

A study of fatigue among Indian deck officers

Ship types & voyage patterns specific

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Abstract

Working onboard a merchant ship as a deck officer has always been demanding and stressful in context with the modern shipping industry. Among many other factors, fatigue is the main challenge which the seafarers have to encounter onboard.

Little has been done to study about the mental and physical conditions for Indian seafarers in the past. This thesis delves into the causes of fatigue among Indian deck officers due to several aspects with a focus on the type of ships and their voyage patterns. A questionnaire was distributed among Indian Deck Officers working on several types of vessels all over the world and 82 participants revealed cases of fatigue onboard. Most of them have either experienced it themselves or within others. It has been seen by the results that fatigue levels depend upon the type of vessels. Most of the officers advocated the need for an additional deck officer onboard to release the workloads due to type of ship and nature of voyages, blaming mostly the enormous amounts of paperwork and checklists.

Language: English

Key Words: Fatigue, rest hours, port calls

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1 Introduction

Fatigue among the seafarers is a growing concern in the world maritime, which is gaining increasing attention due to its impact on health, safety, and environmental protection. Maritime conventions mandate the documentation of onboard rest hours and provides guidelines but practical implementation is challenging as recording of work hours may be incomplete, either due to management oversight or seafarers hesitant to risk their employment by highlighting non-compliance. The impetus for this research stems from authors personal experience as a third mate on a 15-year-old product tanker, operating on short coastal runs facing a grueling 6-on-6-off watch schedule, where even during rest hours, he'd to stay on duty due to frequent berthing stations. The vessel's minimal automation exacerbated fatigue among all deck officers. There was a strong need of additional officer to divide the workload. Despite the company's claimed adherence to ISM protocols, practical implementation fell short the author felt powerless to voice concerns, with no avenue for complaint and the Master already under pressure. Additionally, as a new officer, he feared negative repercussions. This highlights how seafarers often remain silent amidst challenging onboard conditions, without efficient fatigue monitoring systems audited by respective administrations.

1.1 Aim and delimitation

Unlike onshore populations and various transportation services like aviation and trucking, there has been relatively little study in the maritime field. A vessel can bring more workload if its calling frequent ports in short periods of time than it is on long ocean going voyages with less port calls. Then there are issues like shorthands in vessels with hectic schedules and lots of paperwork onboard as the officers have to do 6 on/6 off duty rotations in the absence of an additional officer.

The study aims to comprehensively examine the issue of fatigue among seafarers with working on different ship types, such as tankers, bulk carriers, containers etc. with different voyage patterns such as short (increased frequency of port of calls) & long (with less frequency of port of calls). I will exclusively examine deck officers from India, excluding Masters, and concentrate on participants from various types of vessels of different shipping companies around the world.

1.2 Research Question

To meet my aim, I want to find out "Does a particular type of ship contribute to more workload than other vessels?"

2 Factors contributing to fatigue onboard

2.1 Sleep & Circadian rhythm

There are a number of factors contributing to fatigue onboard with the most notable being sleeping. Deck officers encounter numerous obstacles that hinder their ability to obtain adequate restorative sleep. Everyone has a biological clock which regulates the body's circadian rhythm (Guidance on Fatigue, 2001). The unsynchronized circadian rhythm will adversely impact the quality and quantity of sleep, leading to the impairment of seafarers' performance at work (Guidance on Fatigue, 2001).

2.2 Stress

Stress aboard ship can be caused by a number of things, such as frequent port calls, environmental hardships, personal problems, interpersonal relationships (Guidance on Fatigue, 2001). Increased stress, particularly concerning work, leads to impaired sleep, longer sleep onset times, and heightened fatigue among seafarers. In addition to quantity/quality of sleep and recovery, sea state and stress over time emerged as incremental predictors of fatigue (Duval, 2019, p. 58).

2.3 Working conditions

Longer contracts are attributed to fatigue onboard as the seafarers get bored of the same type of repetitive work onboard most of the time with longer durations remaining on the vessel. The Maritime Labor Convention (MLC) mandates that seafarers receive at least 77 hours of rest per week, with maximum weekly work hours not exceeding 72. Factors such as long work shifts exceeding 12 hours and individual vulnerability contribute to fatigue and associated health risks. The 6/6 watch system is related to a higher risk of severe sleepiness during the early morning hours compared to the 4/8 and the other watch systems assessed (Härmä, Partinen & Repo, 2008, p. 05). Seafarers often work extended hours during duties, leading to fatigue. It is challenging to regulate working hours in the maritime sector because

the workplace onboard is not simply within the auditable range (Allen, Wadsworth & Smithet,2006, p.167).

2.4 Port calls & shore leave

Port conditions have emerged as a major stressor for seafarers, characterized by unpredictable work hours, safety risks, heightened inspections, and demands for rapid turnarounds. The workload amplifies upon ship arrival, particularly at homeports, where maintenance and restocking take place, leading to increased stress and fatigue. Seafarers grapple with balancing duties and shore visits, often resorting to adjusting schedules or working extra hours to compensate for absent crew members, leading to exhaustion. Furthermore, individuals returning from shore leave must promptly resume duties, worsening fatigue concerns. The voyage and scheduling aspect, just like the organizational aspect, is an essential component within management factors (Huanxin,2012, p.22) which can increase fatigue levels. Traffic density encountered by the vessel during the voyage is another aggravating factor leading to many problematic issues such as diminished alertness and impaired work performance (Guidance on Fatigue,2001).

2.5 Inadequate Manning levels

Insufficient manning for safe ship operation stands as a primary contributor to fatigue at sea. The 'minimum safe manning document,' mandated by the ship's flag state under the Safety of Life at Sea (SOLAS) convention, outlines the requisite staffing levels. However, fierce global competition among flag states vying to attract ship owners may lead to relaxation of safe manning evaluation policies. Consequently, seafarers' workloads escalate to burnout levels, as they are compelled to labor beyond their designated hours, including rest periods, to manage the heightened demands resulting from understaffing aboard ships. Sometimes senior officers need to supervise and train the incoming junior officers who take time from their already extensive work schedules leading to mental and physical fatigue.

2.6 Excessive Paperwork

Administrative tasks, often called paperwork on commercial ships, have been increasing steadily over the last decade. These additional tasks add to the already increased workloads

of ship operations for each seafarer. Another issue is that ship operators' time allocations for shipboard operations do not consider paperwork as work tasks. As a result, the paperwork is done during rest hours which exacerbates fatigue.

2.7 ISM (International Safety Management)

New procedures designed to increase ship safety, such as International Safety Management (ISM) and International Ship and Port facility Security (ISPS) procedures and their record keeping process, can bring extra workload for navigation officers (Huanxin,2012, p.22) The ISM code was implemented onboard vessels to reduce the number of accidents & near misses, but it has been observed that it involves too much of paperwork & in the absence of a ships' purser or radio officer, all the burden for completing checklists is on the navigating officers.

