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Relative Risk Assessment for ship-mediated introductions of aquatic nonindigenous species to the Pacific Region of Canada

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Foreword

This series documents the scientific basis for the evaluation of aquatic resources and ecosystems in Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

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ABSTRACT

Ballast water has historically been the predominant ship-mediated vector for aquatic nonindigenous species (NIS) introductions to Canada, while hull fouling is recognized as a leading sub-vector for the introduction of marine aquatic NIS worldwide. Ninety-four aquatic NIS have established in the marine waters of Canada's Pacific coast, 78 of which were recorded near the port of Vancouver in the Georgia Strait. A series of regulatory changes enacted by Transport Canada in the past decade may have slowed the rate of ship-mediated invasions and favoured changes in invader characteristics. The objective of this report is to conduct a relative risk assessment of shipping vectors (ballast water and hull fouling) to ports in the Canadian Pacific region; a subsequent national risk assessment will utilize data from the regional risk assessments to examine risk from a 'pathway' perspective. The risk posed by a NIS is the product of the probability of introduction and the consequences of introduction. First, the probability of introduction was estimated by combining the individual probabilities of successful transition through each stage of the invasion process (i.e., arrival, survival and establishment), based on ship arrival/ballast water discharge data and environmental conditions at Pacific ports and potential source ports. Second, the potential magnitude of consequences of introduction was estimated based on the number of high impact ship-mediated NIS recorded for eco-regions of ports directly connected to Pacific ports through shipping activities. The probability of introduction and potential magnitude of consequences were then combined for a final invasion risk rating. Finally, we identify priorities and make recommendations for future management needs.

A transit analysis shows that Canadian Pacific ports are connected with international ports, resulting in potential for species transfers *via* hull fouling and ballast water discharge. The final relative invasion risk for hull fouling-mediated NIS is higher for Vancouver and lower for all remaining top ports, with high uncertainty. The final relative invasion risk for ballast-mediated NIS is higher for Vancouver and lower for all remaining top ports, with moderate uncertainty. It is important to note that estimated invasion probabilities and risk ratings presented in this document are relative, and that rankings of "lower" or "lowest" do not indicate zero risk.

RÉSUMÉ

Au Canada, l'introduction d'espèces aquatiques non indigènes par les navires se produit surtout par les eaux de ballast, alors qu'à l'échelle mondiale, ce sont les salissures biologiques de la coque des navires qui sont reconnues comme le principal sous-vecteur d'introduction. Quatre-vingt-quatorze espèces aquatiques non indigènes se sont établies dans les eaux marines de la côte ouest du Canada, 78 de ces espèces ont été observées proche du port de Vancouver dans le détroit de Georgia. Au cours des dix dernières années, une série de modifications réglementaires par le gouvernement du Canada pourraient avoir ralenti le rythme d'introductions des espèces non-indigènes par les navires et avoir entraîné des changements dans les caractéristiques des espèces envahissantes. Ce rapport a pour objectif d'évaluer les risques relatifs des vecteurs d'introduction par les navires (salissures de la coque et les eaux de ballast) dans les ports de la région pacifique du Canada; ultérieurement, une évaluation nationale du risque utilisera des données en provenance des évaluations régionales afin d'examiner le risque sous une perspective de « voies d'introcution ». Le risque que représentent les espèces non indigènes est le produit de la probabilité de leur introduction et des conséquences de celle-ci. Tout d'abord, la probabilité d'introduction a été estimée en combinant la probabilité de réussite dans la transition de chaque étape du processus d'invasion (c.-à-d. l'arrivée, la survie et l'établissement), selon les données sur l'arrivée des navires et le déversement des eaux de ballast, les conditions environnementales dans les ports de la côte pacifique et les ports potentiels d'origine. Deuxièmement, l'ampleur potentielle des conséquences de l'introduction a été estimée selon le nombre d'espèces non-indigènes à fort impact introduites par des navires et relevées dans les écorégions des ports directement reliés aux ports du Pacifique par des activités de navigation. La probabilité d'introduction et l'ampleur des répercussions potentielles ont ensuite été combinées pour déterminer le risque final d'invasion. Enfin, des priorités ont été déterminées et des recommandations ont été formulées pour les futurs besoins de gestion.

Une analyse des déplacements montre que les ports de la côte pacifique du Canada sont reliés à d'autres ports nationaux et étrangers, ce qui entraîne l'introduction potentielle d'espèces non-indigènes via les salissures de coque des navires et le déversement des eaux de ballast provenant de ports étrangers, mais également une propagation secondaire potentielle. Le risque relatif final pour les espèces non-indigènes via les salissures de coque des navires a été plus élevé pour Vancouver et faible pour le restant des principaux ports du pacifique. Le risque relatif final d'invasion pour les espèces non-indigènes via les eaux de ballast a été plus élevé pour Vancouver et faible pour le restant des principaux ports du pacifique. Dans les deux cas avec une incertitud mododéré. Il est important de noter que l'estimation de la probabilité d'invasion et le taux de risque exposé dans le présent document sont relatifs, et les taux «faibles» et «très faibles» ne représentent pas une absence de risque.

INTRODUCTION

Species that have established populations outside of their native range are known as nonindigenous species (NIS). The impacts of NIS invasions have become increasingly problematic as globalization has increased both intentional and unintentional species transfers, allowing the establishment of NIS worldwide. NIS may impact recipient ecosystems by competing with native species for limited resources and disrupting the natural food chain (Shea and Chesson 2002; Molnar et al. 2008). In fact, NIS introductions are the second greatest cause of extinction globally and the greatest threat to biodiversity in both freshwater and marine ecosystems (Sala et al. 2000; MEA 2005; Lawler et al. 2006). NIS have caused irreparable damage to ecosystem function and natural resources in many terrestrial and aquatic systems (Carlton and Geller 1993; Allen and Humble 2002; Crooks 2005; Pimentel et al. 2005). Resulting long-term economic consequences have impacted industry and society both directly and indirectly amounting to costs between $13.3 and $34.5 billion/year in Canada alone (Mack et al. 2000; MEA 2005; Colautti et al. 2006*a*). Examples of aquatic NIS impacts include the depletion of commercially important fisheries, increased industrial maintenance costs from NIS-fouled equipment, and the need for ongoing, costly control programs. All ecosystems are vulnerable to, and may suffer severe impacts from, NIS unless comprehensive prevention and management programs are introduced (United States Congressional Office 1993).

The objective of this report is to conduct a semi-quantitative, relative risk assessment of two shipping vectors (hull fouling and ballast water) to Canadian Pacific ports, as a sub-component of a national risk assessment for the 4 coasts of Canada (including also the Arctic, Atlantic Coast and the Great Lakes-St. Lawrence River). Relative risk assessment does not assign a fixed numerical value to the probability of an invasion, however, it is a useful tool to identify and prioritize research needs, resource allocation and policy decisions. It should be noted that it was not possible to calibrate the relative risk ratings against a set of known invasion data; therefore, rankings of “lower” or “lowest” should not be considered zero risk.

Once all regional documents are completed, a national risk assessment will be completed which re-evaluates the relative risks on a national scale and addresses the following questions posed to the authors by formal science advice request in advance of the project:

1. What is the level of risk posed by ships transiting to, or from, Arctic ports for the introduction of AIS to Canadian waters;
2. What is the level of risk posed by ships operating within the ballast water exchange exemption zones on the East and West Coasts;
3. What is the level of risk posed by domestic shipping activities; and
4. Do current ballast water management regulations provide sufficient protection against ship-mediated AIS introductions?

In general, each regional report will provide a synopsis of biological invasion theory, the role of shipping vectors in species introductions, the history and concerns of AIS in the region, and the port-based risk assessment. This particular document provides guidance on the relative risks of ship-mediated introductions to ports in the Pacific coast of Canada, as measured by the product of the probability of introduction and the magnitude of consequences of introduction; a subsequent national risk assessment will utilize data from the regional risk assessments to examine risk from a ‘pathway’ perspective. This risk assessment is based upon the best available information and methodology, and was peer-reviewed at a workshop attended by international aquatic invasive species, shipping and risk assessment experts overseen by DFO's Centre of Expertise for Aquatic Risk Assessment.

THE BIOLOGICAL INVASION PROCESS

Founding individuals, known as propagules, must pass through multiple stages of the invasion process to be successfully introduced to a new location (Figure 1). First, the propagules must be taken up by, and survive conditions within, a transport vector to be moved from the source region to a new environment. Once released, the propagules must survive in the new environment. If enough propagules successfully arrive, survive and form a reproductive population (Establishment), the recipient habitat can then act as a new source of propagules for secondary spread, making the process cyclical. The successful transition between any two stages of the invasion process is dependent on at least three factors: propagule pressure, physical-chemical requirements and biological requirements. Propagule pressure is a measure of the number of propagules released per event coupled with the number of release events over a given time period and is positively related to the probability of introduction (Wonham et al. 2000; Kolar and Lodge 2001; Colautti et al. 2006*b*). Physical-chemical and biological requirements directly affect transition between invasion stages, with inhospitable environmental conditions (e.g., intolerable temperature, salinity, or substrate type) or community interactions (e.g., severe predation or limited food supply) decreasing the probability of introduction (Lockwood et al. 2006, 2009). Efforts to manage NIS introductions can target any or all stages of the invasion process, although preventative efforts focused at reducing propagule pressure at the transportation stage are regarded as most effective and cost-efficient (ISSG 2000; ANSTF 2007). Since NIS transportation vectors are numerous, risk assessments identifying priority or high-risk vectors are necessary to direct limited resources for control efforts.

THE ROLE OF SHIPPING AS A PATHWAY OF AQUATIC NIS INTRODUCTIONS

Transportation vectors for aquatic NIS in Canada's freshwater and marine ecosystems include intentional (i.e., authorized stocking programs) and unintentional releases of aquatic species. Unintentional releases are associated with commercial shipping activities (e.g., ballast water discharge or hull fouling), escape from aquaculture facilities, stock transfers for aquaculture activities (e.g., stock relocations which contain NIS hitchhikers), and unauthorized releases of aquarium, bait fish, and ornamental pond species. Commercial shipping activities are of particular interest because shipping has been implicated in a substantial number of aquatic invasions globally and management strategies for this vector are relatively straight-forward and enforceable (Carlton 1985; Ruiz et al. 2000; Leppäkoski et al. 2002; MacIsaac et al. 2002; Grigorovich et al. 2002, 2003; Ruiz and Carlton 2003).

Ballast water has historically been the focus of shipping vector research for aquatic NIS introductions to Canada (Ricciardi 2001; de Lafontaine and Costan 2002). Natural adjacent water is pumped into ballast tanks to control the trim, stability and stresses on operational ships. Diverse communities of plankton present in the water column may be inadvertently pumped into ballast tanks during ballast water uptake, transported to the destination port and subsequently released (Carlton 1985). In this way, ballast water transfer allows plankton to travel distances far greater than natural dispersal via active or passive mechanisms (Locke et al. 1993; Minton et al. 2005; Blakeslee et al. 2010). Port sediments, and the associated benthic community, can also be re-suspended and entrained in ballast tanks during uptake of ballast water (Bailey et al. 2003; Duggan et al. 2005; Kipp et al. 2010). Suspended sediments can settle out of ballast water and accumulate on the bottom of ballast tanks, providing good habitat for benthic life stages and resting eggs and serving as an additional transport vector for NIS (Bailey et al. 2005; Duggan et al. 2005, 2006). The amount of sediment and associated fauna re-suspended and released during ballast discharge is thought to be low, but studies indicate ballasting operations may promote hatching of resting stages within ballast tanks such that individuals can enter the water column and be available for release (Bailey et al. 2005). Furthermore, water-sediment

slurries may form in tanks with only residual ballast or during in-tank mixing events (ballast uptake/discharge) and provide an intermediate medium for NIS survival and introduction to recipient waters (Sutherland et al. 2009). The transfer of aquatic NIS *via* ballast water, slurry or sediment, can be managed by regulating ballast practices since ballast discharge is required for the release of individuals from ballast tanks. The physical removal of accumulated sediment may be necessary given that ballast discharge is thought to have a minimal effect on sediment flushing (Duggan et al. 2005). Conversely, the transport and release of taxa associated with the external underwater surfaces of a vessel, hereafter referred to as 'hull', is not directly dependent on the ship's ballast activities and is more difficult to manage (Carlton 1985; Minchin and Gollasch 2003). Ship hulls, sea chests, propellers and other underwater surfaces can harbour fouling organisms, such as algae, ascidians, hydroids, bryozoans, barnacles, and bivalves (i.e., sessile taxa), in dense colonies that offer crustaceans and other motile organisms structural habitat and protection against the shearing forces experienced during ship movement, are hereafter generalized as 'hull fouling' (Gollasch 2002; Lewis et al. 2004). Fouling taxa can be detached from the hull or can release reproductive propagules at any time along the vessel transit, thereby potentially establishing a nonindigenous population in any location through which the vessel travels. In fact, hull fouling is now recognized as a leading vector for the introduction of marine aquatic NIS worldwide (Carlton 1985; Gollasch 2002; Coutts et al. 2003). Anchor chains, which are submerged in water at port and relatively protected during transit, are an additional, potentially important mechanism of ship-mediated introductions (West et al. 2007). However, because anchor chains are poorly studied as a sub-vector of introductions, we are not able to assess the relative importance of this vector. While shipping activities may also be important vectors of terrestrial NIS introductions through the movement of wood dunnage and/or infested cargo containers, the analysis of ship-mediated terrestrial introductions is beyond the scope of this study.

Ship type, ship size and trade patterns influence the invasion risk associated with a given vessel and its associated vectors (Simkanin et al. 2009). Vessels that rely heavily on ballast water for cargo operations, such as bulk carriers and tankers, are high-risk for transportation of aquatic NIS *via* ballast water and sediment. Risk is concordant with ship size since ship size influences the amount and capacity of ballast tanks. Vessels that typically do not discharge ballast water, such as passenger vessels, barges and tugboats, are less important for introductions *via* ballast water and sediment. Trans-oceanic vessels are considered high-risk for aquatic NIS introductions because they provide a mechanism for the fauna of distant ports to be exchanged (Carlton 1985), while domestic or coastal vessels have the potential to contribute to the secondary spread of established aquatic NIS (Humphrey 2008; Cordell et al. 2008; Simkanin 2009; Sutherland et al. 2009; Rup et al. 2010, DiBacco et al. 2012).

More recently, hull fouling has been identified as an important vector of marine NIS. In contrast to ballast water, ship type does not influence risk because all vessels have the capacity to transport fouling organisms on exterior surfaces, regardless of ballasting practices. Hull fouling risk is influenced by season, mooring time, elapsed time since last antifouling application, vessel speed, and trade route (Coutts 1999; Ruiz and Smith 2005; Sylvester and MacIsaac 2010). As mooring time and/or time since last antifouling coating increase, the risk associated with a given vessel increases because more fouling organisms are able to accumulate (Coutts 1999; Minchin and Gollasch 2003; Sylvester and MacIsaac 2010). The invasion risk decreases as vessel speed increases, because high speeds can remove or kill organisms attached to the hull (Coutts and Taylor 2004). In addition to the level of risk, trade patterns influence the type of introductions that can be expected from a vector. In the case of hull fouling, the shipping route influences the conditions to which organisms are exposed during transit thereby influencing survival rates. Ships that trade coastally are more likely to be a risk for invasion than ships that

must pass through waters of varying environments, as there will be little change in salinity (Sylvester and MacIsaac 2010).

While the Pacific coastline of Canada is characterized by highly variable salinity due to influences from fjords, major river systems, significant seasonal freshet runoff, and a complex coastline (e.g. Fraser River, BC, Columbia River, OR), considering the large number of terminals in Vancouver, the wide ranging salinity characteristics within the Fraser River watershed, and the short international coastal journey times between similar environments (i.e. 1-3 day river-to-river journeys), NIS spread is plausible given the salinity tolerances of certain organisms. For example, some fouling organisms, such as bryozoans and isopods, are capable of surviving broad changes in salinity (0 – 37 ppt), and temperature (9.9 – 31.6 °C), within a longitude of 32° and 43°, respectively (Davidson et al. 2008). A zebra mussel invasion scenario would require a river-to-river journey spanning a coastal freshet plume, based on lab-derived salinity tolerances of adult organisms (Strayer and Smith 1993). These scenarios may apply to both ballast water and hull-fouling vectors (Dibacco et al. 2011).

Consideration of factors affecting NIS introductions can be used to better predict high-risk introduction vectors for Canada. Given that these factors will affect invasion risk in different ways for different recipient regions, risk must be assessed separately for the different regions of Canada. Here, we conduct a risk assessment for ship-mediated introductions of aquatic NIS to Canada's Pacific coast as a sub-component of a national risk assessment for ship-mediated introductions to Canada.

BALLAST WATER MANAGEMENT REGULATIONS

While aquatic invasions have become a major concern in Canada during the past two decades, a series of Canadian and International regulatory changes may have slowed the rate of invasion and facilitated changes in invader characteristics (Dextrase 2002; Bailey et al. 2011). Ballasted transoceanic ships have been considered risky for aquatic NIS introductions because each ship can discharge a large volume of ballast which can contain a high number of propagules (MacIsaac et al. 2002; Bailey et al. 2011). On average, ships in the Pacific region discharge 13,915 m^3 of ballast water per vessel, whereas ships in the Great Lakes and Atlantic regions discharge 5,190 m^3 and 39,842 m^3, respectively (Humphrey 2008). To prevent aquatic NIS introductions, Canada established ballast water management regulations (voluntary in 2000, mandatory as of June 2006) requiring all vessels entering and operating in Canadian waters, that are at least 50 m in length with a minimum ballast capacity of 8 m^3, to undertake ballast water exchange at sea (Transport Canada 2007), with following exceptions:

(i) ships that operate exclusively in Canadian waters,

(ii) ships that operate exclusively in the American waters of the Great Lakes or the French waters of St. Pierre and Miquelon when outside Canadian waters,

(iii) search and rescue vessels,

(iv) vessels used in government non-commercial service,

(v) ships that carry only permanent ballast in sealed tanks,

(vi) ships that operate exclusively between ports, offshore terminals or anchorage areas situated on the Pacific coast of North America, north of Cape Blanco and south of the Aleutian Islands.

Ballast water exchange (BWE) is a process in which a ship exchanges ballast water loaded near shore with open-ocean saltwater. Empirical studies indicate that BWE purges 80 – 100% of coastal planktonic organisms entrained at the source port and the efficiency is variable with

respect to the characteristics of ships, voyages, types of BWE procedures, exchange sites and different organisms (Rigby and Hallegraeff 1994; Dickman and Zhang 1999; Lavoie et al. 1999; Taylor and Bruce 2000; Rigby 2001; Taylor et al. 2007; McCollin et al. 2008; Cordell et al. 2009; Lawrence and Cordell 2010; Simard et al. 2011). To maximize BWE efficacy, vessels practicing empty-refill exchange must replace a minimum of 95% of their ballast water, whereas flow-through exchange must pump a minimum of three tank volumes through each ballast tank (Transport Canada 2007). Transoceanic vessels must exchange ballast water ≥ 200 nautical miles from land where water depth is ≥ 2000 meters and must achieve a final salinity of ≥ 30 parts per thousand (Transport Canada 2007). If the vessel does not pass an area that meets the minimum requirements during its voyage (e.g., international coastal vessels), Canada will accept exchange in an area ≥ 50 nautical miles from shore where the water depth is ≥ 500 meters (Levings and Foreman 2004). This alternate exchange zone excludes the Bowie Seamount and western Queen Charlotte Sound areas.

Prior to 2006, ships declaring no ballast on board (NOBOB) were exempt from BWE because ballast tanks were considered empty by industrial standards. Further research in the Great Lakes revealed that ships declaring NOBOB can contain tonnes of unpumpable residual water, slurry and/or sediment that may introduce NIS during multi-port ballast operations (Bailey et al. 2003; Colautti et al. 2003; Duggan et al. 2005; Sutherland et al. 2009). As a result, Canada implemented the *Ballast Water Control and Management Regulations* requiring tank flushing of unpumpable residuals as well as BWE, such that all ballast tanks entering Canadian waters are managed (Department of Justice Canada 2006). Similar to BWE, tank flushing involves rinsing 'empty' tanks with open-ocean water in an area ≥ 200 nautical miles from shore to achieve a final salinity of ≥ 30 parts per thousand (Department of Justice Canada 2006). Non-compliant ships are required to either: (i) retain all non-compliant ballast water on board while in Canadian waters, (ii) exchange ballast water at a specified location, (iii) discharge ballast water at a specified location, or (iv) treat ballast water in accordance with an approved method (Department of Justice Canada 2006). As of yet, no alternative treatments have been approved by Canada, although sodium chloride brine has been examined as an emergency treatment for non-compliant tanks of ships on the Great Lakes (Bradie et al. 2010; Wang et al. 2012). Additionally, the uptake of sediment must be minimized, and sediment management procedures, such as monitoring and removal of sediment on a regular basis and deposition at a reception facility, must be incorporated into a vessel's ballast water management plan.

The International Maritime Organization (IMO), an agency of the United Nations that works to improve maritime safety and prevent pollution from ships, introduced the *International Convention for the Control and Management of Ships Ballast Water & Sediments,* also known as the Ballast Water Convention in February 2004 (IMO 2004). This convention, which is yet to be ratified, sets maximum allowable discharge limits, known as the IMO D-2 discharge standard, for organisms and indicator microbes released with ballast water after ballast treatment. In addition to maximum discharge limits, the Convention will require that BWE be completely phased out and replaced by on-board treatment systems by 2016, although both Canada and the U.S. have proposed retaining BWE in combination with treatment to provide enhanced protection to freshwater habitats (IMO 2010; EPA 2011). There are at least 59 treatment systems in development that use various mechanisms such as filtration, biocides, head exposure, electric pulse treatment, ultraviolet rays, ultrasound, magnetic fields, deoxygenation, and antifouling coatings to eliminate ballast water taxa (NRC 1996; Lloyd's Register 2011; Mamlook et al. 2008), although no treatment systems have been approved for use in Canada to date. Domestic vessels operating exclusively within Canadian waters are currently exempt from Canadian ballast water regulations.

HISTORY OF AQUATIC NIS IN THE PACIFIC REGION

The western shoreline of Canada stretches 29,000 km and borders the Pacific Ocean. The Pacific coast is important for aquaculture, the alternative energy industry, First Nations' communities, commercial fisheries, shipping, marine tourism, and various recreational activities (MacConnachie et al. 2007, PNCIMA). Canada's Pacific waters are ecologically diverse; inhabitated by more than 400 marine fish and bird species and at least 27 different types of whales, dolphins, porpoises, seals and sea lions (Stark 2008). The northern portion, bound by Brooks Peninsula and Quandra Island on the south and Alaska on the north, constitutes the Pacific North Coast Integrated Management Area (PNCIMA). This region was identified as an ocean management area in which integrated management planning strategies will be tested to address issues related to multiple use of marine areas, sustainability, and conservation (Hillier and Gueret 2007; PNCIMA). This area is one among many such as Bowie's Seamount, Gwaii Haanas National Park Reserve, Race Rocks Ecological Reserve and the Endeavour Hydrothermal vents that may be of heightened importance for the implementation of procedures to protect against incoming NIS.

The Pacific coast has a series of 27 ice-free, deep-water ports that support a large shipping industry and serves as the Canadian gateway to the Pacific (Transport Canada 2009, this study). The Port of Vancouver located on the south coast, is the busiest port handling over 70 million tonnes of cargo annually, through 31 terminals situated throughout the city of Vancouver in areas of varied salinity (1 – 34ppt). The freshwater component is supplied primarily by the Fraser River, which travels through Vancouver and terminates in a tidal estuary. Here, two ports experience unique freshwater conditions; Fraser Surrey Docks in the inland reach at New Westminster, holds a salinity of 1ppt year round, while Fraser Port in the southern reach experiences seasonally and tidally stratified fresh and marine conditions (1-34ppt) timed with the spring freshet and salt wedge intrusion (Neilson-Welch, 1999). These ports are particularly vulnerable to freshwater NIS transported in unmanaged ballast water from rivers within the ballast water management exemption zone (Levings and Foreman, 2004).The Port of Prince Rupert, which is within the PNCIMA, offers North America's shortest and most efficient route to Asian markets (Transport Canada 2009). At least 45% of Canada's international ship visits occur on the Pacific coast (BMT Fleet Technology Ltd. 2006) and shipping in this region is expected to increase considerably until 2023 (Hall 2008). Ballasted vessels entering Pacific ports each carry an average of 13,915 ± 1,481 m^3 of ballast water, which is approximately twice that carried by Great Lakes vessels, where ballast water is already recognized as an important vector (Humphrey 2008). The relatively large volume of ballast combined with increasing shipping activity may make Canada's Pacific coast especially susceptible to invasions.

Ninety-four aquatic NIS have established in the marine waters of Canada's Pacific coast, 78 of which were recorded near the port of Vancouver in the Georgia Strait (Levings et al. 2002, Gillespie 2007, Daniel and Therriault 2007). Much destruction has accompanied these invasions as is well illustrated by high-impact invaders such as the Eurasian watermilfoil (*Myriophyllum spicatum*), the European green crab (*Carcinus maenas*) and the tunicate *Didemnum vexillum*. The Eurasian water milfoil is a highly competitive underwater aquatic plant that has displaced many native species and altered physiochemical characteristsics of water thereby reducing habitat quality for fish, waterfoul and other species (Canadian Wildlife Service 2003). The milfoil creates such dense colonies that it can interfere with fishing, boating, and swimming, and clog industrial water intake pipes (MOE 2004, OFAH 2009). The European green crab was initially introduced to the Atlantic coast of Canada in the early 19th century and has recently spread to the Pacific coast (WDFW 2009). It is a predatory species that feeds on a variety of plants and animals, including oysters, mussels, clams and juvenile crabs, thereby depleting shellfish (DFO 2008, DFO 2009).Since it can tolerate salinities between 4-54‰ and temperatures between 0-

33°C, it has been a very successful invader (WDFW 2009). *Didemnum vexillum* is one of four tunicate species established in the Pacific coast (Switzer et al. 2011).). Invasive tunicates have become a global concern to marine environments, as once established in an area they become a major fouling species, impacting native species and communities (Dijkstra et al. 2007; Lutz-Collins et al. 2009). Nonindigenous ascidians have been shown to impact shellfish aquaculture industries due to high occurrence of attachment and overgrowth on aquaculture equipment and gear, resulting in increased operation and production costs. Although these cases are not representative of all NIS, the large impacts caused by approximately 10% of aquatic NIS validate the need for comprehensive prevention and control programs (Ricciardi and Kipp 2008).

SPECIFIC ISSUES OF CONCERN TO THE PACIFIC REGION

HULL FOULING

Hull fouling is known to be an important vector for the transfer of marine and coastal aquatic NIS (Carlton 1985; Gollasch 2002; Coutts et al. 2003), and has recently become a particular concern for the introduction and spread of tunicates in Pacific Canada. Sylvester et al. (2011) showed that Vancouver ports receive relatively high abundances and diversity of potential invaders on fouled hulls relative to that of Halifax, influenced largely by a longer duration of stay at port. While shipping companies have historically worked to minimize biological fouling of exterior underwater surfaces since fouling increases drag and decreases fuel economy and ship speed, a 2008 international ban on the use of the highly effective tributyl tin-based anti-fouling paint may may have increased the importance of hull fouling as an invasion vector. While Canada does have regulations regarding anti-fouling systems, such as the regular application of non-TBT anti-fouling paint (Department of Justice Canada 2012), and has supported the adoption of international guidelines for control and management of ships' biofouling, Canada does not currently have domestic hull fouling regulations.

INTERNATIONAL COASTAL U.S. VESSELS

There are at least 113 ballast-mediated NIS on the U.S. west coast (Simkanin et al. 2009) which could be spread to Canadian Pacific ports by intra-coastal shipping. Intra-coastal shipping can disperse species within a region at much higher rates than would occur naturally, and can also transport species to regions which could not be reached via natural mechanisms (Simkanin et al. 2009). Since intra-coastal voyages are often short in duration, high survival in ballast tanks is expected and a potentially high number of propagules could be released, making domestic shipping a pathway of interest (Wasson et al. 2001, Simkanin et al. 2009, Lawrence and Cordell 2010, DiBacco et al. 2011). Further, coastal ballast water exchange (50-200 nautical miles offshore) has been found to be significantly less effective than mid-ocean exchange (>200 nautical miles offshore)(McCollin et al. 2007, 2008, Lawrence and Cordell 2010). In a comprehensive assessment of transoceanic and coastal ballast water discharged at Puget Sound, Washington, average densities of coastal zooplankton carried by exchanged coastal vessels were 1-2 orders of magnitude higher than that carried by exchanged transoceanic vessels, with ballast water from California having higher densities of NIS than ballast from China, Korea, and Japan (Cordell et al. 2009, Lawrence and Cordell 2010).

INTERNATIONAL EXEMPTION ZONES

Current Canadian regulations provide a ballast water exchange exemption for vessels operating exclusively in waters under Canadian jurisdiction and waters south of the Aleutian Islands, Alaska and north of Cape Blanco, Oregon, based on general oceanographic considerations:

plankton communities north of Cape Mendocino are considered contiguous with those in the Canadian Pacific Region because of northward currents (Pickard and Emery 1996, Transport Canada 2007; Figure 2). However, due to the risk of coastal secondary spread of NIS that first establish at international shipping ports, recent research calls into question regional "common waters" agreements that allow vessels to move intracoastal ballast without any form of ballast management (Levings et al. 2004, Lawrence and Cordell 2010, DiBacco et al. 2012). The European green crab (*Carcinus maenas*), thought to be introduced initially to San Francisco Bay through larval transport by ballast water, has spread northward as far as the southwest coast of British Columbia (Cohen et al. 1995; Cohen and Carlton 2003). Coastal spread may have taken place through a combination of natural dispersion and by ballast water transport (See and Feist 2010). In regards to zooplankton NIS, *Pseudodiaptomus forbesi*, is spreading along the western United States coast after being introduced from Asia, likely through ballast water transport (Cordell et al. 2008). Although this copepod has not been documented in Canada yet, large densities of this copepod have been found in ballast water and residual samples destined for the Canadian west coast from coastal US ports (Sutherland et al. 2009; DiBacco et al. 2011). Since this copepod has been observed to form a seasonal summer "monoculture" in the lower Columbia River, unexchanged ballast water transport from this location could provide high-risk conditions. Furthermore, the introduction of this prolific invasive copepod may upset the existing zooplankton diversity in the Fraser River if it established through river-to-river transport exempt from ballast exchange.

The coastline of Western Canada is characterized by highly variable salinity due to influences from fjords, major river systems, significant seasonal freshet runoff, and a complex coastline (e.g. Fraser River, B.C., Columbia River, Or.). Given the high ranging salinity characteristics within the Fraser River watershed, and the short transit times (i.e. 1-3 day river-to-river journeys), NIS spread is plausible given the salinity tolerances of certain organisms. Caution should be taken when applying generalized environmental similarities to complex coastal "common waters".

Further, during the development of this risk assessment, it became apparent that some Transport Canada Inspectors were applying the exemption liberally, permitting direct discharge of ballast water sourced from a port within the exemption zone, regardless of the vessel's operational history. Liberal application of the ballast water management exemption would parallel the 'no ballast on board' (NOBOB) situation in the Great Lakes, where discharge of ballast water sourced from local ports can pose a risk of new introductions by mixing with untreated residual ballast water from foreign ports (Bailey et al. 2003, 2005).

FRASER SURREY

The Fraser Surrey docks were identified as a particularly sensitive port as it is the only consistently fresh water Canadian Pacific port having regular ship traffic. If freshwater NIS were to establish at Fraser Surrey, the port could serve as a beachhead for further invasion of inland fresh waters by coastal shipping. The highest risk comes from coastal river-to-river journeys due to: 1) similar salinities at source-recipient ports; 2) short voyage time (less than one day's travel between Fraser and Columbia Rivers); 3) majority of voyage time spent navigating river systems at low speed; and 4) coastal voyages through lower salinity waters. For these reasons it was decided that Fraser Surrey would be prioritized for full risk assessment.

METHODS

STUDY AREA

For the purpose of this study, the Canadian Pacific region includes all coastal waters of British Columbia (Figure 2). All port areas, wharfs, and harbour zones, hereafter referred to as ports, that received vessel traffic in 2008 were included in the analysis.

DETERMINING HULL FOULING-MEDIATED INVASION RISK

The risk posed by a NIS is the product of the probability of introduction and the consequences of introduction. The risk assessment for hull fouling-mediated introductions used a three-step process, following the methods of Orr (2003) and the National Code on Introductions and Transfers of Aquatic Organisms (DFO 2009*;* Figure 3). First, the probability of introduction was estimated by combining the individual probabilities of successful transition through each stage of the invasion process (e.g., arrival and survival), based on ship arrival data and environmental conditions at Pacific ports. Second, the potential magnitude of consequences of introduction was estimated based on the number of high impact hull fouling-mediated NIS recorded for eco-regions of ports directly connected to Pacific ports through ship traffic. Finally, the probability of introduction and potential magnitude of consequences were combined for a final invasion risk rating. To ensure that uncertainty is characterized in a standardized way for each component of the assessment, we assigned levels of uncertainty, ranging from very high to very low, based on the quality of data available for analysis (Table 1). Further, the suitability of the selected measure as a proxy for the variable of interest was considered as a component of uncertainty during the peer review meeting.

Step 1A: Estimating Probability of Arrival (Hull Fouling)

A comprehensive database of merchant vessel arrivals at Canadian Pacific ports in 2008 was assembled using the Canadian Coast Guard's Vessel Traffic Operations Support System (VTOSS), with supplementary arrival data obtained from the Transport Canada Ballast Water Database (TCBWD; accessed March 2009) as the primary data source. Canada requires all commercial vessels to report to the VTOSS when entering each Canadian Maritime Communications and Traffic Services Zone. We included only merchant vessels in this risk assessment since information on non-merchant vessels was incomplete and unreliable. We recognize that non-merchant vessels, particularly cruise ships and passenger vessels, may undertake a very large number (daily) transits between Canadian ports, and that this activity make be particularly important for spread of AIS between Canadian Pacific ports; future study on this topic is warranted.

The VTOSS records vessel positions every 6 minutes based on radio reports made to the traffic centre at mandatory calling-in points. If the vessel is in an area where there are radar sensors (southern part of coast), then positioning is based on that sensor. In areas of no radar, using the vessel's reported location, course and speed, a dead reckoning course is entered into VTOSS, which is updated each time a vessel reports at mandatory calling-in points; this type of position fixing is not as accurate as radar sensors. We limited our analysis to a 12-month period because of the large volume of data and time constraints. We used shipping data from 1 January 2008 to 31 December 2008 because it was the most complete dataset available to us when the study was initiated in 2010. We obtained ship arrival data from VTOSS by filtering out the unique combinations of vessel transit data to obtain the latest date associated with each arrival event. We then filtered out non-merchant vessels and removed any vessels with blank destination fields. We standardized all location acronyms for Canadian port locations and assigned coordinates to port locations where necessary. The data was then grouped based on

destination location and we removed records that were not within a port vessel traffic services zone (i.e., removed vessels in transit, leaving those arriving to a port).

The information recorded by the VTOSS and TCBWD includes vessel tombstone data, destination port and date of arrival. Although in theory the VTOSS should capture all vessel arrivals, there were a large number of vessel arrivals in the TCBWD that were not recorded in the VTOSS (and *vice versa*). To ensure data quality, we cross-referenced VTOSS and TCBWD against relevant records obtained from the United States' National Ballast Information Clearinghouse (NBIC); data was obtained for all vessels traveling between American and Canadian ports, as well as for vessels arriving to Canadian ports which voluntarily submitted information to the NBIC. We created a single, comprehensive database by combining and cross-referencing all three datasets (VTOSS, TCBWD and NBIC). In some cases, missing information on vessel type was obtained from http://www.shipspotting.com/ or http://www.marinetraffic.com/ based on IMO number and vessel name and confirmed with additional tombstone data. To simplify analysis and give a more accurate estimate of arrivals, we standardized names and abbreviations used for ports, vessels and vessel types, and combined adjacent wharves and/or ports (e.g., Burnaby, English Bay, Roberts Bank into Vancouver and Port Edward as Prince Rupert; for a complete list see appendix A). The data was then organized by: Vessel name, Arrival port, Arrival date and by original database.

By combining several databases from separate sources, we vastly increased the number of vessels captured in the dataset but some arrivals were duplicated. In this situation, the arrival date could not be used to determine duplication since a single voyage commonly had different arrival dates between databases due to differences in reporting intervals (i.e., 96 hour advanced reports estimating arrival date vs. actual arrival date reported); records for arrivals by a single vessel to a specific port were considered duplicates when there were no records of arrival to any other location within 7 days in all databases, based on review of date variability between datasets for obvious duplicates. Our 7-day window appears robust, although we acknowledge two possible types of error: 1) duplicate reports having greater than 7 days difference could be retained as independent arrivals in our final dataset, resulting in overestimate of arrivals to a specific port, thus possibly overestimating risk; while undesirable, this type of error would provide greater than necessary environmental protection. 2) individual short return-haul transits to a nearby Canadian or American port could be mistakenly grouped into a single arrival, resulting in underestimate of arrivals to a specific port, thus possibly underestimating risk; we did our best to exclude this possibility by reviewing all available data from both Canadian (VTOSS and TCBWD) and American sources (NBIC) - a vessel should not have been able to travel to any nearby port without creating an arrival record at that location which would break the 7 day window.

Merchant vessels were grouped into three categories based on operational region during the entire period of the study year: international transoceanic, international coastal U.S. and international exempt (Table 2). Shipping data was organized by date of arrival, vessel name, data source, vessel class, and operational region in order to quantify vessel arrivals and estimate arrival potential at individual ports associated with different vessel categories.

