

Briefing 5

Heavy Fuel Oil use by Fishing Vessels in the IMO Polar
Code Arctic, 2015

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Introduction

The use of heavy fuel oil (HFO) as a marine fuel poses serious environmental and economic risks, especially in ecologically sensitive areas like the Arctic. Using HFO is risky not only because of potential fuel oil spills, but also because burning it produces harmful air and climate pollutants, including black carbon (BC). As ship traffic increases in the Arctic, the risk to the Arctic environment and its peoples will also increase.

The International Council on Clean Transportation (ICCT) has been investigating the use of HFO in the Arctic and the BC emissions that result from it. In 2017, the ICCT published a report titled *Prevalence of Heavy Fuel Oil and Black Carbon in Arctic Shipping, 2015 to 2025*¹ which showed that while less than half of the number of ships in Arctic waters, as defined in the IMO Polar Code, operated on HFO, it represented 76% of the quantity of fuel onboard Arctic ships, since larger ships (with larger fuel tanks) tend to use HFO. The Clean Arctic Alliance, a coalition of environmental non-profit organizations, has used this and other research findings to advocate for an end to the use of HFO in the Arctic. In light of recent advocacy efforts, and as proposed by several IMO Member States, the IMO has agreed to consider ways to reduce the risks of HFO in the Arctic, with the work commencing in 2018.

Many types of ships use HFO, including fishing vessels. While commercial fishing is vital to food security and economic prosperity, it also poses a threat to the Arctic environment through air and climate pollution emissions, including BC, and through the risks of HFO spills. In 2015, fishing vessels accounted for 9.4% of HFO use, 8.2% of HFO carriage as fuel, 0.5% of distance-weighted HFO carriage as fuel (tonne-nautical miles), and 25% of BC emissions in the IMO Arctic.²

This paper takes a closer look at the use of HFO by fishing vessels in Arctic waters as defined in the IMO's Polar Code, which we refer to as the "IMO Arctic" (Figure 1).

¹ Comer, B., Olmer, N., Mao, X., Roy, B., and Rutherford, D. (2017). *Prevalence of heavy fuel oil and black carbon in Arctic shipping, 2015 to 2025*. The International Council on Clean Transportation. Available at: <http://www.theicct.org/2015-heavy-fuel-oil-use-and-black-carbon-emissions-from-ships-in-arctic-projections-2020-2025>

² Ibid at 1. Note that BC emissions are from fishing vessels using either HFO or distillate fuel. HFO-fueled fishing vessels accounted for 8% of total BC emissions from ships operating in the IMO Arctic.



Figure 1. The Arctic as defined in the Polar Code (the "IMO Arctic").

Methodology

IHS, a company that, among other things, maintains a list of commercial ships and their characteristics, categorizes ships into various categories called "ship classes." One ship class is called "fishing vessels." There were 755 fishing vessels operating in the IMO Arctic in 2015. Of these, 159 operated on HFO and 596 operated on distillate. From a climate perspective, the risks of using HFO as a fuel in the Arctic are related to the amount of HFO consumed, since burning HFO emits climate warming pollutants, including BC. From a spill risk perspective, the risks of using HFO in the Arctic are related to the amount of HFO carried onboard ships in their fuel tanks and the distance HFO-fueled ships sail in Arctic waters.

To analyze the risks of using HFO as a marine fuel in the Arctic we consider the metrics in Table 1.

Table 1. Metrics

Metric	Unit	Description ³
HFO used	tonnes	Quantity of HFO a ship burned
HFO carried	tonnes	Quantity of HFO a ship had in its bunker fuel tanks
Distance-weighted HFO carried	tonne-nautical miles	Product of HFO carriage and distance the ship sailed
BC emitted	tonnes	Quantity of BC a ship emitted

Results

In 2015 in the IMO Arctic, 755 fishing vessels operated for 1.4 million hours, traveling 5.6 million nautical miles (the most of any ship class, by far), with 176 thousand tonnes of fuel onboard, collectively, at any given time. These ships consumed 114 thousand tonnes of fuel and emitted 47 tonnes of BC. As shown in Figure 2, 159 of the 755 fishing vessels, or 21%, operated on HFO in the IMO Arctic in 2015. HFO represented 20% of fuel use by weight, 38% of fuel carried by weight, and 26% of distance-weighted fuel carried. In total 33% of the 47 tonnes of BC these ships emitted resulted from burning HFO.

