Briefing 3

Heavy Fuel Oil use in the IMO Polar Code Arctic Summarized by Ship Owner, 2015

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THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

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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.

This briefing paper takes a closer look at the use and carriage (as fuel) of HFO by ships operating in the Arctic, summarized by group beneficial owner (GBO). We focus on ships operating 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

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

Methodology

To analyze the risks of using HFO as a marine fuel in the Arctic we consider the metrics in Table 1 and summarize the results by GBO – i.e., the company that ultimately benefits from owning the ship, which could be either the ship's registered owner or the parent company of the ship's registered owner.

Table 1. Metrics

Metric	**Unit**	**Description**[2]
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

[2] Estimated according to the methodology in the report referenced in footnote #1.

Results

In 2015, in the IMO Arctic, 2,086 ships operated for 2.6 million hours, traveling 10.3 million nautical miles, with 1.1 million tonnes of fuel onboard, collectively, at any given time. These ships consumed 436 thousand tonnes of fuel and emitted 193 tonnes of BC. As shown in Figure 2, 889 of the 2,089 ships, or 42%, operated on HFO in the IMO Arctic in 2015. HFO represented 57% of fuel use by weight, 76% of fuel carried by weight, and 56% of distance-weighted fuel carried. In total, 68% of the 193 tonnes of BC these ships emitted resulted from burning HFO. The appendix contains summary statistics by GBO.

There were 481 GBOs operating HFO-fueled ships in the IMO Arctic in 2015, plus 105 operators whose GBO is unknown. Given that there were 889 HFO-fueled ships operating in the IMO Arctic in 2015, a large proportion of the HFO-fueled fleet is made up of GBOs with small fleets, most owning only one ship.

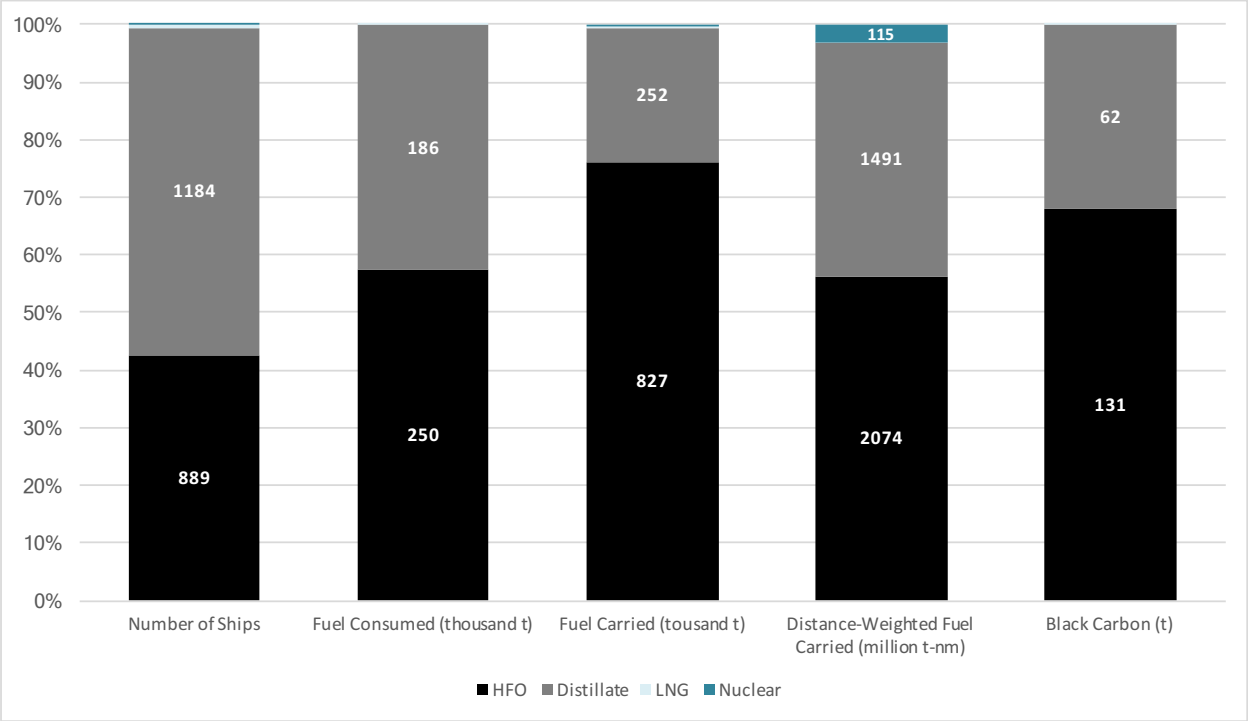

Figure 2. Fuel used, fuel carried, and black carbon emitted in the IMO Arctic, 2015