2.8 Environmental factors

Rough sea conditions demand heightened vigilance and physical exertion from seafarers, with up to 15-20% extra effort needed to maintain balance due to a ship's pitching and rolling. These environmental challenges affect seafarers both during work and rest periods, emphasizing the importance of considering them in fatigue management. Seafarers may face extreme weather conditions like scorching temperatures in the Middle East or freezing temperatures in Arctic regions, exacerbating fatigue.

2.9 Management factors

There is no doubt that the management style implemented onboard ships can significantly affect seafarers' fatigue. In this context, the harsh rules imposed by the company management style may sometimes generate fatigue for seafarers because these rules might conflict with the willingness of seafarers (Huanxin,2012, p.22).

2.10 Ship-specific factors

Ship-specific factors significantly impact the fatigue levels of seafarers. Automation plays a crucial role in reducing workload and mitigating fatigue by streamlining tasks and minimizing human errors. Additionally, equipment reliability and living conditions,

particularly on older vessels, impact fatigue levels. Furthermore, the ship's motion, such as rolling and pitching, also contributes to seafarers' fatigue due to its effect on the aggravation of tiredness (Guidance on Fatigue ,2001).

2.11 Social Factors

Separation from family and friends for extended periods is a major stressor, exacerbated by limited contact with home and challenges around shore leave. Seafarers rely heavily on each other for support, but establishing and maintaining personal relationships is hindered by frequent personnel changes, work-life balance issues, and adapting to new environments and rules. Additionally, lengthy periods away from family strain relationships and hinder communication, leading to unresolved marital issues.

3 Sign & symptoms of fatigue

Following are the signs & symptoms of fatigue onboard.

3.1 Cognitive

Unable to focus, not able to arrange a series of activities, busy with a single job, concentration on a small issues and ignoring main things, less attentive than normal, decrease in efficiency, inattentiveness, problems in doing multitasking (Guidance on Fatigue, 2019).

3.2 Physical

Sleepiness, reduction in closure of eyelids, droopy eyelids, itching in the eyes, not able to keep oneself awake, uncontrolled body movements, speech problems, e.g., unclear pronunciation, sluggish, confused, or difficulty in finding exact words, heaviness in the limbs, clumsiness, such as increased chances of dropping objects like tools or parts etc. (Guidance on Fatigue, 2019).

3.3 Behavioral

Changes in mood, silence, speaking less than usual, more annoyance, less tolerance and anti-social behavior, depression, changes in attitude, not able to anticipate hazards, failure to notice and follow warning signs etc. (Guidance on Fatigue, 2019).

Under the effect of fatigue, job performance can be significantly reduced. Negative changes are noticed in all the aspects of human performance (physically, emotionally, and mentally) such as in ability of make decisions, time of reaction, judgement, coordination between hands and eyes, and numerous other abilities. Such conditions as poor memory or communications, together with other exposures to dangers in the environment, result in incidents. This is evident in various maritime accidents in which fatigue was a fundamental factor.(Guidance on Fatigue, 2019).

4 Indian Seafarers

India is the third-largest provider of seafarers worldwide, following China and the Philippines. It supplies almost 10% of global seafarers (Directorate General of shipping, Government of India, 2017). The Indian seafaring population includes about 160,000 professionally certified seafarers (highly skilled merchant navy 'officers' and semi-skilled workforce classified as 'ratings'), who serve cargo ships of diverse types; and also, some 90,000 seafarers, who serve cruise liners (Bhushan,2024). In 2022, more than 250 thousand Indian seafarers were employed on domestic or foreign vessels. Industry experts estimate that the proportion of Indian seafarers in global shipping is slated to increase to 20% over the next decade.(Ghosh,2024).

The Indian seafaring community is known for its professionalism, experience, and dedication to the maritime industry. As a result, many shipowners and operators from around the world choose to hire Indian seafarers due to their professionalism,adaptibility & work ethics (Bhushan,2024).In the year 2017, there were 6361 chief officers,7006 second officers & 6824 third officers as per Directorate General of Shipping India. No recent records were found. Typically, the contract for management level officers is 3-4 months & operational level officers is 5-6 months in the Indian merchant marine. Indian seafarers are working in the international vessels all around the world under various geographical & climatic zones.

5. Method

The study utilized a questionnaire administered through QuestionPro in English, primarily focusing on seafaring topics. Questions were quantitative except the last two open ended, where the participants were required to give their comments & suggestions. The survey maintained anonymity.

The aim of the questionnaire was to collect data about the average frequency of port of calls for a particular vessel in a month to ascertain the levels of fatigue with a question about breach of rest hours on board. There was a question about the need for an additional officer to reduce the workload and about some fatigue-related symptoms. The last two open ended questions were about noticing fatigue in own or someone else on board & suggestions to improve overall wellbeing of officers by mitigating fatigue. The survey was distributed among Indian maritime professionals via telegram and WhatsApp groups, ensuring that participants are not personally known to myself. The survey questions were put in the groups on 22 May 2024 & open to answer till 24 May 2024 & total of 82 officers answered the questions with 70 respondents answering the open form questions as well.

6. Following are the results obtained from the questions.

6.1 Rank

In the distribution of rank among officers 82 officers, most of the 41 officers (50.0%), are serving as Chief Officer. Then 36 officers (43.9%) are Second Officers. Very few, 5 officers (6.1%), are Third Officers who took part in this survey. The author was expecting more junior officers in the responses. The data concentrates on second & chief officers.

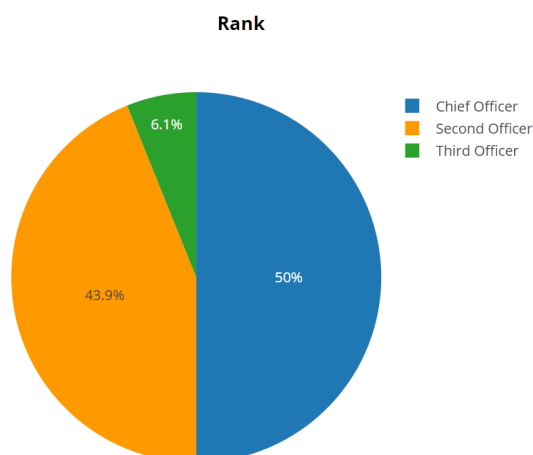


Figure 1: Rank of the respondents

6.2 Type of vessel

Respondents were asked about the recent vessel they have sailed or sailing to correlate the fatigue experienced on vessels. 38 of them worked on tankers, (46.3%) were on tankers with 21 personnel (25.6%) working on Bulk Carriers/General cargo vessels.14 (17.1%), officers were working in container vessels while 7 on offshore vessels. Only 2 people were employed on Ro-Ro (Roll on Roll off)/Car Carriers, whereas nobody was on cruise ships & other specified ships. This was as per expectations as per the current industry trends in India. As speculated, there are very Indian few officers responding in this category.

