

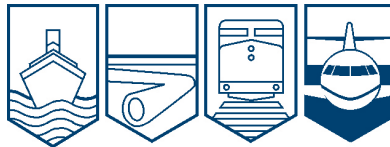
Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

MARINE INVESTIGATION REPORT

M12F0011



COLLISION

**FISHING VESSEL *VIKING STORM* AND
FISHING VESSEL *MAVERICK*
30 NAUTICAL MILES OFF LA PUSH, WASHINGTON,
UNITED STATES
28 SEPTEMBER 2012**

Canada

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Marine Investigation Report

Collision

Fishing Vessel *Viking Storm* and
Fishing Vessel *Maverick*
30 nautical miles off La Push, Washington,
United States
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Report Number M12F0011

Summary

On 28 September 2012, at approximately 0430 Pacific Daylight Time, the Canadian fishing vessel *Viking Storm* collided with the American fishing vessel *Maverick* in thick fog, 30 nautical miles off La Push, Washington. The *Maverick* capsized and sank from the impact; 3 of the 4 crew members on board survived and were rescued by the *Viking Storm*. The fourth crew member was never found and is presumed drowned.

Ce rapport est également disponible en français.

Factual Information

Particulars of the Vessels

Table 1. Particulars of the vessels

Name of vessel	<i>Viking Storm</i>	<i>Maverick</i>
Official/Licence number	800025/VRN 20093	549879
Port of registry	Vancouver, British Columbia	Seattle, Washington
Flag	Canada	United States
Type	Fishing, trawl	Fish catching vessel, longline
Gross tonnage	246	27
Length ¹	27.4 metres	11.99 metres
Draught	3.2 metres	2.5 metres
Built	1981	1973
Propulsion	Diesel engine (850 kW) driving a single fixed-pitch propeller	Diesel engine (120 kW) driving a single fixed-pitch propeller
Cargo	Approximately 118 000 kg of pacific whiting ²	Approximately 815 kg of sablefish
Crew	3	4
Registered owners	Leader Fishing Ltd., New Westminster, British Columbia (1 share) Viking Storm Holdings Inc., Clackamas, Oregon (63 shares)	Private owner, Port Angeles, Washington

Description of the Vessels

The *Viking Storm* is a large ³ fishing vessel outfitted for trawling; it has a welded steel hull and an aluminum deckhouse located forward of amidships (Figure 1). The deckhouse contains the galley, accommodations for 11 persons, the engine room entrance, and stairs to the wheelhouse.

The wheelhouse is equipped with navigation and communication equipment including radars, depth sounders, sonars, very high frequency (VHF) radiotelephones, autopilot, an automatic identification system, ⁴ chart plotters, global positioning systems (GPS), and a satellite

¹ Units of measurement in this report conform to International Maritime Organization Standards (IMO) or, where there is no such standard, are expressed in the International System (SI) of units.

² In the British Columbia fishery, pacific whiting is commonly known as “hake”.

³ Transport Canada Marine Safety and Security classifies fishing vessels exceeding 24.4 metres in length as large fishing vessels.

radiotelephone/television system. The vessel is also fitted with a watch alarm.⁵ Atop the vessel's deckhouse are four 1000-watt high-pressure sodium (HPS) floodlights. All navigation, communication, and fishing electronics are located around the seated conning position on the starboard side of the wheelhouse.

The *Maverick* was a fishing vessel of closed construction with a welded steel hull and deckhouse (Figure 2). At the time of the occurrence, the vessel was outfitted for longlining. The deckhouse was located forward of amidships and contained the conning station, galley, and master's accommodation, as well as the entrance to both the engine room and crew accommodation. The navigation and communication equipment was located near the conning station and included a radar, depth sounder, VHF radiotelephone, autopilot, chart plotter, and GPS. The vessel was not equipped with a watch alarm or an automatic identification system.

History of the Voyages

Maverick

On 25 September 2012, at 1745,⁶ the *Maverick* left La Push, Washington, for an estimated 4-day trip to longline sablefish on the fishing grounds off the Washington coast (Appendix A). The master and 3 deckhands were on board. The first 3 days of the fishing trip were uneventful; from approximately 0630 to 1900 the crew conducted fishing operations, and overnight all of the crew slept while the vessel drifted. On 27 September, the evening before the occurrence, the vessel was set up to drift overnight after fishing operations were completed.

To prepare the vessel to drift, 2 small back deckhouse lights, the anchor light, and the navigation lights were left on. As well, 2 white strobe lights on the longline flag poles were left on. The plotter, VHF radiotelephone, and radar were also left on, and the main engine was left running at idling speed.

At approximately 1930, 2 of the deckhands retired to the crew accommodations. Some 15 minutes later, the master smoked marijuana and then retired for the night. Before retiring, the master noticed



Figure 1. Photo of the *Viking Storm*



Figure 2. Photo of the *Maverick*

⁴ An automatic identification system (AIS) provides the identity, type, position, course, speed, navigational status, and range of other vessels that are also fitted with an AIS.

⁵ A watch alarm is an alarm that can be reset to go off at different intervals, as a way to keep crew members aware/awake and counter the effects of fatigue.

⁶ All times are Pacific Daylight Savings Time (Coordinated Universal Time minus 7 hours), unless otherwise stated.

2 stationary targets on the radar; they were known to be other fishing vessels in the vicinity that were drifting overnight. At approximately 2200, before retiring for the night and leaving the wheelhouse unattended, the third deckhand did a visual and radar check; he did not notice anything unusual.

Viking Storm

On the morning of 23 September 2012, the *Viking Storm* returned to Ucluelet, British Columbia, following a fishing trip (Appendix A). The vessel had been carrying a complement of 4 crew members. Upon reaching Ucluelet, 2 of the crew departed, and only 1 was replaced. The deckhand informed the master of his intention not to participate in the next trip and left the vessel after helping to unload the catch. Another crew member returned from days off and joined the vessel. That same day, the master also left for an anticipated period of 3 days, and 1 of the existing crew members took over for him. At approximately 1500, the vessel departed Ucluelet for the fishing grounds with the relief master, the mate/engineer, and the crew member on board.⁷

The vessel fished on 24 September and then drifted and jogged⁸ overnight with a 1-man watch.⁹ At 1000, on 25 September, the vessel travelled to Ucluelet to unload its catch and then returned to fishing operations on 26 and 27 September. On 27 September, at 2200, fishing operations were complete and the vessel once again departed for Ucluelet to unload its catch.

Upon departure, the relief master set up the communication and navigational equipment in preparation for a restricted visibility situation that was expected to arise at some point during the voyage. One of the radars was set to 6 nautical miles (nm) range, and the other was left on standby. The vessel's 4 HPS floodlights were left on; 2 were pointed directly in front of the vessel and 2 were illuminating the vessel's back deck. The AIS was displayed on both of the vessel's plotters. Shortly after the vessel was underway, the company dispatcher contacted the relief master with instructions to change the vessel's off-load location to Westport, Washington, extending the total voyage distance by over 200 nm. The relief master complied with the instructions and altered course for Westport.

At 2300, the relief master and mate retired to bed, and the crew member took over the watch. Before retiring, the relief master verbally provided instructions that the crew member and mate split the 7-hour wheel watch and wake him at 0600. The relief master did not leave any standing orders.¹⁰ The crew member took the first watch, during which the visibility became restricted and 4 targets were noticed on the operating radar. No adjustments were made to the navigational equipment.