The appendix contains summary statistics related to HFO use and carriage as fuel by flag state.

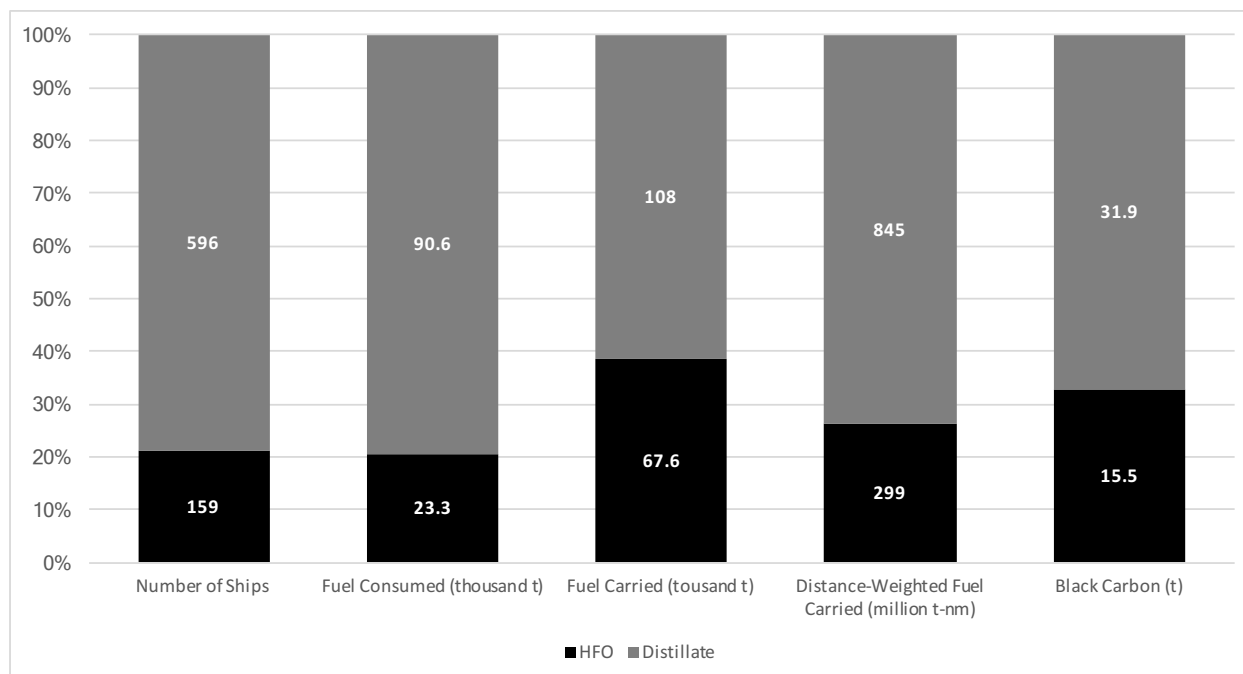


Figure 2. Fuel used, fuel carried, and black carbon emitted by fishing vessels in the IMO Arctic, 2015

³ Estimated according to the methodology in the report referenced in footnote #1.

HFO use and BC emissions

By flag state: Fishing vessels flew 17 different flags in 2015. Ships registered in Russia consumed the most HFO by far in the IMO Arctic in 2015 (Figure 3), followed by Denmark and South Korea. Russian-flagged fishing vessels consumed nearly 15 thousand tonnes of HFO in the IMO Arctic in 2015, emitting approximately 10 tonnes of BC, 10-times more BC than Denmark and South Korea, whose HFO-fueled fleets each emitted approximately 1 tonne of BC. As such, HFO-fueled Russian-flagged ships accounted for 64% of HFO consumption and 21% of BC emissions from fishing vessels (all fuels) in the IMO Arctic in 2015. This should come as no surprise, as Russian-flagged fishing vessels represented 116 of the 159 HFO-fueled fishing vessels (73%) operating in the IMO Arctic in 2015.