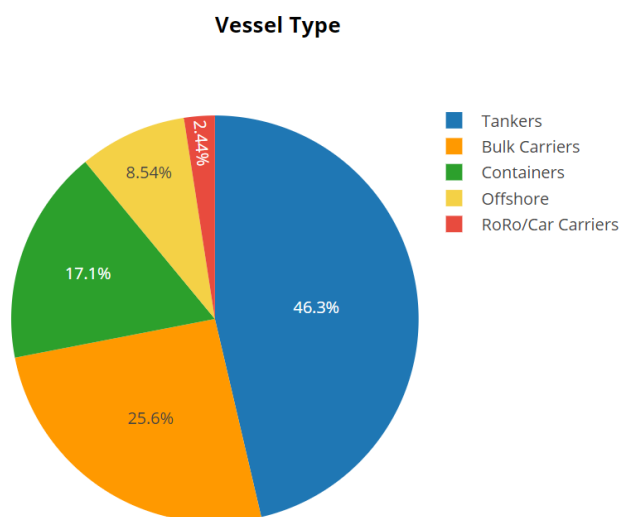


Figure 2: Type of most recent vessel

6.3 Ports of call per month

Most of the vessels (54.32%),44 in number were calling 2-5 ports in a month, followed by 20 vessels (24.69%) those made less than 2 port calls a month.6-10 port calls a month were represented by 12 vessels (14.81%). Only 6 vessels were on the most hectic schedules (more than 10) port visits which is just 6.17% of the total. This means that only 17 out of 82 vessels were engaged in more than 6 port visits a month.

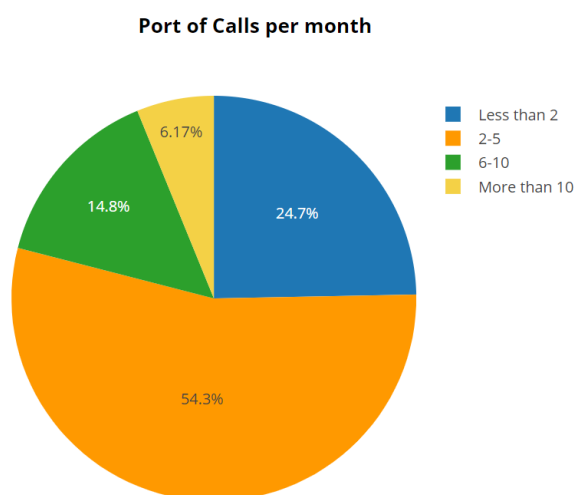


Figure 3: Number of port calls in one month.

More in-depth studies from the excel sheet data generated through the responses revealed that out of 21 officers who worked on bulk carriers, 2 of the officers was working on vessels which have 6 -10 port calls a month. While 6 personnel were on the vessels which getting 2-5 port calls a month. But the fact that is notable is that a majority of 13 officers were getting less than 2 port calls a month. A second officer commented, “Only the simple action required is to employ an additional deck officer, it can change a lot especially during port stay.”

Port Calls in Month for Bulk Carrier/Gen.Cargo

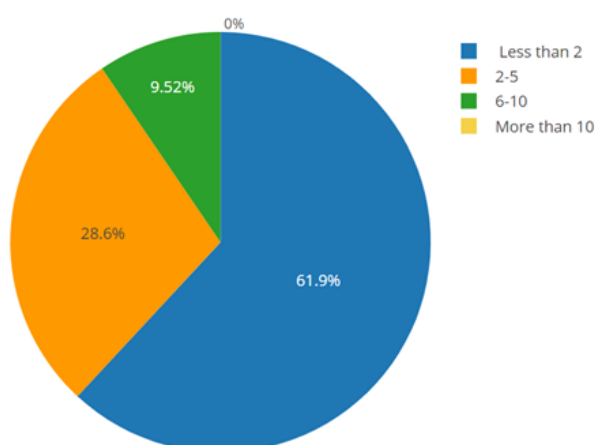


Figure 4: Port calls Bulk carriers/General cargo

Only 3 of the tankers were calling less than 2 ports a month. The majority of 30 vessels were calling 2-5 ports of call in a month. While only 5 vessels had a frequency of 6-10 port of calls

a month. None of the tanker vessels had more than 10 port visits in a month. A second mate said, “An extra deck officer is required onboard specially during port of calls, vetting and surveys.”

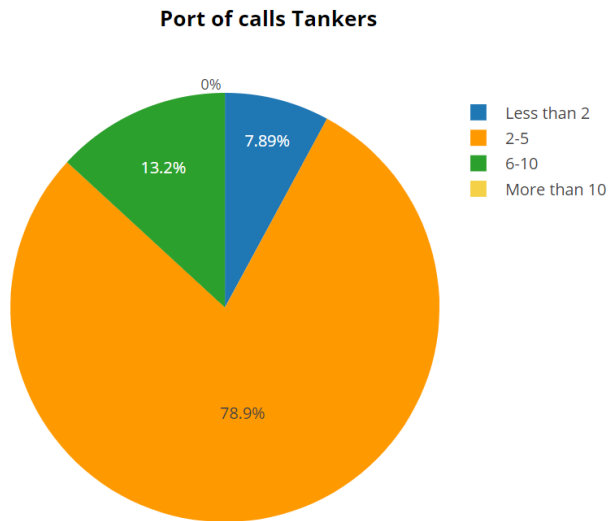


Figure 5: Port calls Tankers

5 containers were making 2-5 port calls a month while 7 were on 6-10 port of calls & 2 ships were on more than 10 calls a month.

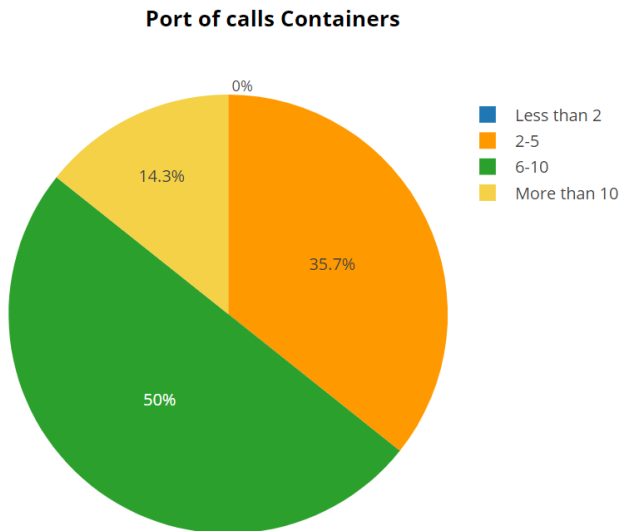


Figure 6: Port calls containers

Only 2 vessels made less than 2 port calls & 2 vessels making 2-5 calls in a month and 3 vessels were calling more than 10 times a month which reveals the schedule of offshore vessels as evident from their name.

