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Application and analysis of the IMO taxonomy on casualty investigation over 20 years of marine events in the Russian Arctic.

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Abstract

The Arctic Ocean is simultaneously rich in terms of hydrocarbons and rare earth and highly sensitive to human activity. Due to the remoteness of the multiple production areas, the development and use of rail roads would be too costly and hard to pay-back, hence the use of maritime transport appears as the main profitable solution.

Yet hydrocarbons fields, mines and human activities are not equally spread around the Arctic. As an evidence, the Russian Federation and Norwegian coast are highly developed with ports such as Sabetta for LNG or Novy for crude oil and also Murmansk as a regional hub for Russia and Kirkenes for Norway.

Concomitantly, former years witnessed an exponential increase in the amount of cargo shipped along the Russian shores in line with the requirement of the President of the Russian Federation and his target of 80 million tons shipped by 2024.

These parameters, combined with the ice melting, may increase the density of traffic in the coming years and consequently the number of accidents and the corresponding number of claims. Until now, few maritime claims within the Russian Arctic have been analyzed and reported in the literature. However, when one investigates different sources of information, it appears that around 140 claims occurred with different layers of severity between 1991 and 2011.

Based on a 20-year observation period and following the standardized IMO taxonomy on casualty investigation, we classified these claims by level of severity, frequency of occurrence, geographical area and time period.

Our results stress the fact that most existing studies underestimate the severity of the claims occurring in the Russian Arctic. Finally, we call for a greater reporting of maritime events and compliance with the IMO risk classification tool to better understand accidentology in this risky zone.

Keywords: risk analysis; Arctic navigation; maritime claims; POLARIS; Russia; IMO Casualty Investigation Code.

1. Introduction

Over the last two decades, the North East Passage has become a matter of increased scientific interest, in particular thanks to the capabilities and economic potentials of the famous Northern Sea Route (NSR) compared to the Suez Canal Route (SCR) and Panama Canal (Faury et al., 2019; Kiiski, 2017; Pruyn, 2016). The impacts of global warming do not spare the Arctic Ocean as a whole (IPCC, 2018; Melia et al., 2016) and ice-free covered areas are more and more frequent especially during summer. Moreover, the Russian Arctic remains a developing area rich in raw materials such as oil and gas (Faury and Cariou, 2016; Humpert, 2014; Faury et al, 2020) attracting investments notably in port infrastructures (Gritsenko and Efimova, 2017) sustained by an ambitious export policy from the Russian government over the 2030 horizon (Ministry of Energy of the Russian Federation, 2010).

The NEP is composed of the Norwegian sea and for the Russian part of the Barents Sea, the Kara Sea, the Laptev Sea, the East Siberian Sea (Vostochno-Sibirskoye) and the Chukchi Sea mainly constitute the Russian Arctic. Regarding the NSR more specifically, it extends for around 3,000 miles (4,800 km) and it is governed by the specific rules of the 'Merchant shipping code of Russian Federation' (NSRA, 2012). Opened since 1991 (Pruyn, 2016; Zhang et al., 2016), the NSR is managed by the 'Northern Sea Route Administration' (NSRA)[1] that monitors and grants the navigation in the NSR waters. Sailing along the NSR is generally feasible during summer season, from July to November (ABS, 2014) while icebreaker assistance is often necessary. The recent years have clearly shown greater volume handled by Russian Arctic ports located along the NSR (NSRA, 2018; SARC, 2017). Around 20 million tons were handled in 2018 with a majority LNG products (Staalesen, 2019). In 2019, 31.5 million tons were carried along the NSR compared to 19.7 in 2018 and 10.7 million tons in 2017 (NSRA, 2019). This increasing traffic is mainly due to the development of oil and gas projects in the Russian Arctic (Marchenko, 2014a) such the Yamal LNG plant and the Prirazlomnaya platform. Consequently, maritime traffic should progressively grow in the next decade (Iudin and Petrov, 2016) not only in terms of liquid or dry bulk but also for passengers (FoU, 2016).

Nevertheless, the rise of maritime traffic in the NEP is not exempt of current and future challenges especially regarding maritime safety. Scholarship (Marchenko, 2012a; 2012b; Fedi et al., 2019) and few professional reports (FoU, 2016) have highlighted the accidentology patterns in this zone. However, the picture provided is fragmented and not following the standards of the IMO Casualty Investigation Code classifying maritime events. This absence of appropriate classification combined to a long-trend underreporting limit the understanding of marine claims in the Russian Arctic.

Based on a 20-years observation, we classified claims that occurred in the Russian and Norwegian Arctic by level of severity, frequency of occurrence, geographical area and time period. The contribution of the paper is to provide a deeper knowledge and understanding of marine accidentology in the Russian Arctic that still appears as a 'black box' while this region is deemed to welcome more maritime activities in the coming years.