We used the number of vessel arrivals as a proxy for propagule pressure and colonization pressure (i.e., the number of species) of fouling NIS potentially arriving at ports, and hereafter use the term 'propagule supply' to describe a joint measure of propagule and colonization pressure. We recognize that the number of vessel arrivals is a coarse proxy for propagule supply as the actual number of NIS individuals and species arriving to the recipient environment have not been quantified. Sailing speed, port layover time, anti-fouling management and voyage history can all affect the propagule supply associated with hull fouling of individual ships

(Minchin and Gollasch 2003; Coutts and Taylor 2004; Sylvester and MacIsaac 2010; Sylvester et al. 2011), but due to data limitations these factors could not be incorporated here.

A ranking system was used to convert the number of vessel arrivals into a probability of arrival, where the maximum number of annual arrivals to a single port was divided into five equal categories (Table 3). The choice of five equal categories assumes a positive linear relationship between the two variables, which is consistent with general invasion theory; however, alternative ranking systems could be applied subject to appropriate evaluation and calibration or if stakeholders' risk tolerance levels change. Since the number of arrivals is a very coarse proxy for the actual propagule supply received by hull fouling, the associated uncertainty is moderate. Due to the large number of ports in the region and limited time and resources available to complete the risk assessment, we prioritized the top three ports in each vessel category, based on the probability of arrival, for further assessment. It was noted during the first peer review that ports ranked below the top three sometimes had values only marginally lower than those ports selected for full assessment; given additional resources in the future, analyses of additional ports below the top three (in all vessel categories) may be of interest.

Step 1B: Estimating Probability of Survival (Hull Fouling)

After being released into a new environment, introduced propagules must survive in the recipient environment in order for an invasion to occur. Species-specific risk assessments typically estimate probability of survival by comparing environmental conditions of native and recipient ranges using data-intensive environmental niche models (e.g. Therriault and Herborg 2007; Therriault et al. 2008a, b). Vector-based risk assessments, involving hundreds to thousands of species, each with individual habitat requirements, prohibit the use of such complex models. While coarse comparison of environmental similarity between source and recipient regions is manageable, the case of hull fouling is further complicated by the potentially long history of species accumulation from a variety of ports. Species encrusted on vessels can represent a menagerie of sources, with the most recent port-of-call contributing perhaps only a very small fraction of the total fouling community (Fofonoff et al. 2003; Mineur et al. 2007). Source-recipient port comparisons would require data on all ports visited since the vessel was last cleaned in drydock, as well the mooring duration at each port and application of any fouling management practices. Since our dataset included only information on the last port-of-call, we could only assign probabilities of survival at a very coarse level. While hull fouling is documented as an important vector of NIS to coastal marine habitats, the risk for fouling by transoceanic vessels appears much lower for freshwater habitats (Sylvester and MacIsaac 2010); therefore, recipient ports which are exclusively freshwater (salinity <2 parts per thousand) were assigned the lowest probability of survival while all other ports were categorized as highest probability of survival. This estimate carries a high level of uncertainty since salinity can vary both spatially (vertically and horizontally) and temporally at a single port.

Step 1C: Calculating Probability of Introduction (Hull Fouling)

The probabilities of arrival and survival were calculated as separate, independent events for each top port by each ship category. However, because the overall probability of introduction is dependent on the sequential occurrence of arrival and survival, a minimum probability approach was used to determine the overall probability that all stages are passed successfully (Orr 2003; DFO 2009). For example, given a lowest probability of arrival and a highest probability of survival, the overall probability of introduction would be lowest, because high survival probabilities are offset by a very low number of arriving individuals available to survive. Due to the very large number of potential hull-fouling species, we were unable to estimate the probability that a reproductive population of any one NIS could establish at a recipient Pacific port or become widespread within Canada (but see section 3.5 on ship-mediated secondary

spread). Excluding these two stages of invasion from the analysis essentially sets their probabilities at the highest level since the minimum probability approach retains the value of the component with the lowest rating. The minimum probability approach is widely used in qualitative risk assessments (e.g., Canadian Food Inspection Agency Weed Risk Assessment Guidelines, Aquatic Nuisance Species Task Force, and Commission for Environmental Cooperation Risk Assessment Guidelines) and produces risk ratings most consistent with quantitative risk approaches (Koops and Cudmore 2009). In contrast, we retained the highest level of uncertainty for any one stage of invasion as the uncertainty associated with the probability of introduction.

Step 2: Estimating the Magnitude of Consequences (Hull Fouling)

Predicting potential impacts of NIS involves evaluating the physical-chemical requirements of the NIS and their interactions with native species at recipient sites; a species-specific estimate for potential impact (Colautti and MacIsaac 2004; Lockwood et al. 2006). Again, predicting potential impact for a vector-based risk assessment is complicated by the wide range of possible NIS associated with the vector. Since up-to-date, port-specific lists of native species and established NIS are not available for most ports, we compiled a list of high impact fouling NIS for connected source ports using data from the Nature Conservancy's Marine Invasive Database (Molnar et al. 2008; available at http://conserveonline.org/ workspaces/ global.invasive.assessment). High-impact NIS are defined as introduced species that disrupt multiple species, ecosystem function, and/or keystone or threatened species. The database includes 81 high impact fouling NIS in 232 coastal ecoregions. We then tabulated the number of high impact fouling NIS recorded for the ecoregion of each source port directly connected to each top Pacific port, assuming that each connected port may be a donor of all high impact fouling NIS established within the ecoregion; therefore, multiple tally counts are given to a single NIS that could originate from multiple source ports.

A ranking system was used to convert the cumulative number of high impact NIS connected to each top Pacific port into a magnitude of consequences, where the maximum value was divided into five equal categories (Table 4). Again, the choice of five equal categories assumes a positive linear correlation, consistent with general theory to date, while noting that alternative ranking systems could be applied depending on the circumstances. Because the list of high impact species was available for ecoregions rather than specific ports, does not account for species that may cause high impacts in new recipient regions despite low or negligible impact in source regions, and does not account for high impact species that are native to the source region, the level of uncertainty associated with magnitude of consequences was considered moderate.

Step 3: Calculating the Final Invasion Risk (Hull Fouling)

The probability of introduction (Step 1) and magnitude of consequences (Step 2) of hull fouling-mediated NIS were combined into a final invasion risk for each top port, by each ship category, based on a symmetrical mixed-rounding matrix that reduces the final ratings to three levels (modified from Therriault and Herborg 2007; Table 5). The colouring of this matrix was determined by consensus at the first peer review meeting to be the most balanced approach for assigning levels of risk; however, the matrix can easily be changed to accommodate differing risk tolerance levels of managers and/or stakeholders. The highest level of uncertainty assigned to either probability of introduction or magnitude of consequences was retained as the uncertainty associated with the final invasion risk.

ESTIMATING SHIP-MEDIATED SECONDARY SPREAD (HULL FOULING)

Analysis of ship-mediated secondary spread by hull fouling was omitted from the Pacific region risk assessment since no merchant vessels operated exclusively within domestic waters of Pacific Canada and we did not have data on the substantial non-merchant (passenger) fleet. Given more time, resources and data from the recently established Pacific Coast INNAV system, it would be fruitful to investigate the influence of non-merchant vessels on secondary spread of NIS in Pacific Canada.

DETERMINING BALLAST-MEDIATED INVASION RISK

A three step process, similar to that outlined above for hull fouling, was utilized to determine the level of invasion risk posed by ballast water (Figure 4). First, the probability of introduction was estimated by combining the individual probabilities of successful transition through each stage of the invasion process (i.e., arrival and survival), based on ballast water discharge data and environmental similarity between source and recipient ports. Second, the potential magnitude of consequences of introduction was estimated based on the number of high impact ballast-mediated NIS recorded for eco-regions of source ports. Finally, the probability of introduction and potential magnitude of consequences were combined for a final invasion risk rating. To ensure that uncertainty is characterized in a standardized way for each component of the assessment, we assigned levels of uncertainty, ranging from very high to very low, based on the quality of data available for analysis (Table 1). Further, the suitability of the selected measure as a proxy for the variable of interest was considered as a component of uncertainty during the peer review meeting. We recognize that residual sediments in ballast tanks may increase the propagule supply associated with ballast water discharge by commercial vessels (Bailey et al. 2007); however, adequate data was not available to evaluate this vector for this study.

Step 1A: Estimating Probability of Arrival (Ballast Water)

Ballast water information for all ships arriving to Pacific Canada in 2008 was obtained from the Transport Canada Ballast Water Database (TCBWD) and incorporated into the ship arrivals database described above in Section 3.2, Step 1A. Data self-reported by vessels to Transport Canada provides information on the ballast history for each vessel transit, including ballast tank capacities, ballast uptake and discharge events, and any management activities. All international vessels with a ballast capacity greater than eight m^3 are required to submit ballast water reports prior to the first port of call in Canadian waters. Due to a large amount of missing data, supplementary ballast water information was obtained from the U.S. National Ballast Information Clearinghouse (NBIC) for vessels arriving to U.S. Pacific ports with a Canadian next port-of-call, as well as for arrivals to Canadian Pacific ports (which were submitted to NBIC as a voluntary precaution). Only merchant vessels were considered for the ballast water assessment because other vessel types carry very little or no ballast water and do not consistently report ballast activities to the TCBWD or NBIC. Some non-merchant vessels, such as cruise ships, ferries and large fishing vessels do carry and exchange >$8m^3$ ballast water, but could not be included in the ballast water assessment due to inconsistent reporting within our dataset.

The TCBWD did not distinguish between Fraser Surrey (freshwater) and Fraser Port (estuarine) for location of ballast water discharge, but treated the two ports as a single location, and it was not possible to differentiate the discharge locations using VTOSS data. Therefore, the Fraser River Ports are treated as a combined port for the propagule supply assessment (Step 1A Arrival), but as separate ports with different environments for the remainder of the risk assessment (Steps 1B Survival, 1C Introduction, 2 Consequences, 3 Final Invasion Risk). In the later steps of the risk assessment, we used the full ballast volume discharged at the Fraser River ports for each Fraser Surrey and Fraser Port, to estimate maximum possible risk at both

ports. This approach is not ideal because the overestimation of P (Arrival) will ultimately impact P (Introduction) and the overall invasion risk. However, given the sensitivity of the freshwater port (Fraser Surrey), it was important to estimate the potential impact of ballast water discharge at both Fraser River ports. Hereafter, the term 'Fraser River Ports' will be used when referring to the two ports as a combined unit.

The TCBWD did not consistently collect data on ballast water discharges by international exempt vessels, nor identify which vessels the exemption was applied to. It was assumed that all vessels operating exclusively within the exemption zone did not manage ballast water, hereafter referred to as "direct" water, although volumes were corrected to account for voluntary exchange when reported. For ease of summary, the geographic location of ballast water sources was condensed into regions, including the Arctic, North-west Atlantic, North-east Atlantic, Western-central Atlantic, Eastern-central Atlantic, South-east Atlantic, and Mediterranean and Black Sea, as described by the Food and Agriculture Organization (FAO 2009; Figure 5) and as used in past ballast water studies (e.g., Amoako-Atta and Hicks 2004; Simard and Hardy 2004; Claudi and Ravishankar 2006).

The volume of foreign ballast water discharged by international vessels was corrected to account for reduction in propagule supply due to mandatory management activities. Ballast water exchange can reduce propagule supply by flushing out most entrained organisms and killing those that remain *via* osmotic stress associated with rapid salinity change (Wonham et al. 2001; Ruiz and Smith 2005). However, some viable NIS propagules entrained at the source port may remain viable in tanks despite full compliance by ships (Levings and Foreman 2004; Ruiz and Smith 2005; Simard et al. 2011). A correction factor of 0.1 for ships with ballast water from saline ports, or 0.01 for freshwater ports, was applied to the reported volumes of exchanged ballast water to estimate propagule supply. These values were derived from ballast water exchange efficacy rates, as determined by total zooplankton abundance, reported for saline water (90%) and freshwater (99%) ports, respectively (Ruiz and Smith 2005; Gray et al. 2007).

We used the corrected volume of ballast water discharged as a proxy for the propagule supply of NIS potentially arriving at ports by ballast water. Ballast volume acts like a scaling coefficient, where large volumes are more likely to transport greater propagule pressure, but they can transport low propagule pressure. While propagule pressure associated with the ballast water of any single vessel is expected to be more directly related to physico-chemical and/or geographic-seasonal factors like water salinity, age of ballast water and management practices than total volume (Aguirre-Macedo et al. 2008; Burkholder et al. 2007; McCollin et al. 2008; Villac and Kaczmarska 2011), the available dataset did not include these data. While imperfect, the use of volume is consistent with previous studies (Drake and Lodge 2004; Herborg et al. 2007; Simkanin et al. 2009).

A ranking system was used to convert the volume of ballast water discharged into a probability of arrival, where the maximum annual corrected volume of ballast water discharged at a single Pacific port was divided into five equal categories (Table 6). The choice of five equal categories assumes a positive linear relationship between the two variables, which is consistent with general invasion theory, while noting that alternative ranking systems could be applied depending on the circumstances. Recognizing that the volume of ballast water discharged is a robust but not a direct measurement of the propagule supply within the water, the associated uncertainty level was set as low. Due to the large number of ports in the region and limited time and resources available to complete the risk assessment, we prioritized the top three ports in each vessel category, based on the probability of arrival, for full assessment. It was noted during the first peer review that ports ranked below the top three sometimes had values only marginally lower than those ports selected for full assessment; given additional resources in the

future, analyses of additional ports below the top three (in all vessel categories) may be of interest.

Step 1B: Estimating Probability of Survival (Ballast Water)

Following the reasoning outlined above for hull fouling (Section 3.2, Step 1B), we conduct a comparison of the environmental similarity between source and recipient ports of ballast water to estimate the probability of survival. Environmental similarity analysis between NIS source and recipient ports is common in ballast water risk assessments (e.g., Hilliard et al. 1997; Gollasch and Leppäkoski 1999; Hayes and Hewitt 2001; Herborg et al. 2007; Keller et al. 2010). The main advantage of this approach is that it rapidly assesses the likelihood of NIS survival post-arrival based on the environmental conditions of the source and recipient sites (Barry et al. 2008). All ports directly connected to each top Pacific port as a source of ballast water were noted, allowing identification of source-recipient port-pairs. Following methodology of Keller et al. (2010) we selected four parameters to estimate environmental similarity between port-pairs, including annual average water temperature, mean water temperature during the warmest month, mean water temperature during the coldest month and annual average salinity. We recognize that additional variables such as pH, dissolved oxygen, day length, ice cover, etc. can influence species survival potential at the recipient environment. However, we focused our analysis on temperature and salinity because they are fundamental physical factors for survival and reproduction of all aquatic organisms (Kinne 1963; Anger 1991; Browne and Wanigasekera 2000; Verween et al. 2007). In addition, including variables that are not related to invasion risk for some or all potential NIS can dramatically decrease the sensitivity of the environmental similarity measure (Barry et al. 2008).

Following Keller et al. (2010), environmental similarity between top ports and global ports was calculated using Euclidean distance in four-dimensional space. Euclidean distance was used because it is a simple method to measure linear distance and is commonly used to measure environmental similarity between two locations (Barry et al. 2008). Sensitivity analysis revealed that salinity was the most influential variable in this calculation, and thus had approximately equal overall weight in the outcome as the three temperature parameters (Keller et al. 2010). We obtained data for the four environmental parameters for 6,651 global ports from Keller et al. (2010). In addition, we interpolated data for these four environmental parameters in ArcGIS 10 (ESRI Inc.) for 56 Arctic ports not included in Keller et al. (2010) using data from the World Ocean Atlas (Antonov et al. 2006; Locarnini et al. 2006). All environmental values were standardized using a z-transformation so that each variable had equal weight in the calculation. Euclidean (Environmental) distance values between each top port and all connected source ports were averaged to obtain a final rating for survival potential.

A ranking system was used to convert the average Euclidean distance value for each port into a probability of survival, where the maximum value for any single source-recipient port-pair (of all possible global port-pairs, not just those that were identified as connected in this dataset) was divided into five equal categories (Table 7). Again, the choice of five equal categories assumes a positive linear correlation, consistent with general theory to date, while noting that alternative ranking systems could be applied depending on the circumstances. This estimate carries a low level of uncertainty, although it is recognized that spatial (vertical and horizontal) and temporal variability in salinity at a single port are likely not well represented by the annual average salinity. Further, we recognized that biological interactions may also enhance or impede NIS survival at the recipient port (Colautti and MacIsaac 2004) but we were unable to assess these interactions due to the large number of species potentially associated with the ballast water vector.

Step 1C: Calculating Probability of Introduction (Ballast Water)

As described above for hull fouling, probabilities of arrival and survival were combined into a probability of introduction at each top port, for each ship category, using the minimum probability method, while retaining the highest level of uncertainty. Probabilities of establishment and spread were not included in this risk assessment.

In addition, to provide information about potentially important source ports of ballast-mediated NIS, we overlaid propagule supply and environmental similarity measures between all connecting port-pairs using ArcGIS 10. Port-pairs in the upper two categories for both components were considered most likely sources of NIS due to sufficient propagule supply and environmental matching (Orr 2003).

Step 2: Estimating the Magnitude of Consequences (Ballast Water)

Similar to the methodology described above for hull fouling, we compiled a list of high impact ballast-mediated NIS for connected source ports using the Nature Conservancy's Marine Invasive Database (Molnar et al. 2008). The database includes a total of 90 high impact ballast-mediated NIS in 232 ecoregions. We first tabulated the number of high impact ballast-mediated NIS recorded for the ecoregion of each source port directly connected to each top Pacific port, assuming that each connected port may be a donor of all high impact ballast-mediated NIS established within the ecoregion; therefore, multiple tally counts are given to a single NIS that could originate from multiple source ports.

A ranking system was used to convert the cumulative number of high impact NIS connected to each top Pacific port into a magnitude of consequences, where the maximum value was divided into five equal categories (Table 8). Again, the choice of five equal categories assumes a positive linear correlation, consistent with general theory to date, while noting that alternative ranking systems could be applied depending on the circumstances. Since the list of high impact species was available for ecoregions rather than specific ports, does not account for species that may cause high impacts in new recipient regions despite low or negligible impact in source regions, and does not account for high impact species that are native to the source region, the level of uncertainty associated with magnitude of consequences was considered moderate.

Step 3: Calculating Final Invasion Risk (Ballast Water)

The probability of introduction (Step 1) and magnitude of consequences (Step 2) of ballast-mediated NIS were combined into a final invasion risk for each top port, for each ship category, based on a symmetrical mixed-rounding matrix, as described above for hull fouling (Table 5). The highest level of uncertainty assigned to either probability of introduction or magnitude of consequences was retained as the uncertainty associated with the final invasion risk.

ESTIMATING SHIP-MEDIATED SECONDARY SPREAD (BALLAST WATER)

Analysis of ship-mediated secondary spread by ballast water was omitted from the Pacific region risk assessment since no merchant vessels operated exclusively within domestic waters of Pacific Canada.

RESULTS AND DISCUSSION

VESSEL ARRIVALS IN THE PACIFIC REGION

A total of 7,261 distinct merchant vessel arrivals were recorded during the 12-month period at 24 Pacific ports. International transoceanic vessels contributed the greatest number of arrivals (n = 6950), followed by international coastal U.S. vessels (n = 168), and international exempt

vessels (n=143). The majority of vessel arrivals terminated at ports in the Strait of Georgia (southern B.C. coast), with a smaller number of important ports in the northernmost section of the B.C. coast (Figure 6).

Probability of Arrival (Hull Fouling)

International Transoceanic Vessels

We identified 3,426 distinct international transoceanic vessel arrivals at 19 Pacific ports during the study period. Vancouver, Fraser Surrey (port of special concern) and Prince Rupert were the top three ports receiving the greatest number of international transoceanic vessel arrivals with Vancouver having the highest probability for arrival of hull-mediated NIS (Table 9). The remaining Pacific ports were rated lowest for probability of arrival of hull-mediated NIS. Top port locations are shown in Figure 7.

International transoceanic vessels operate within a truly global network, providing opportunity for introduction of a wide variety of NIS (Kaluza et al. 2010; Keller et al. 2010). Transoceanic voyages, however, generally expose fouling organisms to long voyages, high travelling speeds and large variation in temperature and salinity, which may decrease survival and subsequent invasion risk (Coutts et al. 2003; Coutts and Taylor 2004). There are, however, fouling organisms (e.g., bryozoans and isopods) capable of tolerating a wide range of salinities (0 – 37 ppt) and temperatures (9.9 – 31.6 °C; Davidson et al. 2008), thus the potential for successful hull-mediated NIS introductions across regions cannot be disregarded completely (Lewis et al. 2006).

International Coastal U.S. Vessels

We identified 115 distinct international coastal U.S. vessel arrivals at 10 Pacific ports during the study period. Vancouver, Fraser Surrey (port of special concern) and Kitimat were the top three ports receiving the greatest number of international coastal U.S. vessel arrivals (Table 10), however all Pacific ports had the lowest potential for arrival of hull-mediated NIS. Locations of top ports are shown in Figure 7.

Coastal vessels typically have shorter voyage times and travel within more similar latitudes than do international vessels and therefore are more likely to transport viable fouling organisms to Pacific ports (Simkanin et al. 2009, Lawrence and Cordell 2010). Coastal voyages, however, may play a more prominent role in the spread of native nuisance species and/or established NIS, rather than the introduction of new NIS from foreign sources, since the geographic extent of potential source ports is much smaller than for international transoceanic vessels.

International Exempt Vessels

We identified 91 distinct international exempt vessel arrivals at 12 Pacific ports during the study period. Vancouver, Fraser Surrey (port of special concern) and Crofton were the top three ports receiving the greatest number of international exempt vessel arrivals. For international exempt vessels, all Pacific ports have the lowest probability of arrival for hull-mediated NIS (Table 11). Locations of top ports are shown in Figure 7.

By definition, international-exempt vessels should be operating exclusively within Canada, Alaska and Northwestern United States. While environmental conditions within the exemption zone can vary (DiBacco et al. 2011), biota fouled on vessel hulls may be able to survive due to the short transit times. While the exemption zone has historically been considered a single biogeographic region with common species across ports, there are now established NIS which could be spread from high traffic U.S. ports within the exemption zone to Canadian Pacific ports.

Probability of Survival (Hull Fouling)

Fraser Surrey (port of special concern) is the only top port with an annual average salinity < 2 parts per thousand and therefore had lowest probability for survival of NIS via hull fouling among top Pacific ports. All of the remaining top Pacific ports considered in this risk assessment have annual average salinities >2 parts per thousand and had highest probability for survival of NIS via hull fouling. While the Columbia River is a close environmental match to Fraser Surrey leading to concerns about the possibility of transfer of freshwater hull fouling-mediated NIS between these two ports due to short transit times, this dataset included only one vessel transit from the Columbia River to Fraser Surrey; seven of the ten transits originating from the Columbia River terminated at Vancouver.

Probability of Introduction (Hull Fouling)

Vancouver has the highest probability for introduction of hull fouling-mediated NIS *via* international transoceanic traffic (Table 12). Probability of introduction for the remaining top ports in each vessel category was lowest, thus hull fouling-mediated NIS introduction is less likely at these ports.

Magnitude of Consequences (Hull Fouling)

The cumulative number of high impact fouling NIS at each top port by vessel category ranged from 57 to 1,550 representing 70 distinct NIS (Table 13; Appendix B). Vancouver was rated highest for magnitude of potential consequences of NIS *via* international transoceanic vessels, with a cumulative number of 1,550 high impact fouling NIS representing 70 distinct NIS. The remaining Pacific top ports were rated lowest to lower for magnitude of potential consequences of fouling NIS.

Final Invasion Risk (Hull Fouling)

The final relative invasion risk for nonindigenous species *via* hull fouling was higher for Vancouver and lower for all remaining top Pacific ports (Table 14).

BALLAST WATER DISCHARGES IN THE PACIFIC REGION

During the study period, merchant vessels conducted 1,071 ballast water discharges, releasing approximately 18,024,247 m^3 of ballast water at 17 Pacific ports (Table 15)(Figure 8a). After correcting for the reduction in propagule supply as a result of ballast water exchange (see ballast water methods, Step 1A for details), the volume discharged was 4,448,236 m^3 (Figure 8b). Approximately 72% of the corrected total volume originated from ports in the northwest Pacific Ocean, while 15% originated from North American ports in the northeast Pacific (Table 16).

International vessels exchanged approximately 92% of ballast tanks with coastal U.S. and international ballast water before discharge (Table 17); however, there were 308 ballast tanks discharged with missing or incomplete BWRFs, for which compliance cannot be assessed. International vessels also moved domestic ballast between Canadian ports on secondary transits; approximately 12% of domestic ballast water was exchanged even though there was no requirement to do so. International coastal U.S. vessels exchanged 94% of tanks on coastal U.S. routes, with an additional 5 tanks for which compliance cannot be assessed due to missing data. In addition, international coastal U.S. vessels conducted exchange for only 55% of tanks sourced from ports within the exemption zone – since these vessels do not operate ‘exlusively’ within the exemption zone, exchange is mandatory for those trips. Conversely, vessels which operated exclusively within the exemption zone exchanged 25 of 41 (61%) tanks, indicating that

there are very few vessels operating exclusively within the exemption zone and that there may be some confusion as to when BWE is required.

Probability of Arrival (Ballast Water)

International Transoceanic Vessels

During the study period, international transoceanic vessels discharged a total of 18,029,343 m^3 of ballast water at 17 Pacific ports. The total discharged volume included 14,213,877 m^3 of international sourced water and 1,861,736 m^3 of international coastal U.S. water to which a correction factor was applied to account for the reduced propagule supply due to mid-ocean exchange. Vancouver, Prince Rupert, and Port McNeill were the top three Pacific ports receiving the greatest combined volume of direct and exchanged (with correction factor applied) ballast water discharged by international transoceanic vessels (Table 18). The probability of arrival of ballast-mediated NIS *via* international merchant vessels was highest for Vancouver, and lowest for the remaining top Pacific ports. The combined Fraser River Ports were number 4 in the list of top ports with a corrected discharge of 78,170 m^3. Top port locations are shown in Figure 9.

Ballast water from international source ports must now be exchanged or flushed on the open ocean, which can dramatically reduce potential propagule supply to Canadian ports (Simard et al. 2011). Therefore, ballast water discharged by international transoceanic merchant vessels may play less of a role in the introduction of NIS from foreign sources.

International Coastal U.S. Vessels

International coastal U.S. vessels discharged a total of 524,596 m^3 of ballast water at 4 Pacific ports (Table 19). Approximately 75% of ballast water discharged by this vessel type was managed by BWE and/or tank flushing. The probability of arrival of ballast-mediated NIS *via* international coastal U.S. vessel discharges was lowest for the four top recipient ports (Vancouver, Fraser River Ports and Port McNeill). Port locations are shown in Figure 9.

Ballast water discharged by coastal vessels may have a higher propagule supply compared to international vessels due to the inverse relationship between duration of voyage and propagule survival – plankton are more likely to survive the environmental conditions and resist predation and competition inside a ballast tank over a shorter period of time (Lavoie et al. 1999; Verling et al. 2005; Simkanin et al. 2009). However, coastal U.S. vessels may play a more prominent role in the spread of native nuisance species and/or established NIS, rather than the introduction of new NIS from foreign sources, since the geographic extent of potential source ports is much smaller than for international transoceanic vessels.

International Exempt Merchant Vessels

During the same period, international exempt vessels discharged a total of 27,608 m^3 of ballast water at 4 Pacific ports[1]. Ballast water exchange was undertaken by some of these vessels even though they were not required to. This exchange likely would not meet ballast water management regulations (exchange >50 nautical miles from shore) without significant alteration to vessel course, thus all ballast water was consider discharged directly in this study. Approximately 29% of ballast water discharged by this vessel type originated from Canadian

[1] Results given based on vessels operating exclusively within the exemption zone. Because Transport Canada did not keep records regarding application of the exemption, it was not possible to quantify the true volume of ballast water discharged under the exemption. Liberal application of the exemption may have permitted 108 discharges (232,580 MT) of unmanaged ballast water sourced from within the exemption zone which has potentially mixed with untreated foreign residual (NOBOB) ballast water carried by international vessels.

ports, with the remainder originating from American ports within the exemption zone. Vancouver, Stewart and the Fraser River Ports were the top four Pacific ports receiving the greatest combined volume of ballast water discharged by international exempt vessels (Table 20). All ports had lowest probability of arrival of ballast mediated NIS *via* international exempt merchant vessels for Pacific Coast ports. Port locations are shown in Figure 9.

Similar to coastal vessels, international exempt vessels typically have shorter voyage times compared to international vessels and therefore are more likely to discharge viable organisms in ballast water (Simkanin et al. 2009, Lawrence and Cordell 2010); however, environmental gradients within the exemption zone do vary significantly (DiBacco et al. 2011), so any discharged biota are expected to have a high probability of survival only if the source and recipient ports are similar environments. While the exemption zone has historically been considered a single biogeographic region with common species across ports, concern has risen recently over the potential for secondary spread of established NIS from high traffic U.S. ports within the exemption zone.

Probability of Survival (Ballast Water)

International Transoceanic Vessels

Two hundred thirty-three foreign and one Canadian Pacific ballast water source ports were identified and evaluated for environmental similarity with Vancouver (Table 21). The overall probability of survival at Vancouver was higher, with 168 source ports having higher or highest environmental similarity to Vancouver. However, all connected ports with higher or highest environmental similarity with Vancouver also had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to Vancouver (Figure 10). A list of global ports with highest environmental similarity to Vancouver is provided in Appendix C; NIS originating from these ports would have the highest probability for survival if introduced to Vancouver.

Seventy-five foreign ballast water source ports were identified and evaluated for environmental similarity with Prince Rupert (Table 22). The overall probability of survival at Prince Rupert was intermediate, with 23 source ports having higher or highest environmental similarity to Prince Rupert. However, all connected ports with higher environmental similarity with Prince Rupert also had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to Prince Rupert (Figure 11). A list of global ports with highest environmental similarity to Prince Rupert is provided in Appendix D; NIS originating from these ports would have the highest probability for survival if introduced to Prince Rupert.

Five American and two Canadian Pacific ballast water source ports were identified and evaluated for environmental similarity with Port McNeill (Table 23). The overall probability of survival at Port McNeill was higher, with four source ports having higher or highest environmental similarity to Port McNeill. However, all connected ports with higher or highest environmental similarity with Port McNeill also had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to Port McNeill (Figure 12). A list of global ports with highest environmental similarity to Port McNeill is provided in Appendix E; NIS originating from these ports would have the highest probability for survival if introduced to Port McNeill.

Sixty-one foreign and three Canadian Pacific ballast water source ports were identified and evaluated for environmental similarity with Fraser Surrey (Table 24) and Fraser Port (Table 25). The overall probability of survival at Fraser Surrey (port of special concern) was intermediate, with 13 source ports having higher or highest environmental similarity to Fraser Surrey. The overall probability of survival at Fraser Port was higher, with 54 source ports having higher or

highest environmental similarity to Fraser Port. However, all connected ports with higher or highest environmental similarity with the Fraser River Ports also had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to the Fraser River Ports (Figure 13). Lists of global ports with highest environmental similarity to Fraser Surrey and Fraser Port are provided in Appendices F and G; NIS originating from these ports would have the highest probability for survival if introduced to the Fraser River Ports.

International Coastal U.S. Vessels

Eleven American ballast water source ports were identified and evaluated for environmental similarity with Vancouver (Table 26). The overall probability of survival at Vancouver was higher, with all source ports having higher or highest environmental similarity to Vancouver. However, all connected ports with higher or highest environmental similarity with Vancouver also had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to Vancouver (Figure 14).A list of global ports with highest environmental similarity to Vancouver is provided in Appendix C; NIS originating from these ports would have the highest probability for survival if introduced to Vancouver.

One American and one Canadian Pacific ballast water source ports were identified and evaluated for environmental similarity with Fraser Surrey (Table 27) and Fraser Port (Table 28). The overall probability of survival at Fraser Surrey (port of special concern) was intermediate, with one source port having higher environmental similarity to Fraser Surrey. The overall probability of survival at Fraser Port was highest, with both source ports having higher or highest environmental similarity to Fraser Port. However, both connected ports had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to the Fraser River Ports (Figure 15). Lists of global ports with highest environmental similarity to Fraser Surrey and Fraser Port are provided in Appendices F and G; NIS originating from these ports would have the highest probability for survival if introduced to the Fraser River Ports.

One American ballast water source port was identified and evaluated for environmental similarity with Port McNeill (Table 29). The probability of survival at Port McNeill was higher, since the ballast water source port (Longview) has higher environmental similarity to Port McNeill. However, Longview also had relatively low propagule supply, making this location an unlikely source of ballast-mediated NIS to Port McNeill (Figure 16). A list of global ports with highest environmental similarity to Port McNeill is provided in Appendix E; NIS originating from these ports would have the highest probability for survival if introduced to Port McNeill.

International Exempt Merchant Vessels

One American ballast water source port was identified and evaluated for environmental similarity with Vancouver (Table 30). The overall probability of survival at Vancouver was higher. However, the connected port also had relatively low propagule supply, making this location an unlikely source of ballast-mediated NIS to Vancouver (Figure 17). A list of global ports with highest environmental similarity to Vancouver is provided in Appendix C; NIS originating from these ports would have the highest probability for survival if introduced to Vancouver.

One Canadian Pacific ballast water source port was identified and evaluated for environmental similarity with Stewart (Table 33). The overall probability of survival at Stewart was highest. However, the connected port with highest environmental similarity to Stewart also had relatively low propagule supply, making this location an unlikely source of ballast-mediated NIS to Stewart (Figure 18). A list of global ports with highest environmental similarity to Stewart is provided in Appendix H; NIS originating from these ports would have the highest probability for survival if introduced to Stewart.

Three American ballast water source ports were identified and evaluated for environmental similarity with Fraser Surrey (Table 31) and Fraser Port (Table 32). The overall probability of survival at Fraser Surrey (port of special concern) was highest, with two source ports having highest environmental similarity to Fraser Surrey. The overall probability of survival at Fraser Port was higher, with the two source ports having higher environmental similarity to Fraser Port. However, all ports also had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to the Fraser River Ports (Figure 19). Lists of global ports with highest environmental similarity to Fraser Surrey and Fraser Port are provided in Appendices F and G; NIS originating from these ports would have the highest probability for survival if introduced to the Fraser River Ports.

Probability of Introduction (Ballast Water)

Vancouver has higher probability for introduction of ballast-mediated NIS *via* international transoceanic vessels (Table 34). Probability of introduction for the remaining top ports in each vessel category was ranked lowest, thus ballast–mediated NIS introduction is less likely at these ports including the Fraser Surrey port of special concern. Fraser Surrey received no ballast water originating from the freshwater Columbia River. Ballast water discharged in Canada from the Columbia River amounted to only 1221 MT of unexchanged ballast water, all of which was deposited in Vancouver.

Magnitude of Consequences (Ballast Water)

The cumulative number of high impact ballast-mediated NIS at each top port by vessel category ranged from 21 to 1,508, representing 89 distinct NIS (Table 35; Appendix I). Vancouver was rated highest for magnitude of potential consequences of NIS *via* international transoceanic vessels, with a cumulative number of 1508 high impact ballast-mediated NIS (83 distinct NIS). The remaining top ports from all vessel categories rated lower to lowest for magnitude of potential consequences by ballast-mediated NIS including Fraser Surrey the port of special concern.

Final Invasion Risk (Ballast Water)

The final relative invasion risk for nonindigenous species *via* ballast water was higher for Vancouver and lower for all remaining top Pacific ports (Table 36).

THE FUTURE OF SHIP-MEDIATED INVASIONS IN THE PACIFIC REGION

Although ballast management regulations coupled with an intensive inspection regime for international vessels appear to have successfully reduced the future risk of introduction of new NIS from foreign ports in the freshwater Great Lakes-St. Lawrence River region (Bailey et al. 2011), Pacific marine ports may be less protected since saltwater taxa are more likely to survive exchange and inspection rates are lower. Ballast water management systems utilizing technologies like filtration and chlorination can further reduce invasion risk by lowering propagule pressure more consistently than exchange methods; these systems are expected to be required for international vessels arriving to the Pacific region by 2016 (IMO 2004).

The results presented in this report are based on current (2008) shipping patterns and environmental conditions; any changes to one or both factors in the future would lead to changes in ship-mediated invasion risk. In particular, any efforts to increase shipping traffic to Canadian Pacific ports could result in higher propagule pressure and/or establish new connections with highly environmentally similar global source ports – such as those listed in Appendices B through H. Further, environmental climate changes could impact analyses of environmental similarity between connected source and donor ports. A reanalysis of

environmental similarity between donor and recipient port-pairs, using environmental variables as projected under climate change, may be useful to predict future invasion risk in the region.

CONCLUSIONS

- Canadian Pacific ports are connected to international and coastal U.S. ports, resulting in potential for species transfers *via* hull fouling and/or ballast water discharge.
- The final relative invasion risk for nonindigenous species *via* hull fouling was higher for Vancouver and lower for all remaining top Pacific ports.
- The final relative invasion risk for nonindigenous species *via* ballast water was higher for Vancouver and lower for all remaining top Pacific ports.
- Liberal application of ballast water management exemptions could serve as a vector for new species introductions to Canadian Pacific ports paralleling the 'no ballast on board' situation recently documented (and now managed) in the Great Lakes.
- It is important to note that all estimated probabilities and risk ratings presented in this document are based on a relative risk ranking system, allowing prioritization of ports within the Pacific region, and that rankings of "lower" or "lowest" do not indicate zero risk. Relative rankings may change in the comprehensive national risk assessment considering differences in intensity of shipping traffic and environmental conditions across regions.