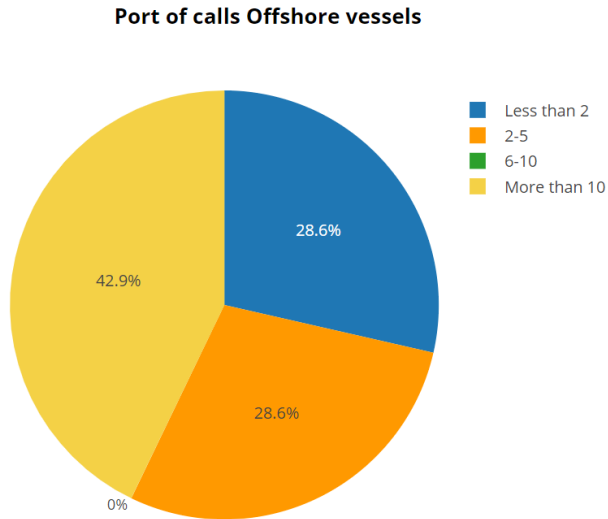


Figure 7: Port calls offshore

One of the RoRo/Car Carrier vessels was calling less than 2 ports while the other was with 6-10 port of calls a month.

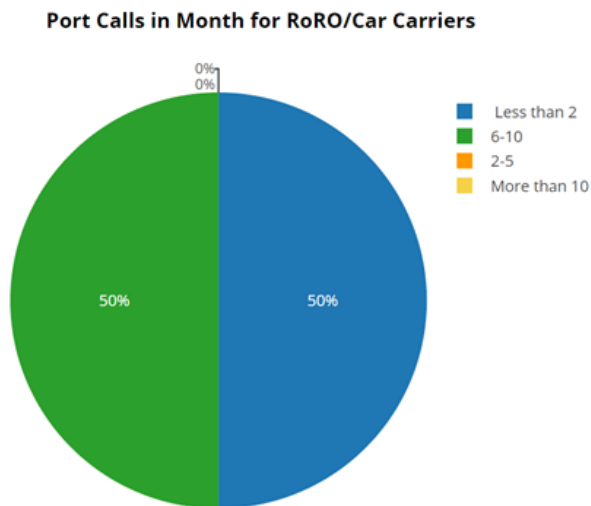


Figure 8: Port calls RoRo/Car carriers

6.4 Rest Hours

Out of 82 respondents, 9 (11%) were always getting less hours of rest as required by regulations ,20 (24.4%) often getting less rest, and 31 (37.8%) sometimes getting less rest.15 respondents (18.3%), rarely get less rest, while only 7 respondents (8.54%) never get less rest which indicates that though the administrations claim the enforcement of rest but those are not being followed in reality. One third officer commented, “Reduce the unnecessary paperwork so that deck officer can have some peaceful rest.”

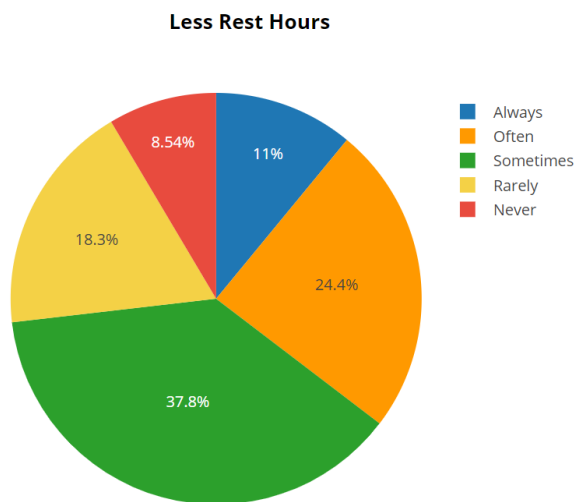


Figure 9: less sleep or fewer "hours of rest" onboard

Only 2 out of 21 officers aboard bulk carriers complained of always getting less hours of rest than the stipulated.6 officers responded often getting less hours of rest whereas 7 of them were sometimes getting less rest hours while 6 personnel rarely or never had any breach of rest hours periods onboard. A chief officer commented, “One additional deck officer will relieve the pressure on the rest of the team onboard.”

Less Rest Hours on Bulk Carriers/General cargo

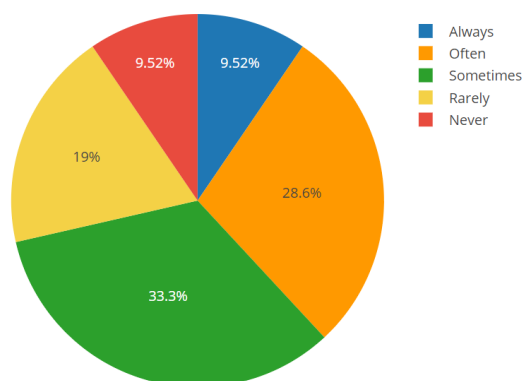


Figure 10: Less rest hours Bulk carriers/General Cargo

In the case of tankers,8 officers were always getting less rest hours,8 often getting less rest hours while the majority of 18 was sometimes getting less rest hours.3 officers rarely encountered less rest hours while only 1 had never got less hours of rest. A second officer commented, “Reduce unnecessary paperwork, improve recreational facilities onboard. Additional officer required.”

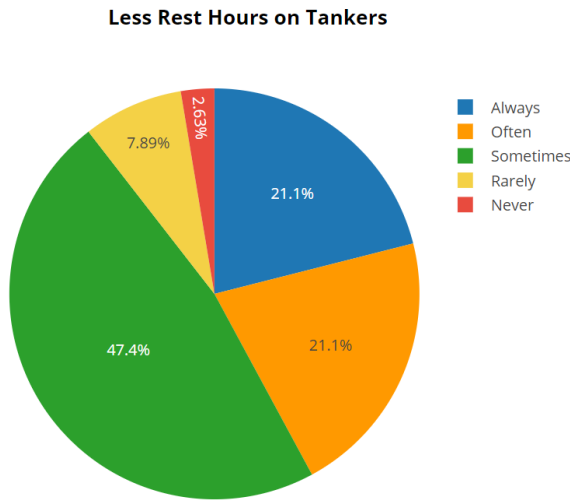


Figure 11: Less rest hours Tankers

Surprisingly, none of the officers reported always getting less rest hours in container vessels while 4 of them often had less hours of rest. Also 4 sometimes had fewer resting hours. & 4 had rarely less rest hours onboard.2 officer had never less hours of rest onboard. One second officer said, “extra officer for paperwork & to stop 6 on 6 off watches”.