After this introductive part, Section 2 reviews the existing literature on marine accidentology in the Russian and Norwegian Arctic. The methodology of the research is explained in Section

[1] http://www.nsra.ru/en/glavnaya/celi_funktsii.html

3 followed by the analysis of maritime events which is contemplated in Section 4. An in-depth discussion is engaged in Section 5 while some conclusions and recommendations are addressed in Section 6.

2. Marine accidentology in the Russian Arctic: a literature review

2.1 Knowledge of marine claims at international level

Marine claims are regularly reported through public and private institutions. At international level, the International Maritime Organization (IMO), which is unifying the rules on safety, security and environmental protection of shipping industry, provides a database called 'Global Integrated Shipping Information System' (GISIS) with a dedicated portal to 'marine casualties and incidents'[2]. This database is maintained by IMO Member States and following the 2008 Casualty Investigation Code (IMO, 2008). Entered into force in 2010, this mandatory instrument sets out that 'investigation and proper analysis of marine casualties and incidents can lead to greater awareness of casualty causation and result in remedial measures, including better training, for the purpose of enhancing safety of life at sea and protection of the marine environment.' That is why IMO member states must notify casualties when they occur and submit their 'final marine safety investigation report' to the IMO (Chapter 14, Part II). These reports must comply with a standardized format and content with regard to provided information. At European level, the same policy is implemented pursuant to Directive 2009/18/EC and European member states associated with Iceland and Norway, also notify casualties occurring in waters under their sovereignty or caused by their flag ships (EU Parliament, 2009) through the 'European Marine Casualty Information Platform' (EMCIP)[3]. Furthermore, private bodies such as the International Union of Marine Insurance (IUMI), insurance companies such as Lloyds or ALLIANZ, regularly publish reports stating an accurate overview on the key trends of the worldwide maritime accidentology. The recent reports have underlined the lowest record of shipping losses with only 46 in 2018 compared to 207 in 2000 pointing out positive responses to safety challenges thanks to better ship design, technology, port operations and updated charts (ALLIANZ, 2019). As a consequence, one observes fewer claims on an international scale (IUMI, 2018).

2.2. Knowledge of marine claims in the Russian Arctic: a black box?

While global or regional statistics are now relatively accessible notably online and accurately commented, they usually provide limited data on accidents occurring in Arctic and particularly in the Russian Arctic. Justifications are numerous although they mainly lie in the fact that maritime traffic is not yet very developed in the Arctic Ocean compared to other traditional maritime areas owing to difficult and risky sailing conditions (Lasserre et al., 2016; Fu et al., 2016; Haavik, 2017). A large combination of hazards, linked to weather conditions, icebergs, ice presence and thickness for most of the year, very cold temperature, shallow waters, lack of up-to-date charts (Pastusiak, 2015), remoteness, few navigational aids and search and rescue (SAR) infrastructures (Fedi et al., 2018a; SARC, 2017; Østreng et al., 2013), represents huge challenges for ships and their crew (Montewka et al., 2015). Scholars and some bodies have evaluated risks both for the Arctic circle (Baksh et al., 2018; FoU, 2016; Marchenko et al., 2015; Kum and Sahin, 2015; AMSA, 2009) and for the Russian Arctic more specifically (Fedi et al., 2019; Vihanninjoki, 2014; ABS, 2014; Marchenko, 2012a, 2012b, 2014).

These specific operational conditions and underlying risks exist even more substantially in the Russian Arctic and then along the Northern Sea Route (NSR). This area is indeed characterized by adverse variable weather conditions aggravated by persistent ice cover even in summer

[2] https://gisis.imo.org/Public/MCI/Default.aspx
[3] http://www.emsa.europa.eu/emcip.html

(AMSA, 2009; ABS, 2014). These ice features vary among ice massif or concentrated ice, drifting ice-pack that make sailing difficult, hazardous and unpredictable (Marchenko, 2012a, 2012b, 2014; Abbassi et al., 2017).