RECOMMENDATIONS

- Biological sampling of ship vectors and recipient port habitats should be conducted with consideration of species-specific and site-specific characteristics to quantify/calibrate invasion risk and/or reduce uncertainty. Future research in the Pacific region should be prioritized at the top ports (including port of special concern - Fraser Surrey) identified in this assessment.
- Additional pathway-based management recommendations derived from synthesis of the four regional risk assessments will be communicated in the national shipping risk assessment.

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TABLES

Table 1. Description of uncertainty levels (level of knowledge; source of data), modified from Therriault and Herborg (2007).

Level of uncertainty	Data Quality
Very high	Little or no scientific information; non supporting data
High	Limited scientific information; circumstantial evidence
Moderate	Moderate level of scientific information; first hand, unsystematic observations
Low	Substantial scientific information; expert opinion
Very low	Extensive scientific/systematic information; peer-reviewed data

Table 2. Vessel classification system based on operational region and ship type with corresponding definitions and examples.

Vessel classification	Definition/Example	Management Requirements
Operational region (refer to Figure 2 for map)		
International Transoceanic	Vessels that operated outside the Canadian Exclusive Economic Zone (EEZ) on a transoceanic route during the study period	Exchange/flush >200nm offshore and >2000m depth prior to entering Canadian EEZ; no management required for subsequent voyages within the EEZ
International Coastal U.S.	Vessels that operated outside the Canadian EEZ and the exchange exemption zone on a coastal U.S. route during the study period	Exchange/flush >50nm offshore and > 500m depth prior to entering Canadian EEZ; no management required for subsequent voyages within the EEZ
International Exempt	Vessels that operated outside the Canadian EEZ, but within the exchange exemption zone, during the study period	No exchange/flush required
Ship Type		
Merchant	Bulk carriers, tankers, general cargo, container ships and roll on/roll off vessels	If ballast capacity >8m^3, exchange/flush according to operational region (above)
Non-Merchant (not included in this study)	Government (navy, warship, U.S. Coast Guard), pleasure (motor yachts, pleasure crafts, sailing vessels), fishing vessels and trawlers, passenger (cruise ships and ferries), research vessels, special purpose (cable vessels and heavy-lift ships), offshore (drill rig, supply), dredgers, tugs and barges	Ballast capacity typically <8m^3, no exchange/flush required. Exceptions: large fishing vessels, cruise ships, and some government vessels exchange ballast but were not included in this study due to incomplete and unreliable reporting.

Table 3. Ranking system for probability of arrival of NIS to Pacific ports via hull fouling, based on the annual number of vessel arrivals to each Pacific port by vessel type.

Annual number of vessel arrivals	P(Arrival)
1811 – 2262	Highest
1358 – 1810	Higher
906 - 1357	Intermediate
453 - 905	Lower
0 - 452	Lowest

Table 4. Ranking system for magnitude of consequences of invasion by hull fouling-mediated species, based on cumulative number of high impact NIS recorded by Molnar et al. (2008) in ecoregions of all ports directly connected to each Pacific top port.

Cumulative number of high impact fouling NIS	Magnitude of consequence
2097 – 2620	Highest
1573 – 2096	Higher
1049 – 1572	Intermediate
525 – 1048	Lower
0 – 524	Lowest

Table 5. Matrix used to combine probability of introduction and magnitude of consequences of introduction into final risk rankings, modified from Therriault and Herborg (2007); green = lower risk, yellow = intermediate risk and red = higher risk.

		P (Introduction)				
		Lowest	**Lower**	**Intermediate**	**Higher**	**Highest**
Consequence	**Highest**	Intermediate risk	Intermediate risk	Higher risk	Higher risk	Higher risk
	Higher	Intermediate risk	Intermediate risk	Intermediate risk	Higher risk	Higher risk
	Intermediate	Lower risk	Intermediate risk	Intermediate risk	Intermediate risk	Higher risk
	Lower	Lower risk	Lower risk	Intermediate risk	Intermediate risk	Intermediate risk
	Lowest	Lower risk	Lower risk	Lower risk	Intermediate risk	Intermediate risk

Table 6. Ranking system for probability of arrival of NIS to Pacific ports via ballast water, based on annual corrected volume of ballast water discharged at a single Pacific port.

Annual corrected volume of ballast water discharged (m^3)	P(Arrival)
2,758,881 – 3,448,601	Highest
2,069,161 – 2,758,880	Higher
1,379,441 – 2,069,160	Intermediate
689,721 - 1,379,440	Lower
0-689,720	Lowest

Table 7. Ranking system for probability of survival of NIS at top Pacific ports, based on environmental distance between top Pacific ports and all connected ballast water source ports.

Environmental distance	P(Survival)
0.00 – 1.02	Highest
1.03 – 2.04	Higher
2.05 – 3.06	Intermediate
3.07 – 4.08	Lower
4.09 – 5.10	Lowest

Table 8. Ranking system for magnitude of consequences of introduction of ballast-mediated species, based on cumulative number of high impact NIS recorded by Molnar et al. (2008) in ecoregions of all ports directly connected to each Pacific top port.

Cumulative number of high impact ballast-mediated NIS	Magnitude of consequence
1459 – 1823	Highest
1095 – 1458	Higher
730 – 1094	Intermediate
365 – 729	Lower
0 – 364	Lowest

Table 9. Arrival statistics for international transoceanic vessels at the top 10 Pacific ports. The asterisk (*) denotes the top three ports for this vessel category. (+) denotes port of special concern.

Top ports	Annual number of arrivals	P(Arrival) at port
Vancouver*	2262	Highest
Fraser Surrey*+	450	Lowest
Prince Rupert*	272	Lowest
Fraser Port	164	Lowest
Kitimat	88	Lowest
Nanaimo	44	Lowest
Victoria	32	Lowest
Crofton	27	Lowest
Port McNeill	27	Lowest
Port Alberni	23	Lowest

Table 10. Arrival statistics for international coastal U.S. vessels at Pacific ports. The asterisk (*) denotes the top three ports for this vessel category. (+) denotes port of special concern.

Top ports	Annual number of arrivals	P(Arrival) at port
Vancouver*	87	Lowest
Fraser Surrey*+	15	Lowest
Kitimat*	3	Lowest
Victoria	2	Lowest
Prince Rupert	2	Lowest
Fraser Port	2	Lowest
Port Mellon	1	Lowest
Port McNeill	1	Lowest
Crofton	1	Lowest
Constance Bank	1	Lowest

Table 11. Arrival statistics for international exempt vessels at the top 10 Pacific ports. The asterisk (*) denotes the top three ports for this vessel category. (+) denotes port of special concern.

Top ports	Annual number of arrivals	P(Arrival) at port
Vancouver*	60	Lowest
Fraser Surrey*+	15	Lowest
Crofton*	3	Lowest
Fraser Port	3	Lowest
Campbell River	1	Lowest
Kitimat	1	Lowest
Port Alberni	1	Lowest
Prince Rupert	1	Lowest
Sechart Channel	1	Lowest
Stewart	1	Lowest

Table 12. Probability of introduction of hull-mediated NIS to top Pacific ports, by vessel category, with level of uncertainty indicated in brackets below each column heading. (+) denotes port of special concern.

	P(Arrival) (moderate)	P(Survival) (high)	P(Introduction) (high)
International transoceanic vessels			
Vancouver	Highest	Highest	Highest
Fraser Surrey+	Lowest	Lowest	Lowest
Prince Rupert	Lowest	Highest	Lowest
International coastal U.S. vessels			
Vancouver	Lowest	Highest	Lowest
Fraser Surrey+	Lowest	Lowest	Lowest
Kitimat	Lowest	Lowest	Lowest
International exempt vessels			
Vancouver	Lowest	Highest	Lowest
Fraser Surrey+	Lowest	Lowest	Lowest
Crofton	Lowest	Highest	Lowest

Table 13. Magnitude of consequences of introduction of hull fouling-mediated species at top Pacific ports, by vessel category, based on the cumulative number of high impact NIS recorded by Molnar et al. (2008) in ecoregions of all ports directly connected to each Pacific top port. (+) denotes port of special concern.

	Cumulative number of high impact fouling NIS	Magnitude of consequence
International transoceanic vessels		
Vancouver	1550	Intermediate
Fraser Surrey+	416	Lower
Prince Rupert	356	Lowest
International coastal U.S. vessels		
Vancouver	642	Lower
Fraser Surrey+	165	Lowest
Kitimat	57	Lowest
International exempt vessels		
Vancouver	350	Lowest
Fraser Surrey+	114	Lowest
Crofton	88	Lowest

Table 14. Relative invasion risk to top Pacific ports by hull fouling NIS, by vessel category, with level of uncertainty indicated in brackets below each column heading. (+) denotes port of special concern.

	P(Introduction) (high)	Magnitude of consequence (moderate)	Invasion risk (high)
International transoceanic vessels			
Vancouver	Highest	Highest	Higher
Fraser Surrey+	Lowest	Lower	Lower
Prince Rupert	Lowest	Lowest	Lower
International coastal U.S. vessels			
Vancouver	Lowest	Lower	Lower
Fraser Surrey+	Lowest	Lowest	Lower
Kitimat	Lowest	Lowest	Lower
International exempt vessels			
Vancouver	Lowest	Lowest	Lower
Fraser Surrey+	Lowest	Lowest	Lower
Crofton	Lowest	Lowest	Lower

Table 15. Discharge statistics at Pacific ports, by source of ballast water, for a 12 month period. Correction factors (10% for saline and 1% for freshwater source ports, respectively) were applied to account for reduction in propagule supply due to exchange/flushing. 'Direct' refers to water that was not exchanged prior to discharging.

Number of discharge events	Ballast water discharge volume (m^3)										
	Grand total	Corrected foreign exchanged		Corrected Coastal Exchange		Coastal direct		Domestic direct		Unknown Source	Corrected total
		SW	FW	SW	FW	SW	FW	SW	FW		
1,071	18,024,247	2,222,014	37,229	231,943	5,788	569,169	36,396	137,302	20,162	1,188,233	4,448,236

Table 16. Discharge statistics at Pacific ports, by ballast water source region, for a 12 month period. Corrected total volume reflects adjustments to account for reduction in propagule supply due to exchange/flushing.

FAO source region	Ballast water volume discharged (m^3)	
	Total	Corrected Total
North-west Pacific	13,614,451	2,204,555
North-east Pacific	1,064,141	458,358
East-central Pacific	2,331,358	239,056
unknown	625,978	67,399
West-central Atlantic	73,122	25,130
West Indian Ocean	146,282	15,186
West-central Pacific	58,070	6,617
Mediterranean and Black Sea	21,556	4,061
East Indian Ocean	26,151	2,615
South-east Pacific	24,711	1,726
North-east Atlantic	28,451	1,398
South-west Pacific	8,826	901
North-west Atlantic	5,727	284
East-Central Atlantic	519	52

Table 17. Ballast water exchange statistics at Pacific ports, by vessel category and ballast water classification for a 12 month period.

Vessel Category	Ballast Water Source Area	# Tanks exchanged	Total # of tanks	% BWE
International transoceanic vessels	Domestic*	22	188	11.70
	Coastal U.S.	1199	1349	88.88
	International	8958	9697	92.38
	Coastal exempt	76	527	14.42
	Unknown	519	827	62.76
International coastal U.S. vessels	Domestic*	0	32	0.00
	Coastal U.S.	212	226	93.81
	Coastal exempt	32	58	55.17
	Unknown	5	10	50.00
International exempt vessels**	Domestic	7	7	100.00
	Coastal exempt	7	18	38.88
	Unknown	11	16	68.75

* Note that BWE is not required for any vessel moving domestic ballast water on transits between Canadian ports.

**Vessels in the international exempt category are not required to conduct BWE on any voyage.

Table 18. Ballast water discharge statistics for international transoceanic vessels at the top 10 Pacific ports. Correction factors (10% for saline (SW) and 1% for freshwater (FW) source ports, respectively) were applied to account for reduction in propagule supply due to exchange/flushing.

Top 10 ports	Number of discharge events	Annual volume of ballast water discharge (m^3)											
		Grand total	Corrected foreign exchanged		Corrected Coastal exchange		Coastal Direct		Domestic Direct		Unknown Source	Corrected total	P (Arrival)
			SW	FW	SW	FW	SW	FW	SW	FW			
Vancouver*	782	13,752,548	1,983,127	32,798	107,651	249	224,156	28,442	61,876	6,993	1,003,309	3,448,601	Highest
Prince Rupert*	89	1,897,788	166,073	1,391	4,535	0	15,404	7,954	0	0	78,203	273,560	Lowest
Port McNeill*	23	544,258	6,876	0	40,716	0	124,540	0	3,383	3,203	0	182,133	Lowest
Fraser River Ports+	58	392,616	32,718	172	1,556	61	6,260	0	9,193	633	27,577	78,170	Lowest
Sechelt	13	294,465	0	0	14,838	1,923	83,111	0	39,909	0	0	176,898	Lowest
Crofton	15	110,768	5,238	65	3,681	121	0	0	3,794	0	2,332	14,148	Lowest
Texada Island	4	60,497	2,125	0	3,199	0	7,253	0	0	0	0	12,577	Lowest
Kitimat	11	87,158	11,126	0	163	0	0	0	0	0	9,171	20,460	Lowest
Port Alberni	14	120,410	10,974	0	122	0	0	0	0	0	9,450	20,546	Lowest
Nanaimo	8	67,244	4,798	19	1,289	0	0	0	0	0	3,782	9,888	Lowest

'Direct' refers to water that was not exchanged prior to discharging. The asterisk (*) denotes the top three ports for this vessel category. (+)Note that Transport Canada does not differentiate between Fraser Port and Fraser Surrey Port in their Ballast Water database.

Table 19. Ballast water discharge statistics for international coastal U.S. vessels at Pacific ports. Correction factors (10% for saline (SW) and 1% for freshwater (FW) source ports, respectively) were applied to account for reduction in propagule supply due to exchange/flushing. 'Direct' refers to water that was not exchanged prior to discharging.

Ports	Number of discharge events	Annual volume of ballast water discharge (m^3)									P(Arrival)
		Grand total	Corrected Coastal exchange		Coastal Direct		Domestic Direct		Unknown Source	Corrected total	
			SW	FW	SW	FW	SW	FW			
Vancouver*	26	468,545	40,795	5	51,113	0	6,842	0	35,275	134,030	Lowest
Fraser River Ports+*	2	14,542	9,597	0	0	0	2,000	4,034	1,018	16,649	Lowest
Port McNeill*	1	30,281	0	0	30,281	0	0	0	0	30,281	Lowest
Crofton	1	11,228	0	1,849	0	0	0	4723	0	6,572	Lowest

+Note that Transport Canada does not differentiate between Fraser River Port and Fraser Surrey Port in their Ballast Water database. The asterisk (*) denotes the top three ports for this vessel category.

Table 20. Ballast water discharge statistics for international exempt vessels at Pacific ports. No ballast water correction factors were applied, as no management was needed by these vessels and acceptable locations would likely involve significant course changes.

Ports	Number of discharge events	Annual volume of ballast water discharge (m^3)							P(Arrival)
		Grand total	Coastal Direct		Domestic Direct		Unknown Source	Corrected total	
			SW	FW	SW	FW			
Vancouver*	1	17,743	12,943	0	0	0	4,800	17,743	Lowest
Fraser River Ports+*	2	9,289	1000	0	4,752	0	3,537	9,289	Lowest
Stewart*	1	576	0	0	0	576	0	576	Lowest

+Note that Transport Canada does not differentiate between Fraser River Port and Fraser Surrey Port in their Ballast Water database. The asterisk (*) denotes the top three ports for this vessel category.

Table 21. Environmental distance between Vancouver and source ports connected via ballast water discharge by international transoceanic vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival.

City	Country	Environmental Distance	P(Survival)
Adelaide*	Australia	1.29	Higher
Burnie*	Australia	0.90	Highest
Devonport*	Australia	1.04	Higher
Fremantle*	Australia	1.91	Higher
Fraser Port*	Canada	0.04	Highest
Penco*	Chile	0.90	Highest
Bayuquan*	China	0.79	Highest
Beihai	China	2.53	Intermediate
Beilun*	China	1.68	Higher
Caofeidian Port*	China	0.91	Highest
Changshu	China	2.40	Intermediate
Chiwan	China	2.53	Intermediate
Dalian*	China	1.13	Higher
Fangcheng	China	2.60	Intermediate
Fengcheng*	China	1.47	Higher
Hong Kong	China	2.58	Intermediate
Huangdao*	China	1.33	Higher
Huangpu	China	2.76	Intermediate
Jiangyin	China	2.39	Intermediate
Lanshan*	China	1.24	Higher
Lianyungang*	China	1.23	Higher
Longkou*	China	1.31	Higher
Mawan	China	2.48	Intermediate
Nanjing	China	2.44	Intermediate
Nantong	China	2.36	Intermediate
Ningbo*	China	1.84	Higher
Qingdao*	China	1.33	Higher
Qinhuangdao*	China	1.21	Higher
Rizhao*	China	1.30	Higher
Shanghai*	China	1.23	Higher
Shekou	China	2.48	Intermediate
Songxia	China	2.07	Intermediate
Taixing	China	2.40	Intermediate
Tangshan*	China	1.07	Higher
Tianjiaan	China	2.44	Intermediate
Tianjin*	China	1.12	Higher
Xingang*	China	1.15	Higher
Yangpu	China	2.81	Intermediate
Yangzhou	China	2.40	Intermediate
Yantai*	China	1.01	Highest
Yantian	China	2.41	Intermediate
Zhangjiabu*	China	1.05	Higher
Zhangjiagang	China	2.38	Intermediate
Zhenjiang	China	2.41	Intermediate
Zhoushan*	China	1.67	Higher

City	Country	Environmental Distance	P(Survival)
Zhuhai	China	2.53	Intermediate
Caldera	Costa Rica	3.38	Lower
Cienfuegos	Cuba	2.97	Intermediate
Havana	Cuba	3.00	Intermediate
Manzanillo	Cuba	3.21	Lower
Moa	Cuba	3.39	Lower
Santiago	Cuba	3.11	Lower
Esmeraldas	Ecuador	3.08	Lower
Guayaquil	Ecuador	3.55	Lower
La Libertad	Ecuador	2.46	Intermediate
Port Said	Egypt	2.36	Intermediate
Acajutla	El Salvador	3.39	Lower
Fos*	France	1.36	Higher
Brake*	Germany	0.29	Highest
Piraeus*	Greece	1.83	Higher
Puerto Quetzal	Guatemala	3.55	Lower
Chennai	India	3.44	Lower
Mumbai	India	3.44	Lower
Bandar Abbas	Iran	3.27	Lower
Genoa*	Italy	1.24	Higher
Gioia Tauro*	Italy	1.92	Higher
Savona*	Italy	1.29	Higher
Akita*	Japan	1.21	Higher
Aomori*	Japan	1.03	Higher
Chiba*	Japan	1.75	Higher
Fukuyama*	Japan	1.55	Higher
Gamagori*	Japan	1.63	Higher
Hachinohe*	Japan	0.69	Highest
Hakata*	Japan	1.62	Higher
Hakodate*	Japan	0.99	Highest
Haramachi*	Japan	1.16	Higher
Hibi*	Japan	1.58	Higher
Hibikinada*	Japan	1.89	Higher
Higashi-Harima*	Japan	1.60	Higher
Hikoshima*	Japan	1.89	Higher
Himeji*	Japan	1.58	Higher
Hirohata*	Japan	1.58	Higher
Hiroshima*	Japan	1.57	Higher
Hitachinaka*	Japan	1.46	Higher
Hososhima*	Japan	1.57	Higher
Imabari*	Japan	1.47	Higher
Ishikara	Japan	2.89	Intermediate
Ishinomaki*	Japan	1.19	Higher
Iwakuni*	Japan	1.55	Higher
Kagoshima	Japan	2.25	Intermediate
Kakogawa*	Japan	1.60	Higher
Kamaishi*	Japan	0.98	Highest
Kanda*	Japan	1.52	Higher
Kashima*	Japan	1.41	Higher
Kawasaki*	Japan	1.56	Higher

City	Country	Environmental Distance	P(Survival)
Kimitsu*	Japan	1.91	Higher
Kinuura*	Japan	1.64	Higher
Kisarazu*	Japan	1.54	Higher
Kobe*	Japan	1.59	Higher
Kure*	Japan	1.48	Higher
Kushiro*	Japan	0.95	Highest
Maizuru*	Japan	1.47	Higher
Marugame*	Japan	1.61	Higher
Matsuura*	Japan	1.61	Higher
Matsuyama*	Japan	1.59	Higher
Miike	Japan	2.35	Intermediate
Mishima-Kawanoe*	Japan	1.55	Higher
Mitsukojima*	Japan	1.48	Higher
Miyako*	Japan	0.96	Highest
Mizushima*	Japan	1.62	Higher
Muroran*	Japan	0.93	Highest
Nagahama*	Japan	1.39	Higher
Nagoya*	Japan	1.68	Higher
Naoshima*	Japan	1.45	Higher
Niigata-Higashi*	Japan	1.39	Higher
Niihama*	Japan	1.51	Higher
Noshiro*	Japan	1.14	Higher
Ofunato*	Japan	0.73	Highest
Oita*	Japan	1.70	Higher
Onahama*	Japan	1.54	Higher
Onomichi*	Japan	1.52	Higher
Osaka*	Japan	1.79	Higher
Oshima*	Japan	1.57	Higher
Otaru*	Japan	1.01	Highest
Reihoku*	Japan	2.02	Higher
Saganoseki*	Japan	1.15	Higher
Saiki*	Japan	1.54	Higher
Sakaide*	Japan	1.55	Higher
Sakaiminato*	Japan	1.55	Higher
Sendai*	Japan	1.24	Higher
Shibushi*	Japan	1.84	Higher
Shikama*	Japan	1.58	Higher
Shimizu*	Japan	1.51	Higher
Shimonoseki*	Japan	1.93	Higher
Soma*	Japan	1.22	Higher
Tachibana*	Japan	1.62	Higher
Takamatsu*	Japan	1.45	Higher
Toba*	Japan	1.73	Higher
Tobata*	Japan	1.93	Higher
Tokushima*	Japan	1.68	Higher
Tokyo*	Japan	1.82	Higher
Tomakomai*	Japan	0.93	Highest
Tonda*	Japan	1.93	Higher
Toyama*	Japan	1.38	Higher
Tsukumi*	Japan	1.21	Higher

City	Country	Environmental Distance	P(Survival)
Tsuneishi*	Japan	1.52	Higher
Tsuruga*	Japan	1.31	Higher
Ube*	Japan	1.52	Higher
Uno*	Japan	1.58	Higher
Wakayama*	Japan	1.54	Higher
Yatsushiro*	Japan	1.94	Higher
Yawata*	Japan	2.03	Higher
Yokkaichi*	Japan	1.60	Higher
Yokohama*	Japan	1.51	Higher
Yura*	Japan	1.66	Higher
Boryeong*	Korea	0.98	Highest
Dangjin*	Korea	0.95	Highest
Hadong*	Korea	1.45	Higher
Inchon*	Korea	0.87	Highest
Jinhae*	Korea	1.38	Higher
Kunsan*	Korea	1.04	Higher
Kwangyang*	Korea	1.56	Higher
Masan*	Korea	1.42	Higher
Mogpo*	Korea	1.27	Higher
Onsan*	Korea	1.48	Higher
Pohang*	Korea	1.38	Higher
Pyeong Taek*	Korea	1.28	Higher
Samcheon Po*	Korea	1.47	Higher
Tonghae*	Korea	1.06	Higher
Ulsan*	Korea	1.42	Higher
Yosu*	Korea	1.43	Higher
Bukpyung*	Korea,	1.06	Higher
Busan*	Korea,	1.46	Higher
Johor	Malaysia	3.29	Lower
Lahad Datu	Malaysia	3.26	Lower
Tanjung Pelepas	Malaysia	3.29	Lower
Lazaro Cardenas	Mexico	3.46	Lower
Mazatlan	Mexico	2.91	Intermediate
Rosarito Terminal	Mexico	2.79	Intermediate
Topolobampo	Mexico	2.72	Intermediate
Vlissingen*	Netherlands	0.80	Highest
Salalah	Oman	3.17	Lower
Muhammad Bin Qasim	Pakistan	3.14	Lower
Balboa	Panama	3.25	Lower
Panama	Panama	3.28	Lower
Callao*	Peru	1.44	Higher
Chimbote	Peru	2.14	Intermediate
Isabel	Philippines	3.41	Lower
Pagbilao	Philippines	3.31	Lower
Lisbon*	Portugal	1.60	Higher
Constantza*	Romania	0.92	Highest
Dammam	Saudi Arabia	3.09	Lower
Jeddah	Saudi Arabia	3.57	Lower
Singapore	Singapore	3.26	Lower
Valencia*	Spain	1.78	Higher

City	Country	Environmental Distance	P(Survival)
Kaohsiung	Taiwan	2.77	Intermediate
Taichung	Taiwan	2.60	Intermediate
Stockton*	United Kingdom	1.23	Higher
Anacortes*	USA	1.26	Higher
Barber's Point Harbor	USA	2.86	Intermediate
Bellingham*	USA	0.24	Highest
Cherry Point*	USA	0.22	Highest
Columbia/Snake River System*	USA	0.53	Highest
Crockett*	USA	1.88	Higher
El Segundo*	USA	1.66	Higher
Everett*	USA	0.29	Highest
Ferndale*	USA	0.29	Highest
Grays Harbor*	USA	0.93	Highest
Hilo	USA	2.92	Intermediate
Honolulu	USA	2.80	Intermediate
Kahului	USA	2.83	Intermediate
Kalama*	USA	1.84	Higher
Long Beach*	USA	1.81	Higher
Longview*	USA	0.27	Highest
Los Angeles*	USA	1.26	Higher
Martinez*	USA	1.91	Higher
Nikiski*	USA	1.44	Higher
Oakland*	USA	1.76	Higher
Pittsburg*	USA	2.01	Higher
Port Hueneme*	USA	1.20	Higher
Portland*	USA	1.85	Higher
Redwood City*	USA	1.64	Higher
Richmond*	USA	1.28	Higher
Sacramento	USA	2.21	Intermediate
San Francisco*	USA	1.26	Higher
Savannah	USA	2.35	Intermediate
Seattle*	USA	0.33	Highest
Selby*	USA	1.79	Higher
Stockton	USA	2.27	Intermediate
Tacoma*	USA	0.28	Highest
Vancouver*	USA	1.85	Higher
Wilmington*	USA	1.81	Higher
Phu My	Vietnam	3.32	Lower
Overall		**1.78**	**Higher**

Table 22. Environmental distance between Prince Rupert and source ports connected via ballast water discharge by international transoceanic vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival.

City	Country	Environmental Distance	P(Survival)
Dalian*	China	1.78	Higher
Hong Kong	China	3.32	Lower
Jiangyin	China	3.22	Lower
Lanshan*	China	1.99	Higher
Longkou*	China	2.04	Higher
Nanjing	China	3.27	Lower
Nantong	China	3.18	Lower
Qingdao	China	2.08	Intermediate
Qinhuangdao*	China	1.86	Higher
Rizhao*	China	2.03	Higher
Tangshan*	China	1.86	Higher
Tianjin*	China	1.95	Higher
Xingang*	China	1.98	Higher
Zhangjiagang	China	3.20	Lower
Belawan	Indonesia	4.01	Lower
Bandar Abbas	Iran	4.00	Lower
Bandar Imam Khomeini	Iran	3.34	Lower
Chiba	Japan	2.66	Intermediate
Fukuyama	Japan	2.34	Intermediate
Hachinohe*	Japan	1.21	Higher
Hakata	Japan	2.49	Intermediate
Haramachi*	Japan	1.83	Higher
Hibikinada	Japan	2.37	Intermediate
Higashi-Harima	Japan	2.40	Intermediate
Hikari*	Japan	1.83	Higher
Hirohata	Japan	2.37	Intermediate
Hiroshima	Japan	2.34	Intermediate
Ishinomaki*	Japan	1.87	Higher
Iwakuni	Japan	2.29	Intermediate
Kakogawa	Japan	2.40	Intermediate
Kamaishi*	Japan	1.57	Higher
Kashima	Japan	2.15	Intermediate
Kimitsu	Japan	2.58	Intermediate
Kinuura	Japan	2.42	Intermediate
Kobe	Japan	2.37	Intermediate
Kushiro*	Japan	0.96	Highest
Maizuru	Japan	2.37	Intermediate
Matsunaga	Japan	2.29	Intermediate
Mizushima	Japan	2.41	Intermediate
Muroran*	Japan	1.23	Higher
Nagoya	Japan	2.47	Intermediate
Nanao	Japan	2.11	Intermediate
Oita	Japan	2.62	Intermediate
Onahama	Japan	2.22	Intermediate
Osaka	Japan	2.59	Intermediate
Reihoku	Japan	2.74	Intermediate
Sakaide	Japan	2.34	Intermediate

City	Country	Environmental Distance	P(Survival)
Shingu	Japan	2.79	Intermediate
Takamatsu	Japan	2.22	Intermediate
Tobata	Japan	2.81	Intermediate
Tokuyama	Japan	2.14	Intermediate
Tokyo	Japan	2.72	Intermediate
Tomakomai*	Japan	1.24	Higher
Toyama	Japan	2.12	Intermediate
Tsuruga*	Japan	2.02	Higher
Wakayama	Japan	2.29	Intermediate
Yokkaichi	Japan	2.36	Intermediate
Yokohama	Japan	2.42	Intermediate
Daesan*	Korea	1.54	Higher
Dangjin*	Korea	1.65	Higher
Hadong	Korea	2.18	Intermediate
Inchon*	Korea	1.56	Higher
Kunsan*	Korea	1.76	Higher
Kwangyang	Korea	2.29	Intermediate
Pyeong Taek*	Korea	1.66	Higher
Samcheon Po	Korea	2.18	Intermediate
Yosu	Korea	2.16	Intermediate
Manzanillo	Mexico	3.86	Lower
Isabel	Philippines	4.08	Lower
Singapore	Singapore	3.93	Lower
Barber's Point Harbor	USA	3.50	Lower
Long Beach	USA	2.47	Intermediate
Pittsburg	USA	2.65	Intermediate
Portland	USA	2.40	Intermediate
San Francisco*	USA	1.88	Higher
Overall		**2.37**	**Intermediate**

Table 23. Environmental distance between Port McNeill and source ports connected via ballast water discharge by international transoceanic vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival.

City	Country	Enviromental Distance	P(Survival)
Plumper Sound*	Canada	0.47	Highest
Red Bay Labrador*	Canada	1.41	Higher
Longview*	USA	1.36	Higher
Redwood City	USA	2.47	Intermediate
Richmond	USA	2.12	Intermediate
San Francisco	USA	2.08	Intermediate
Seattle*	USA	1.49	Higher
Overall		**1.63**	**Higher**

Table 24. Environmental distance between Fraser Surrey and source ports connected via ballast water discharge by international transoceanic vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival. Note that Transport Canada does not differentiate between the two Fraser River Ports in their Ballast Water database; this table includes all source ports which discharged collectively at the Fraser River Ports.

City	Country	Enviromental Distance	P(Survival)
Antwerp*	Belgium	0.44	Highest
Zeebrugge	Belgium	2.40	Intermediate
Crofton	Canada	2.08	Intermediate
Prince Rupert	Canada	2.23	Intermediate
Vancouver*	Canada	1.83	Higher
Qingdao	China	2.56	Intermediate
Shanghai	China	2.50	Intermediate
Caldera	Costa Rica	4.40	Lowest
Acajutla	El Salvador	4.45	Lowest
Puerto Quetzal	Guatemala	4.57	Lowest
Genoa	Italy	2.92	Intermediate
Chiba*	Japan	1.88	Higher
Hakata	Japan	2.60	Intermediate
Hiroshima	Japan	2.86	Intermediate
Iwakuni	Japan	2.93	Intermediate
Kanda	Japan	2.91	Intermediate
Kashima	Japan	2.83	Intermediate
Kawasaki	Japan	2.23	Intermediate
Kishiwada	Japan	2.86	Intermediate
Kobe	Japan	2.87	Intermediate
Kushiro	Japan	2.34	Intermediate
Matsunaga	Japan	2.80	Intermediate
Matsuyama	Japan	2.97	Intermediate
Miike*	Japan	1.92	Higher
Nagoya	Japan	2.91	Intermediate
Naoetsu	Japan	2.71	Intermediate
Naoshima	Japan	2.80	Intermediate

City	Country	Enviromental Distance	P(Survival)
Niigata-Higashi	Japan	2.82	Intermediate
Onahama	Japan	3.00	Intermediate
Osaka	Japan	3.00	Intermediate
Sendai	Japan	2.64	Intermediate
Setoda	Japan	2.83	Intermediate
Shimizu	Japan	2.88	Intermediate
Shingu	Japan	3.36	Lower
Tokushima	Japan	3.01	Intermediate
Tokyo*	Japan	1.87	Higher
Tomakomai	Japan	2.38	Intermediate
Toyohashi	Japan	3.11	Lower
Tsuruga	Japan	2.69	Intermediate
Yokkaichi	Japan	2.93	Intermediate
Yokohama	Japan	2.33	Intermediate
Kunsan	Korea, Republic of	2.59	Intermediate
Masan*	Korea, Republic of	1.66	Higher
Pyeong Taek	Korea, Republic of	2.55	Intermediate
Ulsan	Korea, Republic of	2.76	Intermediate
Manzanillo	Mexico	4.30	Lowest
Topolobampo	Mexico	3.47	Lower
Vlissingen	Netherlands	2.48	Intermediate
Gdansk*	Poland	0.60	Highest
Aviles	Spain	2.82	Intermediate
La Coruna	Spain	2.79	Intermediate
Valencia	Spain	3.27	Lower
Baltimore*	USA	1.60	Higher
Barber's Point Harbor	USA	4.04	Lower
Eureka	USA	2.65	Intermediate
Longview	USA	2.09	Intermediate
Los Angeles	USA	2.84	Intermediate
Oakland*	USA	1.35	Higher
Portland*	USA	0.60	Highest
Sacramento*	USA	1.55	Higher
San Francisco*	USA	1.51	Higher
Seattle	USA	2.13	Intermediate
Vancouver*	USA	0.60	Highest
Puerto Cabello	Venezuela	4.36	Lowest
Overall		**2.60**	**Intermediate**

Table 25. Environmental distance between Fraser Port and source ports connected via ballast water discharge by international transoceanic vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival. Note that Transport Canada does not differentiate between the two Fraser River Ports in their Ballast Water database; this table includes all source ports which discharged collectively at the Fraser River Ports.

City	Country	Enviromental Distance	P(Survival)
Antwerp	Belgium	1.81	Higher
Zeebrugge	Belgium	0.67	Highest
Crofton	Canada	0.86	Highest
Prince Rupert	Canada	0.92	Highest
Vancouver	Canada	0.04	Highest
Qingdao	China	1.32	Higher
Shanghai	China	1.23	Higher
Caldera	Costa Rica	3.40	Lower
Acajutla	El Salvador	3.42	Lower
Puerto Quetzal	Guatemala	3.57	Lower
Genoa	Italy	1.24	Higher
Chiba	Japan	1.75	Higher
Hakata	Japan	1.61	Higher
Hiroshima	Japan	1.56	Higher
Iwakuni	Japan	1.56	Higher
Kanda	Japan	1.52	Higher
Kashima	Japan	1.41	Higher
Kawasaki	Japan	1.56	Higher
Kishiwada	Japan	1.59	Higher
Kobe	Japan	1.58	Higher
Kushiro	Japan	0.92	Highest
Matsunaga	Japan	1.51	Higher
Matsuyama	Japan	1.60	Higher
Miike	Japan	2.34	Intermediate
Nagoya	Japan	1.68	Higher
Naoetsu	Japan	1.37	Higher
Naoshima	Japan	1.45	Higher
Niigata-Higashi	Japan	1.40	Higher
Onahama	Japan	1.56	Higher
Osaka	Japan	1.79	Higher
Sendai	Japan	1.23	Higher
Setoda	Japan	1.55	Higher
Shimizu	Japan	1.51	Higher
Shingu	Japan	2.09	Intermediate
Tokushima	Japan	1.69	Higher
Tokyo	Japan	1.82	Higher
Tomakomai	Japan	0.91	Highest
Toyohashi	Japan	1.78	Higher
Tsuruga	Japan	1.30	Higher
Yokkaichi	Japan	1.61	Higher
Yokohama	Japan	1.51	Higher
Kunsan	Korea, Republic of	1.04	Higher
Masan	Korea, Republic of	1.40	Higher

City	Country	Enviromental Distance	P(Survival)
Pyeong Taek	Korea, Republic of	0.96	Highest
Ulsan	Korea, Republic of	1.41	Higher
Manzanillo	Mexico	3.22	Lower
Topolobampo	Mexico	2.74	Intermediate
Vlissingen	Netherlands	0.81	Highest
Gdansk	Poland	1.46	Higher
Aviles	Spain	1.14	Higher
La Coruna	Spain	1.09	Higher
Valencia	Spain	1.79	Higher
Baltimore	USA	1.59	Higher
Barber's Point Harbor	USA	2.89	Intermediate
Eureka	USA	1.18	Higher
Longview	USA	0.28	Highest
Los Angeles	USA	1.29	Higher
Oakland	USA	1.78	Higher
Portland	USA	1.85	Higher
Sacramento	USA	2.21	Intermediate
San Francisco	USA	1.29	Higher
Seattle	USA	0.35	Highest
Vancouver2	USA	1.85	Higher
Puerto Cabello	Venezuela	3.23	Lower
Overall		**1.60**	**Higher**

Table 26. Environmental distance between Vancouver and source ports connected via ballast water discharge by international coastal U.S. vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival.