On 28 September, at 0200, the crew member left the wheelhouse temporarily unattended while he went to the accommodations to wake the mate. The crew member then returned to the wheelhouse and the mate got up and attended to some engineering duties. At 0230, the mate took over the watch. As the mate was familiar with the functionality of the navigation equipment, he verified that it was set to

⁷ Due to the uncertain economics of fishing, competent crew are in short supply; both the regular master and the ship's husband had found it difficult to find crew.

⁸ Jogging requires at least 1 crew member at the con to ensure a vessel maintains position throughout the evening.

⁹ The *Viking Storm* regularly operated a 1-man watch.

¹⁰ Documented standing orders for bridge watch crews are a norm within the marine industry and comprise of explicit instructions for general and situational bridge watch procedures.

normal settings and checked the AIS display to confirm that no long-range targets were posing a risk of collision. The radar was displaying some intermittent targets.¹¹

At 0351, the mate reported to Marine Communications and Traffic Services on VHF channel 74 that the vessel was crossing latitude 48° N and was checking out of the system. The *Viking Storm* then entered the Canada/U.S. Cooperative Vessel Traffic Service while on autopilot and making approximately 7.5 knots. The mate checked the radar, which was indicating an intermittent target directly ahead of the vessel at 4 or 5 nm. He then continued to use the AIS for detection of long-range opposing targets; the intermittent target did not appear on the AIS. At approximately 0427, the mate looked out the windows and checked the AIS and radar before leaving the wheelhouse to get some food from the galley.

Collision Sequence

At the same time as the mate on the *Viking Storm* left the wheelhouse, 1 of the deckhands on the *Maverick* got up to use the washroom and, through the deckhouse windows, noticed a bright light illuminating the fog.¹² After returning from the washroom, the deckhand continued to monitor the light through the deckhouse windows for approximately 1 minute; the light was blinding until it passed above the deckhouse windows, at which time the *Viking Storm's* bow wake became visible. The *Maverick's* deckhand then shouted a warning to the master.

Meanwhile, the mate on the *Viking Storm* returned from the galley within a couple of minutes and saw the *Maverick* 30 metres directly ahead. He immediately placed the main engine controls to full astern and made a hard over starboard course alteration on the tiller control. On the *Maverick*, the master heard the deckhand's warning but had no time to take evasive action. Within seconds, the *Viking Storm's* bow struck the *Maverick's* port side at an angle of almost 90°. The collision occurred approximately 30 nm west of La Push, Washington, in position 47°57.05' N, 125°19.47' W (Appendix A).

The relief master and crew member on the *Viking Storm* got up immediately after hearing the main engine's pitch change. Both went to the wheelhouse where the relief master took control of the helm and turned the vessel around to search for the *Maverick*. The mate and crew member prepared to rescue the survivors.

The impact pushed the *Maverick* through the water and rolled the vessel onto its starboard side, at which point it began downflooding. One of the 2 deckhands escaped from the crew accommodations to the deckhouse where he joined the other deckhand and master. The master and 2 deckhands then escaped from the deckhouse by swimming through the aft door and climbing onto the port side of the vessel. Within minutes, the *Maverick* sank; the master held on to a bladder, 1 deckhand held on to a hatch cover, and the second deckhand swam directly towards the *Viking Storm*. The third deckhand was never found and is presumed drowned.

The *Viking Storm* rescued the 3 survivors within minutes in near zero visibility. Approximately 30 minutes after the rescue, the relief master on the *Viking Storm* called the United States Coast Guard (USCG) to report the collision. At 0510, USCG dispatched the motor lifeboat *Quillayute River*, the cutter

¹¹ A radar displays targets as dots on a screen. The display refreshes as the radar sweeps through 360°. To verify that a dot represents an actual target, users must wait for the target to appear on at least 2 radar sweeps (nominally 30 seconds). Intermittent targets are dots that do not appear on every radar sweep. They may indicate the presence of larger waves or smaller targets such as driftwood, birds, or small vessels. They may also be echoes from larger targets.

¹² Fishing vessels may occasionally approach one another at night to identify the vessel and gear type.

Alert, and a helicopter to the scene. The relief master on the *Viking Storm* continued to search for the *Maverick*'s missing deckhand until the *Alert* arrived at approximately 0700 and continued the search.

At around 0800, the rescued crew members from the *Maverick* were transferred from the *Viking Storm* to the *Alert*. USCG personnel then boarded the *Viking Storm* and requested urine samples from all of the crew on board. The following afternoon, the master of the *Maverick* also provided a urine sample, and the *Viking Storm* returned to Canadian waters and unloaded its catch in Ucluelet.

Damage to Vessels

The *Viking Storm*'s bow sustained minor damage above the waterline. The *Maverick* capsized and sank from the impact of the collision; the vessel was not recovered.

Environmental Conditions

At the time of the occurrence, there were light winds, low to moderate swell, fog, and near zero visibility.

Vessel Certifications

Pursuant to the *Canada Shipping Act, 2001 (CSA)*, as a fishing vessel over 24.4 metres and 150 gross tonnage, the *Viking Storm* was subject to the *Large Fishing Vessel Inspection Regulations, SOR/82-126*, and held a valid Ship Inspection Certificate.

The *Maverick*, as a fishing vessel of less than 12 metres and 27 gross tonnage, was subject to the U.S. *Code of Federal Regulations (CFR)* and held a valid USCG Certificate of Documentation.

Personnel Certification and Experience

The relief master on the *Viking Storm* had 26 years of fishing experience. He had served the last 15 years as a master on several fishing vessels and had periodically served as relief master on the *Viking Storm* in 2011. He held a Fishing Master, Second Class certificate and was in the process of upgrading his certification. The mate had 28 years of fishing experience, serving the last 4 years on the *Viking Storm*. He held a Fishing Master, Fourth Class certificate. The crew member on the *Viking Storm* had been active in the towing and commercial fishing industry for 32 years; he held a Certificate of Service as Watchkeeping Mate of a Fishing Vessel of Less Than 24 Meters and a Certificate of Service as Master of a Fishing Vessel of Less Than 60 Gross Tonnage.

All 3 crew members on the *Viking Storm* had completed marine emergency duties training. The relief master had taken some additional training needed to upgrade his certification to a Fishing Master, First Class.

The master of the *Maverick* had 46 years of fishing experience and had served as master on the *Maverick* for the past 32 years. He had taken a USCG emergency drill instructor workshop for small vessels and held the required First Aid and CPR certification. None of the deckhands on the *Maverick* had any training or held any certificate of competencies, nor were any required.

Regulatory Requirements

There are a number of regulations, both Canadian and American, in place to ensure a minimum level of safety on fishing vessels. The *Viking Storm* was subject to Canadian regulations and acts, some of which pertained to safe work practices, watchkeeping practices, safe manning, work/rest schedules, and requirements to be fit for duty. As an American fishing vessel, the *Maverick* was subject to the CFR, which contains pertinent regulations with respect to fitness for duty and drug testing.