The underreporting is the second key reason of the knowledge gap on Russian Arctic accidentology (Goerlandt et al., 2017; Fedi et al., 2019) insofar as one can assume that states unequally comply with the IMO Casualty Investigation Code, the Russian Federation in particular and some events are not reported or few data are provided in the relevant databases. The consultation of the GISIS clearly shows this concern. One assumes that its root cause lies in the states' negligence and in the flaws of the Casualty Investigation Code provisions which only requires notification to the concerned parties in case of 'marine casualty' (art. 5.1) and conducting a 'safety investigation' for 'very serious marine casualty' (art. 6.1). It means that investigation as regards simple 'marine incident' and 'serious casualties' are not mandatory even if recommended by IMO (art.17.1). In terms of reporting, member states must make their investigation reports available to the public and submit them to IMO while there are no sanctions in case of non-or underreporting. Nevertheless, some reports have been published but providing a limited period of analysis and uncompleted geographical scope that hindered appropriate evaluation of accidentology in certain locations (Grabowski et al., 2009). This is the case of the Arctic Marine Shipping Assessment (AMSA, 2009) that identified 293 claims over the 1995-2004 timeframe. Furthermore, ALLIANZ has yearly made a focus on casualties/incidents since 2016 (ALLIANZ, 2016, 2017, 2018, 2019) and has emphasized an increase of claims compared to their general decline in other regions (ALLIANZ, 2018; Fedi et al., 2018a; 2018b). However, it is noteworthy that these professional studies provide a general picture on Arctic marine accidentology whereas they are silent with regard to the Russian Arctic (Fedi et al., 2019). One cannot determine what kind of claims occurred in the Russian Arctic that finally appears as a 'black box'. The AMSA (2009) report underlined this gap that has been recently completed thanks to some scholars. Marchenko (2012b; 2014) listed 90 accidents throughout the 1990-2010 period with a focus on the different key areas and demonstrated that floating ice was a determining factor of casualties. Fedi et al. (2019) analyzed a complementary period covering the last two decades and more specifically between 2007 and 2018 and reported 30 marine claims which represents more than 73% of casualties. To the best of our knowledge, this was the first research applying the IMO taxonomy on marine claims.

The Table 1 summarizes the different published studies and research dealing partially or totally with marine accidentology in Arctic and Russian Arctic. This obviously illustrates that data are currently discontinued, fragmented and not fully standardized.

Table 1. Marine accidentology in Arctic and Russian Arctic

Source	Timeframe	Zone	Number of reported claims	IMO taxonomy
AMSA report 2009	1995-2004	Arctic Circle	293	No
ALLIANZ reports 2016-2019	2006-2019	Arctic Circle	588	No
Marchenko 2012	1990-2010	Russian Arctic	90	No
FoU Rapport, 2016	2010-2015	Arctic – High North: Russian Norwegian, Icelandic,	1702 (40 for Russia)	No

		Greenlandic waters		
Fedi et al. 2019	2007-2018	Russian Arctic	30	Yes

Source: The Authors, 2020

In addition, the scarce data on marine accidentology within the Russian Arctic has been often coupled with approximate terminology regarding claims. As a matter of fact, one observes that professional reports such as the ones made by ALLIANZ, AMSA (2009) or FoU (2016) have been generally vague on those marine claims by concurrently referring to the notion of 'incidents' or 'accidents' since they do not refer to the appropriate 2008 IMO taxonomy (Fedi et al., 2019). Obviously, this current weakness that applies to other general reports (Ladan and Hänninen, 2012) involves some confusion with regard to the standardization of claims occurring in the Russian Arctic, hiding their acuity level and then their clear understanding (Fedi et al., 2019).

3. Methodology

The research design of this paper is mainly qualitative and policy-oriented. After considering the existing studies and research on accidentology in the Russian Arctic, we combined data coming from different sources in order to include in our study the maximum possible number of marine claims. This cross-collection searching is justified by the fragmented data provided by existing sources of information and in line with other studies in maritime accidents (Luo and Shin, 2019). We notably used the different reviews on safety and shipping from ALLIANZ, from the International Union of Marine Insurance (IUMI), the IHS Markit database, the IMO GISIS and marine investigation reports from CLARKSONS. Once events were identified, we categorized them pursuant to the appropriate terminology provided by the IMO Casualty Investigation Code (IMO, 2008). According to this code, there are two fundamental categories of maritime events: 'incident' or 'accident' / 'casualty' depending on their severity level. The definitions stated in the Casualty Investigation Code are as follows:

"*A marine incident means an event, or sequence of events which has occurred directly in connection with the operations of a ship that endangered, or, if not corrected, would endanger the safety of the ship, its occupants or any other person or the environment. It does not include a willful misconduct that is to say a deliberate act or omission, with the intention to cause harm to the safety of a ship, an individual or the environment*."

"A *marine casualty*" means an event, or a sequence of events, that has resulted in seven different cases as described in Table 1 and which has occurred directly in connection with the operations of a ship. It does not include a willful misconduct. Marine casualties are divided into two sub-notions: "*serious casualty*" which involve a fire, explosion, collision, grounding, contact, heavy weather damage, ice damage, hull cracking, or suspected hull defect, etc., resulting in: immobilization of main engines, extensive accommodation damage, severe structural damage, such as penetration of the hull under water, etc., rendering the ship unfit to proceed, or pollution (regardless of quantity), and/or a breakdown necessitating towage or shore assistance. A "*very serious marine casualty*" involves the total loss of the ship or a death or severe damage to the environment". To sum-up, the lowest level of gravity belongs to 'marine incidents' (MI) and the highest to 'very serious marine casualties' (VSC) as shown in Table 2.