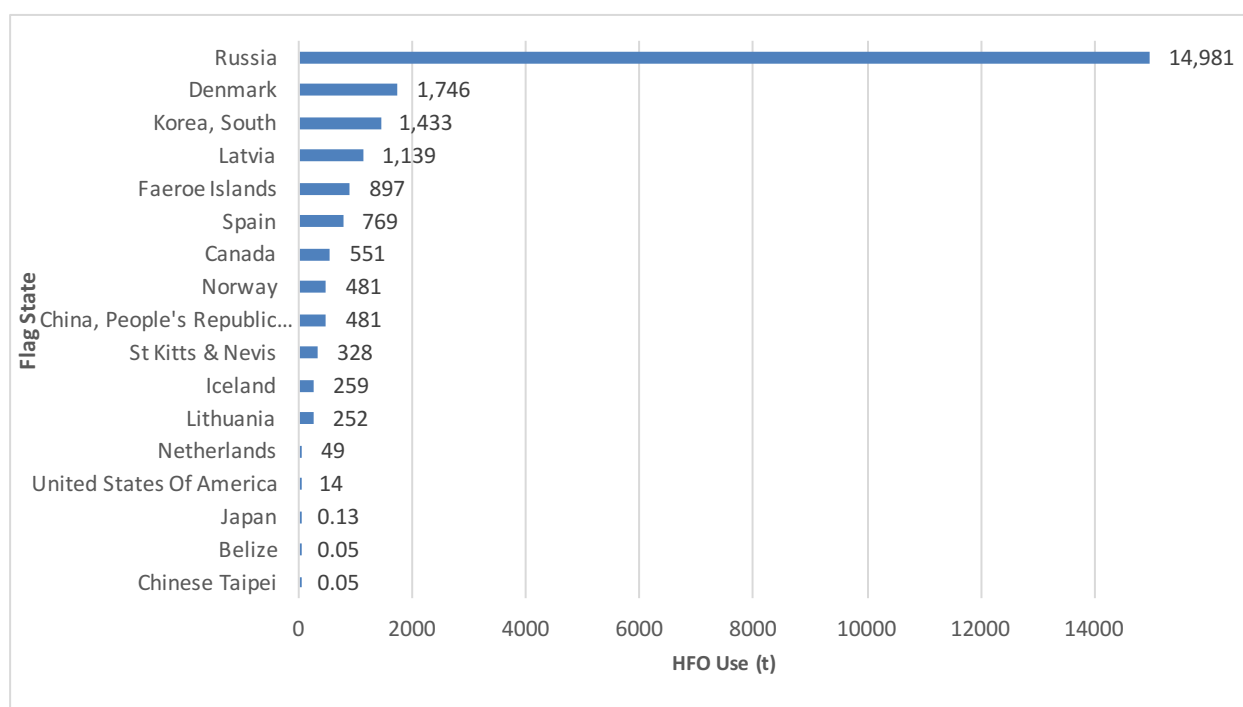


Figure 3. HFO use (t) by fishing vessels in the IMO Arctic by flag state, 2015

By ship: The Danish-flagged trawler *Steffen C*, operated by Sikuaq Trawl AS, consumed the most HFO in 2015 (~780 t), resulting in half a tonne of BC emissions in that year. She operated for over 7,000 hours in the IMO Arctic in 2015, sailing nearly 25,000 nm, with approximately 300 tonnes of HFO in her fuel tanks at any given time. Total distance-weighted HFO carriage equaled over 7.5 million t-nm.



Image Source: ShipSpotting⁴

Figure 4. The Danish-flagged *Steffen C* trawler in Reykjavik in June 2009.

HFO Carriage as Fuel

By flag state: Fishing vessels registered to Russia carried the most HFO onboard as fuel, carrying more than 20-times as much as the next closest flag state, South Korea (Figure 5). Russian-flagged fishing vessels carried over 52 thousand tonnes of HFO as fuel, equivalent to 78% of HFO onboard fishing vessels in the IMO Arctic in 2015. When we multiply each ship's fuel carriage by the distance it sailed, we find that Russian-flagged fishing vessels continue to dominate (Figure 6), representing six-times as much as the next closest flag state, South Korea, and 62% of total distance-weighted HFO carriage. We would expect Russian-flagged fishing vessels to account for the most HFO carriage and distance-weighted carriage given that Russia has 116 HFO-fueled fishing vessels, compared to only 6 registered to South Korea.