Both vessels were subject to the *International Regulations for Preventing Collisions at Sea* (COLREGS), which apply to all vessels and provide that a proper lookout be maintained at all times and by all available means.¹³ The COLREGS also state that the appropriate signals be sounded in restricted visibility¹⁴ and that vessels not exhibit lights that impair the visibility of their navigational lights or interfere with the keeping of a proper lookout.¹⁵

Safety Responsibilities

Canadian federal regulations with respect to safety are found in both the *Marine Personnel Regulations* (MPR) and the CSA. The MPR require the vessel's authorized representative¹⁶ to provide written instructions to familiarize crew members with the operational instructions and shipboard equipment specific to the vessel, their assigned duties and to ensure they can effectively perform those assigned duties.¹⁷ The MPR also require sound navigational practices such as a 2-man watch.¹⁸ The CSA sets out the responsibilities for safety incumbent on a vessel's authorized representative, master, and crew.¹⁹

In BC, the *Occupational Health and Safety Regulations* (OHS) have similar safety requirements to that of the CSA and MPR with respect to owners, masters, and crew members. These regulations require documentation and instructions to familiarize crew members and ensure they can effectively perform their assigned duties. These instructions cover the operational characteristics of the navigation equipment and electronic aids.²⁰

¹³ *Collision Regulations, Schedule 1, International Regulations for Preventing Collision at Sea, 1972, Rule 5.*

¹⁴ *Collision Regulations, Schedule 1, International Regulations for Preventing Collision at Sea, 1972, Rule 35.*

¹⁵ Rule 20 of the *Collision Regulations* states, in part, that "...during such times no other lights shall be exhibited, except such lights as cannot be mistaken for the lights specified in these Rules or do not impair their visibility or distinctive character, or interfere with the keeping of a proper lookout."

¹⁶ Subsection 14(1) of the *Canada Shipping Act, 2001* provides that every Canadian vessel must have a person, known as the authorized representative, who is responsible for acting with respect to all matters relating to the vessel that are not otherwise assigned to another person.

¹⁷ *Marine Personnel Regulations, SOR/2007-115, Part 2, Crewing, paragraphs 206(1)(a) and (b)* state that each crew member be provided written instructions.

¹⁸ *Marine Personnel Regulations, SOR/2007-115 Part 2, Crewing, subsection 216(2) Training and Familiarization and Section 207 Minimum Complement for Work/ Rest Periods, Deck and Radio Watches.*

¹⁹ *Canada Shipping Act, 2001, Part 4, sections 106 to 114.*

²⁰ *WorkSafeBC, Occupational Health and Safety Regulations, Part 24, sections 24.71 to 24.78.*

In Canada, the responsibility for compliance with safety regulations and safe manning requirements lies with the master and the vessel's authorized representative; Transport Canada (TC) and WorkSafeBC rely on education and awareness to ensure compliance.²¹ TC may issue administrative monetary penalties (AMPs) for violations of the *Canada Shipping Act, 2001*. In this occurrence, AMPs were issued.

Safe Manning

Inspected Canadian fishing vessels of more than 15 gross tonnage, such as the *Viking Storm*, are required to comply with a safe manning document.²² This document is based on a TC evaluation of the vessel that determines the vessel's crewing requirements, including the minimum required complement, and specifies the minimum certification requirements for each crew member. The safe manning document ensures that the crew is sufficient and competent for the safe operation of a vessel on its intended voyage, and while responding to an emergency.²³ The safe manning document also specifies the voyage areas permitted and watch arrangements. The authorized representative of a vessel is required to ensure that the requirements specified in the safe manning document are met.²⁴

The *Viking Storm* was required to carry and comply with a safe manning document. The document indicated a 2-watch arrangement on board was required and specified a minimum complement of 4, including a master with a Fishing Master Third Class certification, a mate with a Fishing Master Fourth Class certification, and 2 deckhands. All crew listed on the safe manning document were required to have marine emergency duties training.

Uninspected US fishing vessels, such as the *Maverick*, are exempt from the manning requirements contained in the US CFR-Part 15.

Work/Rest Schedules

Fatigue²⁵ is a serious safety issue in the fishing community and practical, effective strategies to mitigate its effects need to be developed.²⁶ Fatigue can result from acute sleep loss, sleep debt, continuous wakefulness and circadian rhythms. There is currently limited education, few widespread awareness initiatives, and minimal safety information on fatigue, and fishermen generally do not recognize the signs of fatigue and underestimate its effects. In the past, the Board has expressed concern about hours of rest/sleep for fishing crews.²⁷

²¹ WorkSafeBC issued 472 fishing vessel inspection reports in 2012.

²² *Marine Personnel Regulations*, SOR/2007-115, Part 2, Crewing, paragraph 202.3(b).

²³ Transport Canada's Ship Safety Bulletin 05/2008.

²⁴ *Ibid*, Section 211.

²⁵ The term "fatigue" is used to refer to the body's response to sleep loss or disruption. As fatigue increases, the body is increasingly predisposed to sleep and one's ability to perform challenging tasks decreases; at the extreme, an individual is unable to stay awake.

²⁶ TSB Safety Issues Investigation Report No. M09Z0001, *Safety Issues Investigation into Fishing Safety in Canada*. The report can be accessed on the TSB website at www.tsb.gc.ca.

²⁷ TSB Investigation reports M96M0144 (*S.S. Brothers*), M09W0064 (*Velero IV and Silver Challenger II*) and M09Z0001 (*Safety Issues Investigation*).

The MPR sets out a requirement for work/rest schedules to manage fatigue, and states that the master and every crew member must have “at least 6 consecutive hours of rest in every 24-hour period, and at least 16 hours of rest in every 48-hour period” and that it must be ensured that “not more than 18 hours but not less than 6 hours elapse between the end of a rest period and the beginning of the next rest period.”²⁸ The master is required to establish and document the crew’s daily hours of work and rest.²⁹

In BC and some other provinces, OHS regulations require fishermen to declare physical or mental impairment and individuals must not be assigned activities if impairment is observed, while other provinces place emphasis on the employer-employee responsibility to create adequate work/rest schedules to reduce fatigue.

Automatic Identification System

In 2002, the International Maritime Organization (IMO) mandated that vessels over 300 tons and all passenger vessels on international voyages be fitted with an automatic identification system (AIS) Class A transceiver. In 2008, the USCG proposed a rule change to include mandatory AIS for all fishing vessels greater than 20 metres. A final ruling on the proposed change was expected by the end of 2013. Canadian regulations require AIS on vessels larger than 500 tons on domestic voyages, on vessels of 150 tons or more that are carrying more than 12 passengers, and on vessels of 300 tons or more on international voyages; however, fishing vessels are exempt.

Requirements to be Fit for Duty

Although the CSA and MPR do not contain specific regulations about the use of alcohol, drugs and medications by crew on board vessels, the *Criminal Code of Canada*, under section 253, makes it an offence for a person to have care or control of a vessel or to operate a vessel while this person’s ability is impaired by alcohol or a drug.³⁰ TC is amending the MPR to include a drug and alcohol section. The amendments will require the authorized representative to provide written policies on drug and alcohol abuse prevention, including the provision that crew avoid alcohol consumption 4 hours before taking a watch. The amendments will also require that established limits for alcohol are respected while crew are performing safety-sensitive duties. TC projects the new section will be added in 2014.

TC provides a technical publication to guide physicians during the medical examination of seafarers in lieu of specific regulations regarding alcohol and drug use by mariners.³¹ In particular, the guide sets out that there is no tolerance for anyone in a safety-critical position to use marijuana, and a mariner who reports excessive use or presents drug-related symptoms must be deemed unfit.

In BC, there are OHS regulations on fitness for duty that apply to all workplaces, including fishing vessels, under the jurisdiction of WorkSafeBC. The regulations state in part that “individuals must not

²⁸ *Marine Personnel Regulations*, SOR/2007-115, Part 2, Crewing, Section 320.

²⁹ *Ibid*, Section 323.