Table 2. Taxonomy of marine incidents and casualties

Taxonomy	Marine incident	Marine casualty	
		Serious casualty	Very serious casualty
Definition	- Endangers the safety of the ship, its occupants or any other person or the environment	- Fire - Explosion - Collision - Grounding - Contact - Heavy weather damage - Ice damage - Hull cracking - Suspected hull defect - Material damage to a ship - Stranding or disabling of a ship - Material damage to marine infrastructure - Severe damage to the environment	- Total loss of the ship - Death - Severe damage to the environment - Loss, presumed loss or abandonment of a ship

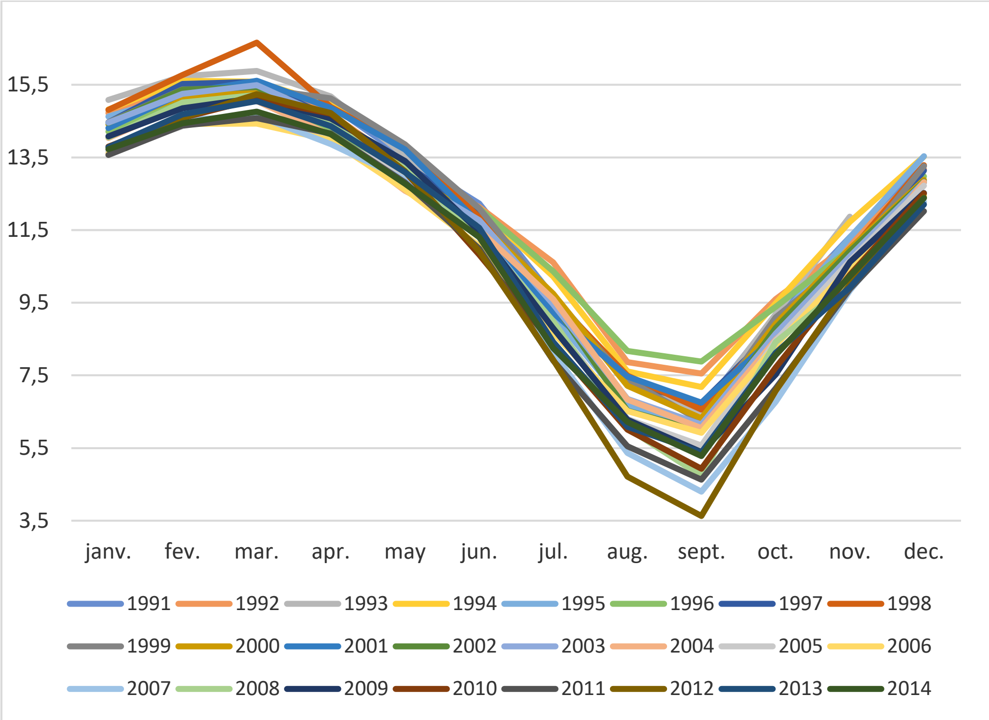
Source: based on (Fedi et al., 2019) and IMO Resolution MSC.255(84) 16 May 2008

4. Accidents analysis and taxonomy

4.1 Ice risk fundamentals

In the Russian and Norwegian Arctic as well as in the Arctic Ocean, the ice extent changes on a yearly basis as illustrated in Figure 1 below. The concerned months showing the lowest and the highest ice extent are usually September and March.The most important change of ice coverage is concentrated in the periods between May and August and between October and December.

Figure 1: Arctic ice extent 1991-2014



Source: NSIDC (2014).

4.2. Data collection analysis

We collected the vessel name, its deadweight, year of construction, date and location of the event (i.e. latitude and longitude) and determining factor. We noticed that 18 events did not report their latitude and longitude while the location of events must be reported. The data collection enabled us to identify 145 events that occurred throughout the 1991-2011 period as illustrated in Table 3. In essence, the majority of these events are 'marine casualties' and not being mere incidents shows an obvious level of severity. We categorized 6 marine incidents (MI), 100 serious casualties (SC) and 36 are very serious casualties (VSC). To sum-up, one observes the following breakdown:

- MI only represents 4.8%
- SC accounts for 69.6%
- VSC is worth 25.5 %

If one takes a closer look as regards the most recurrent SC, it appears that machinery damage or failure such as lost rudder or fouled propeller, constitutes the most recurrent accident with 52 48 claims (33.31%) while wrecked or stranded ship and fire/explosion represent, both, the second most frequent SC (9.6%) and lead to 12 and 6 total losses respectively (Table 3).

Damage or failure to machinery leads to only one total.

The third category lies in Hull damage with 13 events (8.9%) and two total losses. Furthermore, collision represents the fourth category with 10 claims (6.9%). It is noteworthy that one reports 37 total losses out of 145 events meaning that VSC represents 25.5% of the total.