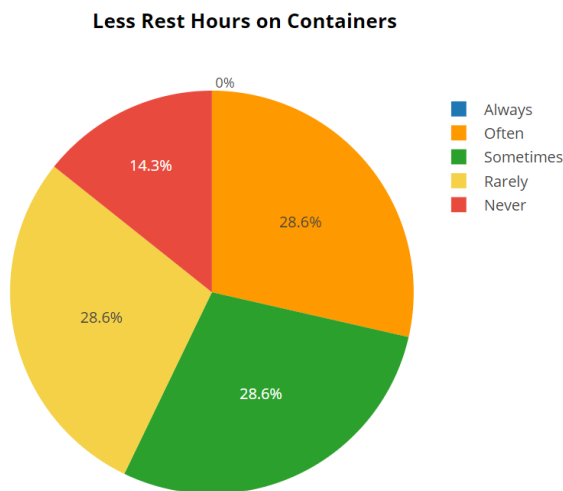


Figure 12: Less rest hours containers

Strangely none of the officers onboard reported always or often getting less hours. 2 of them had sometimes less hours of rest 3 of them rarely had any less rest hours. 2 reported never having less rest hours. This is the most exceptional statistics for the author as he supposed that due to frequent port calls & busy schedules, offshore vessel deck officers are always having less rest hours. A chief officer said, “Additional watch keeping officer is required if vessel is doing frequent port operations.”

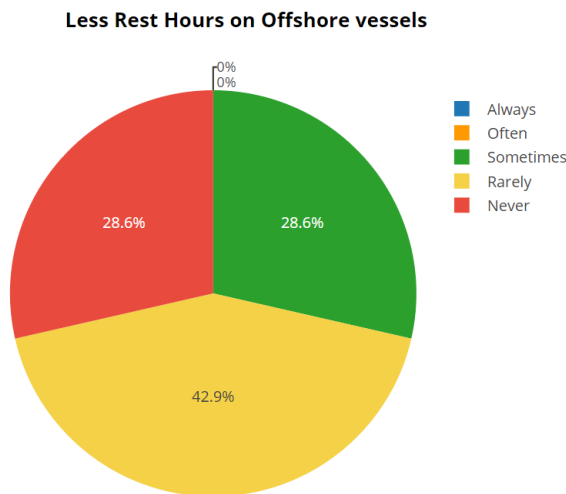


Figure 13: Less rest hours offshore vessels

One officer always had less hours of rest & he was found out to be a chief officer while the other rarely encountered it on RoRo/Car carriers.

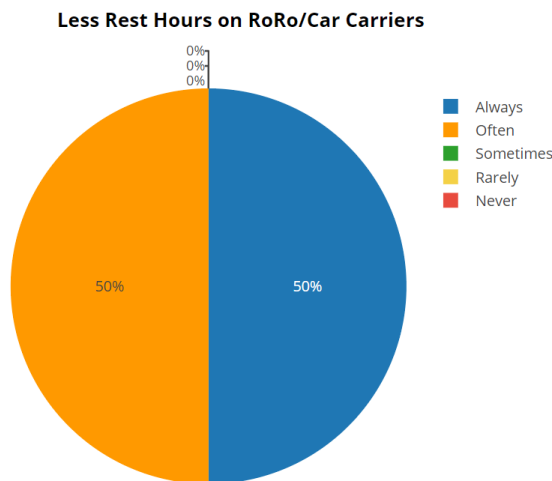


Figure 14: Less rest hours RoRo/Containers

6.5 Additional Officer

About the need of an additional deck officer onboard, 45 respondents strongly agreed about the necessity of extra manpower with 27 respondents (32.10%) agreeing on that. 9 officers chose neither agree nor disagree. Only one person disagreed with the question who a third officer in offshore vessels with 2-5 port was calls in a month. The analysis of the above shows that the majority is of the opinion to hire an additional officer onboard to share the burden of onboard work pressures. A second officer commented “Need extra officer for navigation and cargo watch when vessel trading pattern is hectic, like in chemical tankers. And for oil tanker vessel, when engage in ship-to-ship operations.”

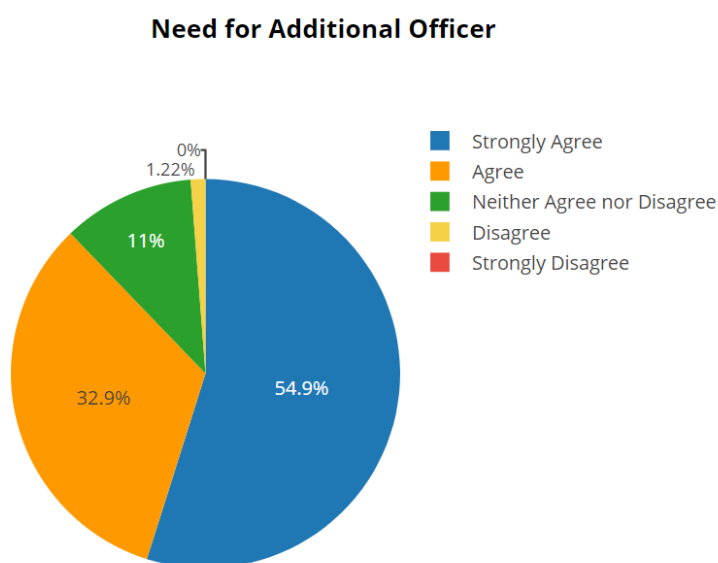


Figure 15: Requirement of additional officer

It is a strange fact that still 18 out of 21 officers strongly agreed or agreed to have extra manpower onboard bulk carriers, while 3 of them were neutral. There was not a single officer who did not want to have an additional officer onboard. This brings to notice that a vast majority wants to ease off the work loads by having additional manpower. A third officer commented “Additional officer should be permanent rank on-board to manage rest hours for all the officers.”

Need for Additional Officer Bulk Carrier/Gen.Cargo

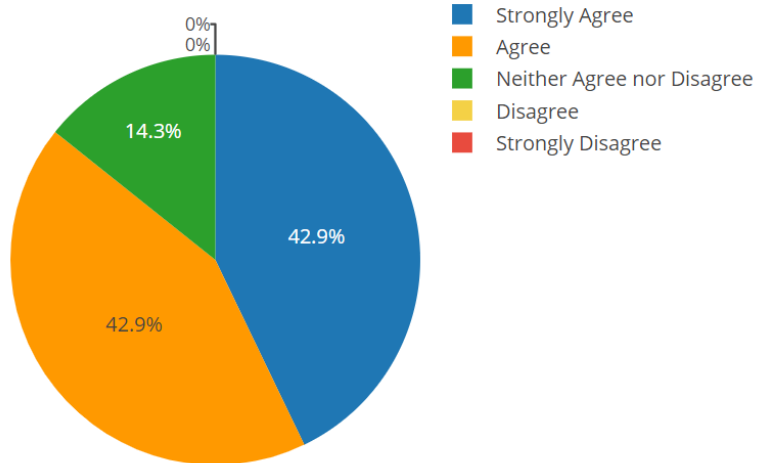


Figure 16: Requirement of additional officer (Bulk carrier/General Cargo)

In the case of tankers, 27 officers strongly agreed & 9 agreed for the need of additional officer on board while 2 had neutral opinion. No one disagreed with having an extra officer on board. A chief officer said "extra officer for paperwork and stop 6 on 6 off watches". Another Chief officer said, "Additional officer should be mandatory onboard tankers especially on tankers with short run."