³⁰ Paragraphs 82(b) and 113(a) of the *Canada Shipping Act, 2001* state generally that crew must be competent, that duties must be carried out safely, and that crew must report any changes that affect their ability to carry out their duties. Subsection 90(1) also requires physicians to inform the Minister of any concerns they have about individuals who constitute a hazard.

³¹ Transport Canada, *Seafarer Medical Examinations: A Physician Guide*, 2013, sections 4.9, 4.11, and 4.22.

work if their ability is affected by alcohol, drugs, or other substances.” OHS regulations also require disclosure of any potential impairment from any source and require that employees be adequately supervised to ensure any impairment is effectively identified and managed.³²

The CFR applies to the U.S. fishing industry and requires that no commercial vessel be operated by an intoxicated crew member.³³ Individuals are considered intoxicated if their blood alcohol concentration is 0.04 or more, or if their general appearance or behavior clearly demonstrates intoxication.

Fishing vessel owners have the responsibility to ensure the safe operation of their vessels. The owners of the *Viking Storm* required the crew to sign a contract indicating that the use or possession of any alcohol, drugs, narcotics, or undisclosed prescription medication was unauthorized, as was reporting for duty under the influence of any drugs, alcohol, or narcotics. The owners also required their vessel masters to sign a contract obligating them to ensure that illegal drugs were not brought aboard or used aboard the vessel and that alcohol was not brought aboard or used aboard unless approved in writing by the owners.

The owners of the *Maverick* did not have formal policies in place with respect to the use of alcohol or drugs. The investigation determined that the master regularly used marijuana while on board the vessel, and some of the other deckhands regularly used marijuana and occasionally used alcohol while on longer fishing trips.

Fishing Operations

In BC, the pacific whiting fishery takes place mostly off the west coast of Vancouver Island. It is mainly a daylight fishery; minimal harvesting is done at night. If the vessels stay on the fishing grounds overnight, they ordinarily drift and jog to stay in position, which necessitates a 1-man watch at minimum.

On the *Viking Storm*, the pacific whiting quota allowed the fishing operation to run continuously on a daily basis through July, August, and September. Typically, the *Viking Storm* needed 3 tows over 2 days to fill its holds, at which point the vessel usually unloaded in Ucluelet and then returned to fishing operations. Ordinarily, the *Viking Storm* operated with a 5-man staff working on a rotation system. Each of the 4 certified crew took 1 week off every 3 weeks, while the deckhand worked every trip.

Crew Work/Rest Schedules

On a typical voyage, the master or relief master was in the wheelhouse and on watch from 0600 to 2100 and was responsible for finding fish and deciding the location, duration, and heading of the tows. The crew schedules were adjusted to ensure that the master/relief master slept at night. Generally, the vessel operated with a 1-man watch system, which left 8 hours of watch time to be divided between the 2 certified crew.

On this voyage, the *Viking Storm* departed Ucluelet on 23 September with 3 crew, reaching the fishing grounds at 0600 on 24 September. The crew were involved in fishing operations until approximately

³² WorkSafeBC, *Occupational Health and Safety Regulations*, Part 4, Section 4.20.

³³ *United States Code of Federal Regulations*, Title 33, Chapter 1, Subchapter F, Part 95.

2000, at which time the vessel drifted and jogged throughout the evening. On 25 September, the vessel made 1 tow early in the morning and then departed at approximately 1000 for Ucluelet. It arrived and began unloading at 0200 on 26 September. One of the crew was available to help during the unloading process. After unloading, the vessel returned to the fishing grounds and started fishing at 1700. Before they arrived, the mate and crew member had an opportunity to rest for approximately 2 hours. Fishing operations were completed at 2200, at which time the vessel drifted and jogged for the evening.

On the day before the occurrence, the mate woke at approximately 0630 after approximately 4.5 hours of sleep. He remained awake and was involved in fishing operations until 2300. The afternoon tow was long and afforded him with a 2-hour rest period during which time the mate ate, read and watched TV. On the night of the occurrence, the mate had 3 hours of sleep after fishing operations before being woken at 0200 to attend to engineering duties and take over the watch (Appendix B).

At the time of the occurrence, there was no specific fatigue management plan in place on the *Viking Storm*.

Toxicology Tests

Viking Storm

At approximately 0900, on 28 September (4.5 hours after the collision), all of the crew members of the *Viking Storm* provided urine samples to the USCG. No ethanol (alcohol) was detected in the urine samples; however, some of the samples contained tetrahydrocannabinol carboxylic acid (THC), the principal psychoactive component of marijuana.³⁴

Maverick

The master and 2 deckhands on the *Maverick* were not tested immediately following the occurrence but were reminded of their responsibilities to undergo drug and alcohol testing as per the CFR.³⁵ Once the crew members of the *Maverick* arrived at the USCG station in La Push later that day, they underwent breathalyzer tests. The results of these tests were negative. Following the occurrence, only the master provided a urine sample, which tested positive for THC.

Toxicology Assessments

The value of urinalysis is generally limited to demonstrating exposure to drugs or alcohol; impairment cannot conclusively be determined from a urine sample.³⁶ In the case of marijuana, repeated or prolonged exposure can result in significant build-up of the drug within the body, meaning that there

³⁴ The U.S. uses a cut-off of 0.05 ug/mL to determine whether an individual has been exposed to THC.

³⁵ *United States Code of Federal Regulations*, Title 46, Chapter 1, Subchapter A, Part 4, Subpart 4.06.

³⁶ D.E. Moody, K.M. Monti and D.J. Crouch, "Analysis of Forensic Specimens for Cannabinoids. II. Relationship Between Blood Δ^9 -Tetrahydrocannabinol and Blood and Urine 11-nor- Δ^9 -Tetrahydrocannabinol-9-carboxylic Acid Concentrations." *Journal of Analytical Toxicology*, 16, (1992): pp. 302 to 306.

is little relationship between intoxication or impairment and urine concentrations of THC metabolites.³⁷ Detection of THC metabolites in urine only demonstrates prior exposure to THC.

Effects of Marijuana

Marijuana has effects on an individual's mood (reduction in anxiety, depression, alertness, and tension); perception (enhanced perception of some stimuli, distorted perception of time); and decrements in cognitive and psychomotor performance (decreased ability to concentrate, decreased memory and information processing ability).³⁸ Onset of the effects of THC is rapid when marijuana is smoked and somewhat slower if it is ingested. The duration of these effects is dependent on the dose and is not well understood. While the majority of the effects will be felt by users within 2 to 3 hours after ingestion, flight simulator studies have shown that decrements in cognitive and motor functions may persist for over 24 hours with the subject being unaware of the level of impairment.^{39, 40}

Safety Issues Investigation into Fishing Safety in Canada

In August 2009, the TSB undertook an in-depth safety issues investigation into fishing vessel safety in Canada. The resulting *Safety Issues Investigation into Fishing Safety in Canada* (SII) report was released in June 2012 and provides an overall, national view of safety issues in the fishing industry, revealing complex relationships and interdependencies among these issues. The Board identified the following significant safety issues requiring attention: stability, fisheries resource management (FRM), lifesaving appliances, training, safety information, cost of safety, safe work practices, regulatory approach to safety, fatigue, and fishing industry statistics.⁴¹

³⁷ C.H. Ashton, "Pharmacology and Effects of Cannabis: A Brief Review." *British Journal of Psychiatry*, 178, 101-106 (2001): 104 -105.

³⁸ Ibid.

³⁹ Ibid.

⁴⁰ National Highway Traffic Safety Administration, *Drugs and Human Performance Fact Sheets*, Report number DOT HS 809 725, April 2004.