Table 3: Synthesis of maritime events 1991-2011

Number of incident or casualty **Type of event**	**Number of marine incident (MI)**	**Number of Serious Casualty (SC)**	**Number of Very Serious Casualty (VSC) / Total loss**
Machinery damage /failure	-	48	1
Wrecked/ stranded ship	-	14	12
Fire/explosion	-	14	6
Foundered (sunk/submerged)	-	-	15
Hull damage (holed, crack, structural)	-	13	2
Collision	-	10	
Miscellaneous	7		
Contact	-	2	
Missing	-		1
Sub-TOTAL	**7**	**101**	**37**
TOTAL	**145**		

Source: Authors (2020)

Concerning the typology of vessels involved in claims, one notices the high number of fishing vessels and trawlers as shown in Table 4. They represent more than the half of identified events. It has to be stressed that they mainly face casualties (97.5%). All size of fishing vessels is concerned while they specifically account for 67.5% of the total losses (25 out of 37).

From a global approach, as stressed by table 4, General Cargo vessels represent 11.72% of the claims and tanker count for 10.32%. this result is in line with the main activity of the Arctic, raw materials exploitation. Other ship typologies are fewer since they are not much operated along the NSR such as passenger or cruise vessels even if they would be more numerous in the long run (FoU, 2016).

Table 4. Typology of involved vessels and related accident taxonomy

Typology of ships*	Number of Marine Incident (MI)	Number of Serious Casualty (SC)	Number of Very Serious Casualty (VSC) – Total loss	Percentage*
Fishing vessel / trawler / fish factory	2	54	25	55.86%
General cargo	1	10	6	11.72%
Tanker	1	13	1	10.34%
Reefer	2	7	2	7.59%
Bulk carrier	-	6	1	4.83%
Tug	-	2	1	2.07%
Icebreaker	1	2	-	2.07%
Passenger ship	-	3	-	2.07%
Research vessel	-	1	1	1.38%
Others	-	3	-	2.07%
TOTAL	7	101	37	100%

Source: The Authors, 2020

It is observed that the youngest ship is 3 years old while the oldest is 50. Table 5 summarizes the average age of each ship category involved in claims. With 29.7 years old, the tug vessels show the oldest average followed by research vessels (28.5), icebreakers (27.5), fishing vessels (24.9), reefer (24.4), general cargo vessels (22.9) and tankers (22) and Others (21.7). Although less represented in our sample, passenger ships, also show a medium average age.

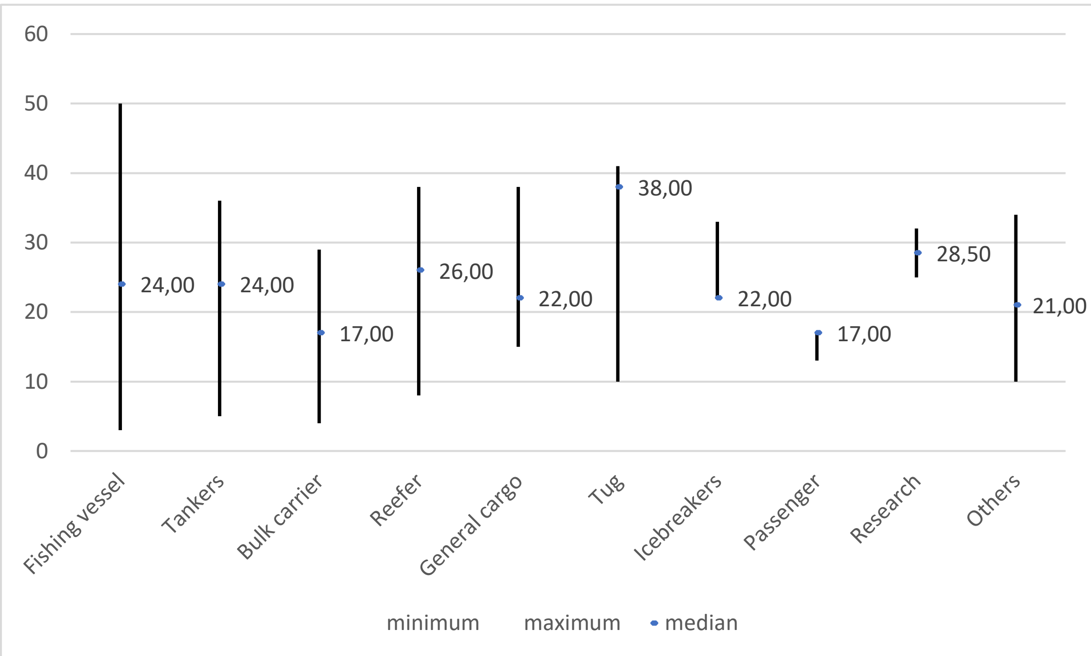
Table 5. Average of vessel age

Typology of vessel	Number of claims	Total loss	Average age
Fishing vessel / trawler / fish factory	81	25	24.9
General cargo	17	5	22.8
Tanker	15	1	22
Reefer	11	2	23.6
Bulk carrier	7	1	17
Tug	3	1	29.7
Icebreaker	3	-	25.7
Passenger ship	3	-	15.7
Research vessel	2	1	28.5
Others	3	-	21.7

