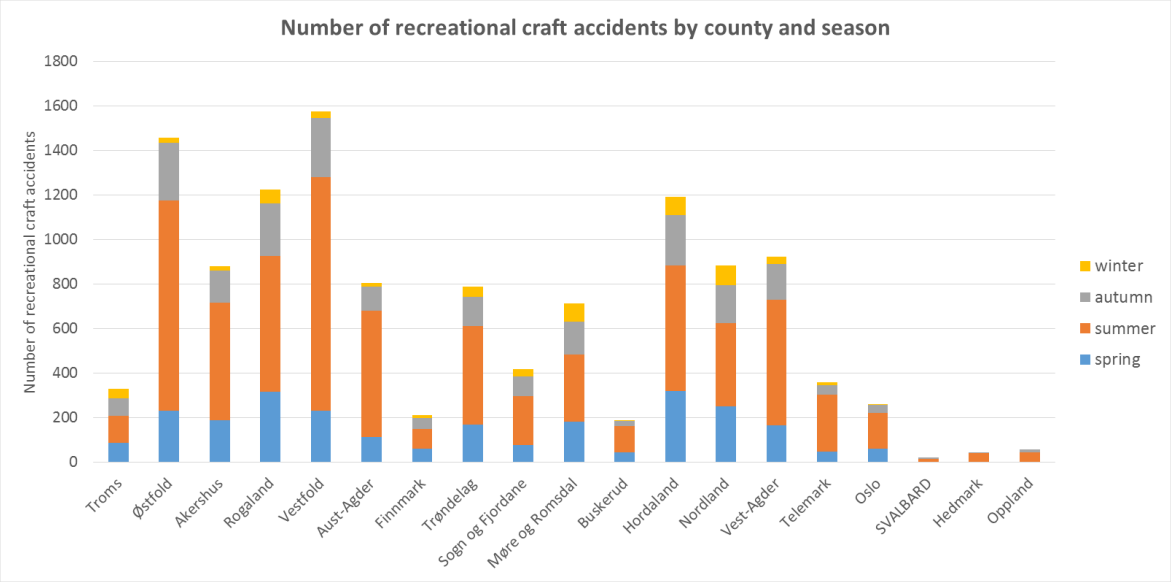


Figure 38: Number of recreational craft accidents by county and season, 2008–2017

4.6 Fatal accidents

Fatal recreational craft accidents are presented in this section. As mentioned earlier, the data set for fatalities is based on statistics from the Norwegian Maritime Authority and information from the JRCC and RS.

To obtain more details about fatal accidents, logs were obtained from the JRCC and a media search performed for fatal accidents over the last five years (2013–2017). The results for this period are presented in section 4.6.2.

4.6.1 Fatal recreational craft accidents, 2008–2017

The number of recorded fatalities in the 2008–2017 period was 367. The number is somewhat higher than was apparent from earlier statistics published by the Norwegian Maritime Authority. This could be due to the fact that there are no compulsory reporting procedures for recreational craft accidents. There is also some uncertainty involved in identifying recreational craft accidents, particularly accidents at quay or jetty, and accidents involving recreational craft used commercially. The number of fatalities per year is shown in Figure 39. Figure 39 shows a slightly falling trend.

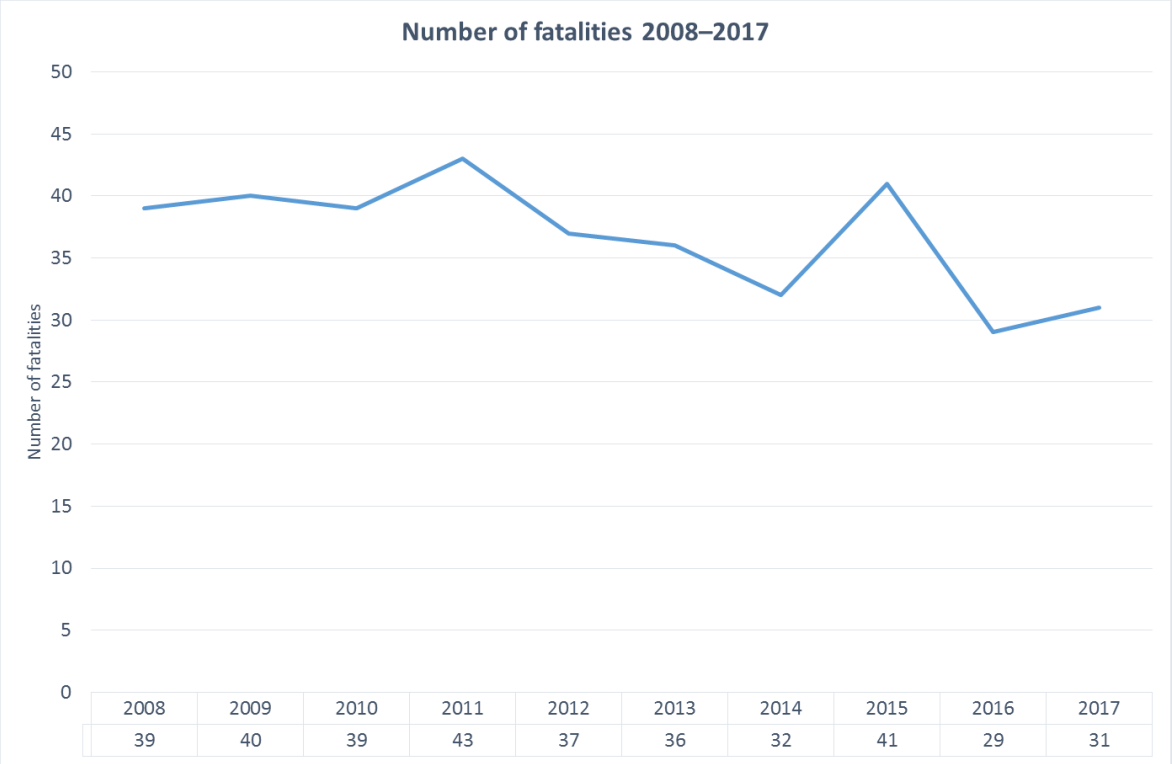


Figure 39: Number of fatalities, 2008–2017

Figure 40 shows the number of fatalities by accident type. The results show that it is accidents involving person overboard, capsizing/foundering, grounding and falls at quay or jetty that most often result in fatalities. Few of the incidents registered as propulsion loss have led to fatal accidents, even though this type of accident dominates the total number of accidents; cf. section 4.3.