⁴ <http://www.shipspotting.com/gallery/photo.php?lid=1044915>

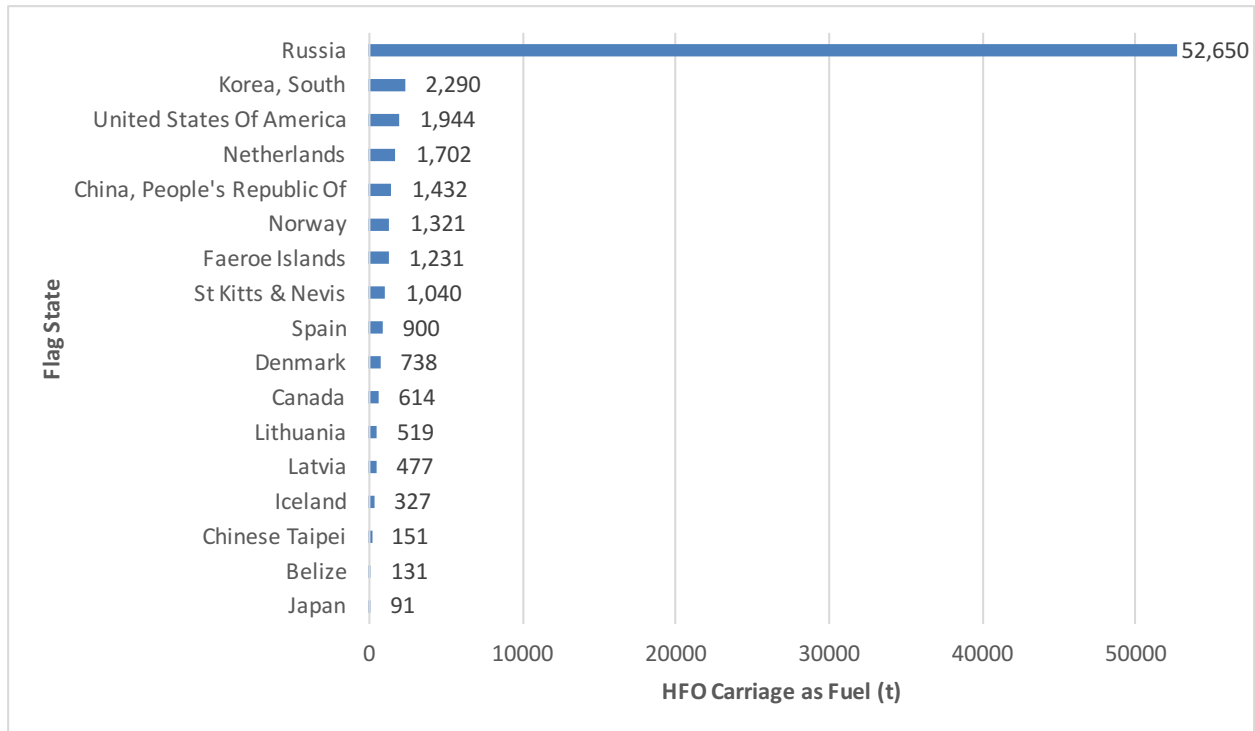


Figure 5. HFO fuel onboard at any given time by fishing vessels in the IMO Arctic by flag state, 2015