HFO use and BC emissions

The six ships owned by Russian nickel and palladium mining and smelting company Norilsk Nickel consumed the most HFO in the IMO Arctic in 2015 (Figure 3), followed by the oil and gas shipping company SOVCOMFLOT (9 oil tankers), then Murmansk Shipping Company, which specializes in Arctic shipping (20 ships: 12 bulk carriers, 4 oil tankers, 3 general cargo, 1 cruise),

and then the Danish Government (5 container ships operated by Royal Arctic Line A/S). Norilsk Nickel owns five general cargo ships and one oil tanker that operated in the region in 2015. These ships consumed over 32 thousand tonnes of HFO in the IMO Arctic in 2015, emitting approximately 18 tonnes of BC (Figure 4). As such, HFO-fueled ships owned by Norilsk Nickel accounted for 13% of HFO consumption and 9% of BC emissions in the IMO Arctic in 2015.

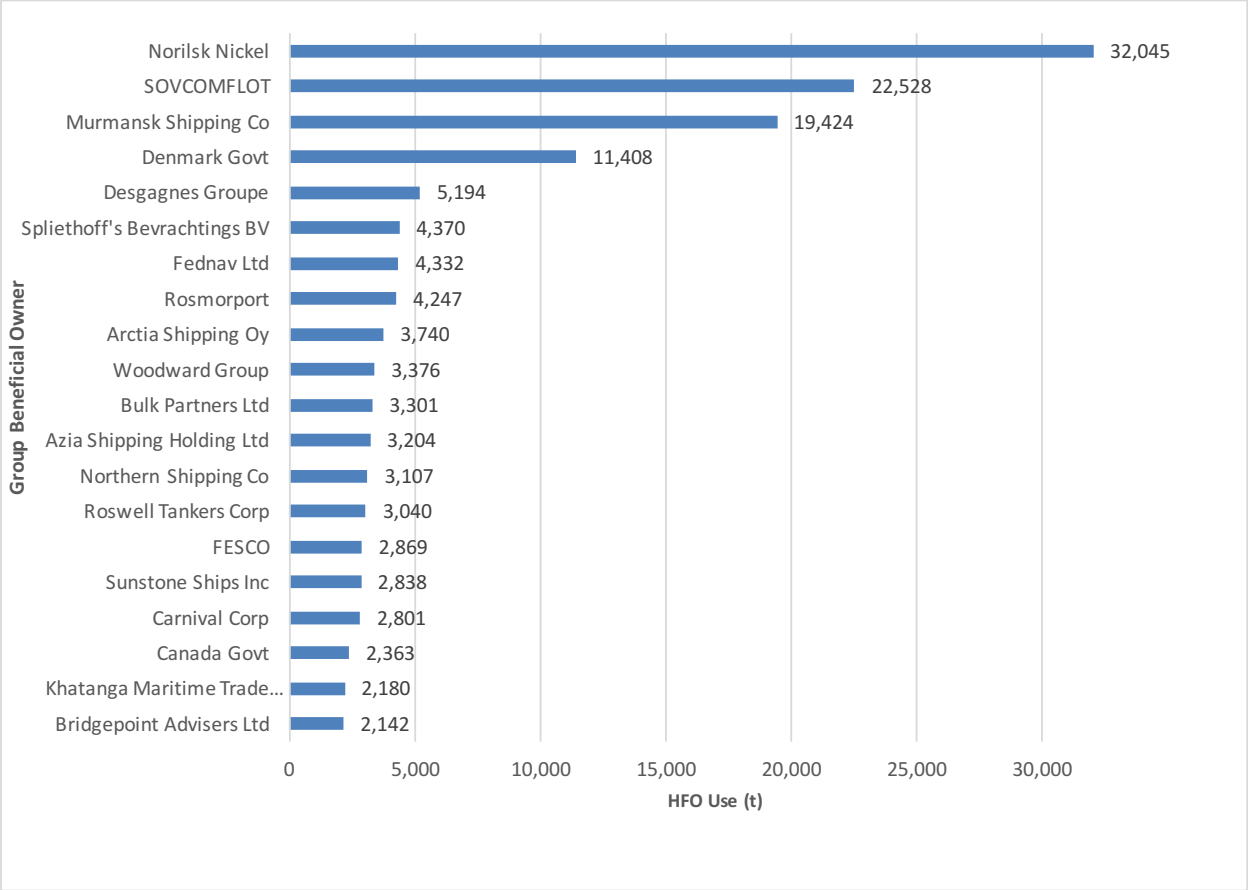

Figure 3. HFO use (t) by group beneficial owner (top 20) in the IMO Arctic, 2015

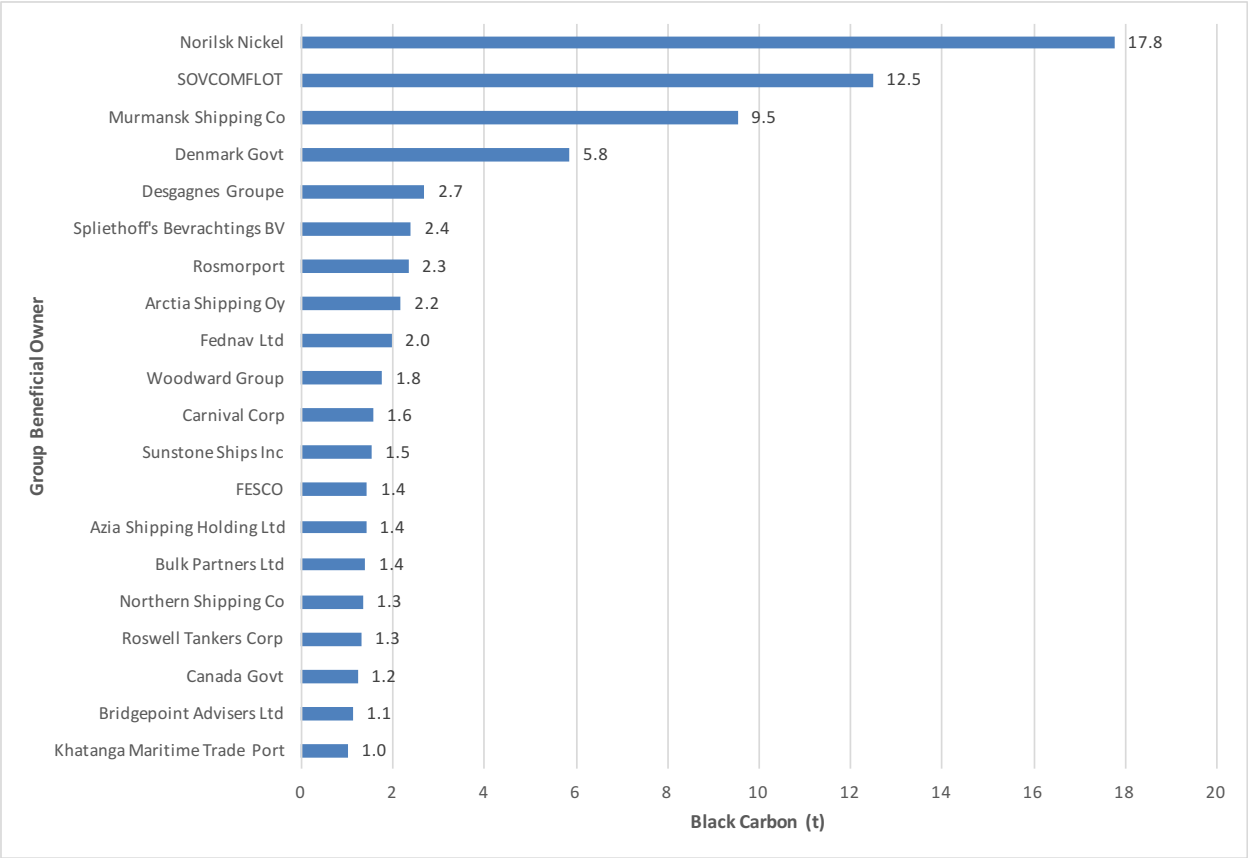

Figure 4. Black carbon emissions (t) by HFO-fueled ships by group beneficial owner (top 20) in the IMO Arctic, 2015.

HFO Carriage as Fuel

Four container ships owned by the Taiwanese container transportation company Evergreen Marine Corporation carried the most HFO onboard as fuel. These ships carried nearly 22 thousand tonnes of HFO as fuel, equivalent to 3% of all HFO fuel onboard ships in the IMO Arctic in 2015. Murmansk Shipping Company and SOVCOMFLOT rank second and third, and the US-based Carnival Corporation's eight cruise ships come in fourth.