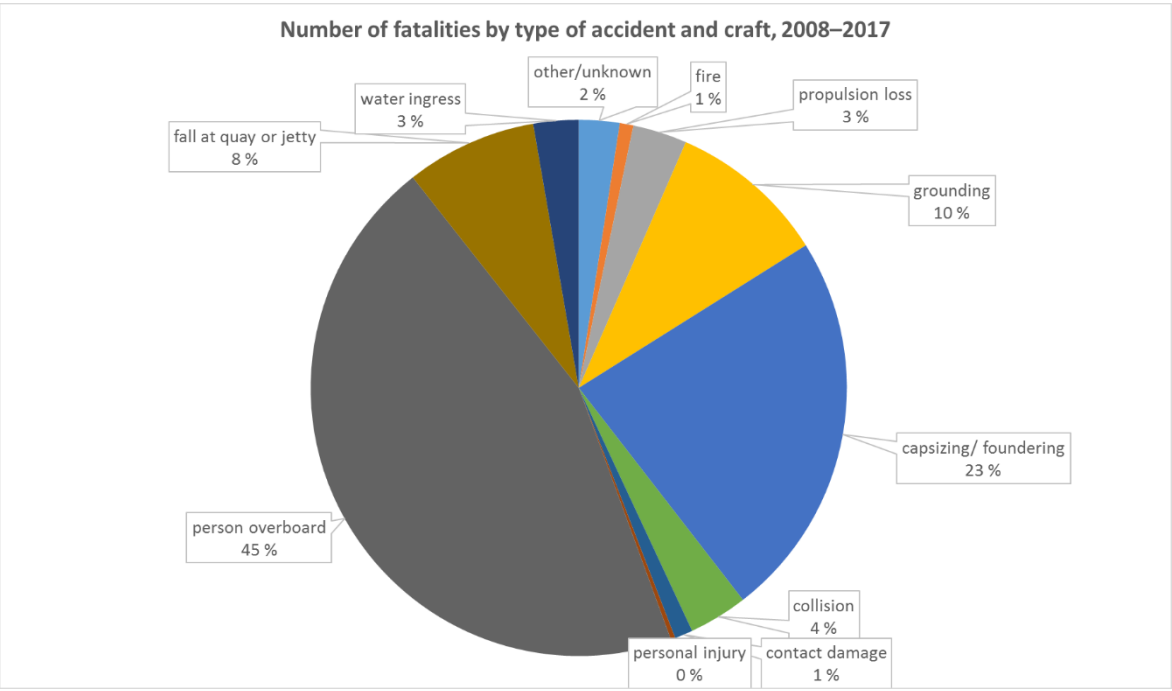


Figure 40: Breakdown of fatal accidents by accident type, 2008–2017

The number of fatalities by type of accident and craft are shown in Figure 41. Most of the fatal accidents involve motorboats, except for incidents involving falls at quay or jetty, where information about the craft is missing in most cases. The results also show that there have been quite a few fatal accidents involving kayaks/canoes in addition to dinghies, rowing boats and sailing boats. Approximately 75% of motorboat accidents where the size is specified concern craft of less than 26 feet. This indicates that most fatal accidents occur on small craft.

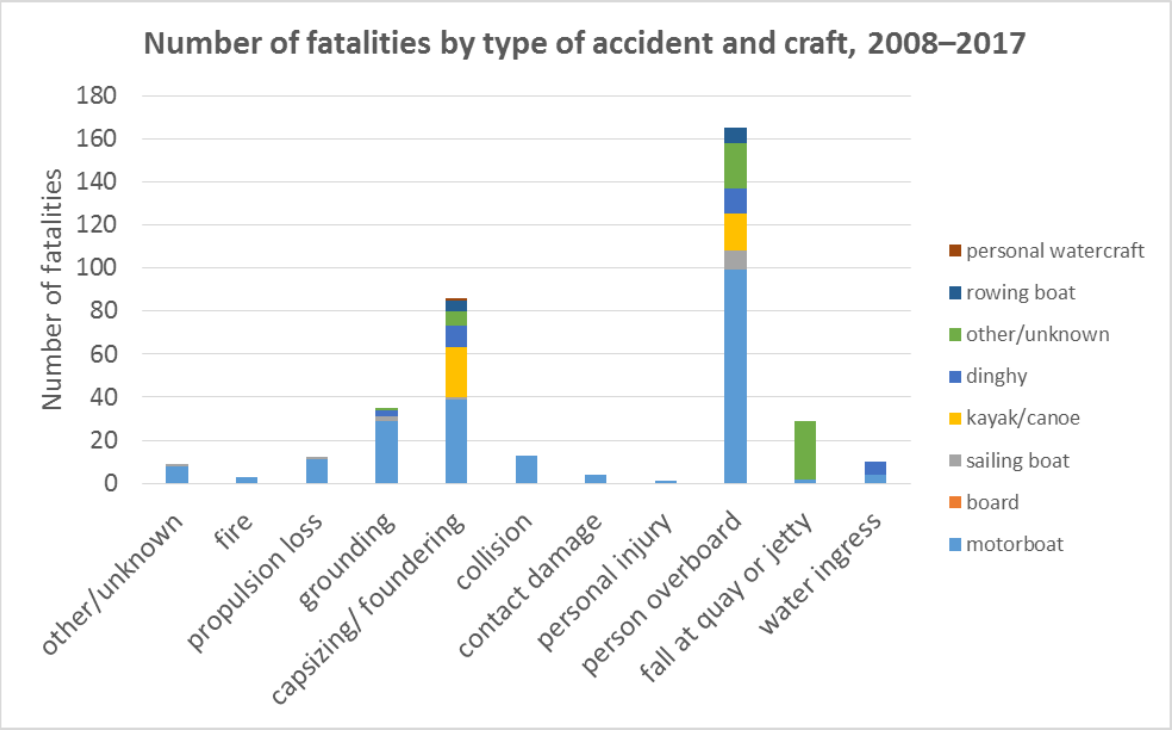


Figure 41: Number of fatalities distributed by type of accident and craft, 2008–2017

The results show that for groundings, almost half (41%) of the fatal accidents occur at night. For around 33% of these incidents, the use of intoxicants was recorded, while the figure was 45% for fatal accidents occurring in connection with falls at a quay or jetty.