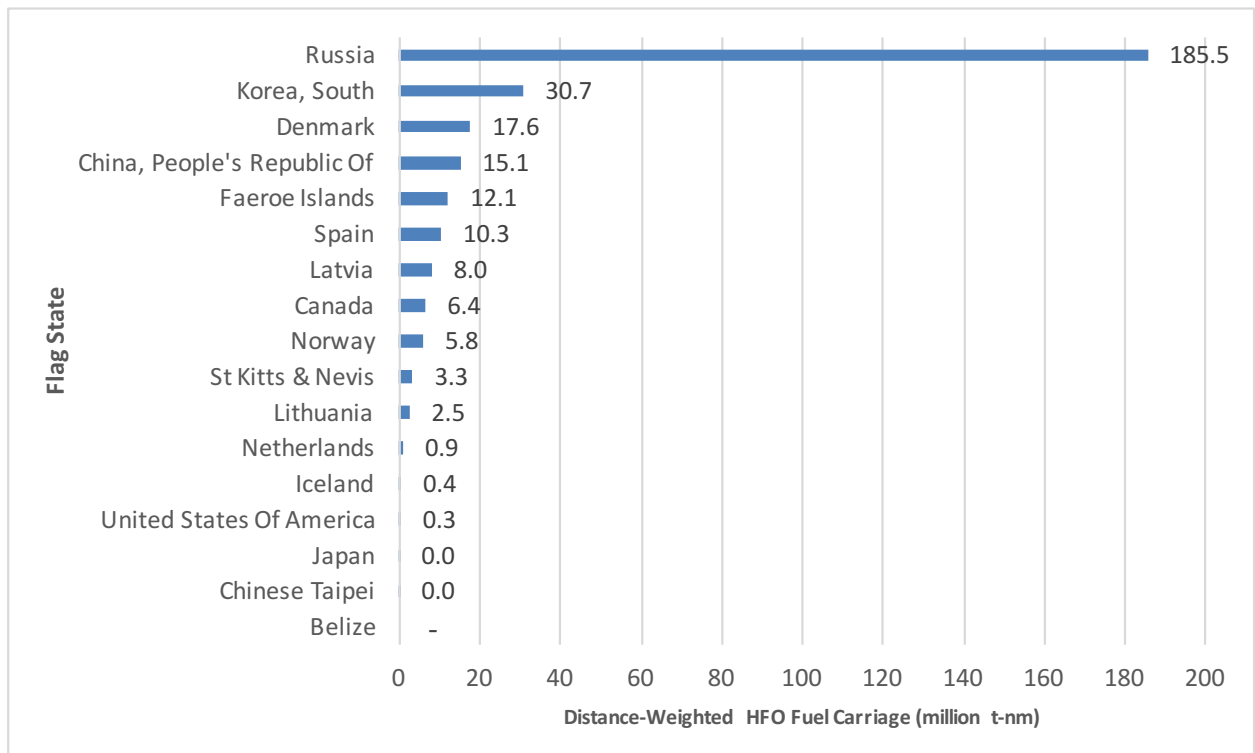


Figure 6. Distance-weighted HFO fuel carriage by fishing vessels in the IMO Arctic by flag state, 2015

By ship: The Russian-flagged, ice-strengthened fish carrier *Korsakov*, owned and operated by Ostrov Sakhalin JSC, had the most HFO in its fuel tanks compared with other fishing vessels,

carrying approximately 3.5 thousand tonnes of HFO onboard as fuel at any given time. She operated in the IMO Arctic for only about 300 hours in 2015, sailing nearly 800 nm, consuming 41 tonnes of HFO, emitting 20 kg of BC. While the *Korsakov* did not operate much in the Arctic in 2015, she is a rather large ship, as shown in Figure 7, with large fuel tanks.

The South Korean-flagged factory stern trawler *Nambukho* (Figure 8), operated by Nambuk Fisheries Co. Ltd., accounted for the most distance-weighted HFO carriage as fuel (~21 million t-nm). She operated in the IMO Arctic for nearly 3,000 hours in 2015, sailing over 13 thousand nm, carrying over 1,500 tonnes of HFO onboard as fuel at any given time, consuming more than 250 tonnes of HFO and emitting 200 kg of BC. The *Nambukho* is a large ship, compared to the smaller fishing vessels that are more common in the Arctic.



Image Source: MarineTraffic⁵

Figure 7. The Russian-flagged fish carrier *Korsakov* in Vladivostok, Russia, 12 November 2017.

⁵ <https://www.marinetraffic.com/en/photos/of/ships/shipid:351400/#forward>



Image Source: MarineTraffic⁶

Figure 8. The South Korean-flagged factory stern trawler *Nambukho* in Busan, Republic of Korea, 1 April 2012.