Source: The Authors, 2020

If one considers the average age of the 143 concerned ships at the time of their claim, it is relatively high with more than 20 years old (Figure 2). Besides, looking at figure 2, it appears that half of the vessel of the fleet analysed (exception for passenger sand bulk) are more than 20 years old. This graph also highlights the fact that, as explained by numerous articles, the fleet of icebreakers has to be renewed, especially since it is the backbone for a safe navigation. Another element that can explain the high number of claims involving fishing vessels is the age of the fleet. If the youngest vessel was 3 years, the oldest one was 50 years. The Arctic development is mainly due to the exportation of raw materials such as minerals or crude oil. If a median and maximum age of 24 years and 36 years respectively tankers may represent a risk for the environment as they are at the third position in term of number of claims just after the bulk carrier (Table 3).

Figure 2: minimum, median and maximum age of vessels victim of claims

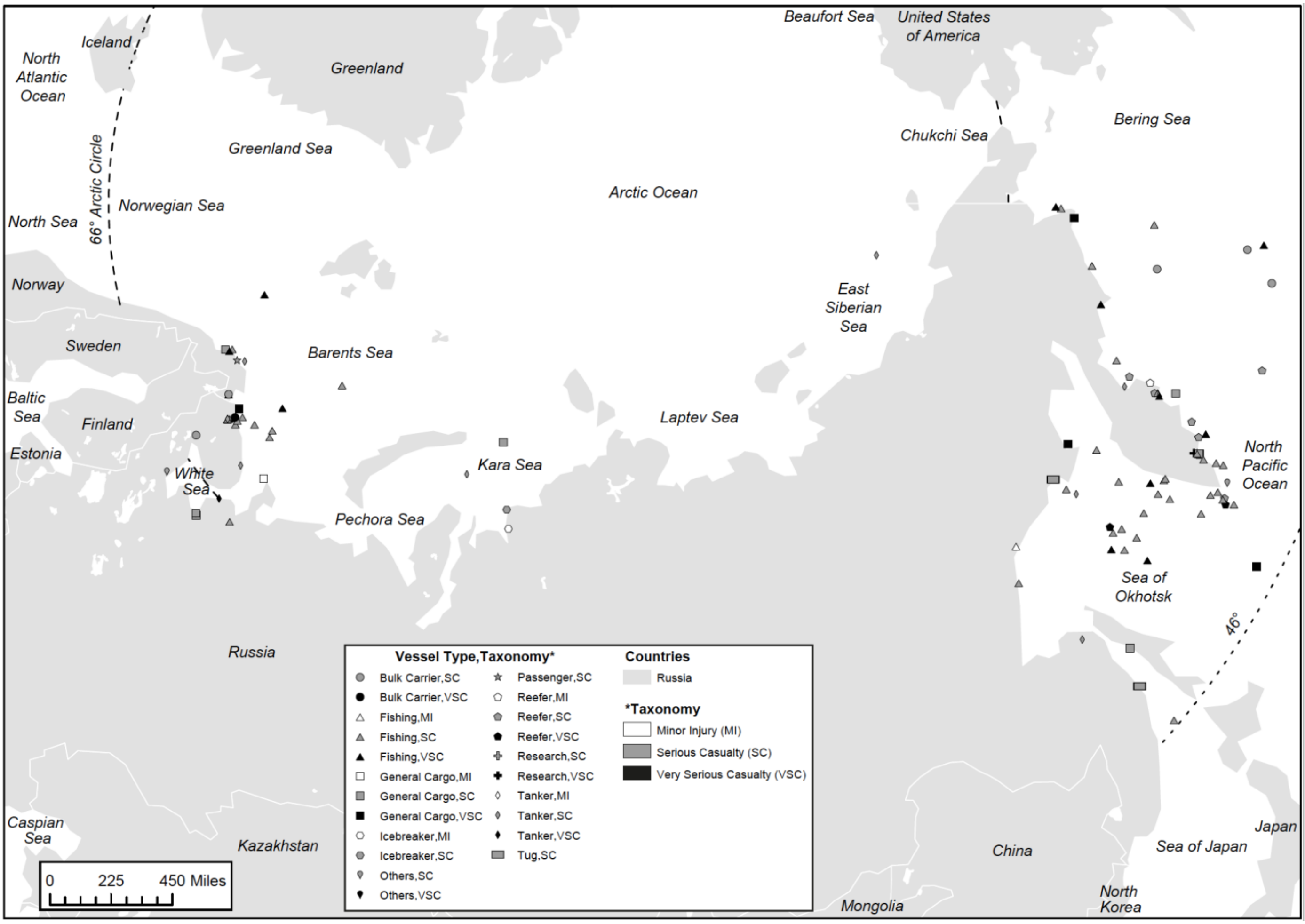


Source: Authors (2020)

As explained above, gathering data within the Russian Arctic is complicated and even more when dealing with the NSR as it can be seen on Figure 3.