Figure 42 shows the number of fatalities by season. The result shows that the distribution is relatively similar to the total number of incidents; see section 4.2.3, with few fatalities in the winter and most in the summer.

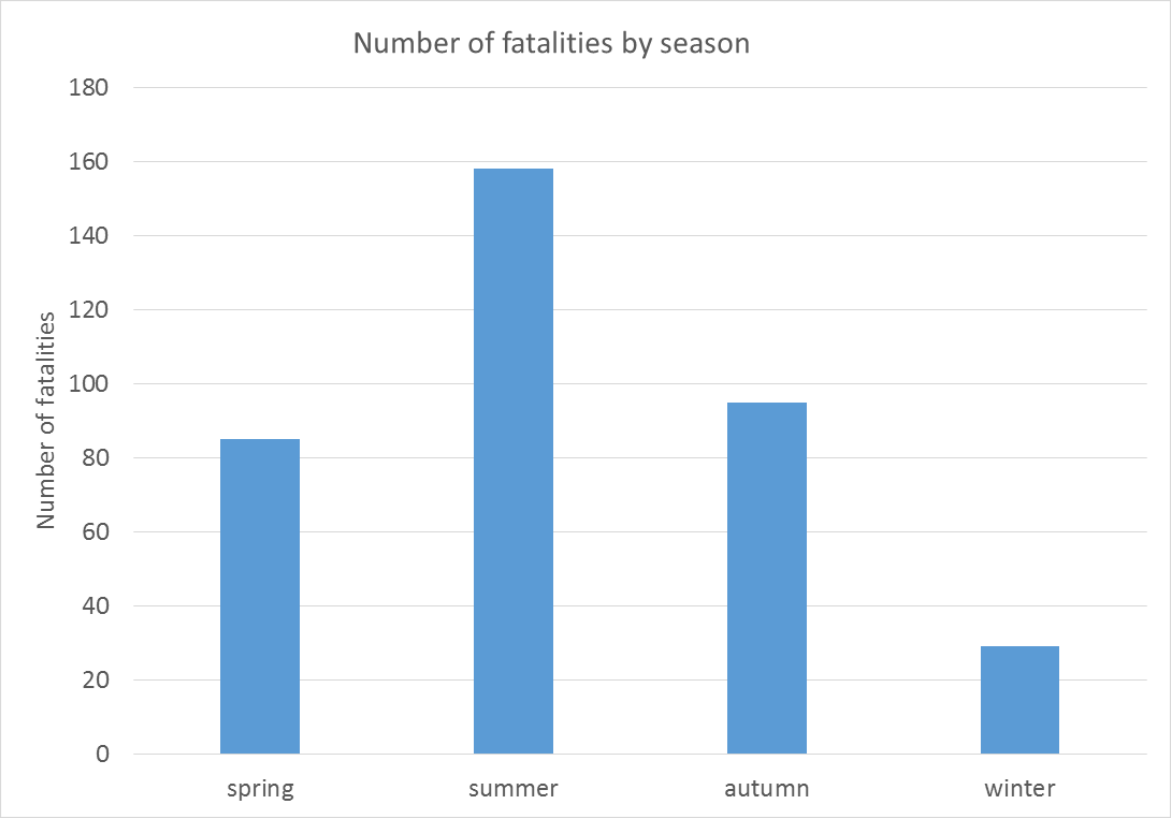


Figure 42: Number of fatalities by season

Figure 43 shows the number of fatal recreational craft accidents by county. The results show that the counties of Hordaland, Nordland, Trøndelag and Møre og Romsdal have the most recorded fatal incidents. These are not the same counties that have the most accidents in general; see section 4.5, apart from Hordaland.

