

Work-Related Mobility and Fatigue on the Great Lakes and St. Lawrence River: Canadian Seafarers' Experiences

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Introduction

Shipping is a safety-critical industry, and seafaring is a demanding job (Sampson, 2013; Walters & Bailey, 2013). The fact that by nature, ships are operationally mobile 24/7 raises a series of health and safety concerns. “Just work and sleep” describes life on board for short-sea seafarers, alternating between demanding work and rest (Pauksztat, 2017). Fatigue has attracted increasing research attention, due to its implications for seafarers' health and well-being and for navigation safety (Jepsen, Zhao, & van Leeuwen, 2015; Oldenburg, Baur, & Schlaich, 2010; Smith, 2007). From the perspective of human rights, legal scholars argue that the enforcement of hours of rest and a minimum manning standard constitute effective measures for reducing seafarers' fatigue (Li & Ng, 2002). These studies provide an important analysis of the contributing factors of job demands to fatigue in a confined environment – such as long hours of work and inadequate manning levels on board. However, they ignore the impact of mobility – in particular various patterns of employment-related mobility – on seafarers' experiences of fatigue. In addition, these studies focus on international seafarers, or short-sea seafarers in Europe, and less research attention has been paid to Canadian seafarers' experiences of fatigue (Jepsen et al., 2015; Oldenburg et al., 2010; Pauksztat, 2017; Wadsworth, Allen, McNamara, & Smith, 2008). To fill the research gaps and drawing on 20 in-depth interviews with seafarers and managers from Canadian shipping companies operating vessels on the Great Lakes and St. Lawrence River, this research explores Canadian seafarers' experiences of work-related mobility and how it affects their fatigue level.

The demanding nature of work on board, long working hours and living in an isolated and confined environment for a prolonged period of time, are identified as contributing factors to seafarers' experiences of fatigue (Hystad & Eid, 2016; Oldenburg et al., 2010; Wadsworth et al., 2008; Wadsworth, Allen, Wellens, McNamara, & Smith, 2006). Fatigue not only creates negative effects on seafarers' health and well-being, but also affects seafarers' decision-making skills and jeopardizes maritime safety (Rothblum, 2000). Legal researchers argue that the right to rest and the right to adequate manning are key measures to prevent seafarers from suffering fatigue on board (Li & Ng, 2002). Accordingly, minimum hours of rest for international seafarers are stipulated in the *Manila Amendments to the Seafarers' Training, Certification and Watchkeeping (STCW) Code* of the International Maritime Organization, and the *Maritime Labour Convention, 2006* of the International Labour Organization. In terms of the right to adequate manning,¹ Stevenson (1996) argues that maritime authorities are able to keep seafarers from fatigue by requiring shipowners to place adequate crew on board. However, even following enforcement of these rules, fatigue is still widely reported among seafarers. One sociological research paper suggests that the burden of legal compliance – such as preparing records of rest hours – have been shifted from shipowners to seafarers, with an increased fatigue level experienced by seafarers (Sampson, Acejo, Ellis, Tang, & Turgo, 2016).

Fatigue refers to “a reduction in physical and/or mental capability as the result of physical, mental or emotional exertion which may impair nearly all physical abilities, including: strength; speed; reaction time; coordination; decision making; or balance.” (International Maritime Organization, 2001). Smith, Allen, and Wadsworth (2006) argue that acute fatigue may be induced by a number of factors: lack of or poor quality sleep; long working hours; excessive workload; and noise, vibration and motion. Chronic fatigue can be

¹ Presented at the 53rd Annual Meetings of the Canadian Transportation Research Forum, June 3-6, 2018 at Gatineau, Quebec.