As previously explain, over the 145 claims, 18 do not have precise location, hence, we were able to map 127 claims. In this map, it clearly appears that both NEP extremes represent the lion share in term of maritime activity during the period analysed. In the map the eastern part is more subject to claims with 63% of them than the western. This result may be the consequence of the Sakhalin fields exploitation and of the fishing activity on the North-Pacific, potentially the king crab.

Figure 3: map of claims



Source: Authors (2020)

5. Discussion

The analysis of identified claims showed an overwhelming predominance of 'marine casualties' and more precisely 'serious casualties' (SC) pursuant to the classification laid down in the 2008 Casualty Investigation Code. With roughly 73% of SC and 23% of VSC, it is assumed that the existing reports underestimated and did not describe accurately the exact nature of claims that occurred in the Russian Arctic. The FoU report (2016) that provided a valuable overview of risk patterns in the High North mainly referred to the notion of 'unwanted incidents'. ALLIANZ reports are used to mentioning the combined terminology of 'incidents/accidents' whereas listing accurate typology of claims (ALLIANZ 2016-2019). Even though Marchenko (2012b) highlighted and described numerous ‘accidents’ that occurred in the Russian Arctic from 1990 to 2010, the appropriate IMO taxonomy was not used. This lack or non-utilization of the Casualty Investigation Code is surprising insofar as this instrument is mandatory since 2010 and its purpose aims to universally categorize maritime claims all around the world. Fedi et al. (2019) initiated the appropriate categorization of claims within the Russian Arctic and our study emphasized this preliminary work that already identified 75% of SC over the 2004-2017 period. Our results are in line with this evaluation showing that marine casualties were the most frequently reported. While our analysis encompasses the 1991-2011 timeframe, it shows similarities regarding the determining factors. Machinery damage or failure and ship wrecked are the top two casualties caused by harsh operating conditions and particularly by ice which represents the key factor. Fire explosion and hull damage are the third and fourth most frequent claims. Recent statistics of the Murmansk Maritime Rescue Coordination Center stressed these principal causes (FoU, 2016) confirmed by ALLIANZ reports (2016-2019) from a broader perspective for the Arctic Circle. Ice drifting, ice jet or forced overwintering lead to most machinery and hull damage and shipwrecks (Marchenko, 2012a, 2012b, 2014b).

It is important to emphasize the high average age of ships having faced casualties and especially those that foundered. According to our analysis, they had roughly 25 years old at the time of their casualty. While an old ship is not necessarily a poorly maintained ship, studies have shown that they have reduced structural resistance and particularly against ice (Marchenko, 2014b). The fishing vessels accidentology that we collected is particularly questioning insofar as it involved the highest level of SC and VSC. Nonetheless, fishing vessels are numerous in the area, totaling around 2.5 thousands, and they are ‘especially old and worn out’ (FoU, 2016). Furthermore, the claims affecting nuclear-powered icebreakers is also a worrying situation. While we only identified three events, one unclassified event and two SC including one collision (M/S Taymyr in 2011) and one explosion/fire (M/S Arktika in 2007). Although the latter was taken out of service in 2008 and huge investments for the construction of new Russian nuclear icebreakers, the current fleet is really aging as well as the world icebreaker fleets (AMSA, 2009). Then, it raises the question of their safe operating conditions. In addition, one observes that tankers and bulk carriers regularly face SC. Their presence in the Russian Arctic and along the NSR seems rationale since commodities such as oil products and dry bulk constitute the main cargoes shipped in this area (NSRA, 2019; Faury and Cariou, 2016). Nevertheless, as regards tankers, one notices their high average age (22 years) combined with severe accidents such as hull damage, collision, fire and explosion that represents possible sources of oil pollution (Konygin et al., 2015; Tikka et al., 2008) and negative impacts in fragile areas (Fedi et al., 2019; Johannsdottir and Cook, 2019; AMSA, 2017). Concerning container ships, one reported a unique claim. It illustrates that the NSR does not constitute an attractive zone for container segment at this stage (Cariou et al., 2019; Lasserre, 2014).

With regard to the limitations of the study, as already explained, our investigation does not cover the 2012-2019 period insofar as other studies already provided some findings on accidentology in the Russian Arctic over the last decade (Fedi et al. 2019). In addition, the identified claims do not pretend to constitute a complete database on marine accidents – incidents. Nevertheless, to the best of our knowledge, this investigation is one of the most quantitatively important on the Russian Arctic.