City	Country	Environmental Distance	P(Survival)
Anacortes*	USA	1.26	Higher
Benicia*	USA	1.91	Higher
Cherry Point*	USA	0.22	Highest
El Segundo*	USA	1.66	Higher
Long Beach*	USA	1.81	Higher
Los Angeles*	USA	1.26	Higher
Martinez*	USA	1.91	Higher
Redwood City*	USA	1.64	Higher
Richmond*	USA	1.28	Higher
San Francisco*	USA	1.26	Higher
Seattle*	USA	0.33	Highest
Overall		**1.32**	**Higher**

Table 27. Environmental distance between Fraser Surrey and source ports connected via ballast water discharge by international coastal U.S. vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival. Note that Transport Canada does not differentiate between the two Fraser River Ports in their Ballast Water database; this table includes all source ports which discharged collectively at the Fraser River Ports.

City	Country	Environmental Distance	P(Survival)
Los Angeles	USA	2.84	Intermediate
Vancouver*	Canada	1.83	Higher
Overall		2.34	Intermediate

Table 28. Environmental distance between Fraser Port and source ports connected via ballast water discharge by international coastal U.S. vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival. Note that Transport Canada does not differentiate between the two Fraser River Ports in their Ballast Water database; this table includes all source ports which discharged collectively at the Fraser River Ports.

City	Country	Environmental Distance	P(Survival)
Los Angeles*	USA	1.29	Higher
Vancouver*	Canada	0.04	Highest
Overall		**0.67**	**Highest**

Table 29. Environmental distance between Port McNeill and source ports connected via ballast water discharge by international coastal U.S. vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival.

City	Country	Environmental Distance	P(Survival)
Longview*	USA	1.36	Higher

Table 30. Environmental distance between Vancouver and source ports connected via ballast water discharge by international exempt vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival.

City	Country	Environmental Distance	P(Survival)
Anacortes*	USA	1.26	Higher
Overall		**1.26**	**Higher**

Table 31. Environmental distance between Fraser Surrey and source ports connected via ballast water discharge by international exempt vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival. Note that Transport Canada does not differentiate between the two Fraser River Ports in their Ballast Water database; this table includes all source ports which discharged collectively at the Fraser River Ports.

City	Country	Environmental Distance	P(Survival)
Portland*	USA	0.60	Highest
Vancouver*	USA	0.60	Highest
Overall		**0.6**	**Highest**

Table 32. Environmental distance between Fraser Port and source ports connected via ballast water discharge by international exempt vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival. Note that Transport Canada does not differentiate between the two Fraser River Ports in their Ballast Water database; this table includes all source ports which discharged collectively at the Fraser River Ports.

City	Country	Environmental Distance	P(Survival)
Portland*	USA	1.85	Higher
Vancouver*	USA	1.85	Higher
Overall		**1.85**	**Higher**

Table 33. Environmental distance between Stewart and source ports connected via ballast water discharge by international exempt vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival

City	Country	Environmental Distance	P(Survival)
Kitimat*	Canada	0.57	Highest
Overall		**0.57**	**Highest**

Table 34. Probability of introduction of ballast-mediated NIS to top Pacific ports and Fraser Surrey, by vessel category, with level of uncertainty in brackets below each column heading.

	P(Arrival) (low)	**P(Survival)** (low)	**P(Introduction)** (low)
International transoceanic vessel ballast water discharges			
Vancouver	Highest	Higher	Higher
Prince Rupert	Lowest	Intermediate	Lowest
Port McNeill	Lowest	Higher	Lowest
Fraser Surrey[+]	Lowest	Intermediate	Lowest
International coastal U.S. vessel ballast water discharges			
Vancouver	Lowest	Higher	Lowest
Fraser River Ports			
Fraser Port	Lowest	Highest	Lowest
Fraser Surrey[+]	Lowest	Higher	Lowest
Port McNeill	Lowest	Highest	Lowest
International exempt vessel ballast water discharges			
Vancouver	Lowest	Higher	Lowest
Fraser River Ports			
Fraser Port	Lowest	Higher	Lowest
Fraser Surrey[+]	Lowest	Highest	Lowest
Stewart	Lowest	Highest	Lowest

([+]) denotes port of special concern.

Table 35. Magnitude of potential consequences of introduction of ballast-mediated species at top Pacific, by vessel category, based on the cumulative number of high impact NIS recorded by Molnar et al. (2008) in ecoregions of all ports directly connected to each top port.

	Cumulative number of high impact ballast-mediated NIS	Magnitude of Consequence
International transoceanic vessel ballast water discharges		
Vancouver	1508	Highest
Prince Rupert	196	Lowest
Port McNeill	157	Lowest
Fraser River Ports[+]	638	Lower
International coastal U.S. vessel ballast water discharges		
Vancouver	275	Lowest
Fraser River Ports[+]	40	Lowest
Port McNeill	21	Lowest
International exempt vessel ballast water discharges		
Vancouver	40	Lowest
Fraser River Ports[+]	62	Lowest
Stewart	1	Lowest

([+]) includes port of special concern.

Table 36. Relative invasion risk to top Pacific ports by ballast-mediated NIS, by vessel category, with level of uncertainty indicated in brackets below each column heading.

	P(Introduction) (low)	Magnitude of Consequence (moderate)	Invasion risk (moderate)
International transoceanic vessel ballast water discharges			
Vancouver	Highest	Highest	Higher
Prince Rupert	Lowest	Lowest	Lower
Port McNeill	Lowest	Lowest	Lower
Fraser Surrey[+]	Lowest	Lower	Lower
International coastal U.S. vessel ballast water discharges			
Vancouver	Lowest	Lowest	Lower
Fraser River Ports			
Fraser Port	Lowest	Lowest	Lower
Fraser Surrey[+]	Lowest	Lowest	Lower
Port McNeill	Lowest	Lowest	Lower
International exempt vessel ballast water discharges			
Vancouver	Lowest	Lowest	Lower
Fraser River Ports			
Fraser Port	Lowest	Lowest	Lower
Fraser Surrey[+]	Lowest	Lowest	Lower
Stewart	Lowest	Lowest	Lower

([+]) denotes port of special concern.

FIGURES

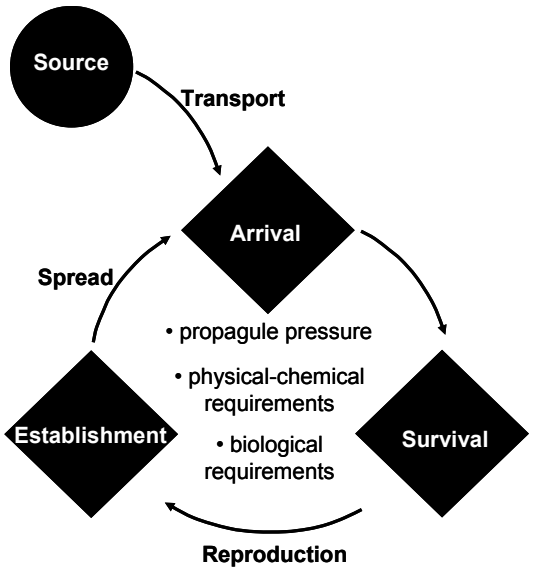


Figure 1. Stages of the biological invasion process.

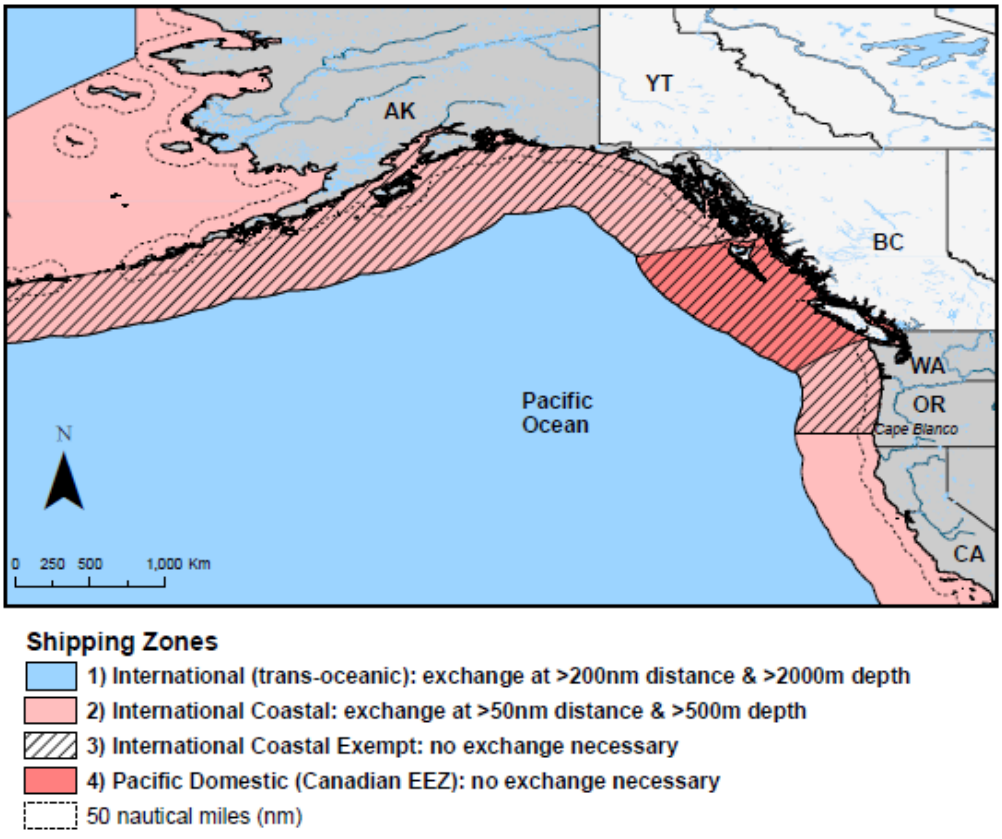


Figure 2. Map of the Pacific region depicting shipping operational regions. The broken line demarcates the 50 nm exchange boundary, the solid line demarcates the 200 nm exchange boundary.

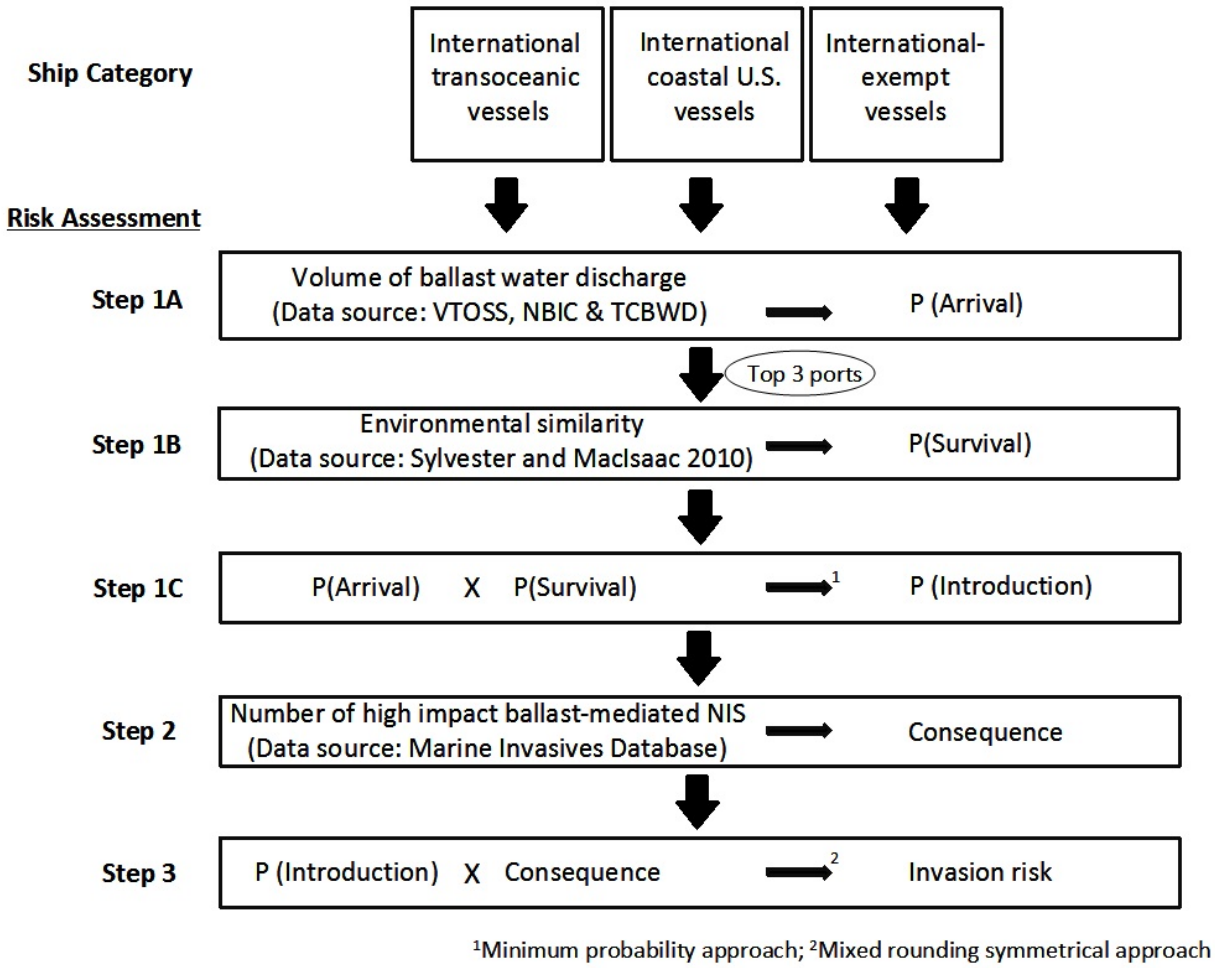


Figure 3. Flow chart illustrating steps for risk assessment of hull fouling-mediated invasions. A filtering approach was used after Step 1A to prioritize the risk assessment to the top three Pacific ports for each ship category.

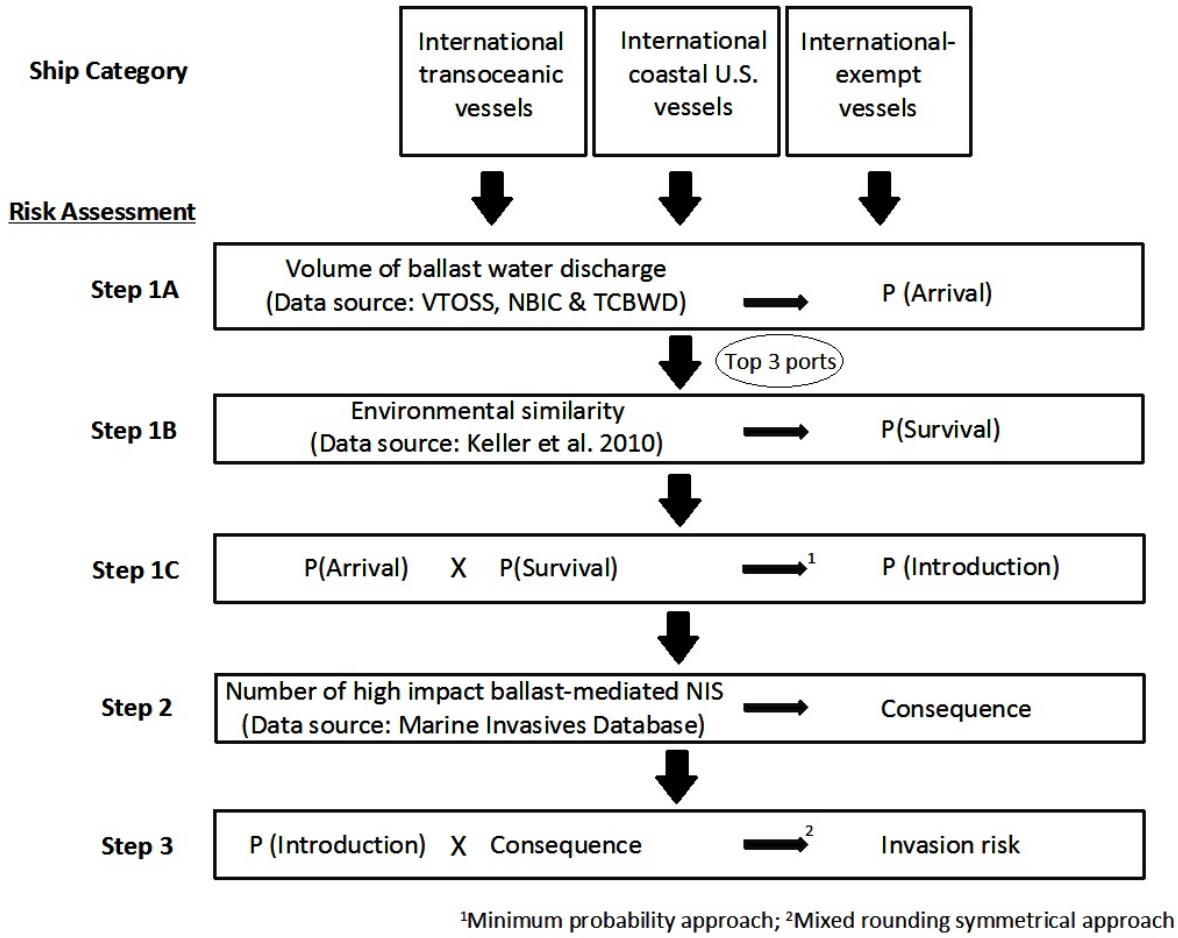


Figure 4. Flow chart illustrating steps for risk assessment of ballast-mediated invasions. A filtering approach was used after Step 1A to prioritize the risk assessment to the top three Pacific ports for each ship category.

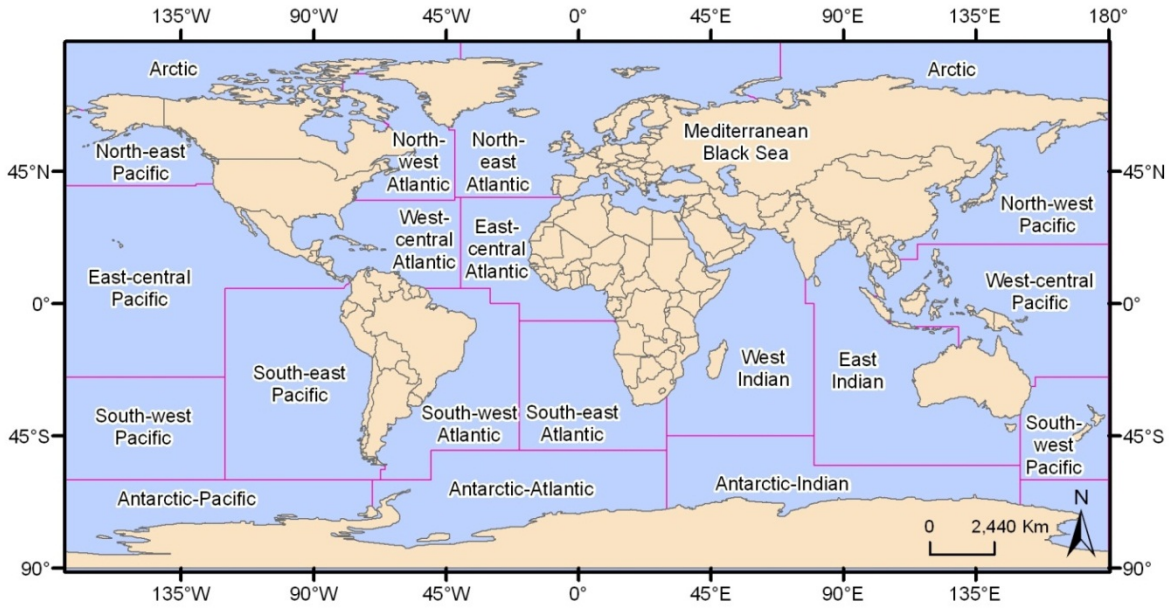


Figure 5. Map illustrating regions of ballast water origin, following the ocean areas designated by the Food and Agriculture Organization of the United Nations (FAO).

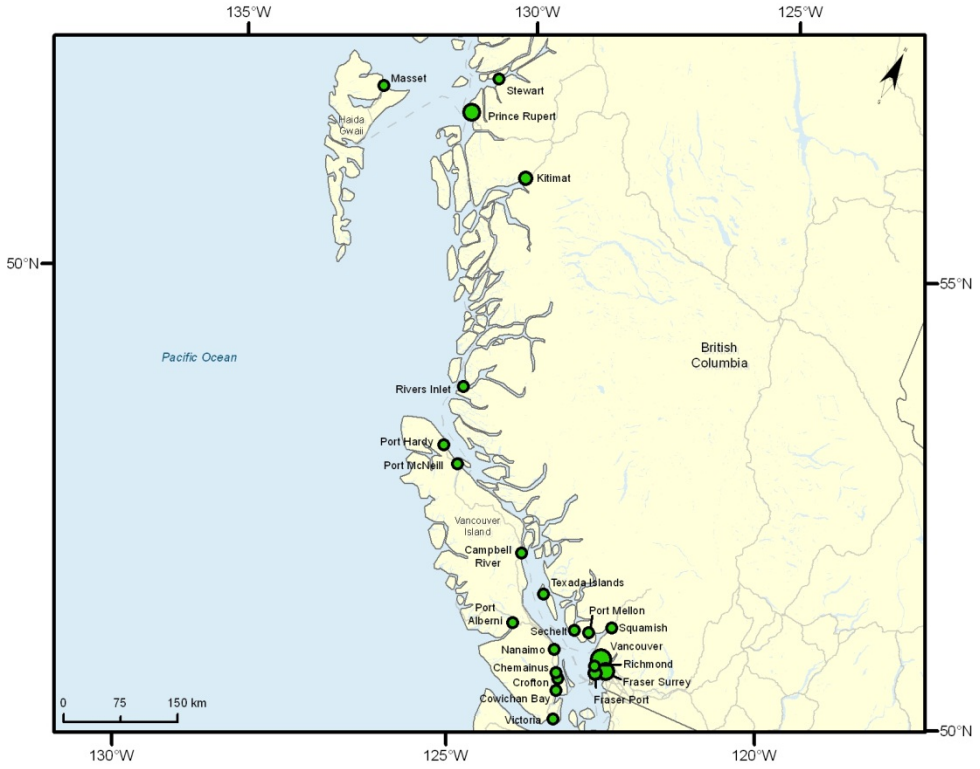


Figure 6. Map illustrating the spatial distribution of vessel arrivals in the Pacific Coast region. Circle size is relative to the number of vessel arrivals.

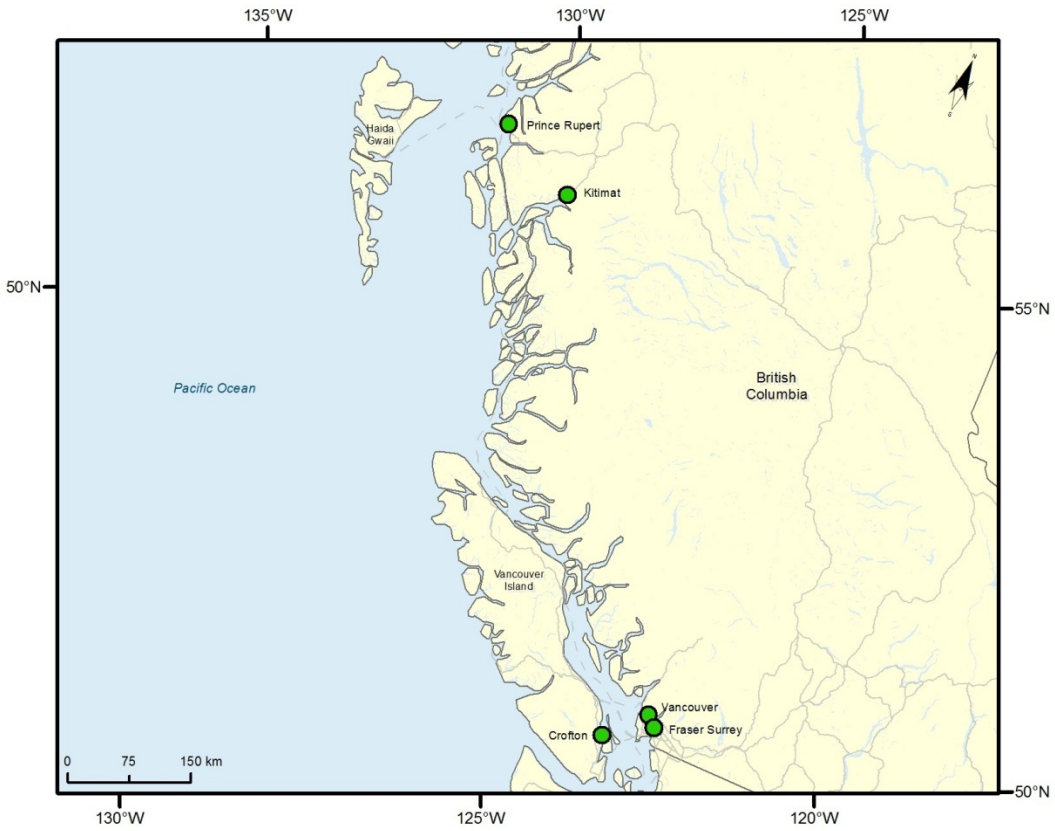


Figure 7. Map illustrating locations of all top Pacific Coast ports based on the number of vessel arrivals for all vessel categories.

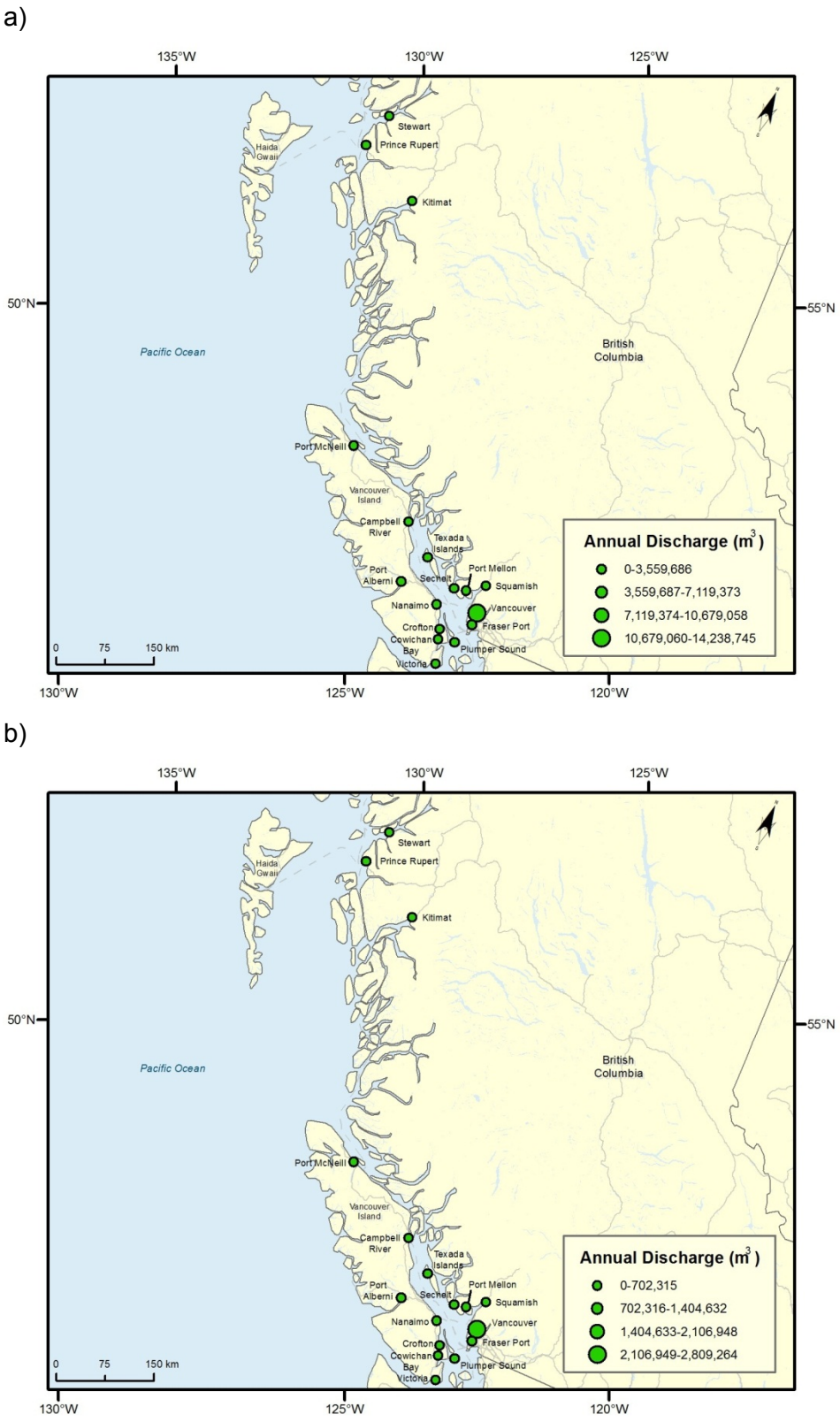


Figure 8. Map illustrating spatial patterns of (a) annual ballast water discharges and (b) combination of direct and foreign exchanged (with correction factor applied) ballast water discharges in the Pacific Coast region.

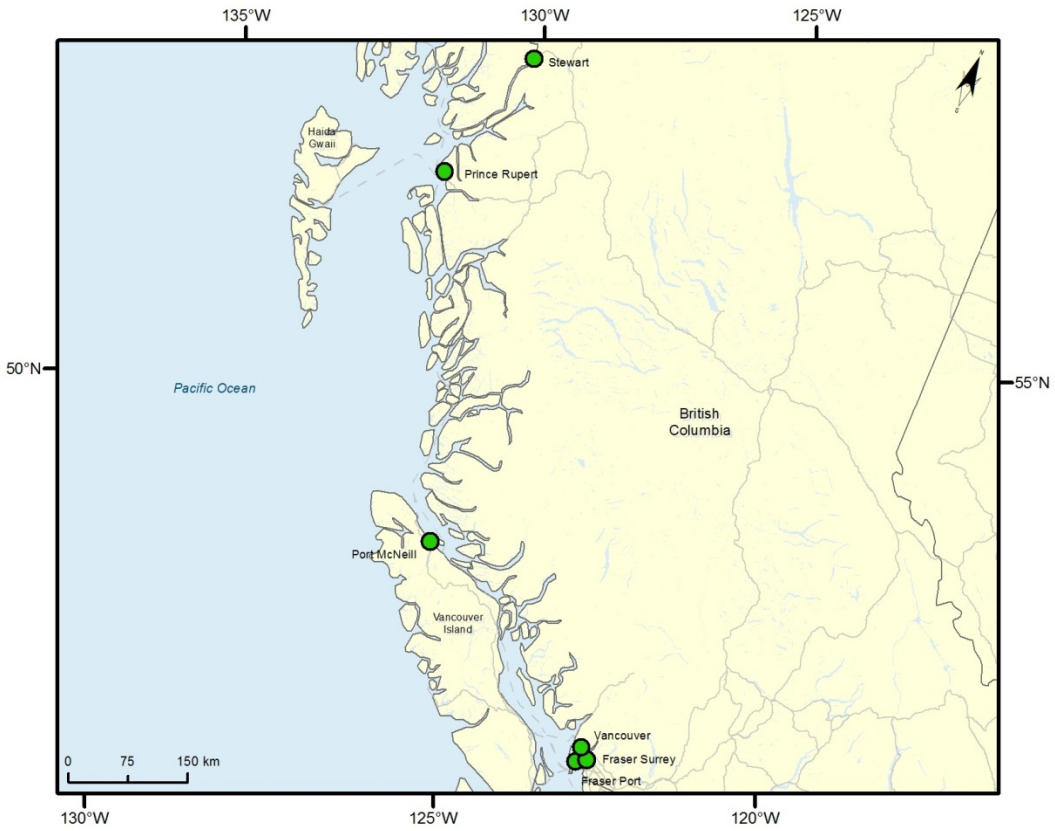


Figure 9. Map illustrating locations of all top Pacific Coast ports based on the annual volume of ballast water discharged by all vessels.

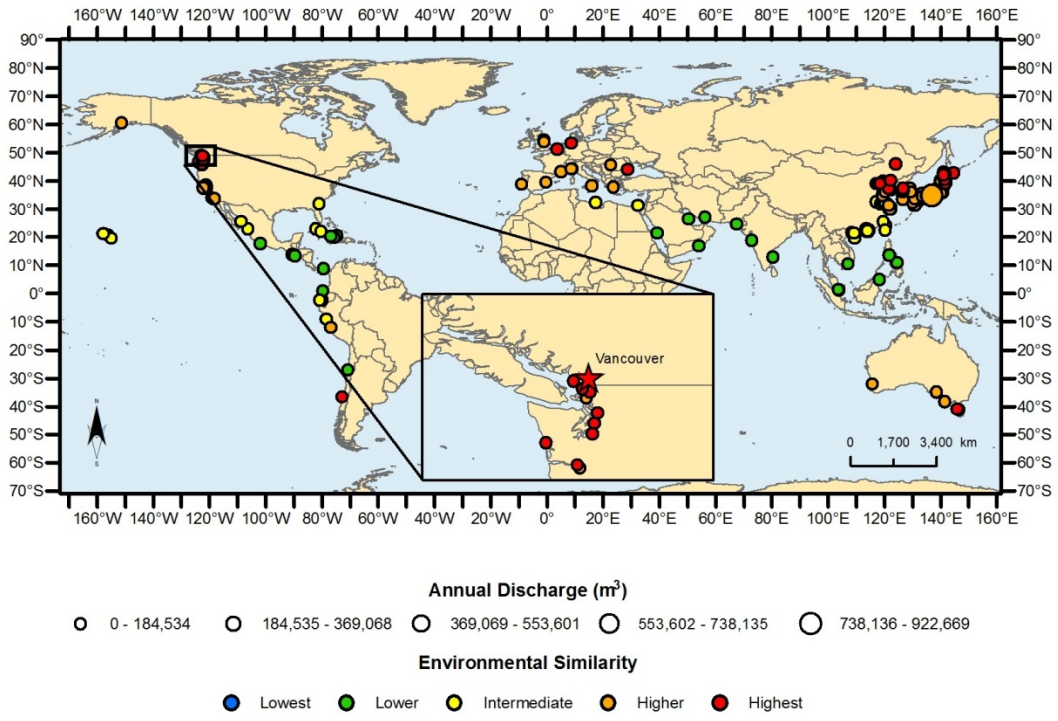


Figure 10. Map illustrating propagule supply and environmental similarity between Vancouver and source ports connected via international transoceanic vessel ballast water discharges.

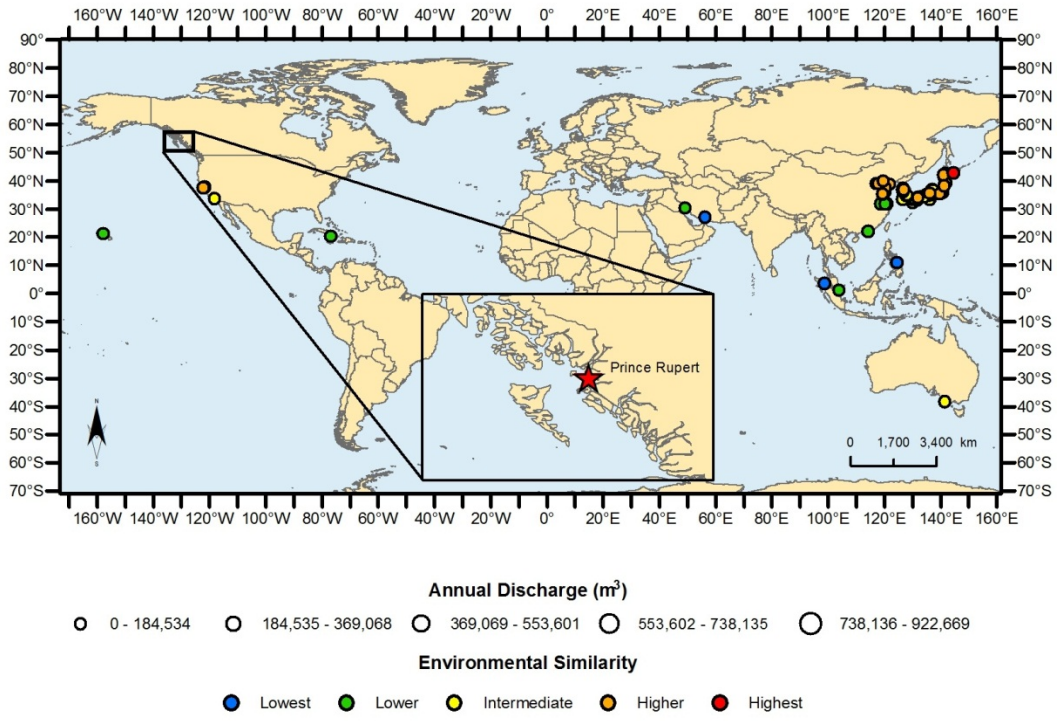


Figure 11. Map illustrating propagule supply and environmental similarity between Prince Rupert and source ports connected via international transoceanic vessel ballast water discharges.