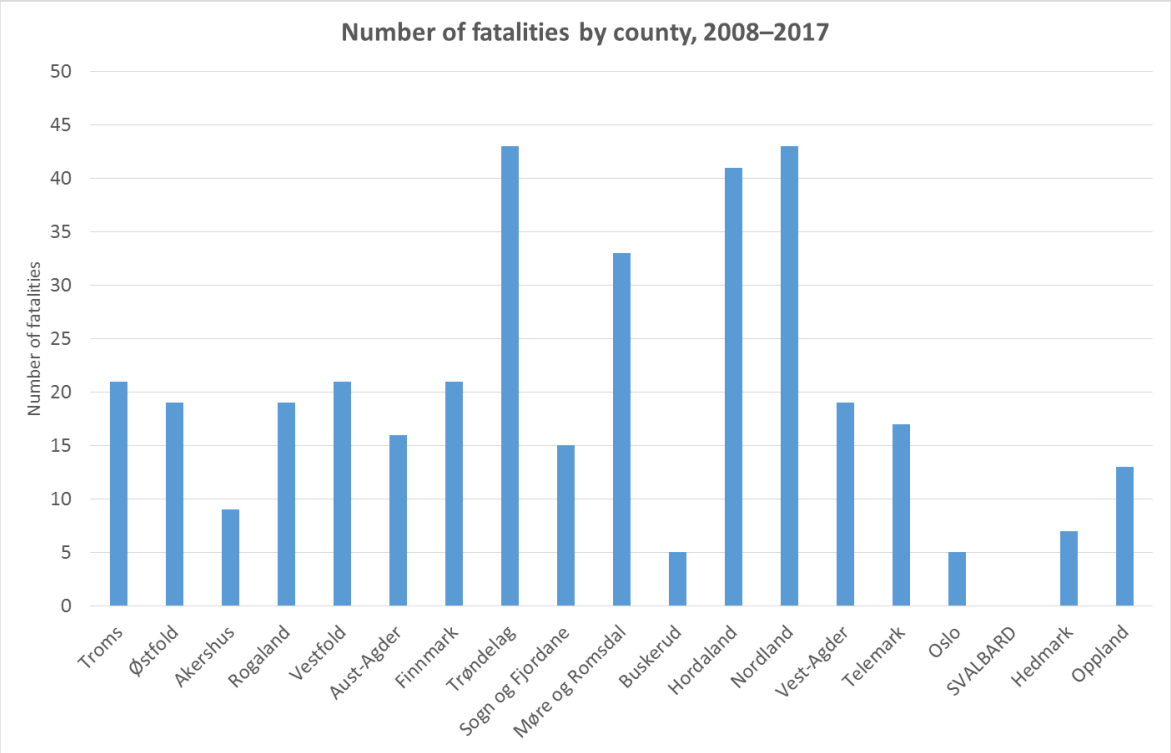


Figure 43: Number of fatalities by county, 2008–2017

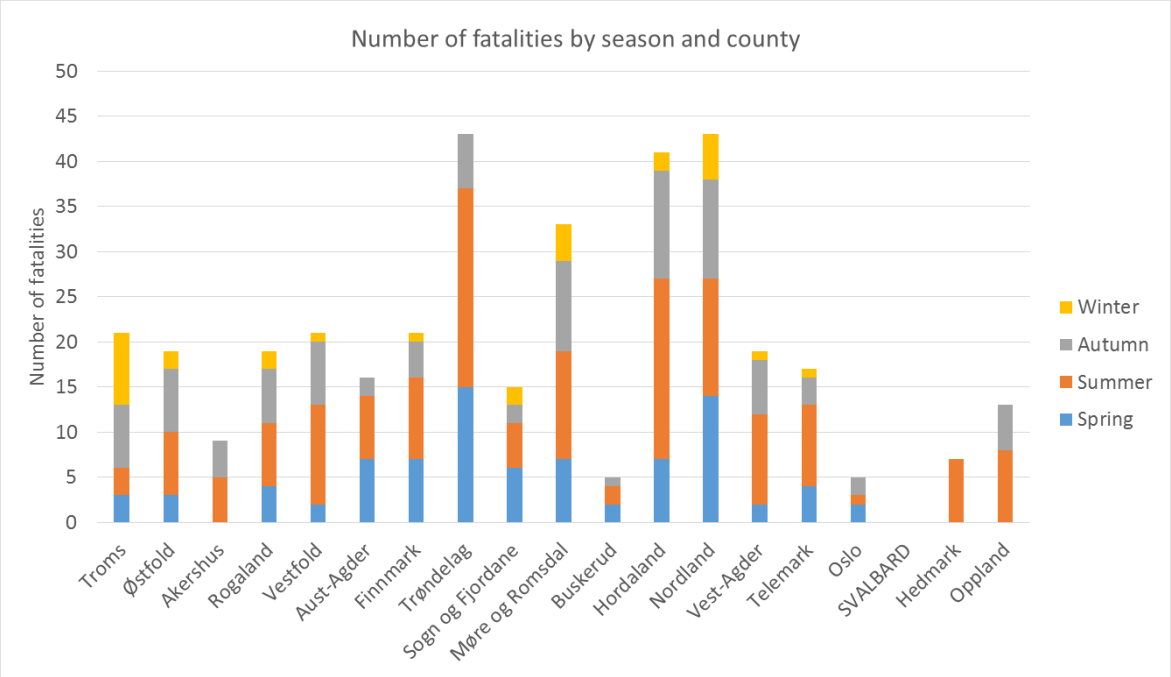


Figure 44: Number of fatalities by county and season, 2008–2017

Figure 45 shows that most of the people who died are Norwegian nationals. Of the 367 fatalities, 312 were Norwegian nationals, while 55 were of other nationalities.

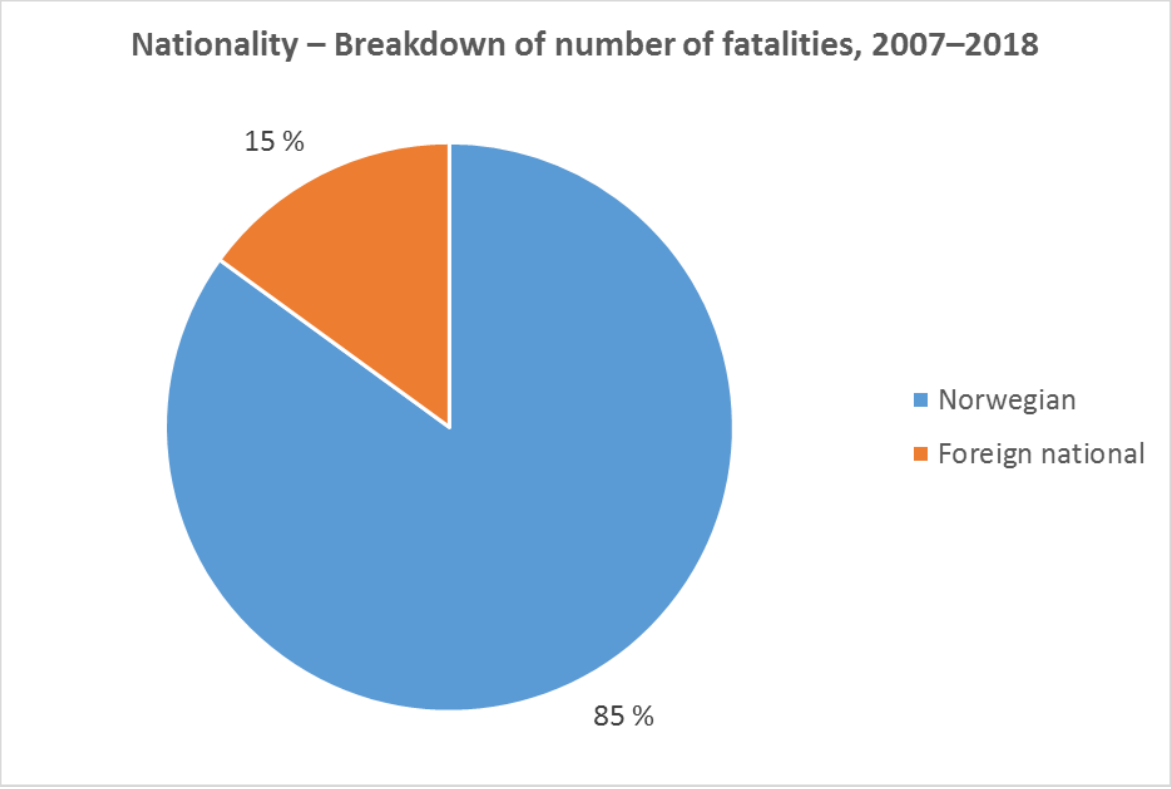


Figure 45: Nationality – Breakdown of number of fatalities, 2008–2017

4.6.2 Fatal recreational craft accidents, 2013–2017

For the last five years, more information was collected in order to find out more about the incidents that resulted in fatalities. The main findings are presented in this section.