due either to repeated exposure to acute fatigue, or can represent a failure to rest. Pauksztat (2017) further argues that ship's schedules, the organization of cargo operations and duration of port calls also affect fatigue levels for seafarers. Sampson et al. (2016) also point to the interaction with shore personnel – including managers from head office, port inspectors and charterers – as another source of pressure leading to fatigue for seafarers. Among the causes of fatigue, factors related to a mobile working environment – such as motion sickness – is reported to be a major cause of fatigue (Wertheim, 1998). A medical study shows that the working patterns on board, in particular the shift system, interrupt human beings' internal clocks (Hystad & Eid, 2016). Extended long shift schedules – in particular, two six-hour shifts per day – have proved to exacerbate fatigue for seafarers. Härmä, Partinen, Repo, Sorsa, and Siivonen (2008) conducted a survey among 185 Finnish officers, and found that compared to the 4/8 watch system (two four-hour shifts per day), the officers working the 6/6 watch system (two six-hour shifts per day), reported more frequent nodding-off on duty (7.3% vs 1.5%), and excessive sleepiness (32% vs. 16%). Therefore, shift systems alternative to 6/6 should be explored. One suggestion given is to use working shifts of 4/8 (four hours on and eight hours off) and 8/4 (eight hours on and four hours off) to ensure seafarers have an eight-hour rest (Härmä et al., 2008). The above studies focus on the effects of the demands of seafaring jobs on the fatigue of seafarers, or view fatigue as a result of the interaction between social actors, but ignore the relationships between various patterns of employment-related mobility – such as commuting – and seafarers' experiences of fatigue.

Employment-related mobility on the Great Lakes and St. Lawrence River

As argued by Urry (2010), mobility should be regarded as an independent subject matter of sociology. The social consequences of interdependencies between various patterns of mobility are emerging concerns of sociology (Urry 2010). Identifying work-related mobility as a pervasive feature of many jobs, Newhook et al. (2011) develop the spectrum of employment-related mobility. In temporal terms, it includes daily, overnight, periodical and permanent movement away from a person's place of residence to their work site. In spatial terms, it ranges from short commuting distances to nearby workplaces, to international migration for work. In addition to the movement between places of residence and work sites, many jobs may require continuous mobility, with seafaring being a representative example (Roseman, Barber, & Neis, 2015). Different forms of employment-related mobility can negatively affect workers' health – such as experiences of increasing levels of stress and depression and increasing risks of cardio-vascular disease (Newhook 2011). Fatigue in transport workers may also lead to accidents, jeopardizing public safety and environment, which has been identified as a contributing factor in several air crashes and marine casualties (Canadian Broadcasting Corporation, 2010; Project Horizon Consortium, 2011). Raby and McCallum (1997) suggest that fatigue and sleepiness are estimated to account for 25% of maritime accidents.

Between 2004 and 2015, 1819 marine accidents and incidents were reported to the Transportation Safety Board of Canada. Of the accidents reported, 71.46% occurred on the Great Lakes and St. Lawrence Waterway, with 8.7% of these accidents involving serious human injuries or death (Council of Canadian Academies, 2016; Research and Traffic Group, 2014). Research by the Council of Canadian Academies (2016) shows that the numbers of injuries and fatal accidents on the St. Lawrence River and Great Lakes are higher compared to British Columbia, the Maritimes, Newfoundland and Labrador, and Northern Canada. As the world's longest deep-vessel marine highway, the Waterway is critical for raw material transport between manufacturing and agriculture centres in Canada and the United States. From 2004 to 2011, the Great Lakes and St. Lawrence River accounted for 39% of all commercial vessel movement in Canada, ranking second after the Pacific region (54%) (Council of Canadian Academies, 2016). More than 3,300 workers directly sail on or assist the operation of vessels in this region (Martin Associates, 2011).

Applying the spectrum of employment-related mobility, the author finds that Canadian seafarers on the Great Lakes and St. Lawrence River confront dual work-related mobility: mobility on water and commuting mobility. When sailing on the Great Lakes and St. Lawrence River, Canadian seafarers are frequently

engaged in mobility on water, including navigating, piloting, swinging outboard, mooring and cargo handling. Prior to and after voyages of duty, Canadian seafarers experience commuting mobility, including long-distance air travel and road driving. Aiming to bridge the research gaps identified above, this article addresses the question of whether this dual employment-related mobility affects Canadian seafarers' experiences of fatigue.

