Marine Policy 73 (2016) 53–60

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

Is Northern Sea Route attractive to shipping companies? Some insights from recent ship traffic data

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ARTICLE INFO

Article history:
Received 14 April 2016
Received in revised form
29 July 2016
Accepted 29 July 2016

Keywords:
Ship traffic analysis
Northern Sea Route
Trade pattern

ABSTRACT

While the media vigorously propagates historic Northern Sea Route (NSR) transits and researchers demonstrate the viability of the NSR, current usage by the shipping industry has been neglected thus far. This study aims to analyse the current ship traffic at NSR using transit data and port call data. The results show that navigation season lasts for five months, and Arc4 and Arc5 vessels are used extensively. Some Asian countries are active participants in the transit activities. NSR seems to be more appealing to liquid, bulk and general cargo transportation. Currently, most activities are still domestic and destinational in nature. The paper provides real statistics that can add value to the viability analysis. It identifies key players of the transits, exhibits trade pattern at NSR, and presents facts that interest shipping companies.

1. Introduction

The continuous retreat of Arctic sea ice in the past decades has attracted wide attentions from various stakeholders. The transarctic shipping routes are said to provide much shorter alternatives between Europe and Asia compared to conventional routes via the Suez/Panama [1]. The NSR, in particular, is in the spotlight, as it has the most favourable ice conditions among all transarctic routes [2,3].

Numerous studies on Arctic shipping issues seem to have sprung up in the past 20 years, and they had their own exclusive objectives and focuses. A number of studies examined transportation feasibility of the NSR, highlighting both advantages and challenges [4–7]. Some researchers investigated the cost competitiveness of the NSR relative to conventional shipping routes [8–11]. A recent trend has been to investigate the views of shipowners to complement the academic works [1,12]. Thus far, the feasibility study of the NSR has been well-rounded.

Russia has been constantly encouraging international use of the NSR. The route was officially opened on January 1, 1991, as an international shipping route [13]. Lately, many new initiatives have been taken to improve the infrastructure along the NSR. Safety and communication has been improved by building ten new bases for search, rescue and communication [14]. After many-year wait, a legal and administrative base for the NSR was created: the *Federal Law of Shipping on the Water Area of the Northern Sea Route* has been in force since 27th January 2013; and the federal state institution, the Northern Sea Route Administration (NSRA), was established in March 2013 [15]. Administrative procedures have been improved and escort fees have become competitive, but are not transparent [13].

The initial premise of this study stems from two observations. First, the feasibility studies of the NSR are comprehensively developed: a wide range of research aspects were considered and shipping sector's perception was also accessed. Second, in contrast to the first observation, there is a lack of analysis of the real shipping traffic data, i.e. we know little about what exactly is happening at NSR. Many studies, indeed, have mentioned those historic shipping events [16,17] and the fact of increasing NSR transits in the past few years [12,16]. However, few of them looked into the details of these transits and conducted ship traffic analysis to identify interesting results. To the best of the authors' knowledge, only four studies have analysed NSRA's transit records: Marchenko [15] and Humpert [18] studied various shipping characteristics in 2013, including cargo volume and type, flag and ice class of vessels, and average transit speed; Moe [13] compared number of transits, cargo volumes, cargo types, origins and destinations (OD) in 2011–2013, while Lasserre and Alexeeva [19] did similar trend analysis for years 2007–2012.

This paper aims to conduct a comprehensive ship traffic analysis for the transits along the NSR. The datasets include NSR transit records and port call information. The contribution of this

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http://dx.doi.org/10.1016/j.marpol.2016.07.030
0308-597X/

study is as follows. It helps to fill in the gap between academic viability studies and practical shipping operations by portraying the actual ship traffic at NSR. The real statistics can add value to the viability analysis by identifying key players and exhibiting trade pattern at NSR. Also, maritime sectors can benefit from operation-related findings of this study: the time window of the route, ice class of vessels, days of transit and etc.

2. Data sources

The authors rely on two sets of data for the analysis. One dataset is the transit records at NSR in 2011–2015, and it is collected from two sources. The Northern Sea Route Information Office reports the transit data annually since 2011. However, the office is owned and operated by the Centre for High North Logistics (CHNL), thus the data cannot be regarded as Russia's official release. NSRA was established in 2013, so they have only maintained records for 2013–2015. The authors primarily use the data from CHNL for ship traffic analysis; the data from NSRA is used to supplement that from CHNL. Another set of data is purchased from the maritime information provider, IHS Maritime & Trade, which gathers worldwide port calls that exhibit vessel movements for years 2013 and 2014. Port call data collection is supported by Automatic Identification System (AIS) and the company's branches at various ports.