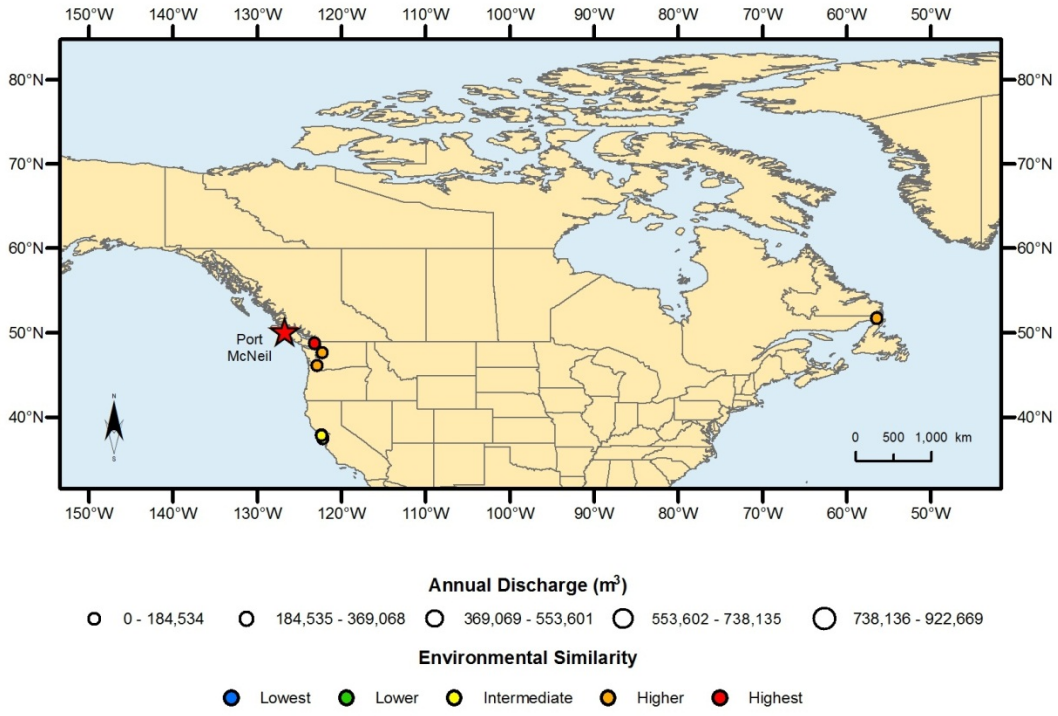
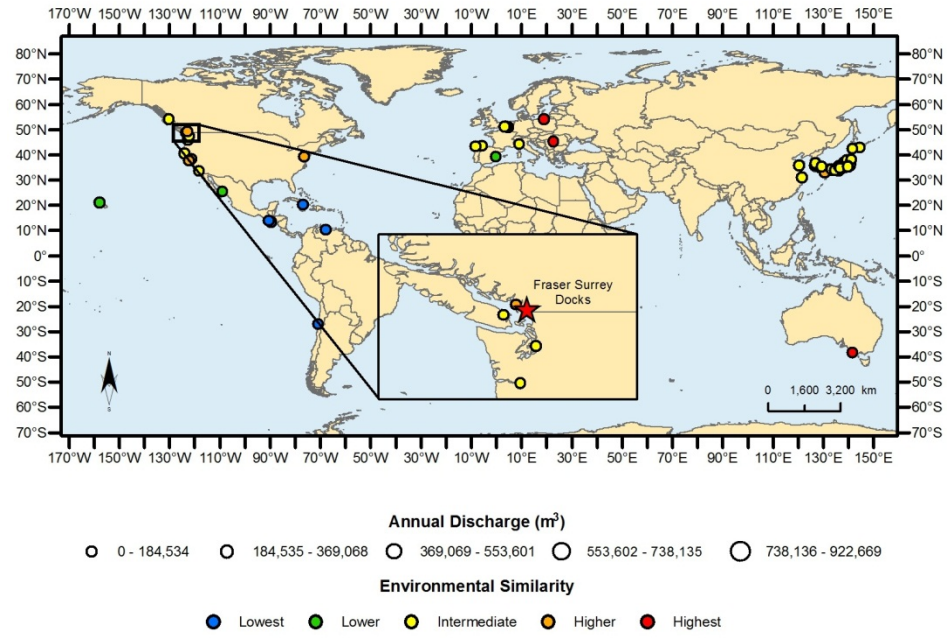


Figure 12. Map illustrating propagule supply and environmental similarity between Port McNeill and source ports connected via international transoceanic vessel ballast water discharges.

a)



b)

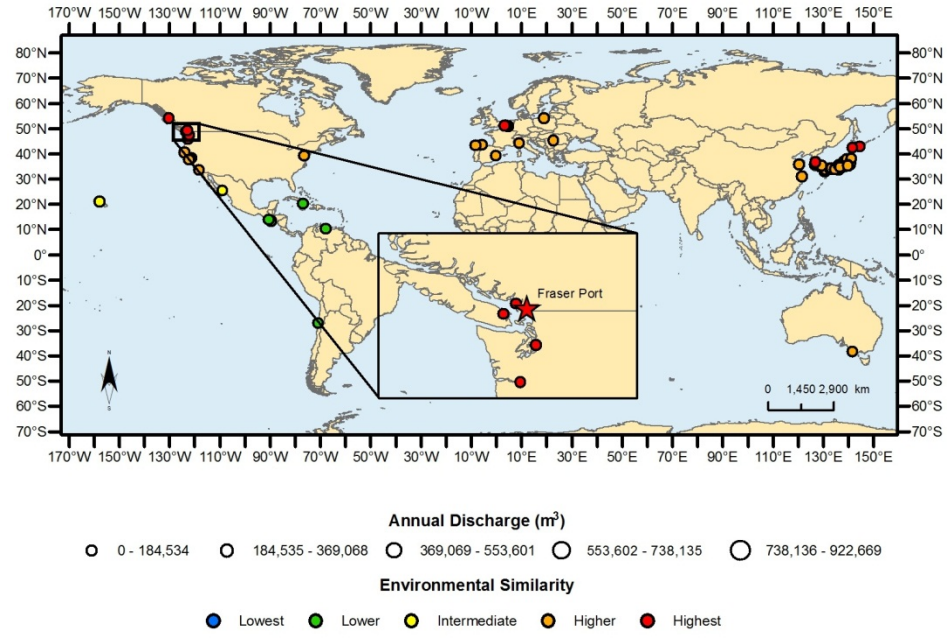


Figure 13. Map illustrating propagule supply and environmental similarity between (a) Fraser Surrey and (b) Fraser Port and source ports connected via international transoceanic vessel ballast water discharges.

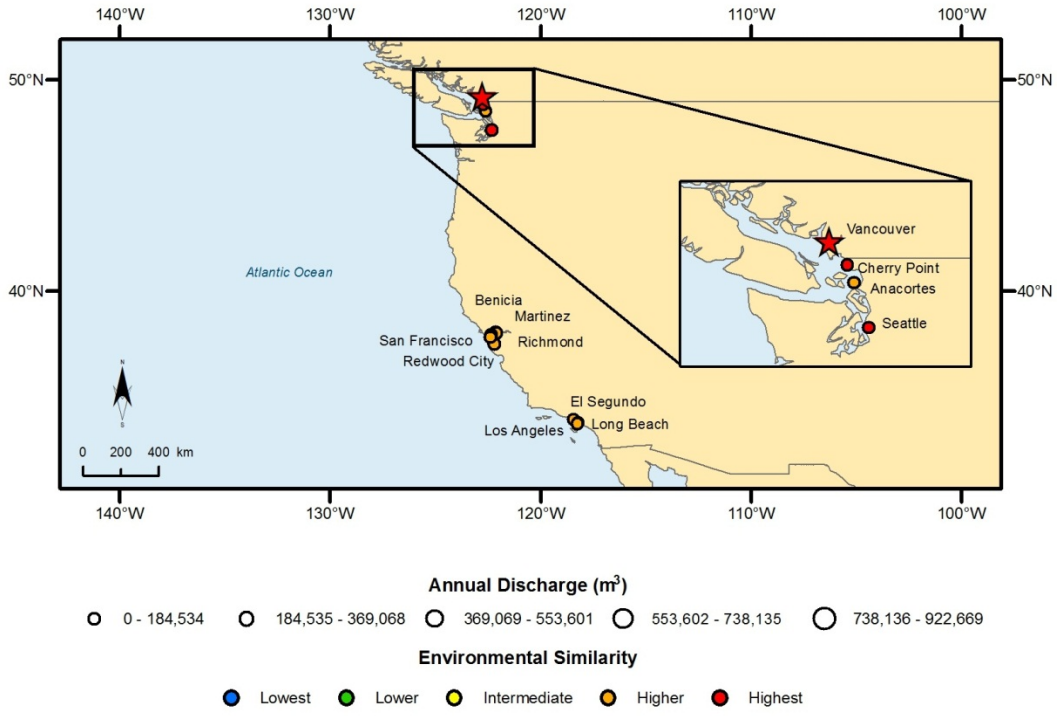
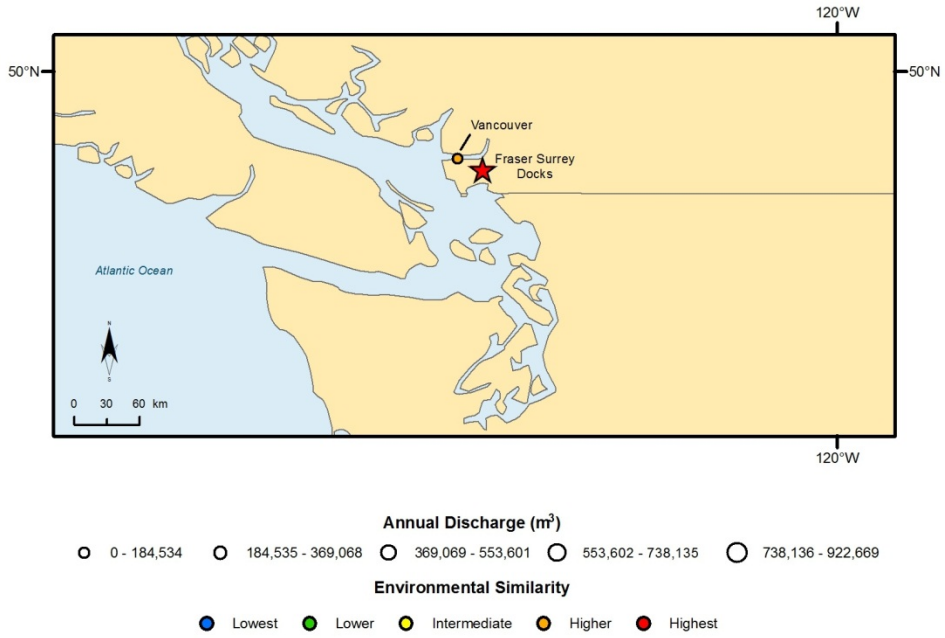


Figure 14. Map illustrating propagule supply and environmental similarity between Vancouver and connected source ports via international coastal U.S. vessel ballast water discharges.

a)



b)

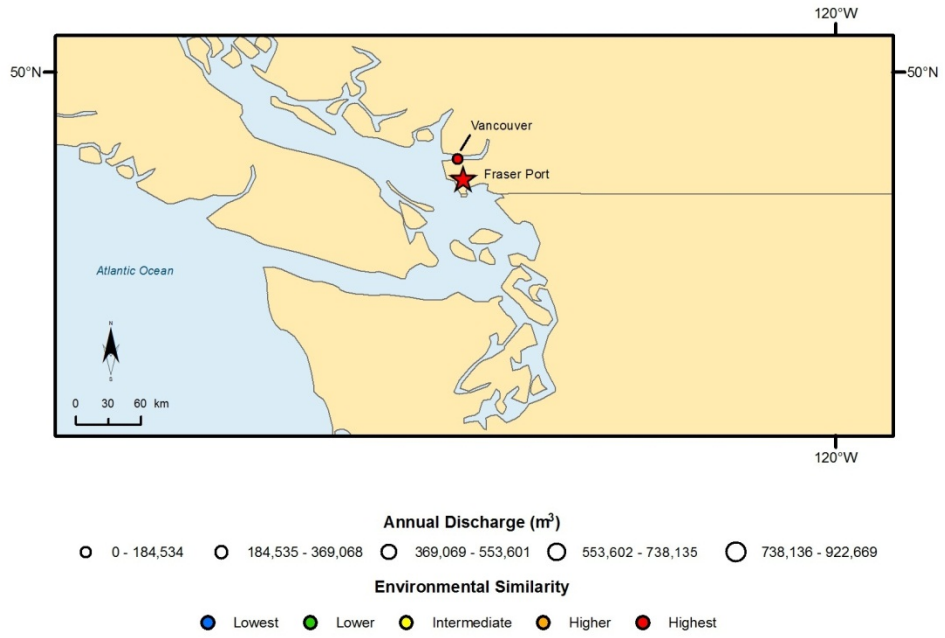


Figure 15. Map illustrating propagule supply and environmental similarity between (a) Fraser Surrey and (b) Fraser Port and connected source ports via international coastal U.S. vessel ballast water discharges.

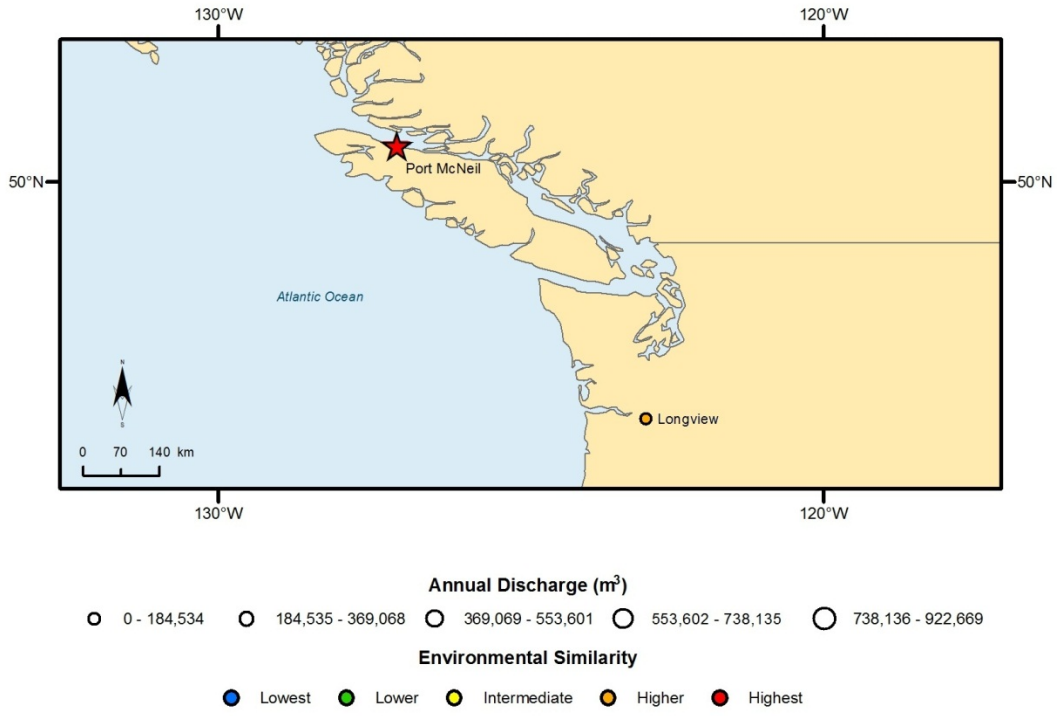


Figure 16. Map illustrating propagule supply and environmental similarity between Port McNeill and connected source ports via international coastal U.S. vessel ballast water discharges.

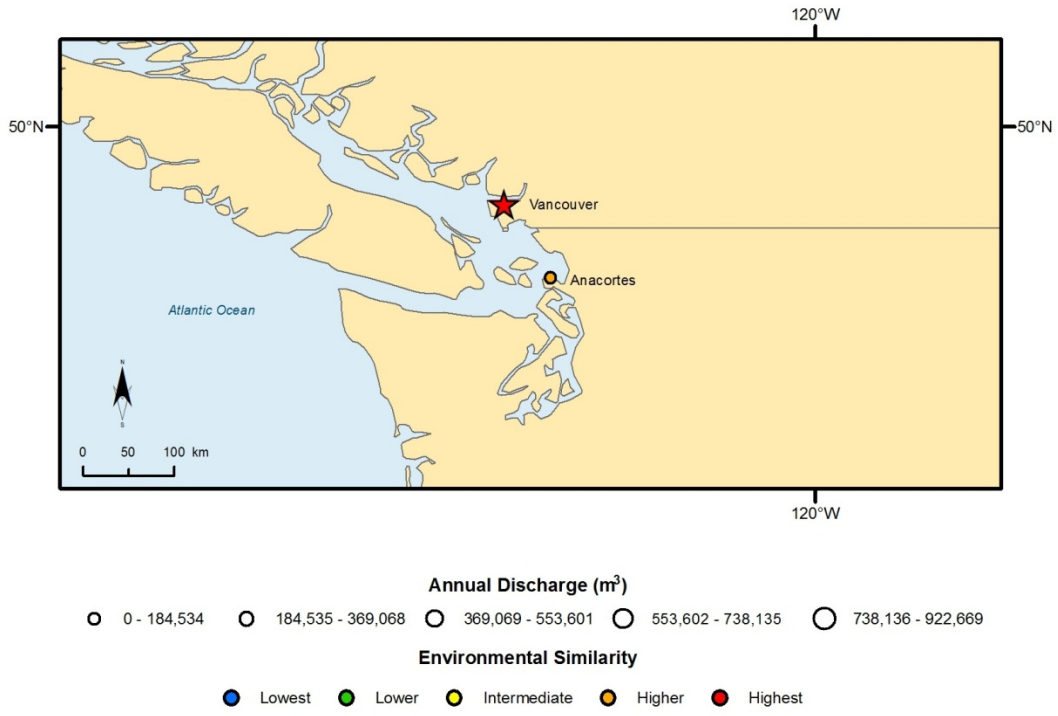
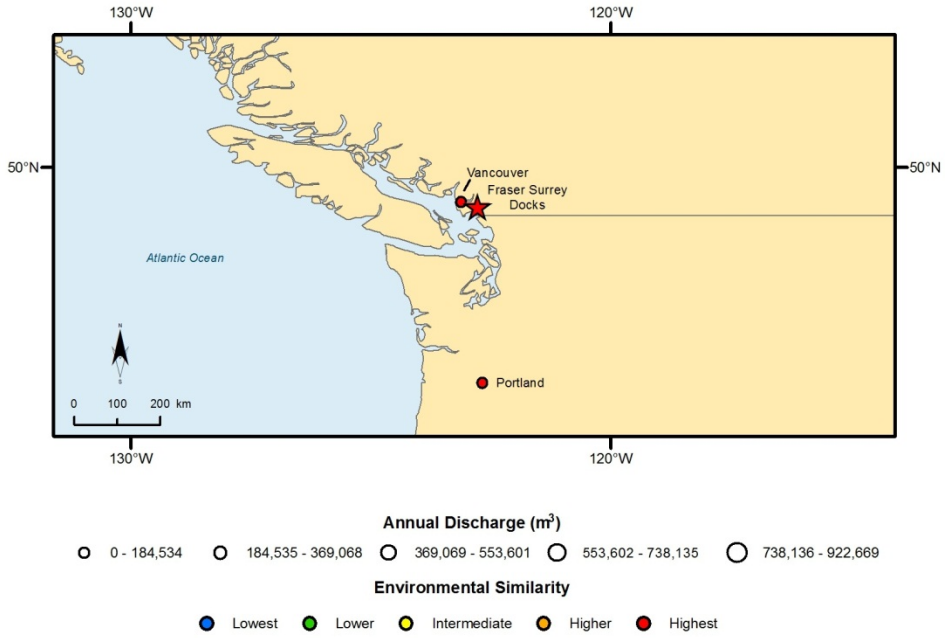


Figure 17. Map illustrating propagule supply and environmental similarity between Vancouver and source ports connected via international exempt vessel ballast water discharges.

a)



b)

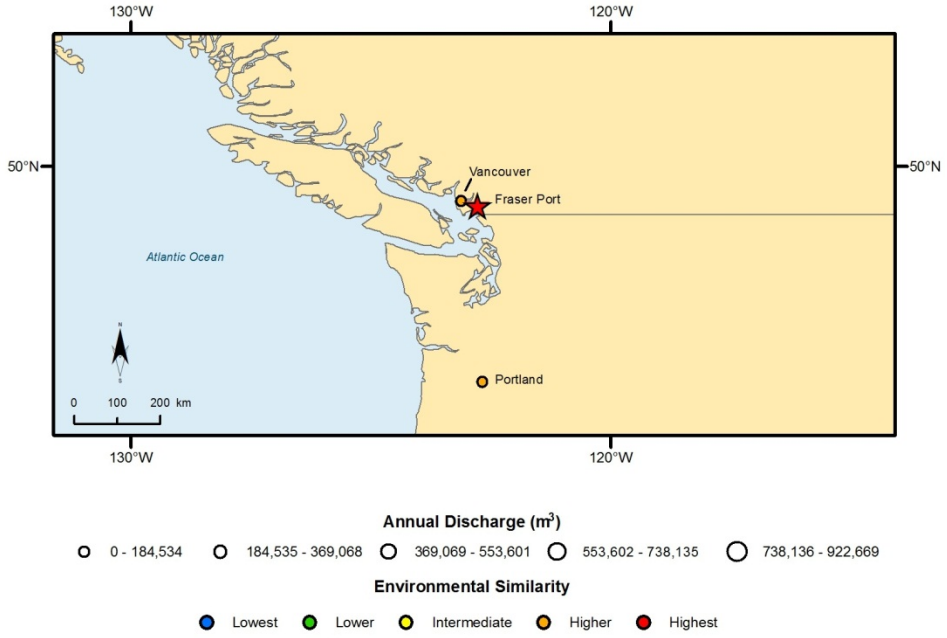


Figure 18. Map illustrating propagule supply and environmental similarity between (a) Fraser Surrey and (b) Fraser Port and source ports connected via international exempt vessel ballast water discharges.

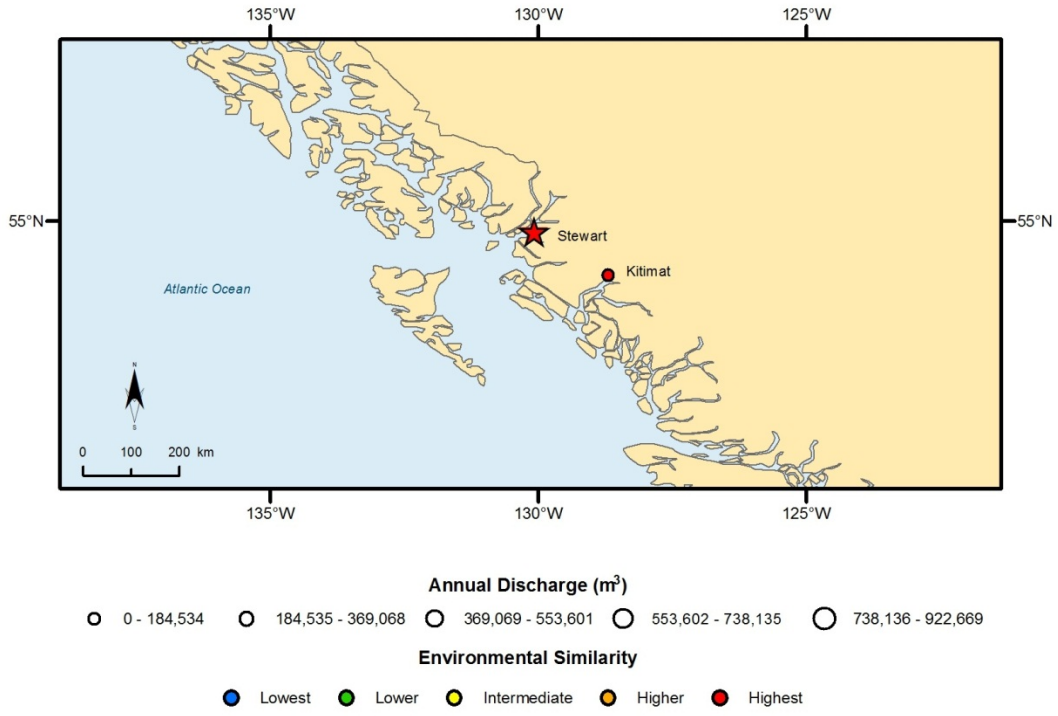


Figure 19. Map illustrating propagule supply and environmental similarity between Stewart and source ports connected via international exempt vessel ballast water discharges.

APPENDICES

Appendix A. List of original and final combined port/wharf names used in the risk assessment.

Original	Final	Country
ALLIANCE GRAIN TERMINAL	VANCOUVER	CANADA
ANNACIS AUTOMOBILE TERMINAL	FRASER SURREY	CANADA
BC SUGAR DOCK	VANCOUVER	CANADA
BERRY POINT	VANCOUVER	CANADA
BUOY VICTOR HOTEL	VICTORIA	CANADA
BURNABY	VANCOUVER	CANADA
CARGILL	VANCOUVER	CANADA
CASCADIA	VANCOUVER	CANADA
CENTERM DOCK	VANCOUVER	CANADA
DELTA PORT	ROBERTS BANK	CANADA
DUNCAN BAY	CAMPBELL RIVER	CANADA
ENGLISH BAY	VANCOUVER	CANADA
ESQUIMALT	VICTORIA	CANADA
FAIRVIEW SOUTH	PRINCE RUPERT	CANADA
FAIRVIEW TERMINALS	PRINCE RUPERT	CANADA
FALSE CREEK	VANCOUVER	CANADA
FIBRECO DOCK	VANCOUVER	CANADA
FIRST NARROWS	VANCOUVER	CANADA
FIVE FINGERS-ENTRANCE ISLAN	NANAIMO	CANADA
FRASER RIVER	FRASER SURREY	CANADA
FRASER RIVER (MAIN ARM)	FRASER SURREY	CANADA
FRASER SURREY DOCKS	FRASER SURREY	CANADA
FRASER WHARVES	FRASER PORT	CANADA
HARMAC	NANAIMO	CANADA
JAMES RICHARDSON INTERNATIONAL	VANCOUVER	CANADA
LYNN TERMINALS	VANCOUVER	CANADA
MCINTYRE BAY	MASSET	CANADA
NAMAIMO ASSEMBLY WHARF	NANAIMO	CANADA
NEPTUNE TERMINALS	VANCOUVER	CANADA
NEW WESTMINISTER	FRASER SURREY	CANADA
NEXON	VANCOUVER	CANADA
OAK BAY	VICTORIA	CANADA
OGDEN POINT	VICTORIA	CANADA
PACIFIC COAST BULK TERMINAL	VANCOUVER	CANADA
PACIFIC GRAIN ELEVATORS	VANCOUVER	CANADA
PORT MOODY	VANCOUVER	CANADA
RAINIER	LONGVIEW	USA
RIDLEY GRAIN	PRINCE RUPERT	CANADA
RIDLEY ISLAND COAL TERMINAL	PRINCE RUPERT	CANADA
ROBERTS BANK	VANCOUVER	CANADA

Original	Final	Country
ROYAL ROADS	VICTORIA	CANADA
SASKATCHEWAN WHEAT POOL	VANCOUVER	CANADA
SECOND NARROWS	VANCOUVER	CANADA
TEXADA MINES	TEXADA ISLAND	CANADA
UNITED GRAIN GROWERS	VANCOUVER	CANADA
VANCOUVER OCEAN TERMINAL	VANCOUVER	CANADA
VANCOUVER WHARVES	VANCOUVER	CANADA
WESTRIDGE TERMINALS	VANCOUVER	CANADA

Appendix B. Potential fouling NIS with high impact globally found at ports connected to Canadian Pacific coast top ports.

Species	Higher taxa	Ports				
		CROFTON	FRASER RIVER PORTS	KITIMAT	PRINCE RUPERT	VANCOUVER
Acanthogobius flavimanus	Fish		X	X	X	X
Acartia tonsa	Crustacean					X
Aglaothamnion halliae	Algae					X
Alitta succinea	Annelid		X	X	X	X
Antithamnionella ternifolia	Algae					X
Asparagopsis armata	Plant		X	X	X	X
Asterias amurensis	Echinoderms					X
Avrainvillea amadelpha	Algae					X
Balanus improvisus	Crustacean	X	X	X	X	X
Balanus trigonus	Crustacean					X
Botryllus schlosseri	Tunicate	X	X	X	X	X
Botryllus violaceus	Tunicate	X	X	X	X	X
Caulerpa racemosa var. cylindracea	Plant					X
Ciona intestinalis	Tunicate	X	X	X	X	X
Cladophora sericea	Algae	X	X	X	X	X
Codium fragile ssp tomentosoides	Algae		X	X	X	X
Codium webbiana	Algae					X
Corbula gibba	Mollusc					X
Cordylophora caspia	Cnidarian	X	X	X	X	X
Crassostrea gigas	Mollusc	X	X	X	X	X
Crepidula fornicata	Mollusc	X	X	X	X	X
Didemnum cf. lahillei	Ascidian	X	X	X	X	X
Didemnum vexillum	Ascidian	X	X	X	X	X
Dreissena polymorpha	Mollusc					X
Drymonema dalmatinum	Cnidarian					X
Elminius modestus	Crustacean					X
Eriocheir sinensis	Crustacean		X		X	X
Ficopomatus enigmaticus	Annelid		X		X	X
Fucus cottoni	Algae		X	X	X	X
Fucus evanescens	Algae					X
Garveia Franciscana	Cnidarian		X	X	X	X
Geukensia demissa	Mollusc		X	X	X	X
Hemimysis anomala	Crustacean					X
Hydroides elegans	Echinoderms					X
Hydroides ezoensis	Annelid					X
Hypnea musciformis	Algae		X		X	X
Jassa marmorata	Crustacean	X	X	X	X	X
Lyrodus medilobatus	Mollusc					X
Maeotias marginata	Cnidarian		X		X	X
Membranipora membranacea	Bryozoan					X
Molgula manhattensis	Ascidian	X	X	X	X	X

Species	Higher taxa	Ports				
		CROFTON	FRASER RIVER PORTS	KITIMAT	PRINCE RUPERT	VANCOUVER
Mya arenaria	Mollusc	X	X	X	X	X
Myriophyllum spicatum L.	Plant	X	X	X	X	X
Mytilicola orientalis	Annelid	X	X	X	X	X
Mytilopsis sallei	Mollusc		X		X	X
Mytilus galloprovincialis	Mollusc	X	X	X	X	X
Perna viridis	Mollusc					X
Phyllorhiza punctata	Cnidarian		X	X	X	X
Polyandrocarpa zorritensis	Tunicate		X	X	X	X
Polydora ciliata	Annelid		X		X	X
Polydora cornuta	Annelid		X	X	X	X
Pontogammarus robustoides	Crustacean					X
Pseudopolydora paucibranchiata	Annelid	X	X	X	X	X
Rapana venosa	Mollusc	X	X	X	X	X
Rhithropanopeus harrisii	Crustacean		X		X	X
Sabella spallanzanii	Annelid					X
Sargassum muticum	Algae	X	X	X	X	X
Sphaeroma quoianum	Crustacean	X	X	X	X	X
Sphaeroma quoyanum	Crustacean		X	X	X	X
Sphaeroma terebrans	Crustacean					X
Spirorbis marioni	Annelid					X
Styela clava	Tunicate	X	X	X	X	X
Synidotea laevidorsalis	Crustacean		X		X	X
Teredo bartschi	Mollusc		X	X	X	X
Tricellaria inopinata	Bryozoan	X	X	X	X	X
Tridentiger trigonocephalus	Fish		X	X	X	X
Ulva fasciata	Algae		X	X	X	X
Undaria pinnatifida	Plant		X	X	X	X
Victorella pavida	Bryozoan		X		X	X
Xenostrobus securis	Mollusc	X		X		

Appendix C. List of global ports that have highest environmental similarity to Vancouver. NIS originating from these ports have the highest potential for survival if introduced at Vancouver.

Global Port	Country	Latitude	Longitude	Environmental Distance
Atucha	ARG	-33.957	-59.251	0.728
Buenos Aires	ARG	-34.590	-58.378	0.907
Caleta Cordova	ARG	-45.717	-67.350	0.770
Caleta Olivia	ARG	-46.433	-67.517	0.774
Caleta Paula	ARG	-46.470	-67.500	0.774
Camarones	ARG	-44.450	-65.700	0.714
Campana	ARG	-34.157	-58.966	0.729
Comodoro Rivadavia	ARG	-45.857	-67.482	0.798
Escobar	ARG	-34.350	-58.767	0.883
Lima(ARG)	ARG	-33.977	-59.187	0.728
Mar del Plata	ARG	-38.033	-57.545	0.877
Necochea	ARG	-38.575	-58.721	0.936
Puerto Deseado	ARG	-47.750	-65.894	0.597
Puerto Madryn	ARG	-42.739	-65.047	1.002
Rio Gallegos	ARG	-51.617	-69.221	0.853
San Fernando(ARG)	ARG	-34.450	-58.533	0.878
Tigre	ARG	-34.433	-58.550	0.878
Zarate	ARG	-34.091	-59.021	0.729
Barry Beach	AUS	-38.717	146.383	0.775
Bell Bay	AUS	-41.133	146.867	0.871
Burnie	AUS	-41.058	145.905	0.898
Georgetown(AUS)	AUS	-41.100	146.817	0.811
Hobart	AUS	-42.838	147.289	0.903
Inspection Head	AUS	-41.150	146.817	0.896
Macquarie Hbr.	AUS	-42.167	145.333	0.779
Port Huon	AUS	-43.167	147.000	0.820
Port Latta	AUS	-40.854	145.387	0.911
Port Welshpool	AUS	-38.700	146.450	0.775
Triabunna	AUS	-42.450	147.933	0.628
Ulverstone	AUS	-41.233	146.167	0.866
Bruges	BEL	51.222	3.221	0.541
Nieuwpoort	BEL	51.134	2.748	0.679
Oostkamp	BEL	51.150	3.250	0.718
Ostend	BEL	51.230	2.923	0.700
Wielingen	BEL	51.383	3.383	0.588
Zandvoorde	BEL	51.217	2.967	0.652
Zeebrugge	BEL	51.323	3.216	0.664
Balchik	BGR	43.383	28.183	0.862
Lesport	BGR	43.167	27.817	0.924
Nessebar	BGR	42.667	27.733	0.919
Pomorie	BGR	42.533	27.650	0.994
Varna	BGR	43.200	27.917	0.854
Aulds Cove	CAN	45.650	-61.433	0.849
Bathurst	CAN	47.617	-65.633	0.944
Beaver Hbr.	CAN	44.867	-62.400	0.863
Belle Hbr.	CAN	47.667	-55.333	0.982
Belleoram	CAN	47.517	-55.417	0.982
Bic	CAN	48.367	-68.750	1.016

Global Port	Country	Latitude	Longitude	Environmental Distance
Big Hbr.	CAN	46.167	-60.417	0.914
Black Cape	CAN	48.117	-65.817	0.986
Bonaventure	CAN	48.283	-53.433	1.011
Bull Arm	CAN	47.767	-53.800	1.007
Campbell River	CAN	50.033	-125.233	0.603
Canso Hbr.	CAN	45.333	-61.000	0.973
Carbonear	CAN	47.733	-53.233	0.987
Carmanville	CAN	49.400	-54.283	1.007
Charlottetown(CAN)	CAN	46.217	-63.117	1.008
Chatham(CAN)	CAN	47.033	-65.467	0.934
Chemainus	CAN	48.917	-123.700	0.844
Cheticamp	CAN	46.633	-61.017	0.852
Cole Hbr.	CAN	45.250	-61.283	0.849
Comox	CAN	49.667	-124.917	0.721
Cowichan Bay	CAN	48.750	-123.600	0.844
Crofton	CAN	48.867	-123.633	0.844
Dalhousie	CAN	48.067	-66.367	1.020
Dartmouth(NS)	CAN	44.667	-63.583	0.827
Digby	CAN	44.633	-65.750	0.644
Duncan Bay	CAN	50.083	-125.283	0.253
Eastern Passage	CAN	44.600	-63.483	0.664
Fishing East	CAN	44.450	-58.783	0.930
Fraser River Port	CAN	49.200	-122.917	0.039
Georgetown(CAN)	CAN	46.183	-62.533	0.865
Grand Bank	CAN	47.100	-55.750	0.974
Gros Cacouna	CAN	47.933	-69.517	1.009
Halifax	CAN	44.633	-63.550	0.681
Hantsport	CAN	45.067	-64.167	0.715
Harmac	CAN	49.133	-123.850	0.673
Holyrood	CAN	47.400	-53.133	0.932
Hubbards	CAN	44.633	-64.067	0.845
Ladysmith	CAN	48.983	-123.783	0.676
Liscomb	CAN	45.000	-62.000	0.858
Liverpool(NS)	CAN	44.050	-64.717	0.925
Meteghan	CAN	44.200	-66.167	0.821
Millbank	CAN	47.050	-65.450	0.934
Montague	CAN	46.167	-62.633	0.853
Mulgrave	CAN	45.583	-61.383	0.849
Nanaimo	CAN	49.167	-123.933	0.673
Newcastle(NB)	CAN	47.000	-65.550	0.945
North Sydney	CAN	46.200	-60.250	0.767
Parrsboro	CAN	45.383	-64.333	0.910
Paspebiac	CAN	48.033	-65.233	1.016
Pictou	CAN	45.683	-62.717	0.820
Plumper Sound	CAN	48.767	-123.200	0.988
Point Tupper	CAN	45.600	-61.367	0.849
Port Edward	CAN	54.233	-130.300	0.957
Port Hastings	CAN	45.650	-61.400	0.849
Port Hawkesbury	CAN	45.617	-61.350	0.849
Port Mellon	CAN	49.517	-123.483	0.717