Canadian seafarers on the Great Lakes and St. Lawrence River are a good case to explore the relationship between work-related mobility and fatigue among short-sea seafarers. First, the ports throughout the Great Lakes and St. Lawrence River are spread out, which gives the researcher a good opportunity to understand the pressure of long commuting mobility on short-sea seafarers. Second, as a group of short-sea maritime workers, Canadian seafarers face on the one hand a higher frequency of vessel manoeuvring in port, including mooring, loading and unloading, and on the other hand short port leave, which may also intensify the mobility on water. Therefore understanding Canadian seafarers' experiences of fatigue will enrich the knowledge of maritime fatigue studies through contributing empirical findings from Canada. In addition, seafarers' experiences of mobility will contribute to the theoretical understanding of employment-related mobility in the Canadian context.

Methods

This research adopted qualitative research methods, which are recognized as valuable instruments to obtain insights into the experiences and views of stakeholders (Silverman, 2011). A key objective was to explore the social consequences of the high mobility of maritime occupations on Canadian seafarers on the Great Lakes and St. Lawrence River. Semi-structured in-depth interviews were conducted with seafarers, safety managers, human resource managers, representatives from unions and charities, and key informants from Canadian maritime authorities.

Online invitation was used to recruit interviewees. Based on the contact information available online, email invitations were sent to maritime authorities, maritime unions and charities. The LinkedIn social medium was used as a major approach to invite seafarers to participate in the research. In total 30 potential interviewees were contacted, including seafarers, managers and key informants from the maritime authorities. But ten seafarers failed to respond to the invitation, or refused it, with most giving no particular reason. One seafarer agreed at first but rejected the invitation later, with the explanation that child care at home left him no time to accept the interview.

Twenty interviews were conducted between July and September. Four face-to-face interviews were conducted at the university meeting room and the offices of the interviewees. Another 16 interviews were conducted by telephone and Skype, at times and places that were convenient for them to share their experiences, views and opinions. The interviews were recorded in audio, with an average length of 90 minutes. The audio recordings were transcribed by the author and NVivo 11 was used to carry out a thematic analysis of the data.

Findings

Commuting: The start of employment-related mobility

The Great Lakes and St. Lawrence Seaway stretches over 3700 kilometres from Duluth (U.S.) to the Atlantic Ocean, with 41 ports spread alongside this the world's longest deep-vessel marine highway. Each port not only serves as an on-and-off ramp for cargo, but also as switch points for seafarers to start their voyage of duties. This long-distance rotational commuting to and from ports is embedded in the employment-related geographical mobility of Canadian seafarers. The uncertainty of the switching ports may extend travel time and increase the tiredness of seafarers at the beginning of their work.

In this research, seafarers from Nova Scotia and Newfoundland reported challenges related to commuting mobility. A captain explained the hard decision he made to keep a crew that was exhausted from travelling working on the Welland Canal:

In my previous company, I had a lot issues with this (commuting hours). When we change 30% of the crew, most of them coming from the east end of Canada, they are coming on board having travelled for eight hours straight. And I am now going on the Welland Canal to Hamilton and back [...]. They were exhausted, but I have no choice but to work these guys! (Captain Cameron)

After finishing a voyage of duty, seafarers may receive an urgent call to another voyage of duty from a different port in Canada. To commute between two ships may disturb the seafarers' planned trip home. A Second Officer shared a problem she encountered when she had a last-minute call for work on another ship at the end of her voyage:

If you are the person who usually says yes, you are picked on it (last-minute call for work). [...] In this case, I had to bring my car (parked at the port of departure) home (in her rest hours – author's note). Because they just called me a day before to join this vessel next day, the crew change day, I had to take my car home and have someone pick me up and bring me back to the vessel, and had a taxi to bring me to the airport to fly to another port to join another vessel. I changed province and the second vessel I joined was in Nova Scotia. So I need to go to the airport to fly there. (Second Officer Julie)