⁴¹ TSB Safety Issues Investigation Report No. M09Z0001, *Safety Issues Investigation into Fishing Safety in Canada*. The report can be accessed on the TSB website at www.tsb.gc.ca.

Analysis

Events Leading to the Collision

The *Maverick* had been drifting without a lookout overnight and, in the hours preceding the occurrence, the mate on the *Viking Storm* had not been maintaining a proper watch, primarily focusing his attention on the automatic identification system (AIS) for detection of long-range opposing targets. When the mate identified an intermittent radar target almost directly ahead of the vessel at 4 or 5 miles, the radar was not used to plot the target, nor was the second radar used to verify the target. Just before the collision, the mate checked the AIS and radar and did a visual check for any traffic before leaving the wheelhouse unattended.

At approximately the same time the mate on the *Viking Storm* left the wheelhouse unattended, the deckhand on the *Maverick* got up and noticed a glow illuminating the fog outside, which was caused by the *Viking Storm's* high-pressure sodium (HPS) lights. Initially, the deckhand was not concerned, as fishing vessels occasionally approach at night. However, as the glow became brighter, he grew concerned by the approach of the other vessel. By this time, the intensity of the HPS lights on the *Viking Storm* impaired the deckhand's vision and ability to determine the vessel's aspect, delaying the taking of evasive action. The mate on the *Viking Storm* returned to the wheelhouse within a few minutes of having left it and saw the *Maverick* 30 metres directly ahead. Despite an immediate manoeuvre to avoid the collision, it was too late to be effective and the *Viking Storm* struck the *Maverick* within less than 10 seconds. Neither vessel sounded the required signals once the visibility became restricted.

Fatigue

Fishermen accept fatigue, mostly related to physical exertion and long work days, as a normal part of doing business. On average, a person needs about 8 hours of sleep per day, preferably obtained during 1 sleep period. A person obtaining less than the required amount of sleep develops a sleep debt, which results in performance degradation and errors due to lack of attention, alertness, and vigilance. The vast majority of fishermen report that they do not get 8 hours of uninterrupted sleep either on the vessel or at home between fishing operations and, as a result, use rest periods or napping to reduce tiredness.⁴²

Although the crew on the *Viking Storm* indicated they had time to rest during extended harvesting periods, they did not demonstrate an understanding that consecutive hours of sleep, as opposed to rest, are required to restore the cognitive functions required to maintain a watch. The crew on the *Viking Storm* managed fatigue by operating a 1-man watch system and resting/napping during the days and evening. From their perspective, rest included such activities as meal breaks, watching TV and reading. The crew therefore performed their duties under the belief that a combination of unpredictable rest periods during down time, together with short periods of sleep (3 to 4 hours) during the night, was sufficient to maintain human performance during their night-time watch shifts (typically 3 to 4 hours).

⁴² TSB Safety Issues Investigation Report No. M09Z0001, *Safety Issues Investigation into Fishing Safety in Canada*. The report can be accessed on the TSB website at www.tsb.gc.ca.

This is not an uncommon belief among fishermen. During the guided discussions conducted across Canada as part of the Transportation Safety Board (TSB) safety issues investigation,⁴³ other fishermen commented that insufficient, fragmented sleep and variable work/rest schedules are commonplace, and equated resting with sleeping in terms of its restorative capacity.

If fishermen equate resting with sleeping in terms of its restorative capacity, there is a risk that they underestimate the continuous hours of sleep necessary to restore their cognitive functions.

At the time of the occurrence, the mate on the *Viking Storm* presented 4 fatigue factors:

- Acute sleep loss
 - The mate was a light sleeper but typically felt fully rested with 7 hours of sleep. On the 3 nights before the occurrence, the mate had slept 3 hours, 4.5 hours, and 3.5 hours respectively.
- Sleep debt⁴⁴
 - Since the beginning of this fishing trip on 23 September, the mate had accumulated approximately 19 hours of sleep debt from his normal restful 7-hour sleep period per day.
- Continuous wakefulness
 - Before the occurrence, the mate was awake for 19 out of the preceding 22 hours with only a short rest period.
- Circadian timing⁴⁵
 - The occurrence was at 0430, a time typically associated with low arousal.

Given the fatigue factors above, it is highly likely that the mate's cognitive abilities were reduced.

Without a fatigue management plan that considers fishing operations and the need to ensure uninterrupted sleep, crew members may not be sufficiently rested to safely perform their duties.

Work/Rest Requirements

The traditional way of managing fatigue in the commercial fishery is through regulated work/rest schedules; however, data suggests that regulating these schedules as the sole means of managing fatigue in a marine environment is ineffective,⁴⁶ given that these schedules do not contain any significant fatigue management measures.

On the *Viking Storm*, the crew were subject to fatigue due to the fishing operations schedule. The ad hoc schedule of rest periods did not provide adequate opportunities for restorative sleep, and the unpredictable nature of the fishing operations made it difficult to maintain regular schedules.

⁴³ Ibid.

⁴⁴ A person obtaining less than the required sleep develops a "sleep debt" and will be subject to performance degradation. Sleep debt is cumulative. It is not possible to store sleep.

⁴⁵ D.J. Frey, P. Badai and K.P. Wright Jr., "Inter- and Intra-Individual Variability in Performance Near the Circadian Nadir During Sleep Deprivation," *Journal of Sleep Research*, 13 (2004): pp. 305 to 315.

⁴⁶ Andy Smith, *Adequate Crewing and Seafarers' Fatigue: The International Perspective* (London: International Transport Federation, 2007).

Operational Decisions

Decision making is a complex process of weighing risks. Research into human behavior has demonstrated that when people must make a decision, they tend to frame the decision as a choice between gain and loss. Studies find that when forced to choose between 2 options, people will select the option that presents a perceived gain (despite associated risks) over the option that presents a certain loss; ^{47, 48} this is called negative framing bias. In this occurrence, the potential financial benefit (perceived gain) of continuing fishing operations (despite the risk of sailing without a full complement) was assessed against the negative outcome of lost time and money (certain loss) incurred by waiting for the regular crew to be available or finding a temporary crew member, and the resulting decision to sail was made.

Assessment of risk is dependent upon identifying a hazard, determining the negative outcomes of the hazard and weighing the likelihood that the negative outcomes will occur. Assessments of risk vary depending on an individual's training, awareness, and experience with detecting hazards and assessing their likelihood. In a group situation, an individual's assessment of a risk may also be influenced by others' attitudes towards it. Individuals who have not experienced the consequences of a hazard tend to rate the likelihood of a negative outcome as minimal.

Fishermen generally perceive the likelihood of an accident as being very low. During the safety issues investigation, the TSB consulted with fishermen, some of whom reported that they have fished for many years without an accident relying only on common sense. In fishing operations that do not have a formal process for identifying hazards, crew perception of risk is dependent only on their ability to assess the likelihood of negative outcomes. When a negative outcome is perceived as unlikely, there is less chance that the steps necessary to mitigate a hazard will be taken (for example, training in hazard awareness and regulatory compliance).

If a crew does not have a formal process for identifying and managing risks, there is a risk that operational decisions will be made without due regard to safety.

Safe Manning

A safe manning document is in place to ensure an adequate complement of certified crew members are on board, enabling the safe operation of a vessel. Safe operation includes ensuring that all crew members are able to obtain the consecutive hours of rest as specified by the *Marine Personnel Regulations* (MPR).