4.6.2.1 *Distribution by gender and age*

The breakdown of fatalities by gender is shown in Figure 46. The figure shows that it is mostly men who die in recreational craft accidents. This is related to the fact that it is mostly men who operate recreational craft, which means that their degree of exposure is higher.

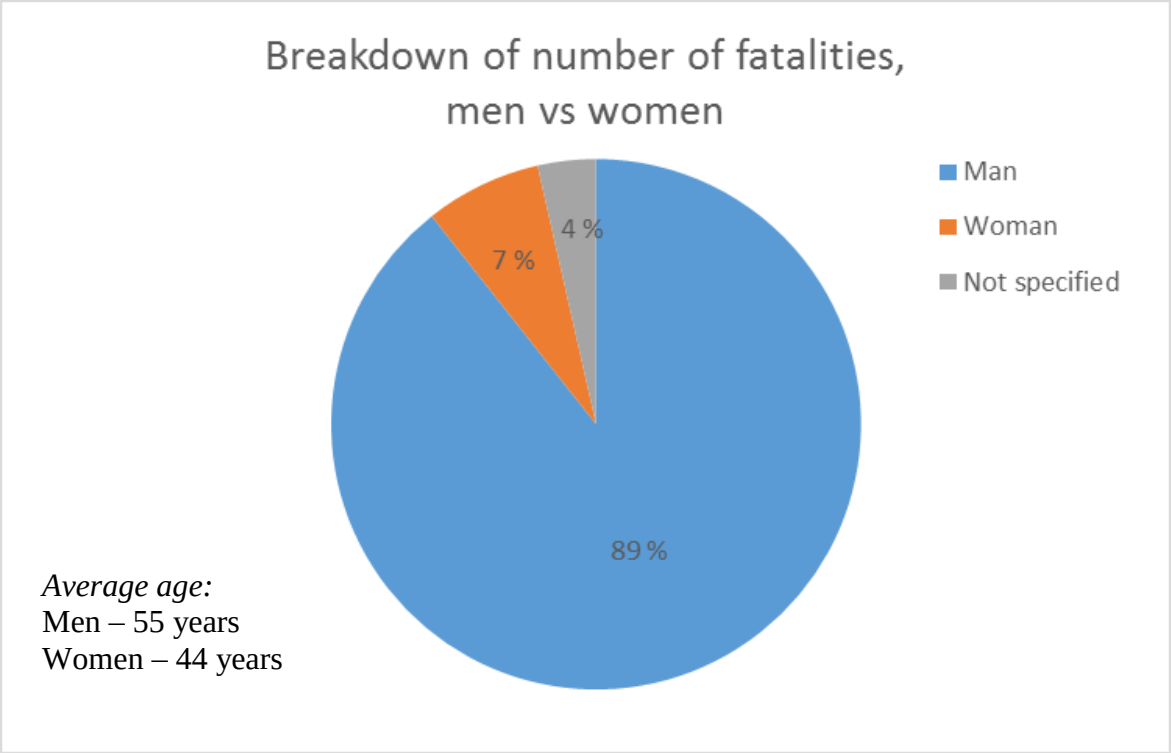


Figure 46: Breakdown of fatalities by gender, 2013–2017

The results also show that the average age of men who died is 55, compared with 44 for women. For 5% of the fatalities, no information about age was provided.

For incidents involving collision, grounding or contact damage, the average age is somewhat lower than the average for all accident types; see Figure 47.

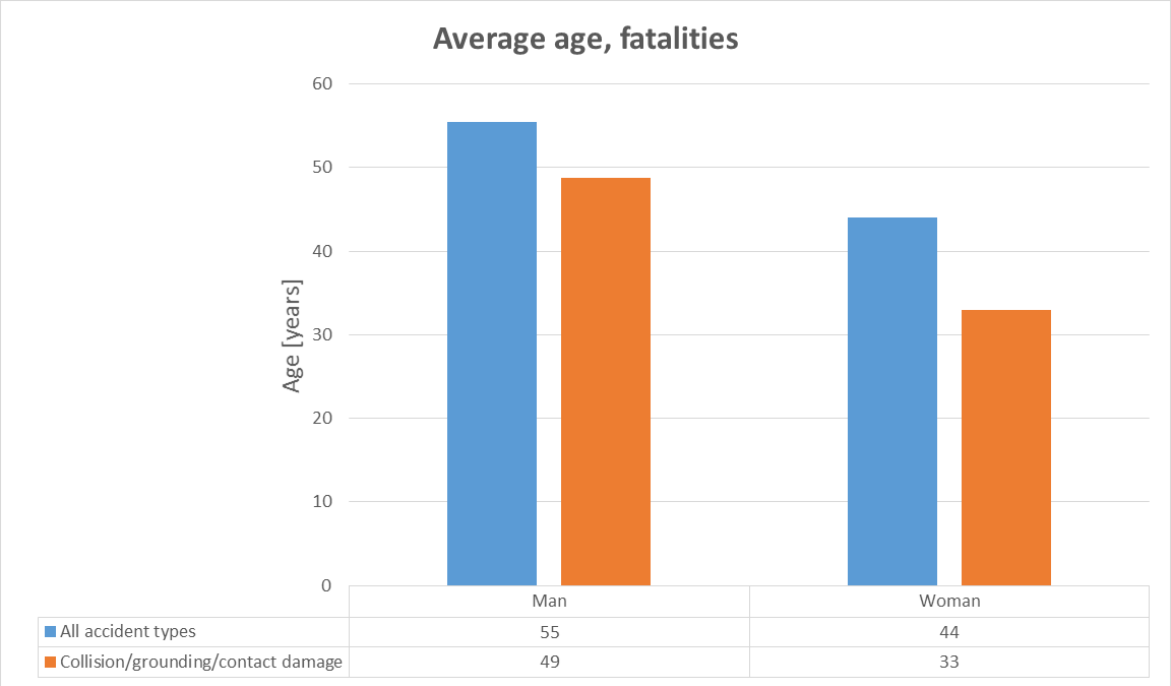


Figure 47: Average age of fatalities, 2013–2017

4.6.2.2 *Fishing as an activity*

In around 33% of the incidents involving fatalities, it is recorded that people on board were pursuing or intended to pursue fishing activities. In over half of the accidents involving fishing activities, the person involved was alone. The results also show that most of the people who died and had been pursuing fishing activities were Norwegian nationals; see Figure 48.