The transit data maintained by CHNL is open to all, and that maintained by NSRA can be obtained once it is requested. Both concern only the transit information along the NSR, and report factors of interest, such as vessel name, flag, ship type and cargo. On the other hand, port call data is commercial and involves worldwide port call information. It reports a standard array of information, including arrival date, sail date, ship name, ship type and port of call.

3. Data analysis

3.1. Transit data

CHNL reported 41, 46, 71, 53 and 18 records respectively in 2011–2015. The number increased from 2011 to 2013, and dropped from 2013 to 2015. As pointed by Moe [13], 'transits' here include all sailings that traversed the most challenging part of the NSR, along the coast of East Siberia. Thus, voyages from Ob Bay and eastwards were included, and so were journeys from the west to Pevek in the Far East, even if they did not sail the full length of the NSR. The origin and/or destination may well be Russian ports. Thus, transit is not the same as international transit.

NSRA reported 37, 23 and 18 records in 2013–2015. The data reported by CHNL and NSRA was exactly the same in 2015. In 2013 and 2014, NSRA reported less number of records than those of CHNL as they kept those transits that sailed the full length of the NSR. However, transits may not necessarily be international.

In this study, the authors try to categorise the transits into three groups based on OD information: domestic transits refer to shipping activities with both OD within Russian territory; destinational transits are those with one of the OD in Russia, and the other in a foreign country; and international transits are those with both OD in foreign countries.

CHNL has not standardized the information fields to be reported, hence different entries were collected over time. On the other hand, NSRA reported almost the same info in three years except that they added one new entry, *i/b assistance*, in 2015 (Table 1).

Table 1
Information fields reported by CHNL.

Year	Information fields
2011	Vessel's name, type, flag, cargo, port of loading and port of destination
2012	Vessel and flag, ice class, shipowner/operator, cargo, destination, port and date of sail, entry to NSR, exit from NSR, time on NSR and average speed
2013	Vessel and flag, ice class, GRT (gross register tonnage), vessel owner/operator, cargo, port of destination, port and date of departure, entry to NSR, exit from NSR, days spent at NSR and average speed
2014	Name of vessel, flag, type, GRT, date and place of entering the NSR water area, date and place of leaving the NSR water area and days spent at NSR
2015	Vessel name, flag, shipowner, ice class, type, cargo owner, cargo, qty, max draught, departure, destination, i/b assistance, entry and exit points at NSR and NSR passage time

3.1.1. Time window and ice class

The NSR is generally accepted as a seasonal route linking Pacific and Atlantic Oceans due to prevalent ice in winter [1,20]. In 2012, the very first activity started in late June and last activity ended in mid-November. In 2013, the time window was from late June to late November; and in 2014, it was from late June to mid-November; and that of 2015 was from late July to early December. Hence, the sailing season was less than five months per year.

Also, since the NSR is ice-covered, ice-class vessels are required to transit across the region. In 2012–2015, the majority of the vessels were either Arc4 (81 ships) or Arc5 (45 ships).

In 2015, NSRA also reported one additional entry on whether icebreaker was employed. Among 18 transits in 2015, only 4 vessels asked for icebreaker assistance. In addition, these vessels were not necessarily of low ice class. Therefore, icebreaker escorting is not compulsory and currently many vessels can sail independently during the sailing season.

3.1.2. Flag and origin and destination for transits

According to CHNL, in 2011, there was a leading proportion of Russian-flag vessels, followed by Singapore. It became more diverse in 2012, with active participations of Panama, Finland and Norway registered vessels. In 2013, one observes the most diversified flags of twelve in total. However, in 2014, the situation became so extreme that only five vessels were foreign registered. According to OFC [21], western sanction on Russia might be the main reason for the decline in foreign shipments at NSR in 2014. In 2015, the number of transits dropped substantially, and there were eight foreign registered vessels and ten Russian-flag vessels only. It seems that parties interested in the NSR may remain in the waiting or investigating stage (Table 2).

However, ship flag does not indicate the exact countries involved in an activity. The ODs of transit activities present clearer evidences. CHNL reported ports of destination and departure in 2011–2013; NSRA data provided departure and destination info for years 2014 and 2015 (Table 3). Note that the proportions of international and domestic transits generally increased over time, while that of destinational transits decreased. Domestic and destinational shipping collectively took up the main business along the NSR, constantly more than 60%. For origin or destination, China, South Korea, Norway and Netherlands' ports appeared often. All Arctic nations have involved in the transits. For Asian countries, China and South Korea have the leading number of transit activities; Japan participates in transits in 2013 and 2015; and Singapore, Malaysia, Thailand, Vietnam and North Korea all have once attempted to utilise the route for transportation.

3.1.3. Ship size, ship type and cargo

The GRT figures were only available for 2013 and 2014. The GRT for vessels ranged from 1207 to 102,236 t in 2013, which covered a