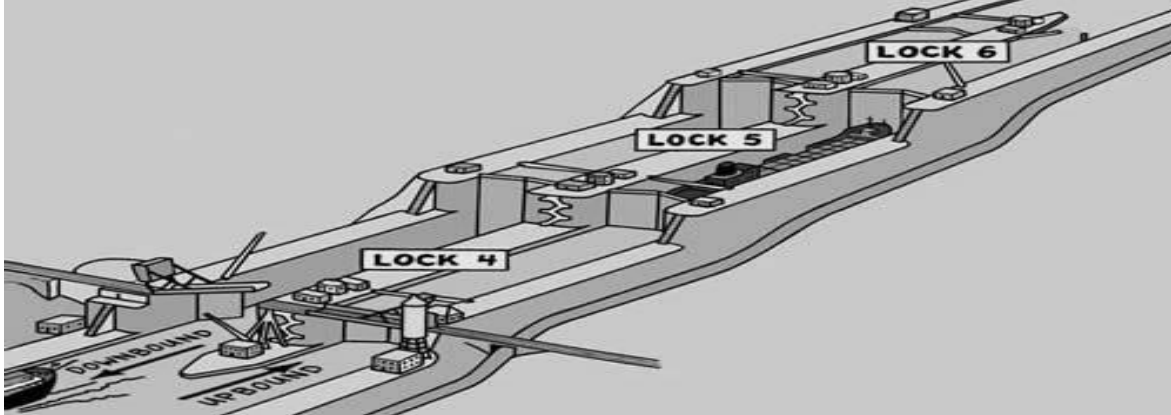
Julie further explains how the commuting challenge made her give up her rest hours:

This time I did not have time to do a handover. I wrote handover notes that I left on the vessel. I had to leave the vessel at 7 am to get the flight in time, but the crew change (on the first vessel) was not supposed to happen until noon. So it depends how badly they need you or someone else, and that will determine how much time you will get for your handover or rest period in-between. This time it was very difficult for me and I had no time to rest. In the five weeks I got (for the second voyage), I have had five different watch cycles. I have worked nights, days, 6 on 6 off, 12 on 12 off in the five-week period. This is crazy.

Employment-related mobility on the Great Lakes and St. Lawrence River

The Great Lakes and St. Lawrence Seaway system is connected by five canals, which include 15 locks. The locks make the Great Lakes and St. Lawrence River the world's most spectacular lift system, which means that in addition to the horizontal mobility of navigation, seafarers also frequently confront vertical mobility. To pass the locks safely, intensive maneuvering of the vessel is required, and mooring may also be required during transit through the locks. Of the five canals on the Seaway system, with eight locks the Welland Canal is reported to be the most fatiguing part of this system.