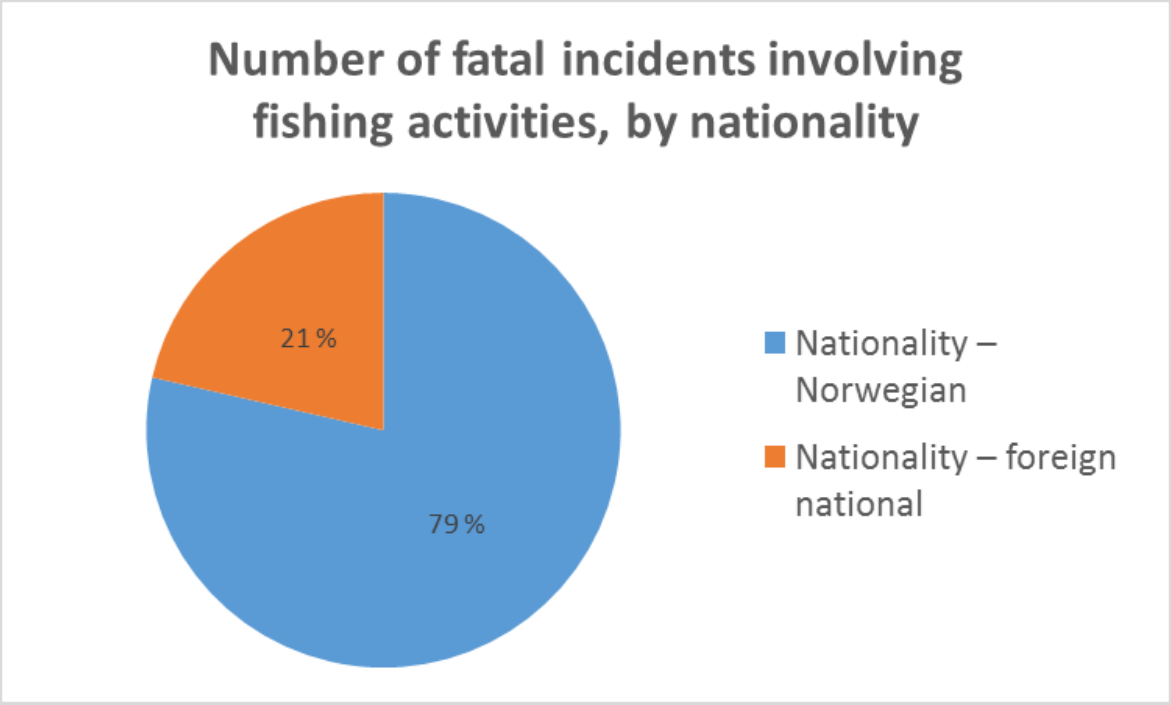


Figure 48: Number of fatal incidents involving fishing activities, 2013–2017

4.6.2.3 *Fishing tourism and rental*

In 14% of the fatal accidents, rental or (fishing) tourism had been recorded in the data material. Figure 49 shows that the number of fatalities over the last five years is relatively constant, with the exception of the year 2014. The recorded accident types relating to (fishing) tourism or rental are mainly person overboard and capsizing/foundering; see Figure 50.

Figure 49: Number of fatalities per year in which rental or (fishing) tourism was recorded

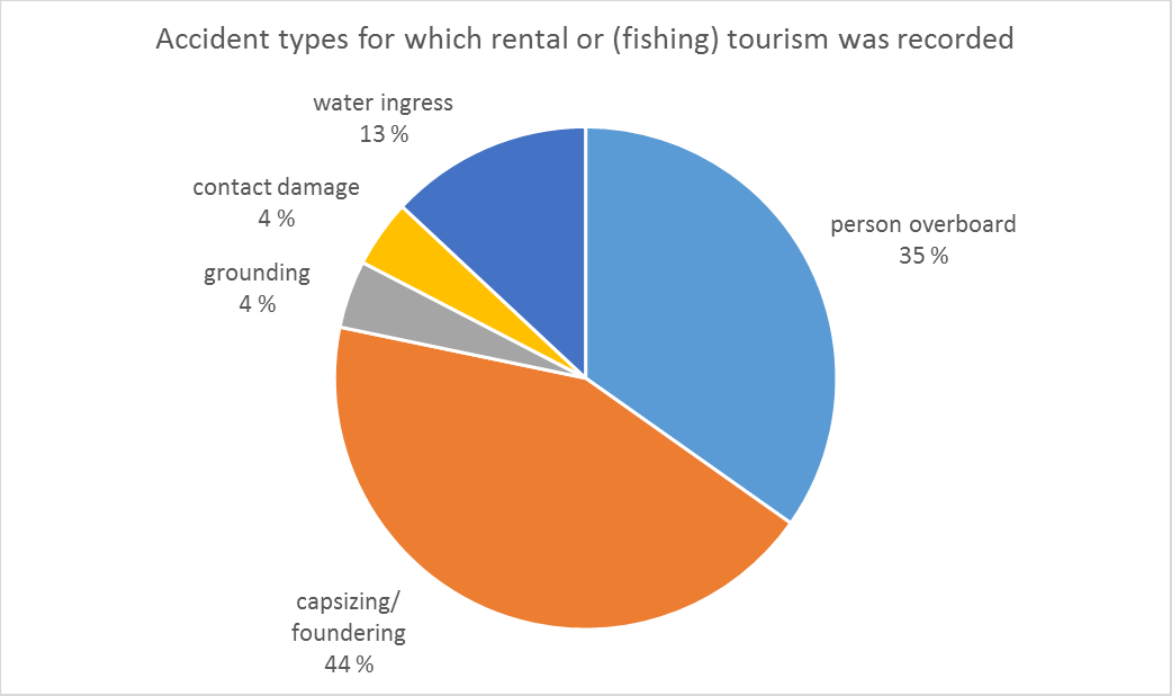


Figure 50: Breakdown of accident types in which rental or (fishing) tourism was recorded

4.6.2.4 *Recorded factors (intoxication, speed, use of lifejacket)*

Intoxication was recorded for around 30% of the fatal incidents. It is not always apparent whether it was the operator or passengers who were intoxicated. Nor was there any information about the blood alcohol content, and whether this was above or below the permitted limit.