Global Port	Country	Latitude	Longitude	Environmental Distance
Powell River	CAN	49.867	-124.550	0.213
Prince Rupert	CAN	54.317	-130.367	0.920
Pugwash	CAN	45.867	-63.667	0.961
Richibucto	CAN	46.683	-64.867	0.914
Richmond(CAN)	CAN	49.150	-123.167	0.112
Roberts Bank	CAN	49.017	-123.133	0.154
Saint John(CAN)	CAN	45.267	-66.067	0.919
Sechelt	CAN	49.467	-123.750	0.101
Sheet Hbr.	CAN	44.850	-62.450	0.863
Ship Harbour	CAN	44.750	-62.750	0.818
Souris	CAN	46.350	-62.250	1.014
South Nelson	CAN	46.983	-65.550	0.945
St. Andrews(CAN)	CAN	45.067	-67.050	0.849
St. Peter's	CAN	45.650	-60.867	0.836
Summerside	CAN	46.400	-63.783	0.850
Sydney(NS)	CAN	46.150	-60.200	0.823
Tasu Bay	CAN	52.767	-132.050	0.930
Tiverton(CAN)	CAN	44.400	-66.217	0.784
Tommy's Arm	CAN	49.433	-55.783	0.970
Union Bay	CAN	49.583	-124.867	0.721
Vancouver(CAN)	CAN	49.283	-123.117	0.000
Walton(CAN)	CAN	45.233	-64.017	0.844
Woodfibre	CAN	49.667	-123.250	0.637
Yarmouth(CAN)	CAN	43.833	-66.117	0.641
Ancud	CHL	-41.867	-73.833	0.965
Castro	CHL	-42.483	-73.767	0.928
Chaiten	CHL	-42.917	-72.717	0.731
Chonchi	CHL	-42.617	-73.783	0.908
Coronel	CHL	-37.033	-73.167	0.904
Corral	CHL	-39.867	-73.417	0.906
Lirquen	CHL	-36.717	-72.983	0.857
Lota	CHL	-37.100	-73.167	0.904
Penco	CHL	-36.717	-73.000	0.903
Puerto Aguirre	CHL	-45.167	-73.517	0.862
Puerto Aisen	CHL	-45.383	-72.683	0.934
Puerto Cisnes	CHL	-44.733	-72.700	0.909
Puerto Montt	CHL	-41.467	-72.950	0.710
Bayuquan	CHN	40.267	122.100	0.790
Beiliang	CHN	38.967	121.800	0.880
Caofeidian Port	CHN	38.963	118.517	0.910
Huludao	CHN	40.717	120.983	0.773
Longyan	CHN	37.400	122.617	0.952
Penglai	CHN	37.817	120.717	0.915
Shidao	CHN	36.883	122.467	0.904
Weihai	CHN	37.500	122.150	0.957
Yantai	CHN	37.567	121.433	1.008
Abbenfleth	DEU	53.683	9.500	0.315
Amrum Is.	DEU	54.633	8.350	0.569
Baltrum	DEU	53.733	7.400	0.561
Bardenfleth	DEU	53.150	8.550	0.290

Global Port	Country	Latitude	Longitude	Environmental Distance
Beidenfleth	DEU	53.867	9.433	0.329
Bensersiel	DEU	53.683	7.583	0.426
Blexen	DEU	53.533	8.533	0.327
Blumenthal	DEU	53.183	8.567	0.305
Borkum	DEU	53.583	6.667	0.605
Brake	DEU	53.333	8.483	0.293
Bremen	DEU	53.083	8.783	0.289
Bremerhaven	DEU	53.550	8.583	0.327
Brokdorf	DEU	53.867	9.333	0.329
Brunsbuttel	DEU	53.900	9.133	0.329
Burg	DEU	53.983	9.283	0.329
Burgstaaken	DEU	54.417	11.200	1.014
Busum	DEU	54.133	8.867	0.363
Butzfleth	DEU	53.650	9.517	0.304
Cuxhaven	DEU	53.867	8.700	0.244
Dagebull	DEU	54.733	8.733	0.461
Ditzum	DEU	53.317	7.267	0.392
Eckernforde	DEU	54.483	9.850	0.765
Einswarden	DEU	53.517	8.517	0.327
Elmshorn	DEU	53.750	9.650	0.315
Elsfleth	DEU	53.233	8.467	0.293
Emden	DEU	53.350	7.183	0.288
Farge	DEU	53.200	8.517	0.305
Fischerhutte	DEU	54.150	9.367	0.369
Flensburg	DEU	54.800	9.433	0.661
Freiburg	DEU	53.817	9.300	0.310
Friedrichstadt	DEU	54.383	9.083	0.412
Ganspe	DEU	53.200	8.550	0.305
Gelting	DEU	54.733	9.900	0.601
Gluckstadt	DEU	53.783	9.417	0.315
Hamburg	DEU	53.550	9.967	0.312
Harlesiel	DEU	53.633	7.750	0.400
Heiligenhafen	DEU	54.367	10.983	1.014
Helgoland	DEU	54.150	7.883	0.568
Hemmoor	DEU	53.700	9.133	0.310
Hochdonn	DEU	54.017	9.300	0.362
Holmer Siel	DEU	54.533	8.867	0.433
Holtenau	DEU	54.367	10.150	0.765
Hornum	DEU	54.750	8.300	0.581
Horumersiel	DEU	53.667	8.017	0.529
Husum(DEU)	DEU	54.483	9.050	0.430
Itzehoe	DEU	53.933	9.517	0.336
Juist	DEU	53.683	7.000	0.501
Kappeln	DEU	54.667	9.933	0.722
Kiel	DEU	54.317	10.133	0.768
Krautsand	DEU	53.767	9.383	0.315
Laboe	DEU	54.400	10.217	0.760
Langeoog	DEU	53.750	7.533	0.523
Lemwerder	DEU	53.167	8.600	0.290
List	DEU	55.017	8.433	0.611

Global Port	Country	Latitude	Longitude	Environmental Distance
Lubeck	DEU	53.867	10.667	0.901
Neuenfelde	DEU	53.500	9.817	0.329
Neuhaus	DEU	53.800	9.033	0.310
Neustadt	DEU	54.100	10.817	0.899
Norddeich	DEU	53.633	7.167	0.520
Nordenham	DEU	53.483	8.483	0.309
Norderney	DEU	53.700	7.167	0.504
Nordstrand	DEU	54.483	8.917	0.415
Oldenburg	DEU	53.150	8.233	0.282
Olpenitz	DEU	54.650	9.983	0.917
Orth	DEU	54.450	11.050	1.014
Oslebshausen	DEU	53.133	8.733	0.289
Ostermoor	DEU	53.917	9.183	0.329
Otterndorf	DEU	53.817	8.900	0.464
Puttgarden	DEU	54.500	11.233	0.857
Rendsburg	DEU	54.317	9.667	0.364
Ruthenstrom	DEU	53.733	9.400	0.315
Schacht-Audorf	DEU	54.300	9.717	0.364
Schleswig	DEU	54.517	9.567	0.791
Schlutup	DEU	53.883	10.783	0.894
Schulau	DEU	53.567	9.700	0.310
Schwarzenhutten	DEU	53.700	9.167	0.310
Stade	DEU	53.600	9.483	0.313
Stadersand	DEU	53.617	9.533	0.304
Tonning	DEU	54.317	8.950	0.383
Travemunde	DEU	53.967	10.900	0.894
Utersen	DEU	53.667	9.650	0.304
Wangerooge	DEU	53.783	7.900	0.506
Wesermunde	DEU	53.533	8.583	0.327
Wewelsfleth	DEU	53.850	9.400	0.329
Wilhelmshaven	DEU	53.517	8.150	0.529
Wischhafen	DEU	53.783	9.333	0.310
Wismar	DEU	53.900	11.467	0.877
Wyk	DEU	54.700	8.583	0.538
Aabenraa	DNK	55.033	9.433	0.701
Aalborg	DNK	57.050	9.917	0.540
Aarhus	DNK	56.150	10.217	0.615
Aarosund	DNK	55.267	9.717	0.789
Aeroskobing	DNK	54.883	10.417	0.909
Anholt	DNK	56.717	11.517	0.773
Asa	DNK	57.150	10.417	0.650
Asaa	DNK	57.133	10.400	0.650
Asnaesvaerkets Havn	DNK	55.667	11.083	0.647
Assens	DNK	55.267	9.900	0.692
Augustenborg	DNK	54.950	9.867	0.615
Avedore	DNK	55.600	12.483	0.991
Bagenkop	DNK	54.750	10.667	0.970
Ballen	DNK	55.817	10.650	0.796
Bandholm	DNK	54.833	11.500	0.763
Bogense	DNK	55.567	10.083	0.780

Global Port	Country	Latitude	Longitude	Environmental Distance
Copenhagen	DNK	55.700	12.617	0.991
Dragor	DNK	55.583	12.683	0.991
Ebeltoft	DNK	56.200	10.667	0.768
Egernsund	DNK	54.900	9.600	0.659
Elsinore	DNK	56.033	12.617	0.827
Endelave	DNK	55.750	10.267	0.810
Enstedvaerkets Havn	DNK	55.017	9.433	0.701
Esbjerg	DNK	55.467	8.433	0.656
Faaborg	DNK	55.100	10.233	0.781
Fakse Ladeplads	DNK	55.217	12.167	0.961
Fano Is.	DNK	55.417	8.417	0.656
Fredericia	DNK	55.567	9.750	0.756
Frederikshavn	DNK	57.433	10.550	0.653
Frederikssund	DNK	55.833	12.050	0.644
Frederiksvaerk	DNK	55.967	12.017	0.643
Gedser	DNK	54.567	11.933	0.951
Glatved	DNK	56.300	10.850	0.757
Graasten	DNK	54.917	9.617	0.659
Grenaa	DNK	56.413	10.913	0.757
Guldborg	DNK	54.867	11.750	0.776
Gulfhavn	DNK	55.200	11.250	0.770
Haderslev	DNK	55.250	9.500	0.789
Hadsund	DNK	56.717	10.117	0.576
Hals	DNK	56.983	10.317	0.657
Halsskov	DNK	55.333	11.100	0.904
Hanstholm	DNK	57.117	8.583	0.869
Hardeshoj	DNK	55.000	9.683	0.785
Havneby	DNK	55.100	8.567	0.598
Hellerup	DNK	55.733	12.583	0.998
Hirtshals	DNK	57.600	9.967	0.772
Hobro	DNK	56.633	9.800	0.586
Holbaek	DNK	55.717	11.717	0.659
Horsens	DNK	55.850	9.867	0.676
Hundested	DNK	55.967	11.850	0.903
Juelsminde	DNK	55.717	10.017	0.780
Kalundborg	DNK	55.683	11.083	0.653
Karrebaeksminde	DNK	55.167	11.633	0.810
Kastrup	DNK	55.633	12.650	0.991
Katholm	DNK	54.933	9.833	0.632
Kerteminde	DNK	55.450	10.667	0.715
Koge	DNK	55.450	12.200	0.813
Kolby Kaas	DNK	55.800	10.533	0.796
Kolding	DNK	55.500	9.500	0.691
Kongsdal	DNK	56.683	10.067	0.576
Korsor	DNK	55.333	11.133	0.904
Kyndby	DNK	55.817	11.883	0.903
Laeso	DNK	57.217	10.700	0.640
Lemvig	DNK	56.550	8.300	0.626
Lindo	DNK	55.467	10.533	0.715
Lyngs Odde	DNK	55.517	9.750	0.766

Global Port	Country	Latitude	Longitude	Environmental Distance
Lyngsbaek Bridge	DNK	56.233	10.617	0.629
Mariager	DNK	56.650	9.983	0.588
Marstal	DNK	54.850	10.517	0.934
Masnedo	DNK	55.000	11.900	0.789
Masnedsund	DNK	55.000	11.900	0.789
Middelfart	DNK	55.500	9.733	0.766
Naestved	DNK	55.233	11.750	0.783
Nakskov	DNK	54.833	11.133	0.787
Nordby	DNK	55.450	8.400	0.656
Norresundby	DNK	57.067	9.917	0.540
Nyborg	DNK	55.300	10.783	0.884
Nyhavn	DNK	55.683	12.583	0.991
Nykobing(Falster)	DNK	54.767	11.867	0.814
Nykobing(Sjaelland)	DNK	55.917	11.683	0.704
Odden	DNK	55.967	11.367	0.852
Odense	DNK	55.417	10.383	0.724
Omo	DNK	55.167	11.150	0.938
Orehoved	DNK	54.950	11.850	0.789
Ostby	DNK	55.733	12.033	0.644
Praesto	DNK	55.117	12.033	0.961
Randers	DNK	56.467	10.050	0.588
Ribe	DNK	55.317	8.767	0.537
Ringkobing	DNK	56.083	8.233	0.442
Ringsted	DNK	55.883	12.533	0.989
Rodbyhavn	DNK	54.650	11.350	0.808
Rudkobing	DNK	54.933	10.717	0.934
Saeby	DNK	57.333	10.517	0.653
Sakskobing	DNK	54.800	11.633	0.771
Skaelskor	DNK	55.250	11.283	0.770
Skaerbaek	DNK	55.517	9.617	0.689
Skagen	DNK	57.717	10.600	0.663
Snaptun	DNK	55.817	10.033	0.625
Soby	DNK	54.950	10.267	0.909
Sonderborg	DNK	54.917	9.783	0.632
Sprogo	DNK	55.333	10.967	0.884
Stevns Pier	DNK	55.317	12.450	0.977
Stigsnaesvaerkets Havn	DNK	55.217	11.250	0.770
Strandby	DNK	57.483	10.517	0.659
Strib	DNK	55.533	9.767	0.756
Studstrup	DNK	56.250	10.350	0.615
Svendborg	DNK	55.050	10.617	0.778
Thyboron	DNK	56.700	8.217	0.869
Tuborg Havn	DNK	55.717	12.583	0.991
Understed	DNK	57.383	10.500	0.653
Vedbaek	DNK	55.850	12.550	0.989
Vejle	DNK	55.717	9.550	0.701
Vordingborg	DNK	55.000	11.900	0.789
Astillero	ESP	43.400	-3.817	0.818
Bermeo	ESP	43.417	-2.717	0.963
Bilbao	ESP	43.311	-3.029	0.563

Global Port	Country	Latitude	Longitude	Environmental Distance
Camarinas	ESP	43.117	-9.183	0.851
Cangas	ESP	42.267	-8.767	0.914
Caraminal	ESP	42.600	-8.933	0.802
Castro Urdiales	ESP	43.400	-3.233	0.985
Cee	ESP	42.950	-9.167	0.844
Cillero	ESP	43.683	-7.600	0.835
Corcubion	ESP	42.950	-9.183	0.844
Cudillero	ESP	43.550	-6.150	0.990
Fene	ESP	43.467	-8.167	0.881
Ferrol	ESP	43.467	-8.267	0.836
Fuenterrabia	ESP	43.367	-1.800	0.844
Guernica	ESP	43.317	-2.667	0.895
Muros	ESP	42.750	-9.017	0.805
Orio	ESP	43.267	-2.117	0.917
Ortigueira	ESP	43.683	-7.833	0.597
Pasajes	ESP	43.333	-1.933	0.966
Puente Ceso	ESP	43.250	-8.900	0.950
Requejada	ESP	43.333	-4.083	0.740
Ribadesella	ESP	43.467	-5.067	0.979
Sada	ESP	43.367	-8.250	0.822
San Esteban de Pravia	ESP	43.567	-6.083	0.990
San Sebastian(ESP)	ESP	43.317	-1.983	0.966
Santa Eugenia de Riveira	ESP	42.550	-8.983	0.793
Santona	ESP	43.467	-3.467	1.018
Vivero	ESP	43.667	-7.600	0.829
Antifer	FRA	49.667	0.167	0.827
Arcachon	FRA	44.667	-1.167	0.616
Barfleur	FRA	49.667	-1.250	0.896
Belz	FRA	47.667	-3.167	0.673
Benodet	FRA	47.883	-4.117	0.491
Boulogne	FRA	50.733	1.617	0.800
Brest	FRA	48.383	-4.483	0.406
Caen	FRA	49.183	-0.350	1.016
Calais	FRA	50.967	1.850	0.684
Camaret	FRA	48.283	-4.600	0.832
Cancale	FRA	48.667	-1.850	0.827
Carteret	FRA	49.367	-1.800	0.921
Cherbourg	FRA	49.641	-1.614	0.773
Concarneau	FRA	47.867	-3.917	0.800
Corniguel	FRA	47.950	-4.117	0.683
Courseulles sur Mer	FRA	49.333	-0.450	0.791
Dahouet	FRA	48.583	-2.567	0.904
Deauville	FRA	49.350	0.067	0.689
Dielette	FRA	49.550	-1.850	0.926
Dieppe	FRA	49.933	1.083	0.703
Douarnenez	FRA	48.100	-4.333	0.821
Dunkirk	FRA	51.050	2.350	0.737
Erquy	FRA	48.633	-2.467	0.880
Etaples	FRA	50.517	1.633	0.451
Fecamp	FRA	49.767	0.367	0.854

Global Port	Country	Latitude	Longitude	Environmental Distance
Granville	FRA	48.833	-1.600	0.861
Gravelines	FRA	50.983	2.133	0.754
Gujan-Mestras	FRA	44.633	-1.050	0.703
Hendaye	FRA	43.367	-1.767	0.800
Hennebont	FRA	47.800	-3.267	0.625
Honfleur	FRA	49.417	0.233	0.687
Keroman	FRA	47.733	-3.367	0.504
La Pallice	FRA	46.167	-1.233	0.842
La Rochelle	FRA	46.150	-1.150	0.811
La Teste	FRA	44.617	-1.150	0.641
La Trinite sur Mer	FRA	47.583	-3.033	0.789
Lannion	FRA	48.733	-3.450	0.873
Le Guildo	FRA	48.633	-2.233	0.858
Le Havre	FRA	49.483	0.117	0.827
Le Legue	FRA	48.533	-2.717	0.904
Le Palais	FRA	47.350	-3.167	0.855
Le Treport	FRA	50.067	1.367	0.701
Le Verdon	FRA	45.550	-1.083	0.839
Loctudy	FRA	47.833	-4.167	0.838
Lorient	FRA	47.750	-3.367	0.864
Marans	FRA	46.317	-1.033	0.994
Mardyck	FRA	51.000	2.233	0.745
Marennes	FRA	45.817	-1.100	0.843
Montoir	FRA	47.333	-2.133	0.954
Morgat	FRA	48.217	-4.500	0.832
Morlaix	FRA	48.633	-3.883	0.806
Ouistreham	FRA	49.283	-0.250	0.800
Paimpol	FRA	48.783	-3.050	0.982
Paluden	FRA	48.583	-4.517	0.432
Piriac	FRA	47.383	-2.550	0.768
Pontrieux	FRA	48.700	-3.167	0.639
Pornic	FRA	47.117	-2.117	0.737
Port Barrier	FRA	48.633	-2.417	0.880
Port Joinville	FRA	46.733	-2.350	0.760
Quiberon	FRA	47.500	-3.117	0.811
Quimper	FRA	47.967	-4.117	0.536
Roscoff	FRA	48.717	-3.983	0.778
Royan	FRA	45.617	-1.033	0.882
Sables d'Olonne	FRA	46.500	-1.800	0.763
Saint Brevin	FRA	47.250	-2.150	0.758
Saint Maclou	FRA	49.367	0.417	0.922
Saint Quay Portrieux	FRA	48.650	-2.833	0.933
St. Malo	FRA	48.649	-2.025	0.858
St. Nazaire	FRA	47.267	-2.200	0.763
St. Valery en Caux	FRA	49.867	0.717	0.852
St. Valery sur Somme	FRA	50.183	1.650	0.705
Treguier	FRA	48.783	-3.233	0.774
Vannes	FRA	47.650	-2.750	0.682
Aberdeen(GBR)	GBR	57.150	-2.067	0.997
Aberdovey	GBR	52.533	-4.050	0.803

Global Port	Country	Latitude	Longitude	Environmental Distance
Aberystwyth	GBR	52.400	-4.100	0.794
Alderney	GBR	49.717	-2.200	0.936
Annan	GBR	54.983	-3.267	0.741
Appledore	GBR	51.050	-4.200	0.433
Arbroath	GBR	56.550	-2.583	0.906
Ardersier	GBR	57.567	-4.033	0.952
Ardrishaig	GBR	56.000	-5.433	0.950
Ardrossan(GBR)	GBR	55.633	-4.817	0.797
Avonmouth	GBR	51.500	-2.717	0.707
Ayr	GBR	55.467	-4.633	0.863
Ballantrae	GBR	55.100	-5.000	0.860
Banff	GBR	57.667	-2.517	1.012
Barcaldine	GBR	56.517	-5.400	0.988
Barnstaple	GBR	51.083	-4.067	0.930
Barrow on Humber	GBR	53.683	-0.383	0.765
Barrow-in-Furness	GBR	54.100	-3.217	0.840
Barry	GBR	51.400	-3.267	0.839
Barton on Humber	GBR	53.700	-0.433	0.844
Battlesbridge	GBR	51.617	0.567	0.782
Beaumaris	GBR	53.267	-4.083	1.015
Bedhampton	GBR	50.833	-1.000	0.401
Bee Ness	GBR	51.433	0.650	0.484
Belfast	GBR	54.600	-5.933	0.626
Bideford	GBR	51.017	-4.200	0.938
Bird Port	GBR	51.567	-2.967	0.963
Bo'ness	GBR	56.017	-3.600	0.973
Borth	GBR	52.483	-4.050	0.794
Boston(GBR)	GBR	52.967	-0.017	0.571
Braefoot Bay	GBR	56.033	-3.300	0.629
Bridport(GBR)	GBR	50.717	-2.767	0.778
Brightlingsea	GBR	51.783	1.033	0.764
Brighton(GBR)	GBR	50.817	-0.100	0.755
Briton Ferry	GBR	51.617	-3.833	0.692
Brixham	GBR	50.400	-3.500	0.984
Bromborough	GBR	53.350	-2.983	0.573
Burghead	GBR	57.700	-3.500	0.937
Burnham on Crouch	GBR	51.617	0.817	0.275
Burntisland	GBR	56.050	-3.233	0.594
Caernarfon	GBR	53.150	-4.267	0.806
Cairnryan	GBR	54.967	-5.017	0.880
Cantley	GBR	52.567	1.533	0.333
Canvey Is.	GBR	51.517	0.633	0.683
Carrickfergus	GBR	54.650	-5.883	0.544
Casquets	GBR	49.733	-2.383	0.949
Charlestown(England)	GBR	50.333	-4.750	0.813
Charlestown(Scotland)	GBR	56.033	-3.500	0.826
Chatham	GBR	51.400	0.550	0.714
Chepstow	GBR	51.650	-2.667	0.959
Christchurch	GBR	50.733	-1.750	0.747
Clacton	GBR	51.800	1.150	0.764

Global Port	Country	Latitude	Longitude	Environmental Distance
Cliffe	GBR	51.483	0.467	0.486
Cockenzie	GBR	55.967	-2.950	0.867
Colchester	GBR	51.883	0.917	0.465
Coleraine	GBR	55.133	-6.667	0.928
Connah's Quay	GBR	53.233	-3.067	0.783
Conwy	GBR	53.300	-3.850	0.970
Coryton	GBR	51.517	0.533	0.357
Cowes	GBR	50.767	-1.300	0.744
Creeksea	GBR	51.617	0.783	0.389
Creetown	GBR	54.900	-4.367	0.884
Cromarty	GBR	57.683	-4.033	0.981
Crombie	GBR	56.033	-3.567	0.973
Cromer	GBR	52.933	1.300	0.718
Dartmouth	GBR	50.350	-3.583	0.781
Dean Quarry	GBR	50.033	-5.083	0.832
Devonport(GBR)	GBR	50.367	-4.167	0.794
Dover	GBR	51.117	1.333	0.782
Dundrum	GBR	54.267	-5.850	0.892
Dunvegan	GBR	57.450	-6.583	0.858
Eastham	GBR	53.350	-2.967	0.573
Eling	GBR	50.900	-1.467	0.722
Ellesmere Port	GBR	53.283	-2.900	0.505
Exeter	GBR	50.717	-3.517	0.873
Exmouth(GBR)	GBR	50.617	-3.417	0.774
Fairlie	GBR	55.767	-4.867	0.853
Falmouth	GBR	50.167	-5.050	0.832
Fareham	GBR	50.850	-1.183	0.698
Faversham	GBR	51.333	0.900	0.711
Fawley	GBR	50.817	-1.333	0.748
Felixstowe	GBR	51.950	1.317	0.775
Fingringhoe	GBR	51.833	0.967	0.319
Fishbourne	GBR	50.733	-1.200	0.744
Fleetwood	GBR	53.933	-3.000	0.602
Folkestone	GBR	51.083	1.200	0.711
Fosdyke	GBR	52.867	-0.033	0.607
Fowey	GBR	50.333	-4.633	0.813
Freshwater Bay(GBR)	GBR	50.667	-1.517	0.739
Garlieston	GBR	54.800	-4.367	0.815
Garston	GBR	53.350	-2.900	0.470
Gillingham	GBR	51.483	0.550	0.355
Glasson Dock	GBR	54.000	-2.833	0.542
Glencripesdale	GBR	56.667	-5.817	0.975
Gosport	GBR	50.800	-1.117	0.580
Granton	GBR	55.983	-3.217	0.615
Great Oakley	GBR	51.900	1.250	0.775
Great Yarmouth	GBR	52.600	1.733	0.822
Grimsby	GBR	53.583	-0.067	0.991
Grovehurst Jetty	GBR	51.367	0.767	0.843
Guernsey	GBR	49.450	-2.533	0.957
Gweek	GBR	50.083	-5.200	0.500

Global Port	Country	Latitude	Longitude	Environmental Distance
Hamble	GBR	50.817	-1.300	0.744
Harwich	GBR	51.950	1.283	0.775
Hastings(GBR)	GBR	50.850	0.583	0.728
Hayle	GBR	50.183	-5.433	0.832
Herne Bay	GBR	51.367	1.117	0.689
Hessle	GBR	53.717	-0.433	0.844
Heysham	GBR	54.033	-2.917	0.700
Hoo	GBR	51.417	0.567	0.714
Hound Point	GBR	56.000	-3.367	0.810
Hull	GBR	53.750	-0.300	0.534
Hunstanton	GBR	52.933	0.500	0.675
Hunterston	GBR	55.750	-4.883	0.817
Ilfracombe	GBR	51.200	-4.117	0.735
Immingham	GBR	53.633	-0.183	0.991
Ince	GBR	53.283	-2.850	0.598
Inchkeith	GBR	56.033	-3.150	0.905
Inverkeithing	GBR	56.033	-3.400	0.812
Ipswich	GBR	52.050	1.167	0.460
Irvine	GBR	55.600	-4.683	0.797
Islay Is.	GBR	55.800	-6.267	0.965
Isle of Grain	GBR	51.433	0.700	0.531
Jersey	GBR	49.183	-2.117	0.915
Killingholme	GBR	53.667	-0.233	0.991
Killyleagh	GBR	54.400	-5.650	0.505
Kingsnorth	GBR	51.417	0.600	0.546
Kirkcaldy	GBR	56.117	-3.150	0.905
Kirkcudbright	GBR	54.833	-4.050	1.016
Kishorn	GBR	57.383	-5.600	0.952
Kylesku	GBR	58.250	-5.017	0.945
Lancaster	GBR	54.000	-2.850	0.542
Largs	GBR	55.800	-4.867	0.922
Leigh	GBR	51.550	0.650	0.683
Leith	GBR	55.983	-3.167	0.880
Littlehampton	GBR	50.800	-0.533	0.755
Liverpool	GBR	53.417	-3.000	0.638
Llanddulas	GBR	53.300	-3.650	0.923
Llanelli	GBR	51.667	-4.167	0.722
Lochinver	GBR	58.150	-5.250	0.891
Lossiemouth	GBR	57.717	-3.283	0.940
Lowestoft	GBR	52.467	1.750	0.807
Lundy Is.	GBR	51.167	-4.650	0.967
Lydney	GBR	51.717	-2.533	0.696
Lymington	GBR	50.767	-1.550	0.745
Macduff	GBR	57.667	-2.500	1.012
Maldon	GBR	51.733	0.667	0.570
Maryport	GBR	54.717	-3.500	0.863
Mevagissey	GBR	50.267	-4.783	0.814
Milford Haven	GBR	51.713	-5.062	0.381
Millom	GBR	54.183	-3.267	0.792
Milton Creek	GBR	51.367	0.767	0.843

Global Port	Country	Latitude	Longitude	Environmental Distance
Mistley	GBR	51.950	1.083	0.450
Mostyn	GBR	53.317	-3.233	0.754
Mullion Cove	GBR	50.017	-5.267	0.840
Nairn	GBR	57.583	-3.867	0.945
New Holland	GBR	53.700	-0.350	0.765
Newhaven	GBR	50.783	0.067	0.736
Newlyn	GBR	50.133	-5.550	0.966
Newport	GBR	51.567	-2.983	0.963
Newport(IOW)	GBR	50.700	-1.283	0.744
North Killingholme	GBR	53.650	-0.233	0.991
Norwich	GBR	52.633	1.283	0.802
Oakham Ness	GBR	51.417	0.650	0.484
Oban	GBR	56.417	-5.483	0.974
Otterham Quay	GBR	51.383	0.633	0.347
Oulton Broad	GBR	52.483	1.733	0.821
Padstow	GBR	50.550	-4.933	0.952
Par	GBR	50.350	-4.700	0.817
Paull	GBR	53.717	-0.217	0.991
Pembroke	GBR	51.693	-4.951	0.471
Penmaenmawr	GBR	53.267	-3.950	0.982
Penryn	GBR	50.167	-5.100	0.440
Penzance	GBR	50.133	-5.533	0.966
Plymouth	GBR	50.367	-4.183	0.794
Poole	GBR	50.717	-1.983	0.862
Port Penrhyn	GBR	53.233	-4.100	1.015
Port Talbot	GBR	51.583	-3.717	0.837
Portavadie	GBR	55.867	-5.300	0.924
Portbury	GBR	51.500	-2.733	0.707
Porthleven	GBR	50.083	-5.317	0.841
Porthmadog	GBR	52.917	-4.133	0.826
Porthoustock Quarry	GBR	50.050	-5.067	0.832
Portishead	GBR	51.483	-2.767	0.707
Portland(GBR)	GBR	50.567	-2.433	0.778
Portrush	GBR	55.217	-6.667	0.904
Portsmouth	GBR	50.800	-1.100	0.580
Queenborough	GBR	51.417	0.733	0.477
Rainham(Kent)	GBR	51.383	0.617	0.347
Ramsgate	GBR	51.333	1.417	0.777
Redbridge	GBR	50.933	-1.467	0.722
Richborough	GBR	51.300	1.350	0.777
Ridham Dock	GBR	51.383	0.767	1.016
Rochford	GBR	51.583	0.733	0.588
Rosyth	GBR	56.017	-3.450	0.868
Rothesay	GBR	55.833	-5.050	0.785
Ryde	GBR	50.733	-1.150	0.741
Rye	GBR	50.933	0.767	0.836
Salcombe	GBR	50.217	-3.783	0.995
Salt End	GBR	53.733	-0.233	1.004
Sark	GBR	49.433	-2.367	0.945
Sharpness	GBR	51.717	-2.483	0.895

Global Port	Country	Latitude	Longitude	Environmental Distance
Sheerness	GBR	51.433	0.733	0.374
Shell Haven	GBR	51.500	0.517	0.355
Shoreham	GBR	50.833	-0.250	0.755
Shotton Wharf	GBR	53.200	-3.033	0.983
Silloth	GBR	54.867	-3.400	0.751
Sittingbourne	GBR	51.350	0.733	1.019
Sizewell	GBR	52.217	1.600	0.793
Snape Bridge	GBR	52.150	1.500	0.793
South Killingholme	GBR	53.633	-0.200	0.991
Southampton	GBR	50.900	-1.400	0.318
Southend	GBR	51.533	0.717	0.684
St. Davids	GBR	56.033	-3.367	0.812
St. Helier	GBR	49.183	-2.117	0.915
St. Ives	GBR	50.217	-5.483	0.832
St. Peter Port	GBR	49.450	-2.533	0.957
Stangate Creek	GBR	51.383	0.700	0.863
Stanlow	GBR	53.283	-2.867	0.598
Strangford	GBR	54.383	-5.600	0.497
Sutton Bridge	GBR	52.767	0.200	0.974
Swansea	GBR	51.617	-3.933	0.692
Teignmouth	GBR	50.550	-3.500	0.777
Thamesport	GBR	51.433	0.700	0.531
Topsham	GBR	50.683	-3.633	1.008
Torquay	GBR	50.450	-3.533	0.781
Totnes	GBR	50.433	-3.683	0.602
Troon	GBR	55.550	-4.683	0.797
Truro	GBR	50.167	-5.033	0.832
Ullapool	GBR	57.900	-5.167	0.928
Walton Bay	GBR	51.467	-2.817	0.707
Walton on the Naze	GBR	51.850	1.267	0.775
Warrenpoint	GBR	54.100	-6.250	0.698
Watchet	GBR	51.183	-3.333	0.720
Wells	GBR	52.967	0.850	0.703
Wemyss Bay	GBR	55.883	-4.883	0.985
Weston Church Wall	GBR	53.317	-2.750	0.846
Weston Point	GBR	53.333	-2.767	0.846
Weymouth	GBR	50.617	-2.450	0.778
Whitehaven	GBR	54.550	-3.583	0.786
Whitstable	GBR	51.367	1.033	0.689
Wigtown	GBR	54.867	-4.433	0.884
Workington	GBR	54.650	-3.567	0.786
Yarmouth(GBR)	GBR	50.700	-1.500	0.744
Yelland	GBR	51.067	-4.150	0.701
Sukhumi	GEO	43.167	41.033	0.710
Jablanac	HRV	44.700	14.867	1.019
Kraljevica	HRV	45.283	14.567	1.001
Makarska	HRV	43.283	17.017	0.963
Maslenica	HRV	44.217	15.533	0.350
Omisalj	HRV	45.217	14.550	1.001
Opatija	HRV	45.333	14.317	0.880

Global Port	Country	Latitude	Longitude	Environmental Distance
Plomin	HRV	45.133	14.200	0.760
Pula	HRV	44.883	13.833	0.983
Rasa	HRV	45.033	14.067	0.843
Rijeka	HRV	45.317	14.433	1.016
Senj	HRV	45.000	14.883	0.978
Sv. Mikula	HRV	44.983	14.083	0.916
Sveti Juraj	HRV	44.933	14.917	0.978
Tar	HRV	45.317	13.600	0.926
Velika Stinica	HRV	44.717	14.867	1.019
Ballylongford	IRL	52.550	-9.467	0.610
Baltimore(IRL)	IRL	51.450	-9.400	1.013
Bantry	IRL	51.700	-9.467	0.581
Buncrana	IRL	55.133	-7.450	0.679
Castletownbere	IRL	51.650	-9.900	0.969
Cobh	IRL	51.850	-8.283	0.522
Cork	IRL	51.900	-8.467	0.766
Courtmacsherry	IRL	51.633	-8.717	0.556
Dingle	IRL	52.133	-10.267	0.914
Drogheda	IRL	53.717	-6.350	0.727
Dundalk	IRL	54.000	-6.383	0.515
Dungarvan	IRL	52.083	-7.600	0.841
Fenit	IRL	52.267	-9.850	0.930
Galway	IRL	53.267	-9.050	0.815
Glandore	IRL	51.567	-9.117	0.682
Glengariff	IRL	51.750	-9.533	0.629
Greenore	IRL	54.033	-6.133	0.646
Kenmare	IRL	51.867	-9.600	0.937
Killala	IRL	54.217	-9.217	0.628
Killybegs	IRL	54.633	-8.433	0.957
Kilrush	IRL	52.633	-9.500	0.644
Kinsale	IRL	51.700	-8.500	0.722
Moneypoint	IRL	52.600	-9.400	0.956
Newport(Co Mayo)	IRL	53.883	-9.550	0.785
Passage West	IRL	51.867	-8.333	0.515
Port Milford	IRL	55.100	-7.700	0.859
Rathmullen	IRL	55.100	-7.533	0.676
Ringaskiddy	IRL	51.833	-8.317	0.517
Skibbereen	IRL	51.550	-9.267	0.937
Skull	IRL	51.517	-9.533	0.889
Sligo	IRL	54.267	-8.467	0.909
Spiddle	IRL	53.250	-9.300	0.851
Tarbert Is.	IRL	52.583	-9.367	0.956
Union Hall	IRL	51.567	-9.133	0.769
Ventry	IRL	52.117	-10.200	0.914
Waterford	IRL	52.117	-6.917	0.856
Westport(IRL)	IRL	53.800	-9.533	0.857
Whiddy Is.	IRL	51.683	-9.533	0.590
Whitegate	IRL	51.833	-8.250	0.547
Youghal	IRL	51.933	-7.833	0.831
Akkeshi	JPN	43.050	144.850	0.926