Need for Additional Officer Tankers

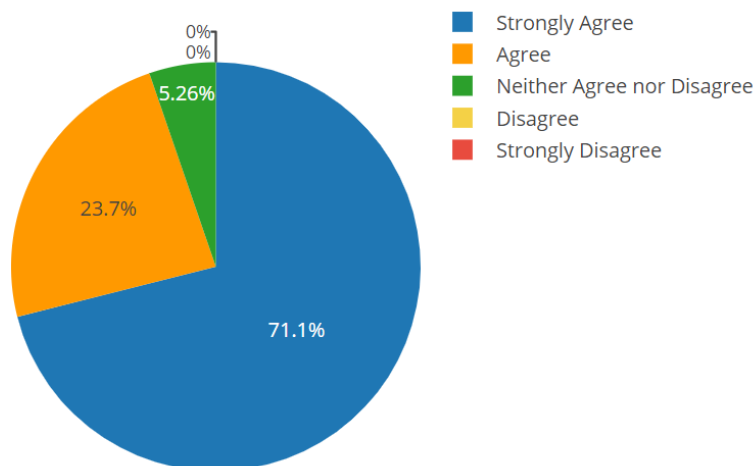


Figure 17: Requirement of additional officer (Tankers)

While on containers,9 of them strongly agreed & 3 agree for the need for extra hand.2 were neutral. None of them disagreed. A second officer said” Additional officers will help to cover everything out.”

Need for Additional Officer Tankers

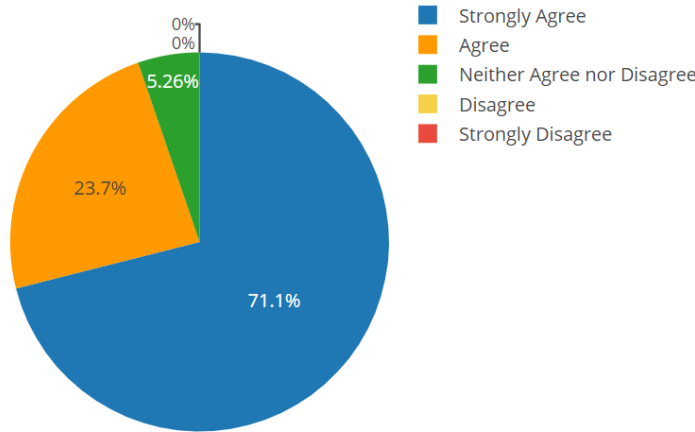


Figure 18: Requirement of additional officer (Containers)

In offshore vessels,4 of the officers agrees to have additional manpower while 2 are neutral in their views about this. One officer disagrees to have extra hand. A chief officer commented” With respect to offshore industry, industry needs to start employing additional officers. Here we do 6 hours on 6 hours off for whole contract duration which at times stretches more than 3 months”.

Need for Additional Officer Offshore vessels

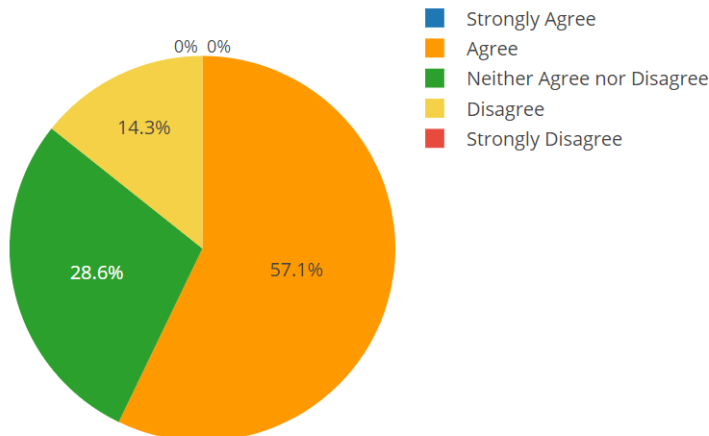


Figure 19: Requirement of additional officer (Offshore vessels)

On RoRo/Car carriers, 1 officer strongly agreed & other agreed to have additional manpower.

Need for Additional Officer RoRo/Car Carriers

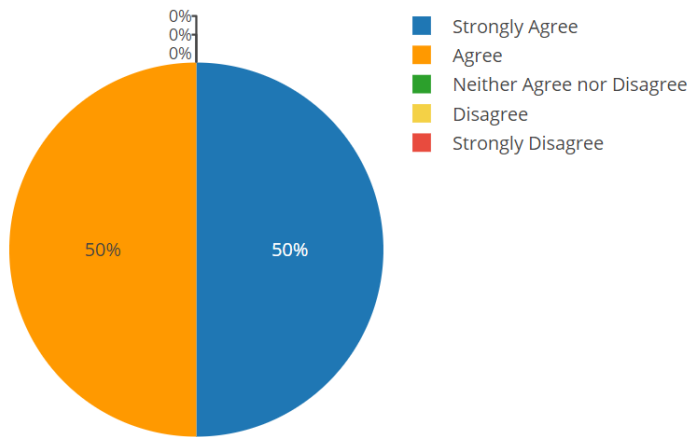


Figure 20: Requirement of additional officer (RoRo/Car Carriers)

6.6 Signs and symptoms of fatigue

Out of 82 respondents, 7 (8.54%) reported being unable to concentrate most of the time, 49 (59.8%) experienced this some of the time, 13 (15.9%) seldom faced this issue, and 13 (15.9%) never had this problem. This shows that more than 50% of the officers have faced this in their sea career with only a few never having the issue. One second officer said” Personnel making mistakes even after following a checklist.”

Inability to concentrate

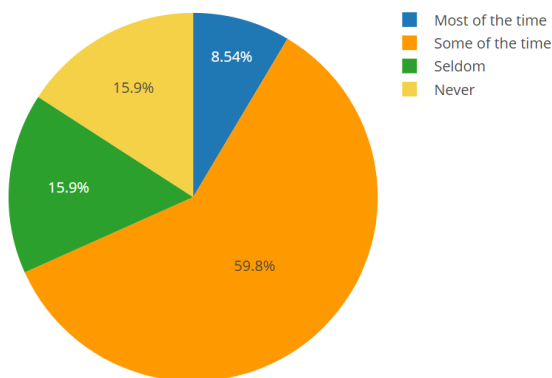


Figure 21: Inability to concentrate.