The usual crew complement for the *Viking Storm* consisted of a master, 2 certified crew, an uncertified deckhand on board and one on leave. This crew complement, as specified by the vessel's safe manning document, did not allow the relief master to configure a schedule for the 2 experienced crew that met

⁴⁷ David O'Hare and Tracy Smitheram, (1995) "Pressing On' Into Deteriorating Conditions: An Application of Behavioral Decision Theory to Pilot Decision Making", *The International Journal of Aviation Psychology*, 5: 4, pp. 351 to 370.

⁴⁸ Amos Tversky and Daniel Kahneman, "The Framing of Decisions and the Psychology of Choice," *Science*, 211, 4481 (1981): pp. 453 to 458.

both the fishing operational requirements and the consecutive hours of rest required by the MPR.⁴⁹ As such, the relief master was unable to establish regular daytime restorative sleep periods for the crew members to ensure they were sufficiently rested for the night watch. Minimum safe manning requirements that do not consider the various aspects of fishing operations may result in crew members not being provided opportunities to achieve the required hours of rest.

In this occurrence, the *Viking Storm* did not have a fourth crew and consequently did not meet the safe manning requirements. The shortage in manning was anticipated to be short term, as the regular master was scheduled to return in 3 days. The authorized representative (AR) was not informed that the crew complement did not comply with the safe manning document. On the *Viking Storm*, the risks of not complying with the safe manning document were considered to be low, and there was a perception that a fourth deckhand was unnecessary for the operation.⁵⁰ Given the certain negative outcome (lost time and money) of postponing fishing operations until a fourth deckhand could be found, the perceived gain of continuing fishing operations outweighed the risk of operating without a full complement, and the resulting decision to sail was made.

Watchkeeping Practices

Watchkeeping practices help to ensure the safe operation of a vessel and are necessary to minimize the risk of collision. Watchkeeping incorporates sight, sound, all available radars, chart plotters, AIS, a 2-man watch and radios, and helps fishermen make a full appraisal of situations and identify any risk of collision. However, the degree to which safe watchkeeping practices are in place on a vessel depends on various factors: training, regulations, safety information, economics, experience, and the perception of risk.

In this occurrence, neither the *Maverick* nor the *Viking Storm* maintained a lookout at all times and by all available means, nor did they use any sound signals when visibility became restricted. On the *Maverick*, it was a common practice for all crew members to retire for the evening and not maintain a lookout.⁵¹ The *Viking Storm* regularly operated a 1-man watch, and occasionally left the watch unattended, only setting the watch alarm when a risk of collision was perceived or when the vessel was travelling close to shore.

By leaving the HPS lights on after fishing operations had ended for the day on 27 September, the ability of the *Maverick's* deckhand to see the *Viking Storm* or its navigation lights was impaired. The HPS lights, in combination with the fog, obscured the deckhand's ability to identify the risk of collision and delayed his taking immediate action. In order to identify a vessel's aspect at night, it is imperative that a vessel's navigational lights be visible. A vessel underway while displaying lights other than those intended for navigation may hinder the ability of other vessels to determine its aspect, placing both that vessel and other vessels at risk.

⁴⁹ *Marine Personnel Regulations*, SOR/2007-115, sections 320 and 321.

⁵⁰ Within the fishing community, there is limited information and a lack of educational programs dedicated to increasing awareness of the risks associated with not properly maintaining a watch or not properly manning a vessel.

⁵¹ In a letter dated June 10, 2005, the USCG responded to a request that a small fishing vessel fleet, operating off the Washington/Oregon coast, be exempted from the requirement to maintain a lookout at all times. As part of its response to this request, the USCG refers to the fleet's practice of drifting at night without a lookout, stating that it is unacceptable.

Although the *Viking Storm's* crew were trained and certified to perform navigational duties and were aware of the requirements to apply sound watchkeeping practices, these practices were not in place on the vessel. Neither vessel carried any documented safe watchkeeping practices. In this occurrence, the perception of risk was minimal and the safety benefits of good watchkeeping practices were underestimated. Even though the crew were trained on watchkeeping practices, the real safety benefit only comes when the crew regularly practice and apply the skills they have learned.

The United States Coast Guard (USCG) has no training requirements or certificates of competency for fishing vessels less than 200 tons, gross tonnage. As such, none of the crew on the *Maverick* had any watchkeeping training, and the master was unaware of the requirement in the *International Regulations for Preventing Collisions at Sea* (COLREGS) to maintain a proper lookout at all times.

Overreliance on Automatic Identification Systems

An AIS enhances a user's situational awareness and can provide reliable information to help mitigate the risk of collision with other vessels that are also fitted with AIS. Nonetheless, the use of AIS does not relieve watchkeepers from other collision avoidance requirements, such as maintaining a lookout, using all available means for detection of a risk of collision, or sounding whistle signals in restricted visibility. While AIS is an effective means to augment standard tools, it must not be relied upon as the primary means for long-range detection of the risk of collision.

The *Viking Storm* was fitted with AIS, which was being used for long-range vessel detection at the time of the occurrence. With its accessibility, ease-of-use and interactive data displayed on 2 chart plotters, the AIS became the navigational focus and the primary means for detecting the risk of collision. The *Maverick* was not fitted with AIS, eliminating the chances of being identified by that means by the *Viking Storm*.

If AIS are used for vessel detection and collision avoidance without the use of other collision avoidance tools, vessels fitted with AIS and those without may be at risk.

Requirements to be Fit for Duty

Individuals in charge of a watch or lookout on board a fishing vessel are responsible for its safety. The use of alcohol, drugs and/or medications can reduce performance and result in safety risks.

In this occurrence, some toxicology samples for the crew of the *Viking Storm* indicated exposure to tetrahydrocannabinol carboxylic acid (THC). The master on the *Maverick* tested positive for THC and regularly used marijuana while on board the vessel. Some of the other deckhands on board the *Maverick* regularly used marijuana and occasionally used alcohol.

As part of guided discussions during the TSB's safety issues investigation, fishing community members across the country reported that the use of marijuana was quite widespread within the fishing industry.

While performance impairment could not be demonstrated in this occurrence, the information available indicates that some of the crew on both vessels used or were in the practice of using marijuana before and/or during service aboard. The practice may have resulted from either a lack of awareness, or an acceptance, of the potential detrimental performance effects of these substances. A

lack of understanding with respect to drug-related impairments may mean that fishermen underestimate these potential impairments, increasing the likelihood that they may be unfit for duty and thereby place the vessel and crew at risk.

Neither the *Canada Shipping Act, 2001* (CSA) nor the MPR contain an explicit requirement for crew to be free from the performance effects of alcohol, drugs or medications while serving aboard a vessel. Currently, guidance is provided by a Transport Canada technical publication and general provisions in the CSA which require the master to ensure the crews are competent to perform their duties and those duties to be carried out in a way which does not present a danger.

In contrast, Section 602.03 of the *Canadian Aviation Regulations* is explicit in this regard and states that “no person shall act as a crew member of an aircraft [...] within eight hours after consuming an alcoholic beverage; while under the influence of alcohol; or while using any drug that impairs the person’s faculties to the extent that the safety of the aircraft or of persons on board the aircraft is endangered”.

In BC, there are occupational health and safety (OHS) regulations in place for workers to be fit for duty which must be met by all workplaces, including fishing vessels, under the jurisdiction of the WorkSafeBC.

Without an explicit requirement for all mariners to be free from the performance effects of alcohol or recreational drugs while serving on board a vessel, there is an increased risk that mariners may knowingly or unintentionally be impaired while serving in a safety-sensitive position.