Global Port	Country	Latitude	Longitude	Environmental Distance
Esashi	JPN	44.933	142.600	0.971
Fukushima	JPN	41.467	140.267	1.005
Hachinohe	JPN	40.533	141.533	0.689
Hakodate	JPN	41.783	140.717	0.993
Hirono	JPN	37.233	141.017	0.745
Ishikari	JPN	43.250	141.350	0.631
Ishikariwan Shinko	JPN	43.217	141.300	1.019
Kamaishi	JPN	39.267	141.900	0.982
Kawauchi	JPN	41.167	141.000	0.654
Kuji	JPN	40.167	141.783	0.654
Kushiro	JPN	42.983	144.367	0.948
Mashike	JPN	43.867	141.517	0.999
Miyako	JPN	39.633	141.967	0.963
Mori	JPN	42.117	140.583	0.943
Muroran	JPN	42.350	140.950	0.932
Mutsu Ogawara	JPN	40.950	141.417	0.719
Ofunato	JPN	38.983	141.750	0.733
Okuma	JPN	37.383	140.983	0.744
Ominato	JPN	41.233	141.183	0.957
Otaru	JPN	43.200	141.017	1.011
Otsuchi	JPN	39.350	141.900	0.969
Rumoi	JPN	43.950	141.633	0.999
Sekinehama	JPN	41.367	141.217	0.936
Shiriya	JPN	41.400	141.467	0.647
Shizuura	JPN	41.483	140.017	0.987
Tamagawa	JPN	40.083	141.833	0.654
Tomakomai	JPN	42.633	141.633	0.935
Tomioka	JPN	37.333	141.000	0.744
Wakkanai	JPN	45.417	141.700	0.732
Wanishi	JPN	42.333	141.000	0.690
Yoichi	JPN	43.217	140.783	1.011
Boryeong	KOR	36.330	126.511	0.979
Daesan	KOR	37.017	126.417	0.949
Dangjin	KOR	36.982	126.794	0.946
Gojeong	KOR	36.300	126.450	0.993
Incheon	KOR	37.467	126.600	0.934
Inchon	KOR	37.445	126.581	0.873
Pyeong Taek	KOR	36.993	126.792	0.955
Sokcho	KOR	38.233	128.550	0.934
Yeonpyung	KOR	37.600	125.717	0.915
Bijela	MTG	42.450	18.667	0.917
Hercegnovi	MTG	42.450	18.533	0.908
Kotor	MTG	42.417	18.767	1.011
Lipci	MTG	42.483	18.667	0.965
Risan	MTG	42.517	18.700	0.580
Tivat	MTG	42.433	18.700	0.764
Zelenika	MTG	42.450	18.583	0.899
Aalsmeer	NLD	52.250	4.750	0.583
Akkrum	NLD	53.050	5.833	0.888
Alkmaar	NLD	52.633	4.717	0.295

Global Port	Country	Latitude	Longitude	Environmental Distance
Almelo	NLD	52.367	6.633	0.403
Almere-Haven	NLD	52.333	5.217	0.360
Alphen aan den Rijn	NLD	52.133	4.633	0.426
Ameland	NLD	53.450	5.633	0.579
Appingedam	NLD	53.317	6.850	0.433
Balk	NLD	52.900	5.567	0.401
Beverwijk	NLD	52.483	4.633	0.629
Borssele	NLD	51.417	3.733	0.491
Breskens	NLD	51.400	3.567	0.557
Buitenhuizen	NLD	52.433	4.717	0.939
Delft	NLD	52.017	4.367	0.349
Delfzijl	NLD	53.333	6.933	0.558
Den Helder	NLD	52.967	4.783	0.522
Den Oever	NLD	52.917	5.017	0.482
Deventer	NLD	52.250	6.150	0.379
Doesburg	NLD	52.017	6.133	0.372
Doetinchem	NLD	51.967	6.283	0.356
Domburg	NLD	51.567	3.500	0.612
Eemshaven	NLD	53.450	6.833	0.558
Europoort	NLD	51.950	4.083	0.500
Farmsum	NLD	53.317	6.933	0.558
Flushing	NLD	51.450	3.583	0.557
Flushing East	NLD	51.450	3.667	0.380
Foxhol	NLD	53.167	6.717	0.746
Franeker	NLD	53.183	5.550	0.445
Gouda	NLD	52.017	4.700	0.742
Groningen	NLD	53.233	6.533	0.918
Haarlem	NLD	52.383	4.650	0.819
Halfweg	NLD	52.383	4.750	0.252
Harlingen	NLD	53.183	5.417	0.531
Hasselt	NLD	52.583	6.083	0.410
Heemstede	NLD	52.350	4.600	0.236
Hengelo	NLD	52.267	6.767	0.393
Hillegom	NLD	52.300	4.583	0.236
Hoogezand	NLD	53.167	6.750	0.752
Hook of Holland	NLD	51.983	4.117	0.510
Kaag	NLD	52.200	4.533	0.242
Kampen	NLD	52.583	5.800	0.399
Katwijk aan Zee	NLD	52.200	4.400	0.470
Koog aan den Zaan	NLD	52.450	4.817	0.804
Kootstertille	NLD	53.217	6.083	0.745
Lauwersoog	NLD	53.400	6.217	0.388
Leeuwarden	NLD	53.200	5.783	0.729
Leiden	NLD	52.150	4.467	0.248
Leiderdorp	NLD	52.133	4.517	0.242
Lelystad	NLD	52.500	5.433	0.345
Lemmer	NLD	52.850	5.683	0.428
Lisserbroek	NLD	52.267	4.567	0.236
Lochem	NLD	52.167	6.417	0.371
Loppersum	NLD	53.317	6.733	0.530

Global Port	Country	Latitude	Longitude	Environmental Distance
Maarssen	NLD	52.167	5.167	0.613
Makkum	NLD	53.067	5.400	0.531
Meppel	NLD	52.700	6.200	0.427
Middelburg	NLD	51.500	3.617	0.356
Midwolda	NLD	53.183	6.983	0.492
Monnickendam	NLD	52.467	5.033	0.360
Muiden	NLD	52.317	5.067	0.361
Nijkerk	NLD	52.217	5.483	0.362
Odijk	NLD	52.033	5.217	1.006
Oostmahorn	NLD	53.383	6.167	0.377
Oostvoorne	NLD	51.917	4.083	0.500
Pijnacker	NLD	52.000	4.417	0.349
Sas van Goes	NLD	51.500	3.900	0.858
Schagen	NLD	52.783	4.785	0.266
Scheveningen	NLD	52.100	4.267	0.470
Schiermonnikoog	NLD	53.483	6.150	0.590
'sGravenhage	NLD	52.083	4.300	0.470
Siddeburen	NLD	53.250	6.867	0.475
Sneek	NLD	53.033	5.667	0.445
Spaarndam	NLD	52.417	4.683	0.198
Staveren	NLD	52.867	5.350	0.452
Steenwijk	NLD	52.783	6.117	0.423
Stellendam	NLD	51.800	4.017	1.006
Stroobos	NLD	53.233	6.217	0.721
Terneuzen	NLD	51.333	3.817	0.795
Terschelling	NLD	53.367	5.217	0.615
Texel	NLD	53.183	4.850	0.593
Uithoorn	NLD	52.233	4.833	0.583
Urk	NLD	52.667	5.600	0.369
Utrecht	NLD	52.083	5.117	0.768
Velsen	NLD	52.467	4.633	0.614
Vlissingen	NLD	52.450	4.583	0.804
Wagenborgen	NLD	53.250	6.933	0.472
Warmond	NLD	52.183	4.483	0.242
Waterhuizen	NLD	53.183	6.633	0.778
Wemeldinge	NLD	51.517	4.000	0.987
West Graftdijk	NLD	52.550	4.783	0.344
Westerbroek	NLD	53.183	6.683	0.778
Westzaan	NLD	52.450	4.783	0.804
Winschoten	NLD	53.133	7.017	0.488
Wognum	NLD	52.067	5.017	0.768
Workum	NLD	52.983	5.433	0.487
Wormerveer	NLD	52.467	4.783	0.940
Woubrugge	NLD	52.167	4.633	0.426
Woudsend	NLD	52.933	5.617	0.401
Yerseke	NLD	51.500	4.050	0.985
Ymuiden	NLD	52.450	4.583	0.463
Zaandam	NLD	52.433	4.833	0.804
Zandvoort	NLD	52.367	4.533	0.463
Zeist	NLD	52.083	5.233	1.006

Global Port	Country	Latitude	Longitude	Environmental Distance
Zoutkamp	NLD	53.333	6.300	0.681
Zuidbroek	NLD	53.167	6.867	0.648
Zutphen	NLD	52.133	6.200	0.370
Zwartsluis	NLD	52.633	6.067	0.410
Zwolle	NLD	52.517	6.117	0.410
Aalefjaer	NOR	58.233	8.033	0.969
Abelsnes	NOR	58.233	6.650	1.006
Agnefest	NOR	58.117	7.050	0.942
Arendal	NOR	58.467	8.767	0.648
Asvall	NOR	59.017	9.600	0.873
Austevoll	NOR	60.100	5.250	0.919
Avaldsnes	NOR	59.350	5.267	0.743
Bamble	NOR	59.017	9.667	0.873
Bokn	NOR	59.217	5.450	1.006
Borg Hbr.	NOR	59.200	10.950	0.717
Drammen	NOR	59.733	10.233	0.852
Drobak	NOR	59.650	10.633	0.825
Egersund	NOR	58.450	6.000	0.718
Elnesvagen	NOR	62.850	7.150	0.954
Engene	NOR	59.683	10.550	0.774
Espevik	NOR	59.333	5.683	0.951
Eydehamn	NOR	58.500	8.883	0.643
Fagerstrand	NOR	59.733	10.600	0.774
Farsund	NOR	58.100	6.817	0.963
Fonnes	NOR	60.800	4.983	0.894
Foresvik	NOR	59.217	5.433	1.006
Fosen	NOR	59.317	5.367	0.788
Fredrikstad	NOR	59.200	10.967	0.717
Gjevingstangholmen	NOR	58.650	9.133	0.710
Greaker	NOR	59.267	11.033	0.724
Grimstad	NOR	58.333	8.600	0.734
Gronsfjord	NOR	58.017	7.033	0.810
Haavik	NOR	59.317	5.317	0.764
Halden	NOR	59.117	11.367	0.740
Halsvik	NOR	60.833	5.083	0.947
Halvorshavn	NOR	59.583	10.617	0.825
Haugesund	NOR	59.417	5.267	0.742
Helvig	NOR	58.100	6.750	0.963
Holm	NOR	59.100	11.383	0.740
Holmestrand	NOR	59.533	10.267	0.822
Horten	NOR	59.417	10.500	0.732
Hurum	NOR	59.617	10.450	0.805
Jelsa	NOR	59.333	6.033	0.955
Kaarsto	NOR	59.267	5.533	0.827
Kambo	NOR	59.483	10.700	0.735
Kilsund	NOR	58.550	8.983	0.710
Kopervik	NOR	59.283	5.300	0.814
Kragero	NOR	58.867	9.417	0.761
Kristiansand	NOR	58.150	8.000	0.778
Langesund	NOR	59.000	9.750	0.802

Global Port	Country	Latitude	Longitude	Environmental Distance
Larkollen	NOR	59.317	10.683	0.701
Larvik	NOR	59.050	10.033	0.715
Lillesand	NOR	58.250	8.383	0.758
Lindesnes	NOR	57.983	7.050	0.786
Lysaker	NOR	59.917	10.633	0.852
Magero	NOR	59.150	10.433	0.730
Mandal	NOR	58.033	7.467	0.845
Melsomvik	NOR	59.217	10.350	0.730
Mongstad	NOR	60.817	5.033	0.971
Moss	NOR	59.433	10.667	0.742
Oslo	NOR	59.900	10.717	0.828
Rafnes	NOR	59.100	9.600	0.938
Randaberg	NOR	59.000	5.633	0.986
Risor	NOR	58.717	9.233	0.728
Rosfjord	NOR	58.050	6.983	0.850
Ryvingen	NOR	57.967	7.500	0.862
Saetrepollen	NOR	59.683	10.533	0.774
Sande	NOR	59.583	10.250	0.822
Sandefjord	NOR	59.133	10.233	0.730
Sarpsborg	NOR	59.267	11.100	0.724
Skudeneshavn	NOR	59.133	5.267	1.006
Slagen	NOR	59.317	10.533	0.742
Slemmestad	NOR	59.783	10.500	0.838
Sogne	NOR	58.083	7.783	0.812
Sola	NOR	58.917	5.567	0.872
Solumstrand	NOR	59.717	10.283	0.852
Sondeled	NOR	58.717	9.200	0.710
Stavanger	NOR	58.967	5.733	0.870
Storasund	NOR	59.383	5.267	0.742
Svelvik	NOR	59.617	10.417	0.805
Tau	NOR	59.067	5.933	0.967
Telavag	NOR	60.250	5.000	0.801
Tofte	NOR	59.550	10.583	0.825
Tonsberg	NOR	59.267	10.417	0.665
Tvedestrand	NOR	58.633	8.933	0.744
Valloy	NOR	59.267	10.500	0.666
Vats	NOR	59.483	5.750	1.018
Vigsnes	NOR	59.400	5.133	1.019
Christchurch	NZL	-43.550	172.667	0.415
Dunedin	NZL	-45.883	170.517	0.704
Lyttelton	NZL	-43.617	172.717	0.502
New Plymouth	NZL	-39.067	174.083	0.979
Opua	NZL	-35.300	174.133	0.985
Picton(NZL)	NZL	-41.267	174.000	0.800
Port Chalmers	NZL	-45.817	170.617	0.648
Tarakohe	NZL	-40.850	172.900	0.830
Timaru	NZL	-44.383	171.250	1.010
Wanganui	NZL	-39.950	175.000	0.947
Kosong(PRK)	PRK	38.600	128.350	0.938
Rajin	PRK	42.183	130.317	0.908

Global Port	Country	Latitude	Longitude	Environmental Distance
Agigea	ROM	44.083	28.617	0.916
Cernavoda	ROM	44.350	28.033	0.960
Constantza	ROM	44.167	28.650	0.916
Luminitza	ROM	44.350	28.633	0.928
Sulina	ROM	45.150	29.650	0.955
Anapa	RUS	44.883	37.300	1.002
Gelendzhik	RUS	44.567	38.117	0.882
Khasan	RUS	42.467	130.800	0.965
Novorossiysk	RUS	44.733	37.783	0.907
Sochi	RUS	43.583	39.733	0.977
Sovetskaya Gavan	RUS	49.033	140.333	0.932
Tuapse	RUS	44.083	39.067	0.938
Vanino	RUS	49.083	140.267	0.932
Yasnomorskiy	RUS	46.750	141.900	0.870
Agnesberg	SWE	57.783	12.000	0.564
Angelholm	SWE	56.250	12.867	0.752
Backviken	SWE	55.900	12.717	0.989
Bastad	SWE	56.417	12.833	0.806
Bohus	SWE	57.850	12.033	0.622
Brofjorden	SWE	58.333	11.383	0.507
Donso	SWE	57.583	11.800	0.513
Edshultshall	SWE	58.117	11.467	0.674
Falkenberg	SWE	56.883	12.500	0.730
Fjallbacka	SWE	58.600	11.283	0.578
Gota(SWE)	SWE	58.100	12.150	0.660
Gothenburg	SWE	57.700	11.950	0.564
Grebbestad	SWE	58.683	11.250	0.621
Gustavsberg	SWE	58.333	11.900	0.624
Halmstad	SWE	56.667	12.850	0.751
Helsingborg	SWE	56.050	12.683	0.836
Henan	SWE	58.233	11.667	0.560
Hoganas	SWE	56.200	12.550	0.763
Hunnebostrand	SWE	58.433	11.300	0.548
Klagshamn	SWE	55.517	12.883	0.957
Kopparverkshamn	SWE	56.017	12.717	0.836
Kungsbacka	SWE	57.483	12.083	0.516
Kungshamn	SWE	58.367	11.233	0.548
Landskrona	SWE	55.867	12.833	0.829
Lilla Edet	SWE	58.117	12.117	0.660
Limhamn	SWE	55.583	12.933	0.980
Lodose	SWE	58.033	12.150	0.660
Lomma	SWE	55.683	13.067	0.850
Lysekil	SWE	58.267	11.433	0.507
Malmo	SWE	55.617	13.000	0.833
Marstrand	SWE	57.883	11.583	0.657
Mossholmen	SWE	57.950	11.567	0.657
Munkedalhamn	SWE	58.433	11.667	0.585
Nol	SWE	57.933	12.133	0.622
Ockero	SWE	57.717	11.633	0.648
Raa	SWE	55.983	12.750	0.829

Global Port	Country	Latitude	Longitude	Environmental Distance
Ramsvik	SWE	58.433	11.267	0.548
Ronnang	SWE	58.083	11.667	0.530
Roro	SWE	57.767	11.617	0.660
Ryxo	SWE	58.367	11.433	0.568
Skarhamn	SWE	57.983	11.550	0.522
Skredsvik	SWE	58.383	11.650	0.585
Smogen	SWE	58.350	11.233	0.548
Stallbacka	SWE	58.300	12.300	0.672
Stensjo	SWE	58.400	11.400	0.568
Stenungsund	SWE	58.083	11.817	0.549
Stromstad	SWE	58.933	11.167	0.716
Surte	SWE	57.833	12.017	0.601
Traslovslage	SWE	57.050	12.267	0.629
Trollhattan	SWE	58.283	12.283	0.672
Uddevalla	SWE	58.350	11.917	0.674
Vanersborg	SWE	58.383	12.333	0.689
Varberg	SWE	57.100	12.250	0.629
Vargon	SWE	58.350	12.383	0.695
Vasterlanda	SWE	58.100	12.117	0.660
Wallhamn	SWE	58.000	11.700	0.547
Bekdash	TKM	41.533	52.600	0.988
Amasra	TUR	41.750	32.383	0.954
Ambarli	TUR	40.967	28.700	0.857
Ayancik	TUR	41.917	34.367	0.758
Bandirma	TUR	40.350	27.967	0.924
Bartin	TUR	41.633	32.333	0.850
Beykoz	TUR	41.133	29.083	1.017
Buyukdere	TUR	41.183	29.050	0.972
Cekmece	TUR	40.983	28.550	0.955
Cide	TUR	41.883	32.917	0.779
Darica	TUR	40.750	29.383	0.978
Derince	TUR	40.750	29.817	0.846
Diliskelesi	TUR	40.767	29.533	0.896
Edincik	TUR	40.350	27.867	0.924
Erdek	TUR	40.400	27.783	0.787
Eregli	TUR	41.300	31.450	0.907
Eregli(Sea of Marmara)	TUR	40.967	27.967	0.873
Fatsa	TUR	41.033	37.383	1.017
Gebze	TUR	40.767	29.433	0.978
Gemlik	TUR	40.433	29.150	0.891
Giresun	TUR	40.917	38.383	0.952
Golcuk	TUR	40.717	29.800	0.846
Haydarpasa	TUR	41.000	29.017	1.015
Hereke	TUR	40.700	29.617	0.896
Igneada	TUR	41.833	28.017	0.869
Igsas	TUR	40.750	29.750	0.846
Inebolu	TUR	41.983	33.750	0.845
Istanbul	TUR	41.000	28.967	0.956
Izmit	TUR	40.767	29.917	1.018
Karabiga	TUR	40.400	27.300	1.005

Global Port	Country	Latitude	Longitude	Environmental Distance
Karacabey	TUR	40.233	28.367	0.971
Kartal	TUR	40.883	29.183	0.945
Kiyikoy	TUR	41.633	28.117	0.865
Kumport	TUR	40.967	28.683	0.857
Kurucasile	TUR	41.833	32.700	0.939
Maltepe	TUR	40.900	29.150	1.015
Marport	TUR	40.967	28.667	0.857
Mudanya	TUR	40.450	28.867	0.907
Pazar	TUR	41.200	40.867	0.828
Pendik	TUR	40.900	29.250	0.945
Podima	TUR	41.483	28.283	0.867
Saraylar	TUR	40.650	27.667	0.902
Selvi Burnu	TUR	41.150	29.067	1.017
Sile	TUR	41.167	29.617	0.975
Silivri	TUR	41.050	28.267	0.897
Sinop	TUR	42.000	35.150	0.906
Surmene	TUR	40.933	40.167	0.934
Tavsancil	TUR	40.783	29.583	0.896
Tekirdag	TUR	40.950	27.500	0.884
Tutunciftlik	TUR	40.750	29.783	0.846
Tuzla	TUR	40.809	29.348	0.978
Unye	TUR	41.133	37.300	1.017
Uskudar	TUR	41.017	29.017	0.893
Yalova	TUR	40.667	29.250	0.811
Yarimca	TUR	40.733	29.767	0.846
Yenikoy	TUR	40.733	29.900	1.018
Zeytinburnu	TUR	40.750	29.767	0.846
Zonguldak	TUR	41.450	31.783	0.738
Belgorod-Dnestrovskiy	UKR	46.183	30.350	0.970
Chernomorsk	UKR	45.500	32.667	0.804
Dneprobugskiy	UKR	46.750	31.917	0.944
Ilichevsk	UKR	46.300	30.650	0.959
Izmail	UKR	45.333	28.850	0.955
Kherson	UKR	46.617	32.600	0.950
Kiliya	UKR	45.433	29.267	0.961
Nikolayev	UKR	46.967	31.967	0.990
Ochakov	UKR	46.600	31.550	0.933
Odessa	UKR	46.483	30.750	0.960
Oktyabrsk	UKR	46.833	31.950	0.944
Sevastopol	UKR	44.617	33.367	0.832
Skadovsk	UKR	46.100	32.917	0.846
Ust-Dunaysk	UKR	45.467	29.833	0.833
Vilkovo	UKR	45.400	29.600	0.956
Yalta	UKR	44.500	34.167	0.670
Yevpatoriya	UKR	45.183	33.383	0.769
Yuzhnyy	UKR	46.600	31.017	0.958
La Paloma	URY	-34.650	-54.150	0.715
Astoria	USA	46.183	-123.833	0.527
Bar Hbr.	USA	44.383	-68.200	0.928
Bayway	USA	40.630	-74.200	0.528

Global Port	Country	Latitude	Longitude	Environmental Distance
Bellingham	USA	48.750	-122.500	0.236
Block Is.	USA	41.233	-71.583	0.864
Boothbay	USA	43.833	-69.650	0.917
Brayton Point	USA	41.700	-71.200	1.010
Bridgeport	USA	41.150	-73.183	0.563
Bristol(USA)	USA	41.667	-71.267	0.967
Camden(ME USA)	USA	44.217	-69.067	0.924
Cherry Point	USA	48.867	-122.750	0.217
City Is.	USA	40.850	-73.783	1.009
Clinton	USA	41.267	-72.533	0.862
Coos Bay	USA	43.383	-124.200	0.799
Davisville	USA	41.617	-71.400	0.845
East Boothbay	USA	43.850	-69.583	0.896
Edmonds	USA	47.817	-122.367	0.317
Everett(WA)	USA	47.983	-122.217	0.292
Ferndale	USA	48.833	-122.717	0.285
Gloucester(MA USA)	USA	42.617	-70.667	0.635
Grays Harbor	USA	46.933	-124.060	0.935
Greenport	USA	41.100	-72.350	0.548
Hingham	USA	42.233	-70.883	0.799
Jamestown(RI USA)	USA	41.500	-71.367	0.870
Jonesport	USA	44.550	-67.617	0.964
Ketchikan	USA	55.350	-131.650	0.989
Klawock	USA	55.550	-133.100	0.983
Longview	USA	46.133	-122.933	0.267
Mamaroneck	USA	40.933	-73.733	0.684
Melville	USA	41.583	-71.283	0.849
Morro Bay	USA	35.367	-120.850	0.961
Moss Landing	USA	36.800	-121.783	0.964
Mukilteo	USA	47.950	-122.300	0.292
Nantucket Is.	USA	41.283	-70.100	0.573
New Bedford	USA	41.633	-70.917	0.564
New Haven	USA	41.250	-72.900	0.875
Newport(RI)	USA	41.483	-71.333	0.870
Northeast Hbr.(USA)	USA	44.300	-68.283	0.899
Northport	USA	40.933	-73.367	0.917
Northville	USA	40.983	-72.650	0.565
Oyster Bay	USA	40.883	-73.517	0.971
Patchogue	USA	40.767	-73.017	0.949
Perth Amboy	USA	40.504	-74.273	0.534
Plymouth(MA USA)	USA	41.950	-70.667	0.570
Point Judith	USA	41.367	-71.483	0.604
Point Wells	USA	47.783	-122.400	0.317
Port Angeles	USA	48.133	-123.417	0.462
Port Chester	USA	40.983	-73.650	0.971
Port Gamble	USA	47.867	-122.583	0.318
Port Townsend	USA	48.117	-122.750	0.347
Portland(ME USA)	USA	43.650	-70.233	0.775
Portsmouth(NH USA)	USA	43.067	-70.700	0.780
Portsmouth(RI USA)	USA	41.600	-71.233	0.841

Global Port	Country	Latitude	Longitude	Environmental Distance
Provincetown	USA	42.050	-70.183	0.655
Longview	USA	46.083	-122.933	0.267
Riverhead	USA	40.917	-72.667	0.559
Rockland	USA	44.100	-69.117	0.910
Sag Hbr.	USA	41.017	-72.300	0.568
Salem(MA USA)	USA	42.517	-70.883	0.937
Sandwich(USA)	USA	41.767	-70.483	0.561
Seattle	USA	47.633	-122.333	0.332
Sesuit Hbr.	USA	41.750	-70.150	0.589
South Bristol	USA	43.850	-69.550	0.896
Sparrow's Point	USA	39.200	-76.467	0.654
Stamford	USA	41.017	-73.533	0.911
Tacoma	USA	47.250	-122.417	0.277
Tiverton(USA)	USA	41.633	-71.200	0.908
Virginia Beach	USA	36.850	-75.950	0.949
Westport(WA USA)	USA	46.883	-124.100	0.476
Wildwood	USA	38.967	-74.817	0.697
Willapa	USA	46.733	-124.067	0.523
Woods Hole	USA	41.517	-70.667	0.886
Yarmouth(USA)	USA	43.800	-70.200	0.958

Appendix D. List of global ports that have highest environmental similarity to Prince Rupert. NIS originating from these ports have the highest potential for survival if introduced at Prince Rupert.

Global Port	Country	Latitude	Longitude	Environmental Distance
Caleta Olivia	ARG	-46.433	-67.517	0.631
Caleta Paula	ARG	-46.470	-67.500	0.631
Comodoro Rivadavia	ARG	-45.857	-67.482	0.616
Puerto Deseado	ARG	-47.750	-65.894	0.778
Punta Loyola	ARG	-51.600	-69.017	0.716
Punta Quilla	ARG	-50.118	-68.413	0.436
Rio Gallegos	ARG	-51.617	-69.221	0.704
Rio Grande(ARG)	ARG	-53.793	-67.704	0.894
San Julian	ARG	-49.250	-67.667	0.620
Santa Cruz(ARG)	ARG	-50.133	-68.383	0.436
Ushuaia	ARG	-54.802	-68.226	0.900
Ulverstone	AUS	-41.233	146.167	1.015
Nieuwpoort	BEL	51.134	2.748	0.787
Ostend	BEL	51.230	2.923	0.685
Wielingen	BEL	51.383	3.383	0.852
Zandvoorde	BEL	51.217	2.967	0.794
Zeebrugge	BEL	51.323	3.216	0.616
Argentia	CAN	47.300	-53.983	0.705
Aulds Cove	CAN	45.650	-61.433	0.892
Baie Verte	CAN	49.933	-56.200	0.985
Bamberton	CAN	48.583	-123.517	0.471
Bay Bulls	CAN	47.300	-52.733	0.867
Bay de Verde	CAN	48.083	-52.900	0.868
Bay Roberts	CAN	47.567	-53.217	0.628
Beaver Cove	CAN	50.533	-126.850	0.740
Beaver Hbr.	CAN	44.867	-62.400	0.731
Belle Hbr.	CAN	47.667	-55.333	0.646
Belledune	CAN	47.917	-65.850	0.549
Belleoram	CAN	47.517	-55.417	0.646
Bic	CAN	48.367	-68.750	0.924
Black Cape	CAN	48.117	-65.817	0.945
Bonaventure	CAN	48.283	-53.433	0.606
Bonavista	CAN	48.650	-53.117	0.849
Bridgewater(CAN)	CAN	44.367	-64.500	0.425
Bull Arm	CAN	47.767	-53.800	0.538
Burgeo	CAN	47.600	-57.617	0.577
Burin	CAN	47.033	-55.167	0.720
Burlington(NF)	CAN	49.767	-56.017	0.757
Butchers Cove	CAN	48.833	-54.000	0.697
Campbell River	CAN	50.033	-125.233	0.400
Campbellton	CAN	48.017	-66.667	0.941
Canaport	CAN	45.270	-66.050	0.628
Canso Hbr.	CAN	45.333	-61.000	0.588
Cap aux Meules	CAN	47.383	-61.867	0.673
Cape Tormentine	CAN	46.100	-63.767	0.790
Caraquet	CAN	47.800	-65.017	0.497
Carbonear	CAN	47.733	-53.233	0.597
Carleton	CAN	48.100	-66.133	0.947
Carmanville	CAN	49.400	-54.283	0.750
Cartwright	CAN	53.700	-57.017	0.863
Catalina	CAN	48.517	-53.067	0.847
Chandler	CAN	48.350	-64.667	0.839
Charlottetown(CAN)	CAN	46.217	-63.117	0.746
Chemainus	CAN	48.917	-123.700	0.433

Global Port	Country	Latitude	Longitude	Environmental Distance
Cheticamp	CAN	46.633	-61.017	0.887
Chevery Harbour	CAN	50.454	-59.621	0.823
Clarks Hbr.	CAN	43.417	-65.633	0.405
Cole Hbr.	CAN	45.250	-61.283	0.742
Come by Chance	CAN	47.800	-54.017	0.610
Comox	CAN	49.667	-124.917	0.386
Constance Bank	CAN	48.350	-123.367	0.489
Cowichan Bay	CAN	48.750	-123.600	0.433
Crofton	CAN	48.867	-123.633	0.433
Dalhousie	CAN	48.067	-66.367	0.976
Digby	CAN	44.633	-65.750	0.885
Dildo	CAN	47.567	-53.567	0.656
Dingwall(CAN)	CAN	46.900	-60.450	0.678
Duncan Bay	CAN	50.083	-125.283	0.703
Eastern Passage	CAN	44.600	-63.483	0.827
Englee Hbr.	CAN	50.717	-56.117	0.933
Englewood	CAN	50.533	-126.867	0.740
Esquimalt	CAN	48.433	-123.433	0.489
Fishing East	CAN	44.450	-58.783	0.330
Forestville	CAN	48.800	-69.067	0.964
Fortune	CAN	47.067	-55.833	0.695
Fraser River Port	CAN	49.200	-122.917	0.922
Gaspe	CAN	48.833	-64.483	0.839
Georgetown(CAN)	CAN	46.183	-62.533	0.987
Glace Bay	CAN	46.200	-59.950	0.632
Grand Bank	CAN	47.100	-55.750	0.552
Grindstone	CAN	47.383	-61.850	0.673
Halifax	CAN	44.633	-63.550	0.963
Harbour Breton	CAN	47.483	-55.800	0.560
Harbour Grace	CAN	47.683	-53.217	0.628
Harmac	CAN	49.133	-123.850	0.466
Havre St. Pierre	CAN	50.233	-63.600	0.769
Hawkes Bay	CAN	50.617	-57.167	0.779
Hibernia Platform	CAN	46.751	-48.794	0.853
Holyrood	CAN	47.400	-53.133	0.620
Jedway	CAN	52.300	-131.217	0.386
La Have	CAN	44.283	-64.350	0.425
Ladysmith	CAN	48.983	-123.783	0.443
L'Anse-au-Loup	CAN	51.517	-56.833	0.913
Les Mechins	CAN	49.017	-66.983	0.904
Lewisporte	CAN	49.250	-55.050	0.869
Liscomb	CAN	45.000	-62.000	0.700
Long Hbr.	CAN	47.450	-53.817	0.705
Long Pond	CAN	47.517	-52.967	0.797
Louisburg	CAN	45.917	-59.967	0.673
Lower Cove	CAN	48.517	-59.100	0.627
Lower Island Cove	CAN	48.000	-52.983	0.867
Lunenburg	CAN	44.367	-64.300	0.425
Main Brook	CAN	51.183	-56.017	0.754
Margaretsville	CAN	45.050	-65.067	0.450
Marystown	CAN	47.167	-55.150	0.720
Masset	CAN	54.000	-132.150	0.426
Matane	CAN	48.850	-67.533	1.009
Meteghan	CAN	44.200	-66.167	0.598
Mont Louis	CAN	49.233	-65.733	0.761
Montague	CAN	46.167	-62.633	1.009

Global Port	Country	Latitude	Longitude	Environmental Distance
Mulgrave	CAN	45.583	-61.383	0.892
Nanaimo	CAN	49.167	-123.933	0.466
New Hbr.	CAN	44.467	-64.083	0.426
New Mills	CAN	47.950	-66.167	0.974
North Sydney	CAN	46.200	-60.250	0.999
Nova Scotia Power Corporation Wharf	CAN	45.582	-61.352	0.614
Parrsboro	CAN	45.383	-64.333	0.846
Paspebiac	CAN	48.033	-65.233	0.905
Perce	CAN	48.500	-64.217	0.581
Pictou	CAN	45.683	-62.717	1.011
Plumper Sound	CAN	48.767	-123.200	0.394
Point Tupper	CAN	45.600	-61.367	0.892
Pointe Noire(CAN)	CAN	50.167	-66.467	0.827
Port aux Basques	CAN	47.567	-59.117	0.587
Port Cartier	CAN	50.017	-66.867	0.880
Port de Grave	CAN	47.600	-53.200	0.628
Port Edward	CAN	54.233	-130.300	0.054
Port Hardy	CAN	50.717	-127.483	0.609
Port Hastings	CAN	45.650	-61.400	0.892
Port Hawkesbury	CAN	45.617	-61.350	0.892
Port McNeill	CAN	50.600	-127.083	0.669
Port Mellon	CAN	49.517	-123.483	0.512
Port Menier	CAN	49.817	-64.350	0.758
Port Saunders	CAN	50.633	-57.300	0.863
Port Simpson	CAN	54.583	-130.417	0.450
Port Union	CAN	48.500	-53.083	0.847
Powell River	CAN	49.867	-124.550	0.744
Prince Rupert	CAN	54.317	-130.367	0.000
Pugwash	CAN	45.867	-63.667	0.655
Ramea Is.	CAN	47.517	-57.417	0.627
Richmond(CAN)	CAN	49.150	-123.167	0.823
Riverport	CAN	44.283	-64.333	0.425
Roberts Bank	CAN	49.017	-123.133	0.768
Saint John(CAN)	CAN	45.267	-66.067	0.791
Sechelt	CAN	49.467	-123.750	0.854
Seven Islands (Sept-Iles)	CAN	50.100	-66.383	0.827
Shediac	CAN	46.233	-64.533	0.767
Sheet Hbr.	CAN	44.850	-62.450	0.731
Shelburne	CAN	43.667	-65.317	0.341
Ship Harbour	CAN	44.750	-62.750	0.771
Shippegan	CAN	47.750	-64.700	0.532
Sidney	CAN	48.650	-123.383	0.435
Souris	CAN	46.350	-62.250	0.746
Springdale	CAN	49.500	-56.067	0.803
Squamish	CAN	49.683	-123.167	0.536
St Lawrence Seaway (Not a port)	CAN	47.632	-70.402	0.912
St. Augustin	CAN	51.222	-58.645	0.823
St. Barbe Hbr.	CAN	51.200	-56.767	0.723
St. George's Hbr.(CAN)	CAN	48.450	-58.483	0.677
St. Jean	CAN	48.250	-70.183	1.011
St. John's(CAN)	CAN	47.563	-52.711	0.830
Stephenville	CAN	48.517	-58.533	0.692
Strait of Canso	CAN	45.333	-61.000	0.615
Tasu Bay	CAN	52.767	-132.050	0.219
Tiverton(CAN)	CAN	44.400	-66.217	0.735
Tofino	CAN	49.133	-125.900	0.528

Global Port	Country	Latitude	Longitude	Environmental Distance
Tommy's Arm	CAN	49.433	-55.783	0.937
Turf Point	CAN	48.433	-58.467	0.677
Twillingate	CAN	49.683	-54.750	0.918
Ucluelet	CAN	48.917	-125.567	0.561
Union Bay	CAN	49.583	-124.867	0.386
Valleyfield Harbour (Newfoundland)	CAN	49.121	-53.608	0.715
Vancouver(CAN)	CAN	49.283	-123.117	0.920
Victoria(CAN)	CAN	48.417	-123.383	0.489
Wabana	CAN	47.633	-52.917	0.797
Walton(CAN)	CAN	45.233	-64.017	0.943
Whiffen Head	CAN	47.767	-54.017	0.610
White Rose Oil Field harbour	CAN	46.789	-48.015	0.755
Witless Bay	CAN	47.283	-52.767	0.867
Woodfibre	CAN	49.667	-123.250	0.544
Yarmouth(CAN)	CAN	43.833	-66.117	0.601
Ancud	CHL	-41.867	-73.833	0.712
Cabo Negro	CHL	-52.950	-70.783	0.326
Calbuco	CHL	-41.750	-73.150	0.806
Caleta Clarencia	CHL	-52.900	-70.150	0.276
Castro	CHL	-42.483	-73.767	0.678
Chacabuco	CHL	-45.467	-72.833	0.272
Chaiten	CHL	-42.917	-72.717	0.522
Chonchi	CHL	-42.617	-73.783	0.700
Gregorio	CHL	-52.633	-70.183	0.545
Guarello	CHL	-50.350	-75.333	0.548
Porvenir(CHL)	CHL	-53.283	-70.367	0.384
Puerto Aguirre	CHL	-45.167	-73.517	0.421
Puerto Aisen	CHL	-45.383	-72.683	0.213
Puerto Cisnes	CHL	-44.733	-72.700	0.252
Puerto Melinka	CHL	-43.900	-73.733	0.800
Puerto Montt	CHL	-41.467	-72.950	0.600
Puerto Natales	CHL	-51.717	-72.517	0.241
Puerto Percy	CHL	-52.917	-70.283	0.526
Puerto Quellon	CHL	-43.150	-73.617	0.799
Puerto Quemchi	CHL	-42.150	-73.483	0.826
Puerto Williams	CHL	-54.933	-67.617	0.850
Punta Delgada	CHL	-52.450	-69.533	0.225
San Vicente	CHL	-36.733	-73.150	1.002
Talcahuano	CHL	-36.683	-73.100	1.002
Abbenfleth	DEU	53.683	9.500	0.715
Amrum Is.	DEU	54.633	8.350	0.525
Baltrum	DEU	53.733	7.400	0.544
Bardenfleth	DEU	53.150	8.550	0.711
Beidenfleth	DEU	53.867	9.433	0.698
Bensersiel	DEU	53.683	7.583	0.692
Blexen	DEU	53.533	8.533	0.659
Blumenthal	DEU	53.183	8.567	0.694
Borkum	DEU	53.583	6.667	0.534
Brake	DEU	53.333	8.483	0.696
Bremen	DEU	53.083	8.783	0.712
Bremerhaven	DEU	53.550	8.583	0.659
Brokdorf	DEU	53.867	9.333	0.698
Brunsbuttel	DEU	53.900	9.133	0.698
Burg	DEU	53.983	9.283	0.698
Busum	DEU	54.133	8.867	0.624
Butzfleth	DEU	53.650	9.517	0.730