Chart 1: Navigation through the locks on the Seaway

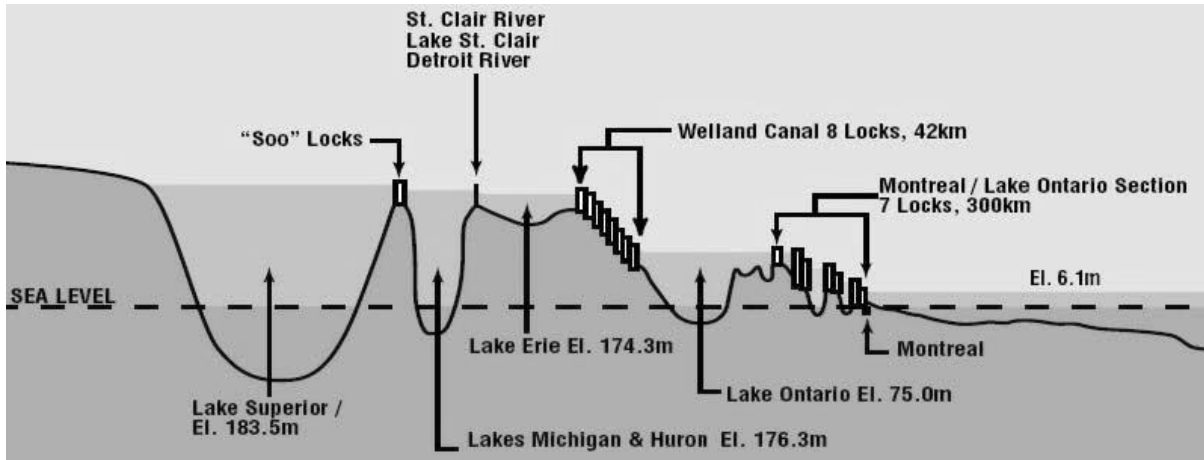


Source: Illustration (c) 2008 Norm Tufford (Excerpt from *Tommy Trent's ABC's of the Seaway*)

One maritime union representative, an ex-wheelsman, described the process of navigation from the St. Lawrence River to the Great Lakes:

Different layers of locks. From Halifax to Thunder Bay. From Halifax to Montreal it takes three days. Three days are not too bad. Once you are on the St. Lawrence River, you will be on the wheel for more intensive work. The minute you get to Montreal, you get the first lock. Then that starts the work: you wake up everybody to wait for the lock, even the engineers. To go into the lock, you have to have the engine on. Not on bunker, light oil. Everyone is standby and everyone is working. You get the linesmen. You do the first lock half an hour and in 1.5 hours you have passed the first lock. Then you get 1.5 hour sailing to the next lock. Then another 30 minutes, another lock; then another five-hour break, then another lock. Then an hour and another lock. Then you got two more locks, then you reach Lake Ontario – from Montreal to Lake Ontario, on and off, on and off. You go to work and come back. So your hours start to rise, and you are about to be called every two hours, four hours and you cannot concentrate. On ships, with the crew reduction, you need to prepare your stuff, and if there is no ship coming down. The fatigue – from Montreal to Lake Ontario and Lake Ontario takes 24 hours to cross and then you get to the Welland Canal. Then you've got another 12 hours for the system of another eight locks, if goes well and fast and smooth. Then you arrive at a dock and unload the ship. Load again and go back down to repeat the above again. That is fatigue. Also think about that now that the crew size is reduced from 30 to 24 and 12 to 17. (Union Representative Dave)

Chart 2: Canals and locks connecting Lake Superior, Lake Erie, Lake Ontario and the St. Lawrence River



Source: Information service, the St. Lawrence Seaway Management Corporation (2003)

According to Dave’s account, intensive shifts crossing the locks on the Seaway extend seafarers’ working hours and reduce their rest hours. Furthermore, quick turnarounds on the Welland Canal mean seafarers have to cope with intensified vertical mobility: passing 16 locks on the downbound and upbound voyages. The only time to have some rest is five hours of horizontal mobility on Lake Ontario.

Chart 3: Eight locks on the Welland Canal



Source: Edwards-May (2005) Inland Waterways of North America

Some seafarers confront triple mobility in their sailing work process: commuting mobility, horizontal mobility and vertical mobility. Experiencing triple mobility is an exhausting part of their sailing career,

according to many seafarers. Captain Cameron shared his experience of experiencing commuting and navigating on the canal together:

I live in Nova Scotia. In a normal flight, I have to change and I have to go from Cape Breton to Halifax airport, and then to Toronto. Quite often, I have a 2-3 hour delay in Halifax. I have an hour to get myself to the airport, 45 minutes to Halifax. Two hours. If I have a two-hour delay in Halifax, it is four. Another hour and half to trans five and half. By the time I get to the destination, at a minimum it is six hours. If I joined the vessel from the Port of Algoma, coming downbound, I worked 12 hours on the Welland Canal. On that particular day I have to work 18 to 20 hours, with almost no breaks. [...] I have a lot of problems with my company about this.
(Captain Cameron)

In the navigating process through the locks on the Great Lakes and St. Lawrence River seafarers – whether for officers like Cameron as a captain, or for the ratings like Dave as a wheelsman – experience fatigue related to the intensified manoeuvring of ships in the vertical mobile process in the canals connecting lakes and the river. The commuting mobility may exacerbate the fatigue, since seafarers rarely get rest opportunities when coming across locks on the canal.