Safety Management

Although currently not required by regulation in the fishing industry, a safety management system (SMS) provides a formal mechanism which assists in developing a culture of identifying hazards, establishing strategies to minimize risks, and then tracking the effectiveness of those strategies. Effective management of risks is a key component of any safely-functioning operation. Although an SMS is not a requirement on fishing vessels, it is a good approach to maintaining safe operations and initiating collaborative and coordinated actions by all those responsible for safety.

Without the basic elements of an SMS, there is a risk that crew members may not have the guidance required to safely operate the vessel.

Safety Issues

The *Safety Issues Investigation into Fishing Safety in Canada* (SII) categorized actions impacting safety into 10 significant safety issues and found that there are complex relationships and interdependencies among them. These safety significant issues are further analyzed in the SII.⁵² In this occurrence, 6 of these 10 significant safety issues were present. The following practices and procedures relating to these 6 significant safety issues identified in the SII were also evident in this occurrence:

⁵² TSB Safety Issues Investigation Report No. M09Z0001, *Safety Issues Investigation into Fishing Safety in Canada*. The report can be accessed on the TSB website at www.tsb.gc.ca.

Safe Work Practices

Safety issues investigation finding	Relationship to this occurrence
Fishermen learn and reinforce their operating practices based on experience and exchanges with peers.	Operating a 1-man watch and not maintaining a lookout at all times are operating practices that were learned and reinforced by fleet practices and past experiences.
Fishermen change or eliminate some safe work practices to meet economic pressures.	The <i>Viking Storm</i> did not wait for replacement crew and departed for the fishing grounds without a full complement of crew to avoid a negative financial impact.
In some cases, fishermen practice safe work practices only to comply with regulations.	The normal practice for the <i>Viking Storm</i> was to carry the required number of crew of 4, even though the extra deckhand was not certified, not needed for fishing operations, and did not take or accompany a watch.

Fatigue

Safety issues investigation finding	Relationship to this occurrence
Fishermen accept fatigue as a normal part of doing business.	The mate on board the <i>Viking Storm</i> had 4 fatigue risk factors which likely impacted his cognitive abilities.
Fishermen generally do not recognize the signs of fatigue or understand its effects.	Crew members mostly related fatigue to physical exhaustion, which is only 1 sign of fatigue.
Fishermen report using coffee, cigarettes and naps to reduce the effects of fatigue.	On occasion, the crew on the <i>Viking Storm</i> would nap to reduce the effects of fatigue; however, naps alone do not replace the need for restorative sleep.
Fishermen may need to participate in consecutive fisheries, which lead to fatigue.	The <i>Viking Storm</i> was provided additional quota, allowing it to harvest pacific whiting continuously for several months.
Fishermen reduce crew or hire less experienced crew, adding to workload.	The <i>Viking Storm</i> departed Ucluelet, BC with 3 crew members, which increased workload.

Regulatory Approach to Safety

Safety issues investigation findings	Relationship to this occurrence
Fishermen resist regulations that are not sensitive or adaptable to fishing operations.	The <i>Viking Storm</i> operated with a 1-man watch to accommodate fishing operations.

Training

Safety issues investigation findings	Relationship to this occurrence
Fishermen generally conduct their business based on knowledge, skills, and attitudes gained primarily through experience.	On the <i>Maverick</i> , none of the crew held any certificates of competency; they relied solely on their experience.
Fishermen assess and manage risk based on experience.	In this occurrence, the crew did not have training in identifying and managing risks. Therefore, operational decisions with respect to watchkeeping were made without due regard to safety.

There was no training required for the operator on the *Maverick* and the master was unaware of basic collision regulations. The *Viking Storm*, on the other hand, required 2 certified crew to be on board at all times, but some basic watchkeeping practices were not followed.

Safety Information

Safety issues investigation findings	Relationship to this occurrence
Fishermen do not always seek out safety information and do not find it readily accessible.	The master of the <i>Maverick</i> was unaware of any safety information relating to the COLREGS.

Cost of Safety

Safety issues investigation findings	Relationship to this occurrence
Fishermen see the likelihood of an accident as very low.	The need for a 2-man watch and the need to maintain a lookout was considered unnecessary, as the likelihood of an accident was not perceived.
Fishermen have to consider economics which may negatively impact decisions aboard fishing vessels.	The <i>Viking Storm</i> did not wait for a replacement crew member and departed for the fishing grounds without a full complement; waiting would have had a negative financial impact.

Interdependency of Safety Issues

In this occurrence, there were a number of interrelated unsafe conditions and safety issues on both vessels (Appendix C). Within the fishing industry, past attempts to address these safety issues on an issue-by-issue basis have not led to the intended result: a safer environment for fishermen. The SII emphasized that to obtain real and lasting improvement in fishing safety, change must address not just one of the safety issues involved in an accident, but all of them, recognizing that there is a complex relationship and interdependency among those issues. For example, on the *Viking Storm*, the inability to recognize the signs of or manage fatigue had a complex relationship with

- access to and availability of practical training;
- work practices;
- regulatory approach to safety;
- access to and comprehension of safety information; and
- the cost of safety.

Removing a single unsafe condition may prevent an accident, but only slightly reduces the risk of others. The safety of fishermen will be compromised until the complex relationship and interdependency among safety issues is recognized and addressed by the fishing community.

Findings

Findings as to Causes and Contributing Factors

1. The *Maverick* was drifting overnight without maintaining a lookout.
2. Leading up to the collision, the mate on the *Viking Storm* was not maintaining a proper watch by all available means to detect and mitigate the risk of collision; in addition, just before the collision, he left the wheelhouse unattended.
3. It is highly likely that the cognitive abilities of the mate on the *Viking Storm* were reduced due to fatigue resulting from a combination of acute sleep loss, continuous wakefulness and circadian rhythm timing.
4. The high-pressure sodium lights on the *Viking Storm* impaired the vision and ability of the deckhand on the *Maverick* to determine the vessel's aspect, delaying the taking of evasive action.
5. No sound signals were used by either vessel despite the restricted visibility in the hours leading up to the collision.

Findings as to Risk

1. The safety of fishermen will be compromised until the complex relationship and interdependency among safety issues is recognized and addressed by the fishing community.
2. If automatic identification systems (AIS) are used for vessel detection and collision avoidance without the use of other collision avoidance tools, vessels fitted with AIS and those without may be at risk.
3. A vessel underway while displaying lights other than those intended for navigation may hinder the ability of other vessels to determine its aspect, placing both that vessel and other vessels at risk.
4. If a crew does not have a formal process for identifying and managing risks, there is a risk that operational decisions will be made without due regard to safety.
5. If fishermen equate resting with sleeping in terms of its restorative capacity, there is a risk that they may underestimate the continuous hours of sleep necessary to restore their cognitive functions.
6. Minimum safe manning requirements that do not consider the various aspects of fishing operations may result in crew members not being provided opportunities to achieve the required hours of rest.