When each ship's fuel carriage is multiplied by the distance it sailed, Norilsk Nickel, with its one oil tanker and five general cargo ships, edges out Murmansk Shipping Company, with its 20 cargo ships, and SOVCOMFLOT, with nine oil tankers, followed by the Danish Government, with five container ships, and the Russian-government-owned Rosmorport, with its icebreaking research/cruise vessel and Arctic service tug (Figure 6). These ships both carry a lot of fuel onboard and also sail long distances over the year in the Arctic. In fact, the fleets of Murmansk Shipping Company, Norilsk Nickel, the Danish Government, and SOVCOMFLOT sailed the greatest total distances in the IMO Arctic in 2015.

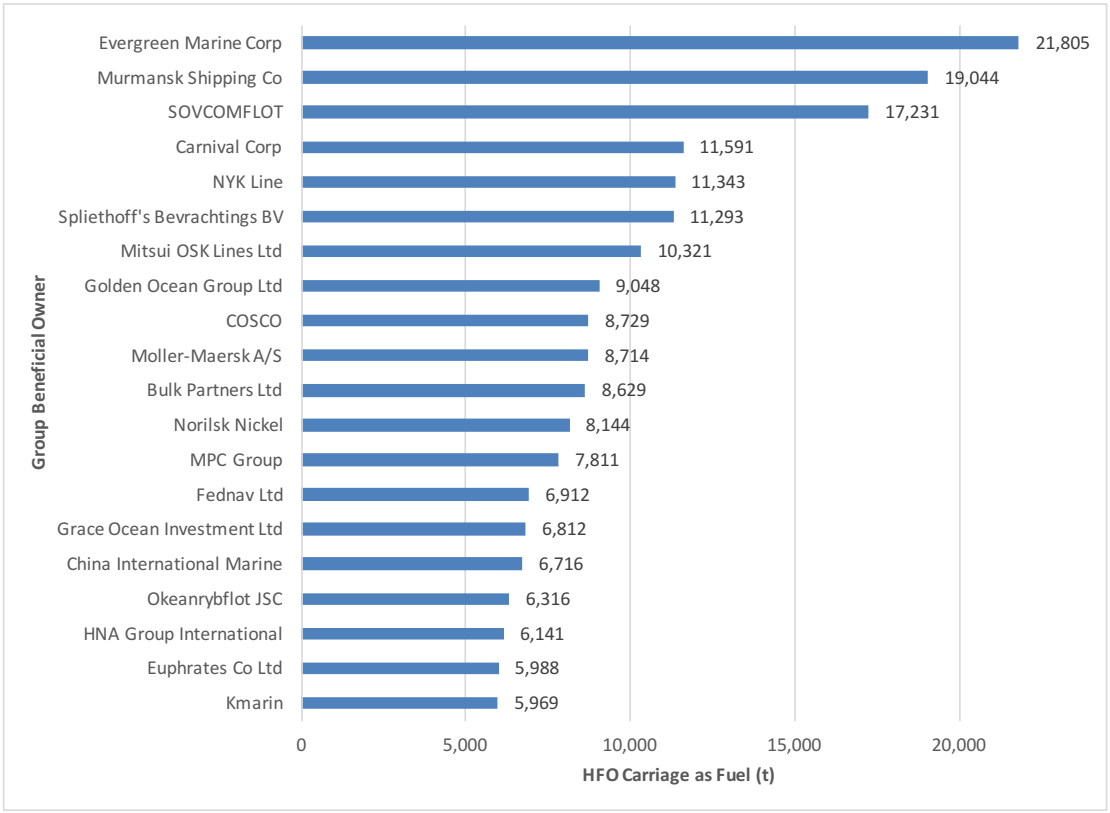

Figure 5. HFO fuel onboard at any given time by group beneficial owner (top 20) in the IMO Arctic, 2015