11 of the respondents (13.4%) felt physically tired most of the time. 56 officers (68.3%) were tired some of the time, which is alarming. 8 respondents (9.76%) seldom experienced physical tiredness while 7 personnel (8.54%) never got tired onboard. This shows that working at sea as a deck officer is physically demanding some of the time. A chief officer commented “That totally depends on nature of jobs and situations Also effects and load increased due to changes ,types of ship and voyage schedule.”

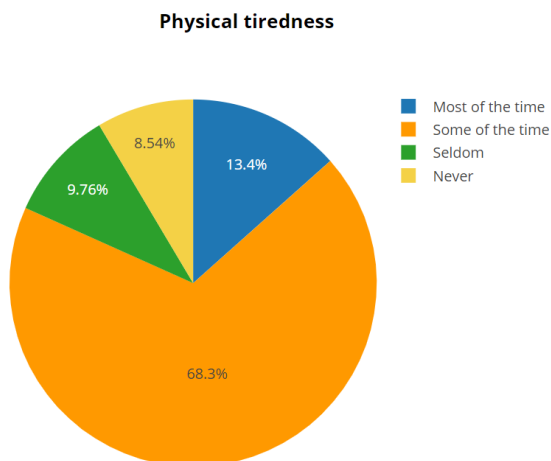


Figure 22: Physical tiredness

Only 4(4.88%) of officers reported slow responses most of the time while at work but 43 of them (52.4%) had come across the situation some of the time with 18(22%) seldom experiencing this symptom & 17 (20.7%) never had this onboard. Many of the officers had this some of the time, which is a notable fact. A second officer explains, “Yes/ due to less sleep other related issues.”

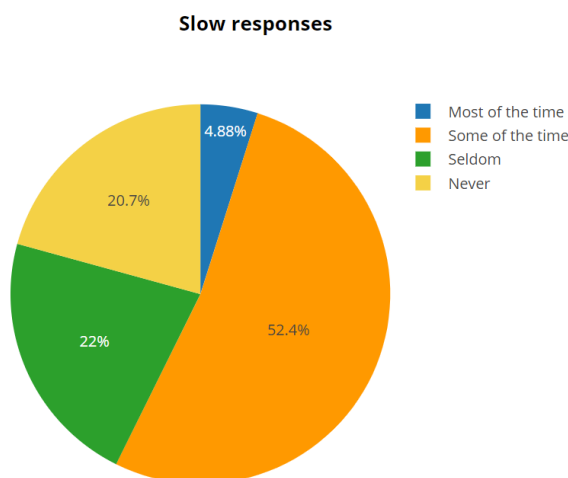


Figure 23: Slow responses

Of the 82 respondents, 17 (21.25%) admitted mood changes most of the time with 41 (48.75%) reporting some of the time. 11 officers (13.75%) seldom experienced this and 13 (16.25%) never had this while working onboard. This is a contributing factor to fatigue.

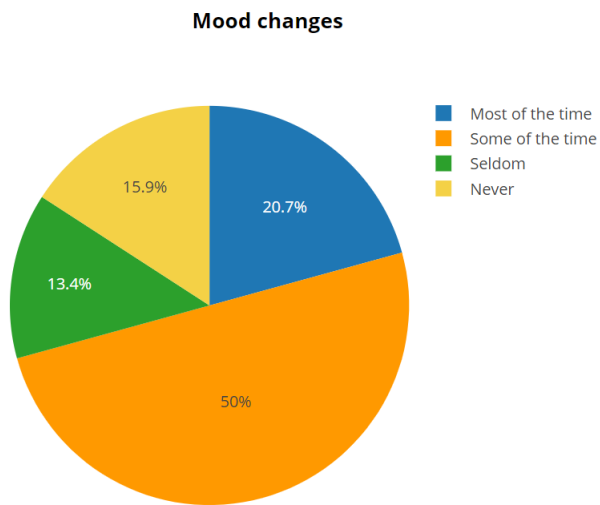


Figure 24: Mood changes

5 of the respondents (6.25%) had headaches most of the time. A substantial number of 39 (46.25%) had this some of the time which is notable due to the amount of workload in the industry. 23 (28.75%) seldom experienced headaches, and 15 (18.75%) never experienced headaches. A chief officer said, "Yes/ due to less sleep and other related issues."

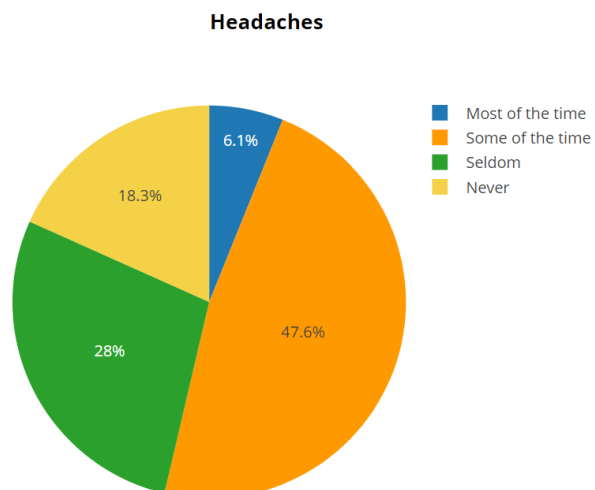


Figure 25: Headaches

10 of the respondents (12.50%) reported poor memory problems most of the time. Those who encountered it some of the times were 31 (36.25%). 22 personnel (27.50%) seldom had

it whereas 19(23.75%) never experienced it. The number of respondents who have had it some of the time is significant considering the nature of the job of deck officers, which requires a sound state of mind.

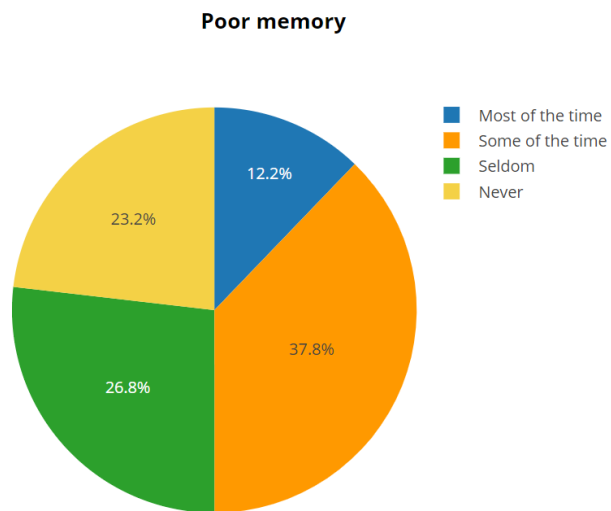


Figure 26: Poor memory

6.7 Experiencing Fatigue

It was about experiencing fatigue in oneself or others onboard due to 6 on/6 off watchkeeping schedules, long shift hours or frequent berthing situations.

A vast majority out of the 70 comments received have written “yes” for the above question. The comments are as under, “Sometimes due to 6 on 6 off schedule, very difficult to work.”