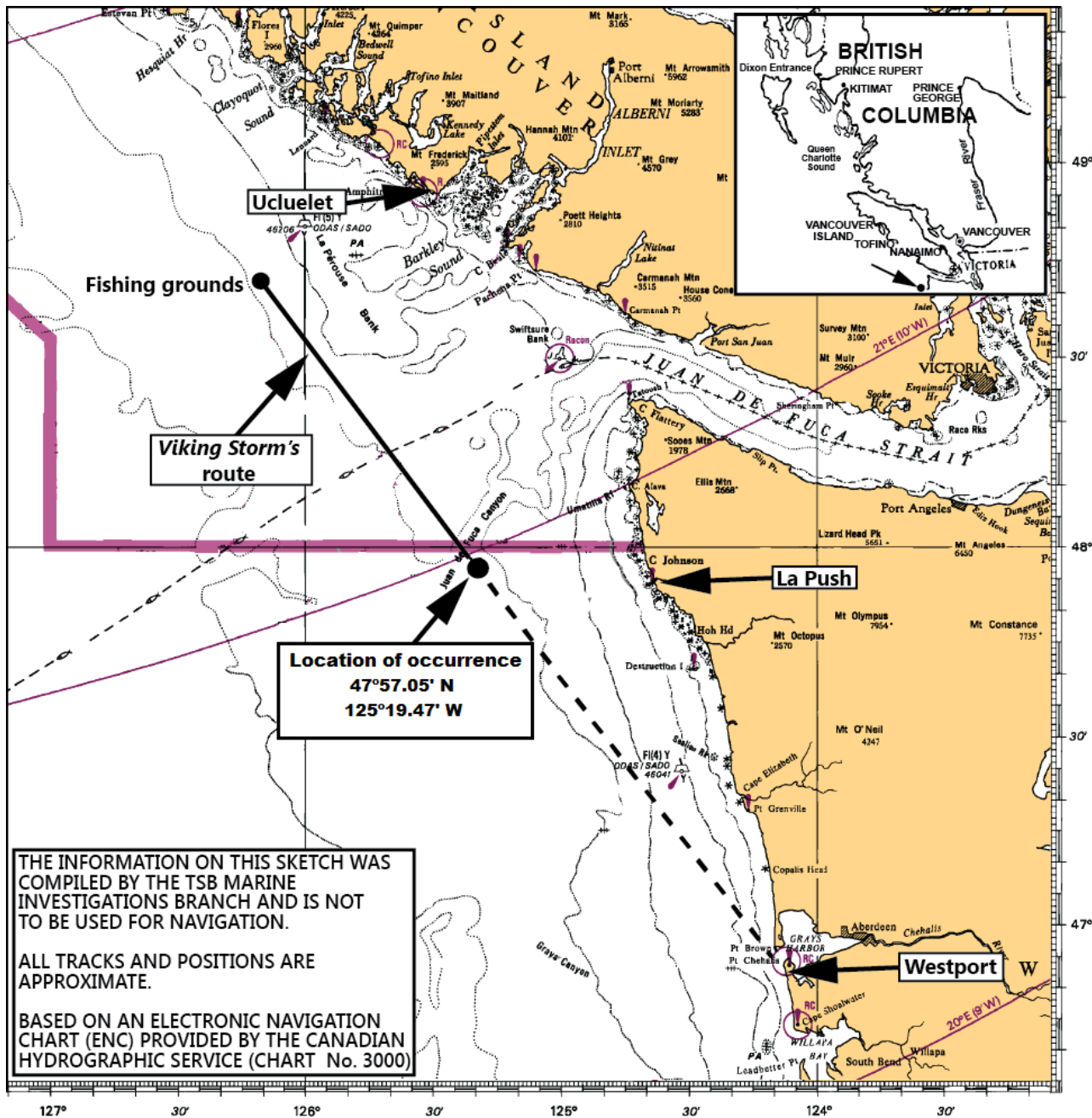
7. Without a fatigue management plan that considers fishing operations and the need to ensure uninterrupted sleep, crew members may not be sufficiently rested to safely perform their duties.
8. Without the basic elements of a safety management system, there is a risk that crew members may not have the guidance required to safely operate the vessel.
9. If individuals are not free from the performance effects of alcohol and recreational drugs while serving on board a vessel, there is an increased risk that accidents will occur.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 6 November 2013. It was officially released on 21 January 2014.

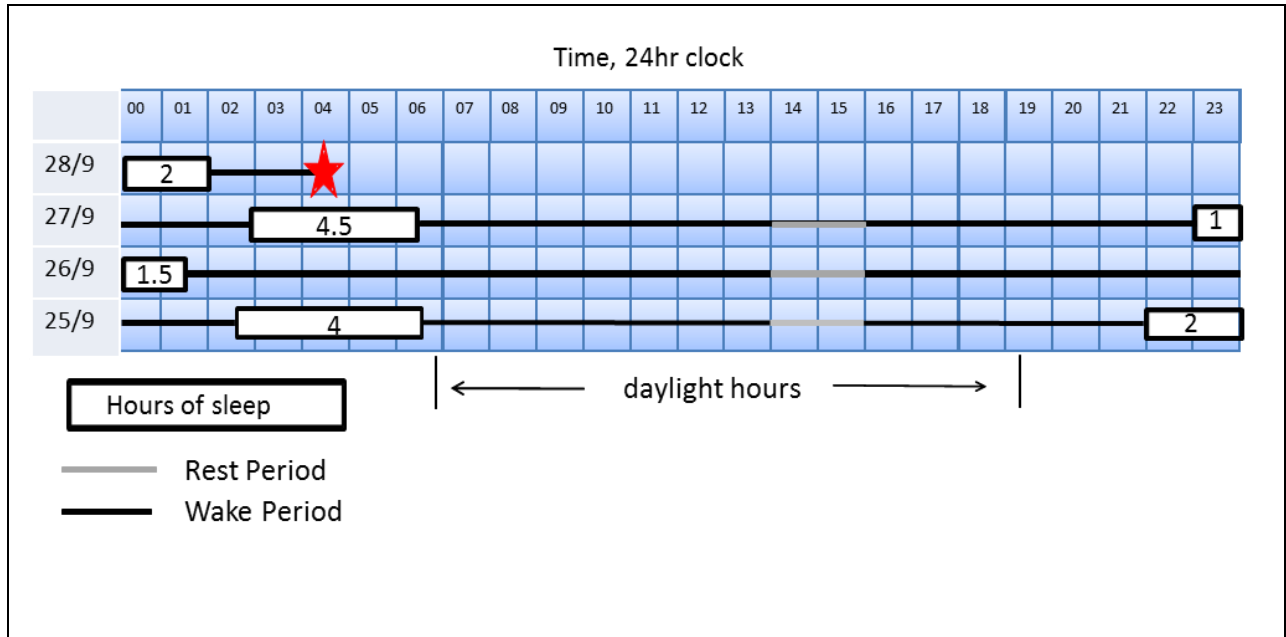
Visit the Transportation Safety Board's website (www.bst-tsb.gc.ca) for information about the Transportation Safety Board and its products and services. You will also find the Watchlist, which identifies the transportation safety issues that pose the greatest risk to Canadians. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.

Appendices

Appendix A- Area of the Occurrence



Appendix B – Sleep/rest/work schedule for the mate on the Viking Storm



Appendix C – Unsafe Conditions and Associated Safety Issues

Unsafe conditions	Safety issues					
	Fatigue	Work practices	Cost of safety	Training	Regulatory approach	Safety information
Neither vessel maintained a proper lookout	X	X	X	X	X	X
Neither vessel used sound signals		X		X	X	X
Operating below the required crew complement	X	X	X	X	X	X
Operating a 1-man watch system	X	X	X	X	X	X
Navigational focus on AIS	X	X		X	X	X
Not using all available means to detect vessels	X	X		X	X	X
HPS lights on while vessel was underway		X		X	X	X
Crew performing duties without the required rest periods	X	X	X	X	X	X