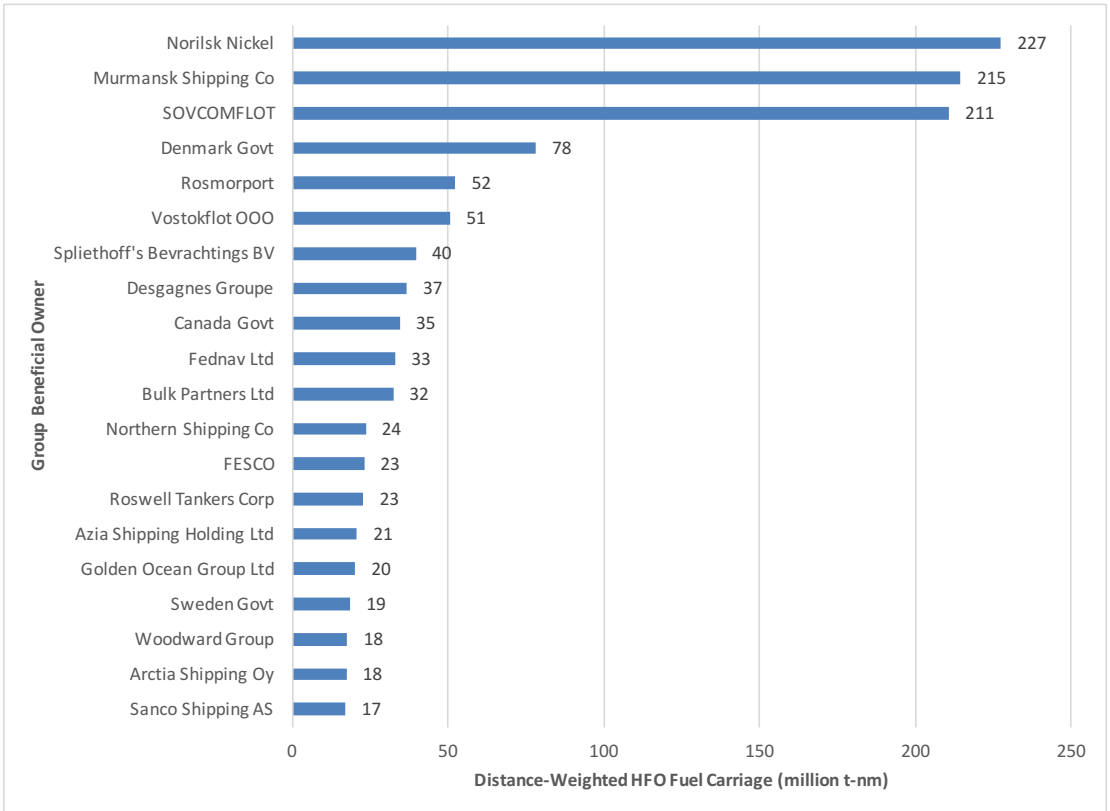

Figure 6. Distance-weighted HFO fuel carriage by group beneficial owner (top 20) in the IMO Arctic, 2015

Conclusions

Russian, Taiwanese, Danish, and US-based companies own the ships that used and carried the most HFO and emitted the most BC in the IMO Arctic in 2015. HFO-fueled ships owned by Russia-based companies Norilsk Nickel, SOVCOMFLOT, and Murmansk Shipping Company which specialize in Arctic shipping, especially in transporting materials from mining and oil and gas operations, used the most HFO, emitted the most BC, and accounted for the most distance-weighted HFO fuel carriage. Taiwan-based Evergreen Marine Corporation, which owns four HFO-fueled container ships that sailed in the IMO Arctic in 2015, carried the most HFO onboard at any given time in the IMO Arctic in 2015. Five containerships owned by the Danish Government and operated by Royal Arctic Line A/S ranked 4th in HFO use, BC emissions, and distance-weighted HFO fuel carriage, behind the three Russia-based companies. Finally, the US-based Carnival Corporation, with its eight HFO-fueled cruise ships, ranked 4th in HFO fuel onboard at any given time.

To reduce the risks of HFO in the Arctic, one could focus on these companies and seek voluntary actions to stop using HFO. However, there are hundreds of owners of HFO-fueled ships engaged in Arctic shipping. Thus, an Arctic-wide policy to prohibit the use of HFO would be more effective at reducing the risks of HFO spills and BC emissions from ships in the Arctic.

Appendix

Summary Statistics for HFO-fueled Ships Operating in the IMO Arctic in 2015 by Group Beneficial Owner

Table A-1: Summary statistics for HFO-fueled ships operating in the IMO Arctic in 2015, by group beneficial owner (top 50; across 3 pp.)