Intoxication and/or speed were recorded more frequently in fatal incidents involving collision, grounding or contact damage than for other accident types; see Figure 51. The data do not contain any more detailed information about either blood alcohol content or speed.

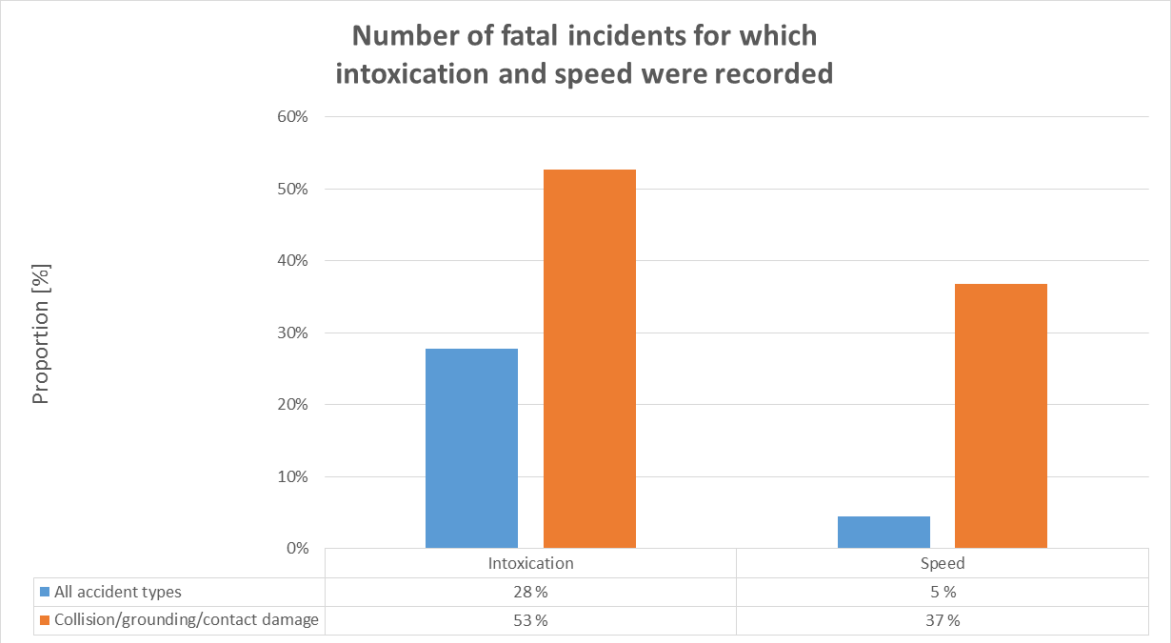


Figure 51: Number of fatal incidents in which intoxication and speed were recorded, 2013–2017

Figure 52 shows the number of fatal incidents in which the use of lifejackets was recorded. The results show that lifejackets were not used in over half of the fatal incidents. There is not enough information in the data to evaluate the effect or relevance of the use of lifejackets for the reported incidents. For recreational craft of less than eight metres, people are required to wear a suitable buoyancy vest or lifejacket while the craft is under way. This means that some of the incidents will involve situations in which the use of a lifejacket is not legally required.

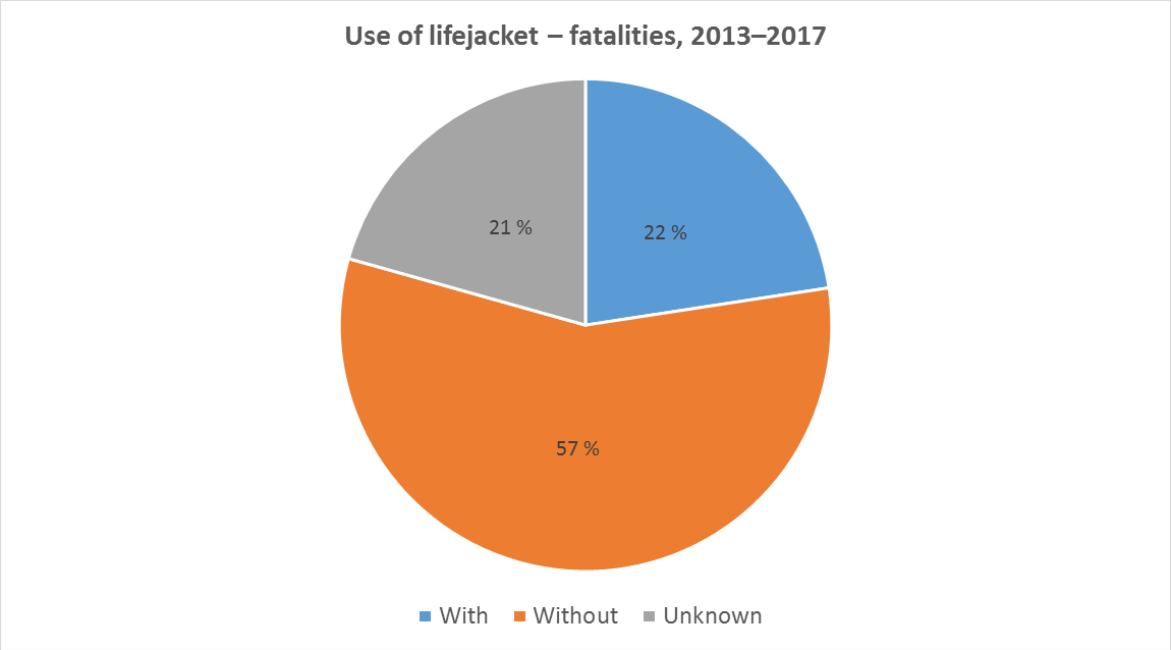


Figure 52: Use of lifejacket recorded for fatalities, 2013–2017

5. UNCERTAINTY

The results presented in this report contain a high degree of uncertainty. The figures presented should therefore be treated as trends and not absolute values.