In addition to the vertical mobility, and commuting mobility, the motion of the ship is another reason seafarers' fatigue may increase. The second officer Julie explained how the motion of the ship along swells affects her sleep:

Another thing people tend not to talk about is sea conditions. What would you do in the 30 or 40 feet swell? You cannot sleep because the vessel is moving so much. You still have to go on watch and carry on. You get time off but you cannot sleep because the motion of ships at sea. My cabin was back on the elevator. When it was stormy and you had a little bit of swell of water, you could hear the cables in the elevator trunk banging back and forth. Even some simple things like the noise of the ships just destroys your sleep patterns.

Seafarers on the Great Lakes and St. Lawrence River confront various patterns of mobility, ranging from commuting mobility to the ship and horizontal sailing mobility, to the motion of the ship and vertical mobility crossing the locks of the canals. All these patterns of mobility will disturb seafarers' rest and add to seafarers' fatigue levels. When they experience horizontal sailing mobility on the water that is precious time for seafarers to take some rest and recover from their tiredness. These precious rest hours are also controlled in a shift system, to ensure the 24/7 mobile operation of the ships.

Recovering from fatigue while on the move: Minimum hours of rest and maximum work duration on board

Working on ships, seafarers accumulate tiredness arising from commuting, navigation through canals and locks, and the motion of the vessel. Hours of rest are important for seafarers to recover from their tiredness and fatigue, which is added to by the movement of ships. However, to maintain the mobility of maritime transport and deliver cargo in a timely fashion, seafarers have to follow a shift system to ensure the efficiency of the ship's operation. Legally, maritime transportation on the Great Lakes and St. Lawrence Seaway is exempted from the maximum hours of work limit (48 hours a week) of Section 171 of the *Canada Labour Code*, according to the *East Coast and Great Lakes Shipping Employees Hours of Work Regulations*, 1985 C.R.C., c 987.

In this research study, two patterns of shift work are identified on the Great Lakes and St. Lawrence Seaway. One is the four on, eight off schedule on bulk carriers, and the other is six on, six off on tankers. In the former situation, seafarers are assigned to two standard watches of four hours, and work eight hours

per day on a three watch system, 56 hours a week. In the six on, six off system, licensed seafarers will work a twelve-hour day, normally in two six-hour watches, and 84 hours in a week. The mobile operation of ships is of a continuous nature. Therefore no weekends are applied on board. In addition, in port or in transit on canals, additional overtime hours may also be required by the Captain or Chief Engineer. Section 320 of the Marine Personnel Regulations (SOR/2007-115) set as minimum hours of rest for seafarers: (i) at least six consecutive hours of rest in every 24-hour period; (ii) at least 16 hours of rest in every 48-hour period; and (b) not more than 18 hours but not less than six hours elapsing between the end of a rest period and the beginning of the next rest period (Section 320). Correspondingly, the maximum working hours per day for seafarers on the Great Lakes and St. Lawrence River could be 18 hours in every 24-hour period and 32 hours in every 48-hour period.

However, the hours of rest that Canadian seafarers are entitled to is less than those of international seafarers subject to the *Maritime Labour Convention, 2006*. Regulation 2.3 of the Maritime Labour Convention, 2006 provides as follows: maximum hours of work shall not exceed: (i) 14 hours in any 24-hour period; and (ii) 72 hours in any seven-day period; or (b) minimum hours of rest shall not be less than: (i) ten hours in any 24-hour period; and (ii) 77 hours in any seven-day period.