Group Beneficial Owner	Number of Ships	Operating Hours	Distance Traveled (nm)	Fuel Consumed (t)	Fuel Carried (t)	Distance-Weighted Fuel Carried (million t-nm)*	Black Carbon (t)
Norilsk Nickel	6	29,263	165,023	32,045	8,144	227	18
Murmansk Shipping Co	20	52,471	204,022	19,424	19,044	215	10
SOVCOMFLOT	9	18,254	100,913	22,528	17,231	211	12
Denmark Govt	5	19,452	151,991	11,408	2,599	78	6
Rosmorport	2	4,662	25,514	4,247	4,006	52	2
Vostokflot OOO	4	4,273	69,136	2,068	3,548	51	1
Spliethoff's Bevrachtings BV	14	7,021	49,610	4,370	11,293	40	2
Desgagnes Groupe	9	10,999	61,471	5,194	5,098	37	3
Canada Govt	2	4,515	24,059	2,363	2,541	35	1
Fednav Ltd	6	8,422	30,519	4,332	6,912	33	2
Bulk Partners Ltd	6	5,201	23,001	3,301	8,629	32	1
Northern Shipping Co	10	15,205	66,776	3,107	2,819	24	1
FESCO	9	14,321	31,524	2,869	5,934	23	1
Roswell Tankers Corp	3	6,149	34,667	3,040	1,985	23	1
Azia Shipping Holding Ltd	6	9,008	42,958	3,204	2,343	21	1
Golden Ocean Group Ltd	6	3,318	13,363	1,730	9,048	20	1

Group Beneficial Owner	Number of Ships	Operating Hours	Distance Traveled (nm)	Fuel Consumed (t)	Fuel Carried (t)	Distance-Weighted Fuel Carried (million t-nm)*	Black Carbon (t)
Sweden Govt	1	1,815	9,993	787	1,868	19	1
Woodward Group	4	9,122	38,998	3,376	1,877	18	2
Arctia Shipping Oy	2	4,800	16,184	3,740	2,164	18	2
Sanco Shipping AS	1	2,116	12,166	349	1,409	17	0
ZPMC	2	908	7,866	1,042	4,226	17	0
DEME Group	3	6,214	23,564	1,814	2,278	16	1
Nakhodka Active Fishery	5	6,860	26,736	844	3,121	15	1
Russia Govt	5	13,537	62,367	1,508	1,270	15	1
Murmansk Trawl Fleet Co	4	4,859	24,700	645	3,115	13	1
Khatanga Maritime Trade Port	6	12,568	38,111	2,180	1,561	13	1
ESL Shipping Ltd	2	1,475	9,720	1,125	1,781	12	0
Carnival Corp	8	758	8,385	2,801	11,591	12	2
LORP JSC	7	20,020	63,235	1,267	1,213	11	1
Trident Trust Group	1	1,733	17,050	842	608	10	0
Shanghai Kaichuang Fisheries	1	2,313	10,943	289	889	10	0
Hansa Heavy Lift GmbH	5	1,696	12,011	1,149	3,878	10	1
Palmali Shipping & Agency	2	2,040	13,451	1,428	1,319	9	1

Group Beneficial Owner	Number of Ships	Operating Hours	Distance Traveled (nm)	Fuel Consumed (t)	Fuel Carried (t)	Distance-Weighted Fuel Carried (million t-nm)*	Black Carbon (t)
Polar Seafood Greenland AS	1	8,354	28,917	681	296	9	0
Chukotka Trading Co	2	7,017	29,219	1,699	585	8	1
Arkhangelsk River Port JSC	1	4,886	19,284	953	423	8	0
Baltjura-Serviss Ltd	4	15,752	67,193	1,139	477	8	1
Keishin Kaiun Co Ltd-Ehime	2	838	4,324	478	3,707	8	0
Eko Shipping Ltd	1	4,805	19,417	1,173	394	8	1
Euphrates Co Ltd	4	3,032	4,258	851	5,988	8	0
Hapag-Lloyd AG	3	2,083	18,625	1,654	3,698	8	1
Moller AP	3	2,133	8,351	962	2,778	8	0
Alternativa JSC	2	5,882	28,036	612	1,281	7	0
Ehime Kisen KK	1	846	4,308	448	1,687	7	0
Okeanrybflot JSC	10	2,569	11,689	666	6,316	7	0
Fishing Fleet-FOR Plc	1	1,338	7,797	257	881	7	0
Paroos Co Ltd	2	15,117	56,935	973	235	7	1
Amadea Shipping Company	1	415	5,004	961	1,216	6	1
Loran Co Ltd	3	5,765	19,825	415	911	6	0
Ostrov Sakhalin JSC	2	1,294	5,493	155	4,229	6	0

*Ordered by distance-weighted fuel carried