Conclusions

One-hundred fifty-nine (159) of 755, or 21%, of fishing vessels operated on HFO in the IMO Arctic in 2015. For fishing vessels, HFO represented 20% of fuel use, 38% of fuel carried, and 26% of distance-weighted fuel carried. HFO-fueled fishing vessels emitted 15.5 tonnes of BC in the IMO Arctic in 2015, approximately 8% of BC emitted by all ships in that region that year.

Regarding flag states, Russia had 116 HFO-fueled fishing vessels flying its flag in the IMO Arctic in 2015, by far the most of any flag state. As such, ships registered in Russia used the most HFO, emitted the most BC, carried the most HFO as fuel, and led in distance-weighted HFO fuel carriage as well. Indeed, HFO-fueled Russian-flagged fishing vessels accounted for 64% of HFO use, 21% of total BC emissions from fishing vessels (all fuels), 78% of HFO carriage as fuel, and 62% of distance-weighted HFO fuel carriage.

Regarding individual ships, the Danish-flagged trawler *Steffen C*, operated by Sikuaq Trawl AS, consumed the most HFO in 2015 (~780 t), resulting in half a tonne of BC emissions, the most of any one fishing vessel. The Russian-flagged, ice-strengthened fish carrier *Korsakov*, owned and operated by Ostrov Sakhalin JSC, had the most HFO in its fuel tanks compared with other fishing vessels, carrying approximately 3.5 thousand tonnes of HFO onboard as fuel at any given time. Lastly, the South Korean-flagged factory stern trawler *Nambukho*, operated by Nambuk

⁶ <https://www.marinetraffic.com/tr/photos/of/ships/shipid:673416/#forward>

Fisheries Co. Ltd., accounted for the most distance-weighted HFO carriage as fuel at ~21 million t-nm.

Clearly, Russia dominates fishing activity in the IMO Arctic. Thus, voluntary actions from Russia to phase out the use of HFO in all or a portion of its fleet could have a dramatic impact on reducing the risks of HFO from fishing vessels in the IMO Arctic. With that said, there are large ships registered to Denmark and South Korea that use and carry a considerable amount of HFO that pose a threat to the Arctic. Therefore, it seems that a region-wide policy that applies to the entire Arctic, regardless of flag, would offer the most protection against the risks of HFO.

Appendix

Summary Statistics for HFO-fueled Fishing Vessels Operating in the IMO Arctic in 2015 by Flag State

Table A-1: Summary statistics for HFO-fueled fishing vessels operating in the IMO Arctic in 2015, by flag state

Flag State	Number of Ships	Operating Hours	Distance Traveled (nm)	Fuel Consumed (t)	Fuel Carried (t)	Distance-Weighted Fuel Carried (million t-nm)*	Black Carbon (t)
Russia	116	198,881	820,043	14,981	52,650	185.5	9.72
Korea, South	6	17,124	78,814	1,433	2,290	30.7	1.00
Denmark	3	19,567	64,515	1,746	738	17.6	1.03
China, People's Republic of	2	4,499	20,777	481	1,432	15.1	0.49
Faeroe Islands	6	9,986	44,293	897	1,231	12.1	0.81
Spain	3	11,423	44,018	769	900	10.3	0.55
Latvia	4	15,752	67,193	1,139	477	8.0	0.64
Canada	2	4,902	20,691	551	614	6.4	0.34
Norway	5	5,278	23,505	481	1,321	5.8	0.38
St Kitts & Nevis	3	4,474	22,361	328	1,040	3.3	0.18
Lithuania	1	1,914	4,806	252	519	2.5	0.15
Netherlands	2	140	1,029	49	1,702	0.9	0.03
Iceland	2	5,489	2,031	259	327	0.4	0.15
United States of America	1	21	172	14	1,944	0.3	0.01
Japan	1	2	14	0.13	91	0.0	<0.01
Chinese Taipei	1	1	1	0.05	151	0.0	<0.01
Belize	1	1	<1	0.05	131	<1	<0.01
Total	159	299,454	1,214,261	23,381	67,558	299.0	15.48

*Ordered by distance-weighted fuel carried