Canadian seafarers' daily minimum hours of rest (six hours) is four hours less than those for international seafarers (ten hours). In a seven-day period, Canadian seafarers' hours of rest (56 hours) are 21 hours less than those of international seafarers (77 hours). For Canadian seafarers engaged in trades on the Great Lakes and St Lawrence River, the Canadian legal protection of daily and weekly hours of rest is lax compared to the international Convention.

The daily and weekly hours of rest regulation for Canadian ships do give ship managers and operators flexibility in coastal trade. However, whether the minimum daily and weekly rest of hours can help Canadian seafarers to recover from fatigue linked with intensified mobility of navigation on the Great Lakes and St. Lawrence River is an open question. In this research, one explanation to justify the reduced daily/weekly minimum hours of rest is that according to collective bargaining agreements Canadian seafarers (in the 4-on, 8-off pattern) can claim one month off, usually after three months' work at sea, or after a maximum of 140 working days on board. In addition, Canadian seafarers (in 6-on, 6-off patterns) can claim six weeks off after six weeks of service on board. Regulation 2.5 of the *Maritime Labour Convention, 2006* provides that "the maximum duration of service periods on board following which a seafarer is entitled to repatriation – such periods to be less than 12 months".

Time-off periods shall be for 30 days from the scheduled date of getting off the vessel and shall be taken on a consecutive basis for positions where there are more than one employee. Time off shall be scheduled so that employees will not work in excess of 140 consecutive days. (Excerpt from Collective agreement between a union of unlicensed seafarers and a bulk carrier on the Great Lakes)

(The shipowner's name) will operate a "one-for-one" leave system for all of its Officers. The schedule of work and leave shall be six (6) weeks of work followed by six (6) weeks of leave with pay.

One young seafarer expressed his preference to the 6-on, 6-off pattern with a "one-for-one" leave system:

Working six hours, on six hours off gives me a long holiday and I can stay home longer. I can accumulate 1.5 times as much sea time, which can help me be promoted quicker. (Second Officer Tom)

However, one captain holds a different opinion about the above justification:

Four to six weeks off cannot reduce the fatigue of long working hours. The long work shifts on the Lakes affect safety management. My crew are drowsy on watch-keeping. (Captain Cameron)

The above accounts of seafarers show that the compromise Canadian seafarers make between minimum hours of rest and maximum service duration on board. For Second Officer Tom, in order to obtain long holidays at home he preferred the long shift hours on board (two six-hour shifts per day). However, from the on-board management perspective, Captain Cameron argue that holidays cannot help the crew to recover from fatigue on board. In addition, in some cases seafarers' holidays cannot be ensured. Chief Engineer Abraham gives an example that an officer's holidays were cancelled and this officer served two voyages of 180 days in total, on two ships without a break:

At the moment of the accident, the officer in command continued to work on board for 180 days. [...] She was physically tired. [...] She completed a 90-day voyage and then was sent to another 90-day voyage of duty. [...] The company set the policy that 140 days should be the maximum. In her case, she was only given a two-day break between two ships. Actually that was not a break. She spent two days in the airport, to catch the next ship. (Chief Engineer Abraham)

Therefore, if holidays are cancelled, the fatigue of seafarers would be cumulative and they would not have opportunities to recover from the fatigue until they had completed two voyages of duties.

A break from mobility on water: Shore leave

When ships call at a port, during the cargo loading and unloading process some crew may have an opportunity to have a short shore break to go to the supermarket to do groceries. Evolving port security measures make the shore breaks for seafarers more difficult – in particular the adoption of the International Ship and Port Facility Security Code (ISPS Code). Coming into force in 2004, it prescribes responsibilities for governments, shipping companies, shipboard personnel and port/facility personnel to “detect security threats and take preventative measures against security incidents affecting ships or port facilities used in international trade”. Under the ISPS Code, seafarers usually have to wait for the shuttle bus to take them to the port city, which may frequently be unavailable in some ports. Chief Engineer Abraham said that:

[i]n Canadian ports, it is not easy for us to take shore breaks now. [...] The unloading process is pretty fast: in about 4 to 6 hours we can finish it. [...] The shuttle buses are not available when we need them. The crew just give up on taking shore breaks now. (Chief Engineer Abraham)

New technologies, such as self-unloading and hands-free mooring, are speeding up cargo operations and the mooring process in ports. The amount of staff in the port is also reduced. This also increases the difficulty for seafarers to get permission for their shore breaks. One tunnel man said:

Before the hands-free mooring technique, there were three staff at the terminal. If we needed a shore break, we could report to the port staff and they would open the gate for us. Now with the hands-free mooring, there is only one staff member, and he or she may be away for some reason. If we cannot find him/her, we cannot have a shore break. (Tunnel man Edmund)

The strict security measures have reduced the chance for seafarers to take shore breaks, which may intensify the isolation and fatigue they suffer.

Conclusion and recommendations

Throughout the spectrum of employment-related mobility, it can be found that mobility has created significant social consequences for the work and fatigue level experienced by Canadian seafarers. Various patterns of mobility are embedded into seafaring jobs on the Great Lakes and St. Lawrence River, including commuting mobility (including driving, taxi and flights), vertical mobility (through canals and locks on the Seaway, which requires alertness by the whole crew on board) and horizontal sailing mobility with the motion of the vessels. Fatigue accumulated during work on the move needs to be recovered from, but rest is constantly disturbed by the motion and noise on board. Time off periods and holidays after service on board have become the only limited measures for seafarers to recuperate from fatigue. However, last-minute calls for a second voyage may deprive them of this opportunity.

The continuous use of 6/6 shift systems raises a disturbing question: as short-sea seafarers engaged in work of transiting through locks, manoeuvring and unloading in port that is more intense than that of international seafarers, why are Canadian seafarers entitled to fewer hours of rest compared to their international colleagues subject to the *Maritime Labour Convention, 2006*? Medical studies show that compared to the 4/8 watch system, officers working on the 6/6 watch system reported more frequent nodding-off on duty (7.3% vs 1.5%), and excessive sleepiness (32% vs 16%) (Harma et al. 2008). This research study suggests that Canadian seafarers' rights to minimum hours of rest should be levelled up to be equivalent to the international labour standards, which is to say that "minimum hours of rest shall not be less than: (i) ten hours in any 24-hour period; and (ii) 77 hours in any seven-day period."

The compound effects of commuting mobility and vertical mobility during transits on canals should receive special attention by the companies and regulators. The Welland Canal is mentioned frequently as the most demanding and stressful part of navigation on the Great Lakes and St. Lawrence River. In the current situation, it is recommended that following a long commute from Nova Scotia and Newfoundland, seafarers may not be alert enough to straightaway undertake shifts of twelve hours or more to cross the Welland Canal. This research recommends that an eight-hour rest period be given following a long commute from Atlantic Provinces to the Lakes, with a crew change point to ensure that the crew on board are alert enough to cope with the demanding job of canal transit.

Seafarers' right to rest, as a key component of their right to occupational health, is under pressure from the complex patterns of employment-related mobility. The opportunity to take shore breaks in port is diminishing due to strict security control. Although port operators and authorities do not have employment relationships with the seafarers on board, good will to facilitate the shore break procedures is necessary, or alternately facilitating of other social supports to reach seafarers, such as ship visits by charities and volunteers. Seafarers should not be forgotten by society, which benefits from maritime transport. Canadian seafarers' health, well-being and rights are negatively affected by the complex patterns of work-related mobility. Therefore this research study recommends that regulators and maritime employers should have consideration for the challenges related to employment-related mobility that seafarers confront in commuting and transiting on the canals. They should build and implement a helpful shiftwork system and avoid compounding the mobility challenges, such as long commutes plus the canal transit.

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ⁱ See Chapter V, Regulation 14 of the Safety of Life at Sea Convention (1974).