The most significant uncertainties are presented here:

- The AIBN has sorted much of the data manually, both by removing and categorising incidents. This is due to the fact that the data material received contained a lot of free text, and was not categorised in the same way as in this report.
- The AIBN has used some selected sources based on which sources could best be used in the mapping work, in relation to the available time frame, use of resources and relevance. Since not all available sources were used, it is possible that not all relevant incidents were included in the data.
- Many recreational craft accidents are not reported.
- There are few incidents recorded for the accident type ‘fall at quay or jetty’ that did not result in deaths (mainly data received from the Norwegian Maritime Authority). This group is therefore assumed to be under-reported in relation to the number of incidents.
- The data contains both serious accidents as well as minor incidents and near-accidents.
- The data may also contain omissions with respect to accidents on inland lakes.

- The data provide some opportunity for the discussion of causes and circumstances. This is used as a reference base in the report ‘Mapping of recreational craft accidents 2018’.

- The results have not been normalised against the number of recreational craft in Norway. Since there is no compulsory small craft register in Norway, there are no exact figures available for the number of recreational craft in Norway, nor is there a breakdown by geographic area over a ten-year period. It is on this basis that no normalisation was carried out of the number of craft by, for example, county or region. Variations from one geographic location to another in the number of incidents presented could therefore be closely related to the number of craft in an area.

6. CONCLUSIONS AND SUGGESTIONS FOR FURTHER WORK

The main conclusions and suggestions for further work are presented in this chapter.

6.1 Conclusions

The results must be interpreted as trends and not absolute values. The main conclusions from this mapping work may be summarised as follows:

6.1.1 All accidents/incidents involving recreational craft

- The average number of registered recreational craft accidents/incidents per year in the 2008–2017 period was approximately 1,200. The total number of recreational craft accidents shows an increasing trend over the ten-year period.

- Propulsion loss and grounding are the most frequently recorded accident types in Norway, making up a total of approximately 70% of the accidents (approx. 420–450 on average per year).

- Water ingress, capsizing/foundering, fire and person overboard accidents occur less frequently than the accident types mentioned above, but have a frequency of approximately 40–90 incidents on average per year.

- Collision, contact damage and personal injury are recorded as less frequently occurring incident types (approx. 6–9 on average per year).

- There are also around 100 incidents on average per year recorded as other/unknown.

- The overall increase in the number of accidents is primarily caused by the number of motorboat accidents. This is mainly due to the increase in the number of propulsion loss and grounding incidents for this type of craft. This could also be related to the increase in the number of motorboats.

- Motorboats are the type of craft involved in the most accidents per year, most likely because there are more motorboats than other craft, followed by sailing boats.

- Kayaks/canoes, personal watercrafts and boards are also showing an increasing trend in the number of accidents, although the number is significantly lower than for motorboats and sailing boats.

- Østfold, Vestfold, Rogaland and Hordaland are the counties with the most recorded recreational craft accidents.

- The results show that most of the incidents occur in the summer season from June to August. Around half of the recreational craft accidents in the summer months occur in July.

- Most of the accidents occurred during the day (06:00–24:00). The results show an increase in the number of recreational craft accidents during the day, while there is a constant trend in the development of recreational craft accidents at night. The most

common accidents at night are collisions (22%) and person overboard accidents (16%).

- The data set has insufficient information regarding the effect and extent of the use of lifejackets.

6.1.2 Fatal recreational craft accidents, 2008–2017

- The number of recorded fatalities in the period 2008–2017 was 367. The results show a slightly falling trend.

- The most frequent cause of fatal incidents is recorded to be person overboard accidents (45%), followed by capsizing/foundering (23%), grounding (10%) and fall at quay or jetty (8%). Few of the incidents involving propulsion loss have led to fatal accidents, even though this type of accident dominates the total number of accidents.

- There is little or no information about the causes of falls overboard in the data.

- Capsizing/foundering and person overboard incidents resulting in deaths are mainly recorded for motorboats or kayaks/canoes.

- Most of the fatal accidents involve motorboats, except for incidents involving falls at a quay or jetty, where information about the craft is missing in most cases. The results also show that there have been quite a few fatal accidents involving kayaks/canoes in addition to dinghies, rowing boats and sailing boats. Approximately 75% of motorboat accidents where the size is specified concern craft of less than 26 feet. This indicates that most fatal accidents occur on small craft.

- The results show that for groundings, about half (41%) of the fatal accidents occur at night. Intoxication was recorded for around 33% of these incidents. Intoxication was recorded for around 45% of the fatal incidents involving falls from a quay or jetty.

- The counties with the most fatalities differ somewhat from the counties with the highest total number of accidents. Hordaland, Nordland, Trøndelag and Møre og Romsdal are the counties where the most fatalities are recorded.

- The results show that most of the people who died were Norwegian nationals (85%).

6.1.3 Fatal recreational craft accidents, 2013–2017

- The results show that it is mostly men who die in recreational craft accidents. This is probably because it is mostly men who operate recreational craft, which means that their degree of exposure is higher. The results also show that the average age of men who died is 55, compared with 44 for women. For 5% of the fatalities, no information about age was provided.

- For incidents involving collision, grounding or contact damage, the average age is somewhat lower than the average for all accident types.

- In around 33% of the incidents involving fatalities, it is recorded that people on board were pursuing or intended to pursue fishing activities. In over half of the accidents

involving fishing activities, the person involved was alone. In 14% of the fatal accidents, rental or (fishing) tourism was recorded in the data material.

- Intoxication was recorded for around 33% of the fatal incidents in this period. It is not always apparent whether it was the operator or passengers who were intoxicated. Nor was there any information about the blood alcohol content, and whether this was above or below the permitted limit.

- Intoxication and/or speed were recorded more frequently in fatal incidents involving collision, grounding or contact damage than for other accident types. The data do not contain any more detailed information about either blood alcohol content or speed.

- The results show that lifejackets were not used in over half of the incidents involving fatalities in the 2013–2017 period. There is not enough information in the data to evaluate the effect or relevance of the use of lifejackets for the various incidents.

6.2 Suggestions for further work

The mapping work has found that, if a single set of statistics is to be kept for recreational craft accidents over time, a system will have to be established for the collation of data from multiple parties through defined parameters, in order to simplify the task and make the results more accurate.

An important aspect will be to establish procedures that guarantee that relevant incidents will be reported as completely as possible. Accidents that do not involve an acute need for immediate assistance, but that nevertheless result in significant material damage or personal injury, should also be included.

The registration system should contain functions for recording relevant information, both for the purpose of monitoring trends in recreational craft accidents and with a view to establishing measures to reduce the number of recreational craft accidents.

Accident Investigation Board Norway

Lillestrøm, 27 March 2019