“Yes, due to less sleep other related issues.”

“Yes, sometimes continuous work due to shifting of berth.”

“Officer or crew to be added as per the vessel requirements for busy routes or tight schedule.”

“I have experienced it myself and have seen it. The extreme case involved helmsman falling asleep while steering since he was on duty prior 24 hours without rest due to tank cleaning requirements from Charters. I have felt extremely tired that I had to immerse my head in a tub of water to ensure that I don't fall off!”

Only 9 out of 70 respondents said “No” to this answer, with mostly experiencing in themselves or other. This explains that in most cases, fatigue is present onboard which is a serious risk to the health and wellbeing of deck officers.

6.8 Improvement of wellbeing

Improvement of well being of deck officers due to additional workload arising out of ship types & voyage patterns:

The majority of the respondents advocated the need for an additional deck officer to share the burdens of hectic schedules, most notably the amount of paperwork onboard. Here are few comments from the questionnaire:

“This topic needs to be addressed but the problem is that if one nationality crew start reporting it other nationalities are ready to work even 16 hours so eventually, we are at loss.”

Which highlights an important concern among officers of underdeveloped nations though it’s out of scope of this study.

“Additional watch keeping officer is required if vessel is doing frequent port operations.”

“There is one simple thing! Additional officer to be provided on ships engaged in short voyages.”

“Please let the officer do only 4 hours on and 8 hours off watches in port and in sea. And they should no be disturbed in between for other jobs so that they are always available in case any emergency.”

“Reduce paperwork and different reporting forms.”

“Voyage patterns play a vital role in how a contract onboard can be. If the voyages are short, then crew and officers become tired and exhausted nearing mid contract. Many are not situationally aware of what is going around and work like zombies. As per me this is the major cause of accidents and incidents.”

“Please let the officer do only 4 hours on and 8 hours off watches in port and in sea. And they should no be disturbed in between for other jobs so that they are always available in case any emergency.”

“One dedicated ships clerk/ safety officer is required to complete the amount of paperwork, which is the biggest reason for violation of rest hours, inability to concentrate due to sheer amount of backlogs completing and filling, checklists, vetting inspections other survey audits preparations , month end reports, port papers, crew documentations and following up with office for pending and half supplied requisitions and justifying the amount etc.”

“Adding an additional officer for navigation/ paperwork will help.”

“Give an additional officer/additional deck hands. Company pressure and paperwork is too much from my point of view in regard of inspections, surveys, audits etc.”

“I believe one additional officer onboard can be of great help.”

“Only the simple action required is to employ an additional deck officer, it can change a lot especially during port stay.”

The majority have stressed the need for an additional officer. A few of the respondents blamed the ever-increasing amounts of paperwork on board.

6.9 Cross reference tables

As we can notice in the following table 1 that bulk carriers have the least number of port calls while offshore vessels have the highest port of calls in a month.

Table 1: Percentage of port calls by ship types

Ship Type	Less than 2	2-5	6-10	More than 10
Tankers	7.89	78.9	13.2	0
Bulk carrier/General Cargo	<u>61.9</u>	28.6	9.52	0
Container	0	35.7	50	14.3
Offshore	28.6	28.6	0	<u>42.9</u>
RoRo/Car carrier	50	0	50	0

In the following table 2, it has been observed that most of the officers on tankers always have less rest hours while containers & surprisingly offshore vessels which are considered to be always on busy schedules, never had this. RoRo/Car carriers have the least breach of rest hours.

Table 2: Percentage of less hours of rest by ship types

Ship Type	Always	Often	Sometimes	Rarely	Never
Tankers	<u>21.1</u>	<u>21.1</u>	47.4	7.89	2.63
Bulkcarrier/General Cargo	9.52	28.6	33.3	19.0	9.52
Container	0	28.6	28.6	28.6	14.3
Offshore	0	0	28.6	<u>42.9</u>	<u>28.6</u>
RoRo/Car carrier	50	0	0	<u>50</u>	0

From table 3 below, it is clear that mostly the tankermen have stressed the need for an additional officer followed container vessels and bulk carrier/General cargo vessels. The only ones who disagree with this are few officers from offshore vessels .

Table 3: Percentage of responses for additional manpower by ship types

Ship Type	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Tankers	<u>71.1</u>	23.7	5.26	0	0
Bulk carrier/General cargo	42.9	42.9	14.3	0	0
Container	<u>64.3</u>	21.4	14.3	0	0
Offshore	0	57.1	28.6	<u>14.3</u>	0
RoRo/Car carrier	33.3	66.7	0	0	0

7 Conclusion

By analysis of the cross comparison between diverse types of vessels, voyage patterns, amount of rest hours onboard, it is clear from the results that officers working on tankers have least number of rest hours available as compared to other types of vessels. This means they are on duty for more hours than the personnel on other vessels. Hence tanker ships have emerged as the vessels with the highest workload. Bulk carriers/general cargo & containers are also not far behind in terms of compromise for hours of rest. The most surprising fact is that offshore vessels officers reported less breach of rest hours periods while it's a general perception that their schedules are more hectic than other ships.

Almost all the officers working on a variety of vessels addressed the need for an additional officer onboard to distribute the workloads due to ever increasing paperwork which shows the alarming levels of fatigue onboard. Many of them agreed to have some sort of fatigue related signs and symptoms onboard. They had it some of the time onboard. In the open-ended questions, majority of the officers have themselves encountered fatigue or have noticed in their colleagues which reveals the prevalence of fatigue among the Indian deck officers. They blamed the short voyages & more paperwork for this.

8 Discussion and Critical Review

The study did not include Masters who also must perform navigation watches on smaller vessels most of the time. The job as a Master is mentally more stressful than any other officer. It also did not include other departments such as engine and catering. As majority of the officers were serving on the rank of chief officer which is a demanding position in the maritime world onboard hence there is a possibility that the complain about the rest hours periods could have tilted the figures of the survey. On the contrary, there were very few third officers among the respondents, which I didn't expect. The study lacks their valuable outputs as they are the junior most of all the deck officers and have the least say when it's related to report rest hours due to fear of negative appraisal reports from seniors. There was not enough sample of RoRo/Car carriers which was expected by me. There was not a single officer from a passenger or Cruise vessels. The length of the contracts, which also significantly affect fatigue levels, was not included due to narrowing down the scope of the study. Though there was little time to distribute and get responses from the questionnaire, I was satisfied with the sample quantity. It was difficult to cross check the

different signs and symptoms of fatigue with the nature of port calls of a vessel during the data analysis due to complexity.

9 Future Studies

The respondents were quick to answer questions and most of them had written long comments on the qualitative questions which shows their enthusiasm. There have been very few studies conducted in India related to problem of fatigue among seafarers. Future studies could involve Masters and the length of contracts for the officers, on a larger scale with more samples and interviews. It may also include the other departments such as Engine and Catering.

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