Moreover, it is noteworthy that the current IMO marine casualties and incidents database (GISIS) should provide the accurate and relevant information on Arctic accidentology whatever the concerned areas are. However, this is not the case insofar as the current IMO legal framework on reporting is not coercive enough (IMO, 2008). IMO members are only bound to notify casualties and investigate VSC and even if they are deemed to publish their investigation reports, they are never sanctioned in case of absence of notification and reporting. As a consequence, the global database is not adequately alimented and the IMO does not publish statistics on maritime accidentology thanks to its database. Although there is no legal requirement that constrains IMO to publish statistics, a greater transparency is desirable to promote and to encourage states to maintain the GISIS marine casualties and incidents database. Considering the current critics on transparency addressed to IMO and shipping industry as a whole (Lister et al., 2015; Fedi, 2016; InfluenceMap, 2017; Monios, 2019), an evolution seems necessary in the short run.

On the contrary, the Directive 2009/18 EC imposes stronger requirements at EU level since the occurrence of all types of events (incident or casualty) and all investigation reports must be notified by EU member states to the EMCIP platform. The non-compliance with this principle notification can lead to financial penalties. In addition, the reports have to be published and publicly available. Accordingly, on observes a stronger transparency and detailed reports are annually provided by the European Maritime Safety Agency[4] (EMSA) in accordance with Regulation n°100/2013 (EU Parliament, 2013). However, EMSA reports do not include the Russian Arctic. The situation could be improved through the future 'Compendium of Arctic Shipping Accidents' (CASA) with the aim to collect statistics on marine claims occurring in Arctic Circle and including Russia (PAME, 2017; Fedi et al., 2019). An embedded question is whether the concerned states of the Arctic Council will "play the game" or not. This database that was deemed to start by the end of 2019 is not yet implemented. Looking at the current fragmented information on Arctic accidentology, and the existence of numerous claims just for Norway with more than 1630 claims just the 2012-2015 timeframe, the launch of CASA appears as a pressing need. If this platform was duly and regularly maintained in accordance with the IMO taxonomy, it would allow a stronger knowledge and understanding of the Arctic area and then enables stakeholders to set up relevant measures and policies. Public and private policy makers such as Arctic states, classification societies, shipowners and underwriters are certainly the first concerned. Even if a stronger safety awareness is emerging in the High North including Russia (FoU, 2016) with progressive responses at structural level through the development of infrastructure and at operational level thanks notably to the adoption of the Polar Code (Fedi and Faury, 2016; Dalaklis et al., 2018), our analysis reveals the perceived gaps which need to be overcome.

It is recognized that the availability of accurate and regular data on marine accidentology eases their analysis (Luo and Shin, 2019; Oltedal and Mc Arthur, 2011; Hassel et al., 2011) and the elaboration of appropriate statistics that underwriters search prior to cover shipping risks. However, these statistics are still limited for the Arctic area (Kiski, 2017; Sarrabezoles et al., 2014; Gold, 1999) and leading to extreme prudence of insurance companies regarding risk insurability in Arctic waters notwithstanding the Polar Code adoption (Fedi et al., 2018). In addition, regarding the Russian Arctic, a greater accessibility of data should allow a better understanding of this zone that is facing a growing traffic (FoU, 2016). Consequently, it would enable public and private stakeholders to define the best policies and measures on risk management for mitigating marine casualties in this singular area.

6. Conclusion

This paper aimed to shed a light on maritime claims that occurred in the Russian Arctic over the 1991-2011 period. Around 160 events were both reported and analyzed. While this does not constitute an exhaustive database, our evaluation can be considered as one of the most quantitatively important records on the Russian Arctic so far and represents a valuable source

[4] http://www.emsa.europa.eu/accident-investigation-publications/annual-overview.html

of information for further investigation especially for a global analysis over the last three decades (1990-2020).

These preliminary results clearly showed a high number of serious casualties compared to incidents. This obviously confirms that the Russian Arctic remains a very risky area and justifies why the Russian government set out specific sailing requirements along the NSR and planned other measures notably improving the existing SAR infrastructures and creating new ones (FoU, 2016). Nevertheless, it raises the question of the compliance with the NSR regulations and the likelihood consequences of increased traffic in this zone. In 2017, the NSR administration faced some breaches of its rules (NSRA, 2017). Furthermore, some reports have underlined bad statistics in Arctic circle as a whole while the global statistics have shown significant improvements with the best figures ever recorded (ALLIANZ, 2019; IUMI 2018).

It can be reasonably expected that the entry into force of the Polar Code should improve these negative statistics insofar as it requires a stronger operational adaptation of ship and crew in terms of safety requirements and related risk management (DNV-GL, 2017). Indeed, the different mandatory rules on crew certification, ship ice class, polar water operational manual and voyage planning are designed to reduce risk occurrence and then accidentology in Polar areas. However, the implementation of the Polar Code must not exclude the compliance of the Casualty Investigation Code that has been neglected so far. As explained, a greater reporting is obviously needed quantitatively and qualitatively for a better understanding of the Russian Arctic accidentology.

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