Global Port	Country	Latitude	Longitude	Environmental Distance
Cuxhaven	DEU	53.867	8.700	0.767
Dagebull	DEU	54.733	8.733	0.534
Ditzum	DEU	53.317	7.267	0.930
Einswarden	DEU	53.517	8.517	0.659
Elmshorn	DEU	53.750	9.650	0.715
Elsfleth	DEU	53.233	8.467	0.696
Emden	DEU	53.350	7.183	0.808
Farge	DEU	53.200	8.517	0.694
Fischerhutte	DEU	54.150	9.367	0.666
Flensburg	DEU	54.800	9.433	0.937
Freiburg	DEU	53.817	9.300	0.715
Friedrichstadt	DEU	54.383	9.083	0.573
Ganspe	DEU	53.200	8.550	0.694
Gelting	DEU	54.733	9.900	0.983
Gluckstadt	DEU	53.783	9.417	0.715
Hamburg	DEU	53.550	9.967	0.729
Harlesiel	DEU	53.633	7.750	0.657
Helgoland	DEU	54.150	7.883	0.510
Hemmoor	DEU	53.700	9.133	0.714
Hochdonn	DEU	54.017	9.300	0.667
Holmer Siel	DEU	54.533	8.867	0.559
Hornum	DEU	54.750	8.300	0.520
Horumersiel	DEU	53.667	8.017	0.490
Husum(DEU)	DEU	54.483	9.050	0.560
Itzehoe	DEU	53.933	9.517	0.698
Juist	DEU	53.683	7.000	0.702
Krautsand	DEU	53.767	9.383	0.715
Langeoog	DEU	53.750	7.533	0.555
Lemwerder	DEU	53.167	8.600	0.711
List	DEU	55.017	8.433	0.496
Neuenfelde	DEU	53.500	9.817	0.713
Neuhaus	DEU	53.800	9.033	0.714
Norddeich	DEU	53.633	7.167	0.638
Nordenham	DEU	53.483	8.483	0.678
Norderney	DEU	53.700	7.167	0.703
Nordstrand	DEU	54.483	8.917	0.577
Oldenburg	DEU	53.150	8.233	0.714
Oslebshausen	DEU	53.133	8.733	0.712
Ostermoor	DEU	53.917	9.183	0.698
Otterndorf	DEU	53.817	8.900	0.637
Rendsburg	DEU	54.317	9.667	0.666
Ruthenstrom	DEU	53.733	9.400	0.715
Schacht-Audorf	DEU	54.300	9.717	0.666
Schulau	DEU	53.567	9.700	0.730
Schwarzenhutten	DEU	53.700	9.167	0.714
Stade	DEU	53.600	9.483	0.716
Stadersand	DEU	53.617	9.533	0.730
Tonning	DEU	54.317	8.950	0.605
Utersen	DEU	53.667	9.650	0.730
Wangerooge	DEU	53.783	7.900	0.549
Wesermunde	DEU	53.533	8.583	0.659
Wewelsfleth	DEU	53.850	9.400	0.698
Wilhelmshaven	DEU	53.517	8.150	0.490
Wischhafen	DEU	53.783	9.333	0.715
Wyk	DEU	54.700	8.583	0.558
Aabenraa	DNK	55.033	9.433	0.911

Global Port	Country	Latitude	Longitude	Environmental Distance
Aalborg	DNK	57.050	9.917	0.495
Aarhus	DNK	56.150	10.217	0.804
Aarosund	DNK	55.267	9.717	0.948
Anholt	DNK	56.717	11.517	0.814
Asa	DNK	57.150	10.417	0.346
Asaa	DNK	57.133	10.400	0.346
Asnaesvaerkets Havn	DNK	55.667	11.083	1.019
Assens	DNK	55.267	9.900	0.972
Augustenborg	DNK	54.950	9.867	0.973
Ballen	DNK	55.817	10.650	0.852
Bogense	DNK	55.567	10.083	0.882
Ebeltoft	DNK	56.200	10.667	0.786
Egernsund	DNK	54.900	9.600	0.936
Endelave	DNK	55.750	10.267	0.888
Enstedvaerkets Havn	DNK	55.017	9.433	0.911
Esbjerg	DNK	55.467	8.433	0.483
Fano Is.	DNK	55.417	8.417	0.483
Fredericia	DNK	55.567	9.750	0.862
Frederikshavn	DNK	57.433	10.550	0.371
Glatved	DNK	56.300	10.850	0.752
Graasten	DNK	54.917	9.617	0.936
Grenaa	DNK	56.413	10.913	0.752
Haderslev	DNK	55.250	9.500	0.948
Hadsund	DNK	56.717	10.117	0.720
Hals	DNK	56.983	10.317	0.601
Hanstholm	DNK	57.117	8.583	0.220
Hardeshoj	DNK	55.000	9.683	0.959
Havneby	DNK	55.100	8.567	0.528
Hirtshals	DNK	57.600	9.967	0.276
Hobro	DNK	56.633	9.800	0.710
Horsens	DNK	55.850	9.867	0.837
Hundested	DNK	55.967	11.850	1.002
Juelsminde	DNK	55.717	10.017	0.882
Kalundborg	DNK	55.683	11.083	1.011
Katholm	DNK	54.933	9.833	0.955
Kolby Kaas	DNK	55.800	10.533	0.852
Kolding	DNK	55.500	9.500	0.844
Kongsdal	DNK	56.683	10.067	0.720
Kyndby	DNK	55.817	11.883	1.002
Laeso	DNK	57.217	10.700	0.389
Lemvig	DNK	56.550	8.300	0.566
Lyngs Odde	DNK	55.517	9.750	0.877
Lyngsbaek Bridge	DNK	56.233	10.617	0.833
Mariager	DNK	56.650	9.983	0.710
Middelfart	DNK	55.500	9.733	0.877
Nordby	DNK	55.450	8.400	0.483
Norresundby	DNK	57.067	9.917	0.495
Nyborg	DNK	55.300	10.783	1.006
Odden	DNK	55.967	11.367	0.922
Randers	DNK	56.467	10.050	0.710
Ribe	DNK	55.317	8.767	0.490
Ringkobing	DNK	56.083	8.233	0.522
Saeby	DNK	57.333	10.517	0.371
Skaerbaek	DNK	55.517	9.617	0.844
Skagen	DNK	57.717	10.600	0.368
Snaptun	DNK	55.817	10.033	0.910

Global Port	Country	Latitude	Longitude	Environmental Distance
Sonderborg	DNK	54.917	9.783	0.955
Sprogo	DNK	55.333	10.967	1.006
Strandby	DNK	57.483	10.517	0.375
Strib	DNK	55.533	9.767	0.862
Studstrup	DNK	56.250	10.350	0.813
Thyboron	DNK	56.700	8.217	0.384
Understed	DNK	57.383	10.500	0.371
Vejle	DNK	55.717	9.550	0.821
Mare Hbr.	FLK	-51.917	-58.467	0.664
Stanley Harbour	FLK	-51.683	-57.833	0.824
Antifer	FRA	49.667	0.167	0.715
Audierne	FRA	48.017	-4.533	0.920
Barfleur	FRA	49.667	-1.250	0.792
Boulogne	FRA	50.733	1.617	0.716
Brest	FRA	48.383	-4.483	1.001
Calais	FRA	50.967	1.850	0.866
Cancale	FRA	48.667	-1.850	0.804
Carteret	FRA	49.367	-1.800	0.797
Cherbourg	FRA	49.641	-1.614	0.860
Courseulles sur Mer	FRA	49.333	-0.450	0.733
Dahouet	FRA	48.583	-2.567	0.763
Deauville	FRA	49.350	0.067	0.912
Dielette	FRA	49.550	-1.850	0.790
Dieppe	FRA	49.933	1.083	0.887
Dunkirk	FRA	51.050	2.350	0.677
Erquy	FRA	48.633	-2.467	0.792
Fecamp	FRA	49.767	0.367	0.718
Granville	FRA	48.833	-1.600	0.817
Gravelines	FRA	50.983	2.133	0.665
Honfleur	FRA	49.417	0.233	0.907
Le Guildo	FRA	48.633	-2.233	0.811
Le Havre	FRA	49.483	0.117	0.715
Le Legue	FRA	48.533	-2.717	0.763
Le Palais	FRA	47.350	-3.167	0.963
Le Treport	FRA	50.067	1.367	0.876
Mardyck	FRA	51.000	2.233	0.681
Morlaix	FRA	48.633	-3.883	0.985
Ouistreham	FRA	49.283	-0.250	0.716
Paimpol	FRA	48.783	-3.050	0.787
Paluden	FRA	48.583	-4.517	0.944
Piriac	FRA	47.383	-2.550	0.916
Pornic	FRA	47.117	-2.117	0.887
Port Barrier	FRA	48.633	-2.417	0.792
Port Joinville	FRA	46.733	-2.350	0.938
Roscoff	FRA	48.717	-3.983	1.001
Saint Quay Portrieux	FRA	48.650	-2.833	0.740
St. Malo	FRA	48.649	-2.025	0.811
St. Valery en Caux	FRA	49.867	0.717	0.715
St-Pierre et Miquelon	FRA	46.817	-56.167	0.753
Treguier	FRA	48.783	-3.233	0.974
Dalur	FRO	61.767	-6.667	0.913
Fuglafjordur	FRO	62.250	-6.817	0.888
Gota(FRO)	FRO	62.183	-6.700	0.893
Hosvik	FRO	62.150	-6.933	0.674
Hvalba	FRO	61.600	-6.950	0.911
Hvalvik	FRO	62.183	-7.000	0.715

Global Port	Country	Latitude	Longitude	Environmental Distance
Klaksvik	FRO	62.233	-6.583	0.887
Kollafjordur	FRO	62.117	-6.900	0.674
Midvagur	FRO	62.033	-7.183	0.635
Nordskali	FRO	62.200	-6.983	0.714
Runavik	FRO	62.100	-6.717	0.893
Saltangara	FRO	62.117	-6.700	0.893
Sandvagur	FRO	62.050	-7.133	0.659
Skalafjordur	FRO	62.200	-6.850	0.714
Skali	FRO	62.150	-6.767	0.893
Skopun	FRO	61.900	-6.867	0.920
Sorvagur	FRO	62.083	-7.417	0.903
Strendur	FRO	62.117	-6.750	0.893
Streymnes	FRO	62.183	-7.017	0.715
Toftir	FRO	62.083	-6.717	0.893
Torshavn	FRO	62.000	-6.750	0.892
Tvoroyri	FRO	61.550	-6.800	0.911
Vagur	FRO	61.467	-6.800	0.892
Vestmanna	FRO	62.150	-7.167	0.636
Aberdeen(GBR)	GBR	57.150	-2.067	0.420
Aberdovey	GBR	52.533	-4.050	0.572
Aberlady Bay	GBR	56.017	-2.850	0.456
Aberystwyth	GBR	52.400	-4.100	0.596
Alderney	GBR	49.717	-2.200	0.787
Alnwick	GBR	55.400	-1.700	0.457
Annan	GBR	54.983	-3.267	0.510
Appledore	GBR	51.050	-4.200	0.944
Arbroath	GBR	56.550	-2.583	0.437
Ardersier	GBR	57.567	-4.033	0.431
Ardrishaig	GBR	56.000	-5.433	0.355
Ardrossan(GBR)	GBR	55.633	-4.817	0.505
Avonmouth	GBR	51.500	-2.717	0.772
Ayr	GBR	55.467	-4.633	0.406
Ballantrae	GBR	55.100	-5.000	0.474
Ballycastle	GBR	55.217	-6.233	0.600
Ballylumford	GBR	54.833	-5.783	0.497
Baltasound	GBR	60.750	-0.833	0.696
Banff	GBR	57.667	-2.517	0.403
Bangor(GBR)	GBR	54.667	-5.667	0.524
Barcaldine	GBR	56.517	-5.400	0.395
Barrow-in-Furness	GBR	54.100	-3.217	0.335
Barry	GBR	51.400	-3.267	0.745
Beaumaris	GBR	53.267	-4.083	0.431
Belfast	GBR	54.600	-5.933	0.757
Benbecula	GBR	57.417	-7.383	0.614
Berwick-upon-Tweed	GBR	55.767	-2.000	0.459
Blyth	GBR	55.117	-1.483	0.466
Borth	GBR	52.483	-4.050	0.596
Braefoot Bay	GBR	56.033	-3.300	0.601
Bressay	GBR	60.133	-1.083	0.661
Bridlington	GBR	54.083	-0.183	0.388
Bridport(GBR)	GBR	50.717	-2.767	0.782
Brightlingsea	GBR	51.783	1.033	0.633
Brighton(GBR)	GBR	50.817	-0.100	0.759
Briton Ferry	GBR	51.617	-3.833	0.810
Brixham	GBR	50.400	-3.500	0.786
Broadford	GBR	57.233	-5.900	0.620

Global Port	Country	Latitude	Longitude	Environmental Distance
Brodick	GBR	55.567	-5.100	0.463
Bromborough	GBR	53.350	-2.983	1.005
Bruichladdich	GBR	55.767	-6.367	0.559
Buckie	GBR	57.683	-2.950	0.410
Bunnahabhainn Bay	GBR	55.883	-6.117	0.413
Burghead	GBR	57.700	-3.500	0.441
Burnham on Crouch	GBR	51.617	0.817	0.970
Burntisland	GBR	56.050	-3.233	0.440
Burray	GBR	58.850	-2.900	0.615
Caernarfon	GBR	53.150	-4.267	0.537
Cairnryan	GBR	54.967	-5.017	0.442
Campbeltown	GBR	55.417	-5.583	0.484
Cantley	GBR	52.567	1.533	0.866
Canvey Is.	GBR	51.517	0.633	0.861
Carrickfergus	GBR	54.650	-5.883	0.525
Casquets	GBR	49.733	-2.383	0.770
Castlebay	GBR	56.933	-7.467	0.620
Cemaes Bay	GBR	53.417	-4.450	0.471
Charlestown(England)	GBR	50.333	-4.750	0.846
Charlestown(Scotland)	GBR	56.033	-3.500	0.932
Christchurch	GBR	50.733	-1.750	0.828
Clacton	GBR	51.800	1.150	0.633
Cockenzie	GBR	55.967	-2.950	0.430
Coleraine	GBR	55.133	-6.667	0.965
Colonsay	GBR	56.050	-6.183	0.557
Conwy	GBR	53.300	-3.850	0.391
Coryton	GBR	51.517	0.533	1.018
Cowes	GBR	50.767	-1.300	0.932
Craignure	GBR	56.467	-5.700	0.552
Creetown	GBR	54.900	-4.367	0.387
Cromarty	GBR	57.683	-4.033	0.410
Cromer	GBR	52.933	1.300	0.703
Cullivoe	GBR	60.700	-1.000	0.677
Dartmouth	GBR	50.350	-3.583	0.878
Dean Quarry	GBR	50.033	-5.083	0.893
Devonport(GBR)	GBR	50.367	-4.167	0.881
Dover	GBR	51.117	1.333	0.649
Dundee	GBR	56.467	-2.967	0.469
Dundrum	GBR	54.267	-5.850	0.462
Dunvegan	GBR	57.450	-6.583	0.445
Eastham	GBR	53.350	-2.967	1.005
Ellesmere Port	GBR	53.283	-2.900	0.995
Exmouth(GBR)	GBR	50.617	-3.417	0.885
Eyemouth	GBR	55.867	-2.083	0.509
Fairlie	GBR	55.767	-4.867	1.011
Falmouth	GBR	50.167	-5.050	0.893
Faversham	GBR	51.333	0.900	0.769
Fawley	GBR	50.817	-1.333	0.878
Felixstowe	GBR	51.950	1.317	0.630
Findochty	GBR	57.700	-2.900	0.410
Fingringhoe	GBR	51.833	0.967	0.978
Fishbourne	GBR	50.733	-1.200	0.932
Fishguard	GBR	52.017	-4.983	0.514
Fleetwood	GBR	53.933	-3.000	0.689
Folkestone	GBR	51.083	1.200	0.797
Fowey	GBR	50.333	-4.633	0.846

Global Port	Country	Latitude	Longitude	Environmental Distance
Fraserburgh	GBR	57.683	-2.000	0.574
Freshwater Bay(GBR)	GBR	50.667	-1.517	0.959
Garlieston	GBR	54.800	-4.367	0.489
Garston	GBR	53.350	-2.900	0.905
Girvan	GBR	55.250	-4.867	0.472
Glasson Dock	GBR	54.000	-2.833	0.902
Glencripesdale	GBR	56.667	-5.817	0.786
Glensanda	GBR	56.567	-5.533	0.354
Granton	GBR	55.983	-3.217	0.422
Great Oakley	GBR	51.900	1.250	0.630
Great Yarmouth	GBR	52.600	1.733	0.582
Grimsby	GBR	53.583	-0.067	0.337
Guernsey	GBR	49.450	-2.533	0.774
Gweek	GBR	50.083	-5.200	0.931
Hamble	GBR	50.817	-1.300	0.932
Hartlepool	GBR	54.700	-1.200	0.480
Harwich	GBR	51.950	1.283	0.630
Hastings(GBR)	GBR	50.850	0.583	0.841
Hayle	GBR	50.183	-5.433	0.893
Herne Bay	GBR	51.367	1.117	0.860
Heysham	GBR	54.033	-2.917	0.485
Holyhead	GBR	53.317	-4.617	0.480
Hound Point	GBR	56.000	-3.367	0.832
Hull	GBR	53.750	-0.300	0.990
Hunstanton	GBR	52.933	0.500	0.634
Hunterston	GBR	55.750	-4.883	0.964
Ilfracombe	GBR	51.200	-4.117	0.728
Immingham	GBR	53.633	-0.183	0.337
Inchkeith	GBR	56.033	-3.150	0.405
Invergordon	GBR	57.683	-4.167	1.005
Inverkeithing	GBR	56.033	-3.400	0.830
Ipswich	GBR	52.050	1.167	0.979
Irvine	GBR	55.600	-4.683	0.505
Islay Is.	GBR	55.800	-6.267	0.475
Isle of Whithorn	GBR	54.700	-4.367	0.426
Jersey	GBR	49.183	-2.117	0.800
Jura Is.	GBR	55.850	-6.083	0.413
Kilkeel	GBR	54.067	-6.000	0.554
Killingholme	GBR	53.667	-0.233	0.337
Killyleagh	GBR	54.400	-5.650	0.662
Kilroot	GBR	54.717	-5.750	0.524
Kinlochbervie	GBR	58.450	-5.033	0.592
Kirkcaldy	GBR	56.117	-3.150	0.405
Kirkwall	GBR	59.000	-2.983	0.635
Kishorn	GBR	57.383	-5.600	0.732
Kyle of Lochalsh	GBR	57.283	-5.733	0.389
Kyleakin	GBR	57.267	-5.733	0.389
Kylesku	GBR	58.250	-5.017	0.569
Lamlash	GBR	55.533	-5.067	0.463
Lancaster	GBR	54.000	-2.850	0.902
Largo Bay	GBR	56.217	-2.933	0.456
Larne	GBR	54.850	-5.783	0.497
Leigh	GBR	51.550	0.650	0.861
Leith	GBR	55.983	-3.167	0.414
Lerwick	GBR	60.150	-1.133	0.661
Littlehampton	GBR	50.800	-0.533	0.759

Global Port	Country	Latitude	Longitude	Environmental Distance
Llanddulas	GBR	53.300	-3.650	0.357
Llanelli	GBR	51.667	-4.167	0.742
Loch Aline	GBR	56.533	-5.783	0.366
Loch Aline Pier	GBR	56.533	-5.783	0.366
Loch Carnan	GBR	57.333	-7.250	0.596
Lochboisdale	GBR	57.150	-7.300	0.619
Lochinver	GBR	58.150	-5.250	0.682
Lochmaddy	GBR	57.600	-7.133	0.596
Lossiemouth	GBR	57.717	-3.283	0.454
Lowestoft	GBR	52.467	1.750	0.600
Lundy Is.	GBR	51.167	-4.650	0.619
Lymington	GBR	50.767	-1.550	0.854
Lyness	GBR	58.833	-3.183	0.614
Macduff	GBR	57.667	-2.500	0.403
Magheramorne	GBR	54.817	-5.767	0.508
Mallaig	GBR	57.000	-5.833	0.427
Maryport	GBR	54.717	-3.500	0.359
Methil	GBR	56.183	-3.000	0.456
Mevagissey	GBR	50.267	-4.783	0.847
Mid Yell Voe	GBR	60.600	-1.067	0.691
Milford Haven	GBR	51.713	-5.062	0.758
Millom	GBR	54.183	-3.267	0.387
Mistley	GBR	51.950	1.083	0.779
Montrose	GBR	56.700	-2.467	0.512
Mostyn	GBR	53.317	-3.233	0.463
Mull of Galloway	GBR	54.633	-4.850	0.489
Mullion Cove	GBR	50.017	-5.267	0.836
Nairn	GBR	57.583	-3.867	0.427
Newhaven	GBR	50.783	0.067	0.835
Newlyn	GBR	50.133	-5.550	0.882
Newport(IOW)	GBR	50.700	-1.283	0.932
Nigg	GBR	57.700	1.283	0.462
North Killingholme	GBR	53.650	-0.233	0.337
North Shields	GBR	55.017	-1.433	0.463
North Sunderland	GBR	55.583	-1.650	0.455
Oban	GBR	56.417	-5.483	0.405
Orbost	GBR	57.383	-6.567	0.418
Oulton Broad	GBR	52.483	1.733	0.581
Padstow	GBR	50.550	-4.933	0.833
Par	GBR	50.350	-4.700	0.811
Paull	GBR	53.717	-0.217	0.337
Pembroke	GBR	51.693	-4.951	0.896
Penmaenmawr	GBR	53.267	-3.950	0.405
Penryn	GBR	50.167	-5.100	0.923
Penzance	GBR	50.133	-5.533	0.882
Peterhead	GBR	57.500	-1.783	0.571
Plymouth	GBR	50.367	-4.183	0.881
Point Lynas	GBR	53.417	-4.283	0.471
Poole	GBR	50.717	-1.983	0.668
Port Askaig	GBR	55.850	-6.100	0.413
Port Ellen	GBR	55.617	-6.217	0.537
Port Penrhyn	GBR	53.233	-4.100	0.431
Portavadie	GBR	55.867	-5.300	0.369
Portavogie	GBR	54.450	-5.433	0.535
Portbury	GBR	51.500	-2.733	0.772
Porthleven	GBR	50.083	-5.317	0.837

Global Port	Country	Latitude	Longitude	Environmental Distance
Porthmadog	GBR	52.917	-4.133	0.532
Porthoustock Quarry	GBR	50.050	-5.067	0.893
Portishead	GBR	51.483	-2.767	0.772
Portland(GBR)	GBR	50.567	-2.433	0.848
Portnockie	GBR	57.700	-2.867	0.410
Portpatrick	GBR	54.850	-5.117	0.496
Portree	GBR	57.400	-6.183	0.758
Portrush	GBR	55.217	-6.667	0.512
Ramsgate	GBR	51.333	1.417	0.647
Redcar	GBR	54.617	-1.067	0.480
Richborough	GBR	51.300	1.350	0.647
Rosyth	GBR	56.017	-3.450	0.916
Rothesay	GBR	55.833	-5.050	0.927
Ryde	GBR	50.733	-1.150	0.960
Rye	GBR	50.933	0.767	0.711
Salcombe	GBR	50.217	-3.783	0.814
Salt End	GBR	53.733	-0.233	0.351
Sanday	GBR	59.217	-2.500	0.642
Sandhaven	GBR	57.683	-2.017	0.574
Sandwick	GBR	60.000	-1.233	0.660
Sark	GBR	49.433	-2.367	0.781
Scalloway	GBR	60.133	-1.267	0.661
Scarborough(GBR)	GBR	54.283	-0.383	0.405
Scrabster	GBR	58.617	-3.533	0.425
Seaham	GBR	54.833	-1.317	0.472
Seaton Sluice	GBR	55.083	-1.467	0.466
Shapinsay	GBR	59.050	-2.850	0.639
Shoreham	GBR	50.833	-0.250	0.759
Silloth	GBR	54.867	-3.400	0.504
Sizewell	GBR	52.217	1.600	0.612
Snape Bridge	GBR	52.150	1.500	0.612
South Killingholme	GBR	53.633	-0.200	0.337
South Shields	GBR	55.000	-1.433	0.463
South Strome	GBR	57.350	-5.567	0.993
Southampton	GBR	50.900	-1.400	0.997
Southend	GBR	51.533	0.717	0.871
St. Davids	GBR	56.033	-3.367	0.830
St. Helier	GBR	49.183	-2.117	0.800
St. Ives	GBR	50.217	-5.483	0.893
St. Kilda	GBR	57.817	-8.567	0.718
St. Margaret's Hope	GBR	58.833	-2.950	0.615
St. Monans	GBR	56.200	-2.767	0.481
St. Peter Port	GBR	49.450	-2.533	0.774
Stockton	GBR	54.624	-1.153	0.542
Stornoway	GBR	58.200	-6.383	0.610
Strangford	GBR	54.383	-5.600	0.623
Stranraer	GBR	54.917	-5.033	0.496
Stromness	GBR	58.967	-3.300	0.578
Stronsay	GBR	59.117	-2.617	0.640
Sullom Voe	GBR	60.450	-1.333	0.483
Sunderland	GBR	54.917	-1.367	0.472
Swansea	GBR	51.617	-3.933	0.810
Tayport	GBR	56.450	-2.883	0.469
Teignmouth	GBR	50.550	-3.500	0.841
Tenby	GBR	51.700	-4.717	0.500
Thurso	GBR	58.583	-3.517	0.425

Global Port	Country	Latitude	Longitude	Environmental Distance
Tiree Is.	GBR	56.517	-6.800	0.580
Tobermory(GBR)	GBR	56.617	-6.050	0.401
Tofts Voe	GBR	60.500	-1.183	0.693
Torquay	GBR	50.450	-3.533	0.878
Troon	GBR	55.550	-4.683	0.505
Truro	GBR	50.167	-5.033	0.893
Tyne	GBR	55.000	-1.433	0.463
Ullapool	GBR	57.900	-5.167	0.586
Vidlin Voe	GBR	60.383	-1.133	0.708
Walton Bay	GBR	51.467	-2.817	0.772
Walton on the Naze	GBR	51.850	1.267	0.630
Warkworth	GBR	55.333	-1.567	0.457
Warrenpoint	GBR	54.100	-6.250	0.789
Watchet	GBR	51.183	-3.333	0.741
Wells	GBR	52.967	0.850	0.669
Weymouth	GBR	50.617	-2.450	0.848
Whitby	GBR	54.483	-0.617	0.412
Whitehaven	GBR	54.550	-3.583	0.457
Whitstable	GBR	51.367	1.033	0.860
Wick	GBR	58.433	-3.083	0.596
Wigtown	GBR	54.867	-4.433	0.387
Workington	GBR	54.650	-3.567	0.457
Yarmouth(GBR)	GBR	50.700	-1.500	0.853
Kangilinnguit	GRL	61.200	-48.100	0.997
Jablanac	HRV	44.700	14.867	0.927
Velika Stinica	HRV	44.717	14.867	0.927
Castletown	IOM	54.067	-4.650	0.467
Douglas	IOM	54.150	-4.467	0.436
Peel	IOM	54.233	-4.700	0.468
Port St. Mary	IOM	54.067	-4.733	0.467
Ramsey	IOM	54.317	-4.383	0.431
Arklow	IRL	52.800	-6.150	0.706
Ballylongford	IRL	52.550	-9.467	0.966
Baltimore(IRL)	IRL	51.450	-9.400	0.809
Bantry	IRL	51.700	-9.467	0.668
Buncrana	IRL	55.133	-7.450	0.446
Burtonport	IRL	55.000	-8.433	0.690
Cahirciveen	IRL	51.967	-10.333	0.813
Castletownbere	IRL	51.650	-9.900	0.709
Cobh	IRL	51.850	-8.283	0.642
Courtmacsherry	IRL	51.633	-8.717	0.931
Dingle	IRL	52.133	-10.267	0.732
Dublin	IRL	53.350	-6.217	0.571
Dun Laoghaire	IRL	53.300	-6.133	0.571
Dundalk	IRL	54.000	-6.383	0.843
Dungarvan	IRL	52.083	-7.600	0.696
Fenit	IRL	52.267	-9.850	0.612
Galway	IRL	53.267	-9.050	0.670
Glandore	IRL	51.567	-9.117	1.010
Glengariff	IRL	51.750	-9.533	0.747
Greenore	IRL	54.033	-6.133	0.378
Killala	IRL	54.217	-9.217	0.640
Killybegs	IRL	54.633	-8.433	0.550
Kilrush	IRL	52.633	-9.500	0.943
Kinsale	IRL	51.700	-8.500	0.887
Moville	IRL	55.183	-7.033	0.620

Global Port	Country	Latitude	Longitude	Environmental Distance
Newport(Co Mayo)	IRL	53.883	-9.550	0.844
Passage West	IRL	51.867	-8.333	0.812
Port Milford	IRL	55.100	-7.700	0.855
Rathmullen	IRL	55.100	-7.533	0.457
Ringaskiddy	IRL	51.833	-8.317	0.681
Rosslare	IRL	52.250	-6.333	0.687
Skull	IRL	51.517	-9.533	0.775
Spiddle	IRL	53.250	-9.300	0.613
Valentia	IRL	51.933	-10.300	0.813
Ventry	IRL	52.117	-10.200	0.732
Waterford	IRL	52.117	-6.917	0.748
Westport(IRL)	IRL	53.800	-9.533	0.950
Wexford	IRL	52.333	-6.417	0.687
Whiddy Is.	IRL	51.683	-9.533	0.592
Whitegate	IRL	51.833	-8.250	0.658
Wicklow	IRL	52.983	-6.033	0.595
Youghal	IRL	51.933	-7.833	0.779
Akranes	ISL	64.317	-22.083	0.686
Blonduos	ISL	65.667	-20.300	0.963
Bordeyri	ISL	65.217	-21.150	0.946
Borgarnes	ISL	64.533	-21.917	0.754
Dyrholaey	ISL	63.400	-19.133	0.600
Eyrarbakki	ISL	63.867	-21.150	0.667
Gardabaer	ISL	64.067	-21.933	0.643
Grenivik	ISL	65.950	-18.200	0.979
Grindavik	ISL	63.833	-22.433	0.544
Grundarfjordur	ISL	64.917	-23.217	0.860
Grundartangi	ISL	64.350	-21.783	0.896
Gufunes	ISL	64.150	-21.817	0.727
Hafnarfjordur	ISL	64.067	-21.917	0.643
Hellisandur	ISL	64.900	-23.900	0.721
Hjalteyri	ISL	65.850	-18.200	0.979
Hofdhakaupstadur	ISL	65.833	-20.317	0.993
Hofn	ISL	64.267	-15.217	0.687
Hofsos	ISL	65.883	-19.400	0.913
Hvaleyri	ISL	64.333	-21.733	0.871
Keflavik	ISL	64.000	-22.550	0.718
Kopasker	ISL	66.283	-16.450	0.977
Kopavogur	ISL	64.100	-21.883	0.643
Korsnes(ISL)	ISL	64.117	-21.900	0.643
Kroksfjardarnes	ISL	65.450	-21.933	0.896
Olafsvik	ISL	64.900	-23.717	0.912
Patrekshofn	ISL	65.583	-23.983	0.929
Reykholar	ISL	65.450	-22.217	0.915
Reykjanes	ISL	63.800	-22.700	0.769
Reykjavik	ISL	64.150	-21.948	0.643
Rifshofn	ISL	64.883	-23.667	0.912
Sandgerdhi	ISL	64.050	-22.717	0.722
Sandur	ISL	64.917	-23.817	0.916
Stokkseyri	ISL	63.833	-21.083	0.630
Straumsvik	ISL	64.050	-22.050	0.698
Thorlakshofn	ISL	63.850	-21.333	0.727
Vestmannaeyjar	ISL	63.433	-20.267	0.752
Abashiri	JPN	44.017	144.283	0.683
Akkeshi	JPN	43.050	144.850	0.928
Kushiro	JPN	42.983	144.367	0.964

Global Port	Country	Latitude	Longitude	Environmental Distance
Monbetsu	JPN	44.350	143.367	0.673
Nemuro	JPN	43.333	145.583	0.573
Shiriya	JPN	41.400	141.467	0.949
Tokachi	JPN	42.300	143.333	0.625
Wakkanai	JPN	45.417	141.700	0.835
Wanishi	JPN	42.333	141.000	0.953
Alkmaar	NLD	52.633	4.717	0.806
Almelo	NLD	52.367	6.633	0.639
Almere-Haven	NLD	52.333	5.217	0.782
Ameland	NLD	53.450	5.633	0.569
Appingedam	NLD	53.317	6.850	0.736
Balk	NLD	52.900	5.567	0.687
Breskens	NLD	51.400	3.567	0.871
Delft	NLD	52.017	4.367	0.948
Delfzijl	NLD	53.333	6.933	0.546
Den Helder	NLD	52.967	4.783	0.636
Den Oever	NLD	52.917	5.017	0.658
Deventer	NLD	52.250	6.150	0.678
Doesburg	NLD	52.017	6.133	0.696
Doetinchem	NLD	51.967	6.283	0.733
Domburg	NLD	51.567	3.500	0.657
Eemshaven	NLD	53.450	6.833	0.546
Europoort	NLD	51.950	4.083	0.720
Farmsum	NLD	53.317	6.933	0.546
Flushing	NLD	51.450	3.583	0.871
Franeker	NLD	53.183	5.550	0.605
Halfweg	NLD	52.383	4.750	0.876
Harlingen	NLD	53.183	5.417	0.606
Hasselt	NLD	52.583	6.083	0.623
Heemstede	NLD	52.350	4.600	0.830
Hengelo	NLD	52.267	6.767	0.657
Hillegom	NLD	52.300	4.583	0.830
Hook of Holland	NLD	51.983	4.117	0.691
Kaag	NLD	52.200	4.533	0.901
Kampen	NLD	52.583	5.800	0.711
Katwijk aan Zee	NLD	52.200	4.400	0.727
Lauwersoog	NLD	53.400	6.217	0.708
Leiden	NLD	52.150	4.467	0.870
Leiderdorp	NLD	52.133	4.517	0.901
Lelystad	NLD	52.500	5.433	0.731
Lemmer	NLD	52.850	5.683	0.688
Lisserbroek	NLD	52.267	4.567	0.830
Lochem	NLD	52.167	6.417	0.698
Loppersum	NLD	53.317	6.733	0.863
Makkum	NLD	53.067	5.400	0.606
Meppel	NLD	52.700	6.200	0.600
Middelburg	NLD	51.500	3.617	0.832
Midwolda	NLD	53.183	6.983	0.942
Monnickendam	NLD	52.467	5.033	0.782
Muiden	NLD	52.317	5.067	0.782
Nijkerk	NLD	52.217	5.483	0.680
Oostmahorn	NLD	53.383	6.167	0.600
Oostvoorne	NLD	51.917	4.083	0.720
Pijnacker	NLD	52.000	4.417	0.948
Schagen	NLD	52.783	4.785	0.700
Scheveningen	NLD	52.100	4.267	0.727

Global Port	Country	Latitude	Longitude	Environmental Distance
Schiermonnikoog	NLD	53.483	6.150	0.519
'sGravenhage	NLD	52.083	4.300	0.727
Siddeburen	NLD	53.250	6.867	0.796
Sneek	NLD	53.033	5.667	0.605
Spaarndam	NLD	52.417	4.683	0.773
Staveren	NLD	52.867	5.350	0.674
Steenwijk	NLD	52.783	6.117	0.603
Terschelling	NLD	53.367	5.217	0.559
Texel	NLD	53.183	4.850	0.575
Urk	NLD	52.667	5.600	0.732
Vlissingen	NLD	52.450	4.583	0.514
Wagenborgen	NLD	53.250	6.933	0.792
Warmond	NLD	52.183	4.483	0.901
West Graftdijk	NLD	52.550	4.783	0.883
Winschoten	NLD	53.133	7.017	0.978
Workum	NLD	52.983	5.433	0.598
Woudsend	NLD	52.933	5.617	0.687
Ymuiden	NLD	52.450	4.583	0.708
Zandvoort	NLD	52.367	4.533	0.708
Zuidbroek	NLD	53.167	6.867	1.003
Zutphen	NLD	52.133	6.200	0.698
Zwartsluis	NLD	52.633	6.067	0.623
Zwolle	NLD	52.517	6.117	0.623
Aaheim	NOR	62.050	5.517	0.743
Aakrehamn	NOR	59.250	5.167	0.166
Aalefjaer	NOR	58.233	8.033	1.018
Aalesund	NOR	62.467	6.167	0.314
Abelsnes	NOR	58.233	6.650	0.915
Abelvaer	NOR	64.733	11.167	0.336
Andenes	NOR	69.317	16.133	0.705
Arendal	NOR	58.467	8.767	0.333
Askvoll	NOR	61.350	5.067	0.964
Asvall	NOR	59.017	9.600	0.597
Aukra	NOR	62.783	6.967	0.420
Austevoll	NOR	60.100	5.250	0.848
Avaldsnes	NOR	59.350	5.267	0.433
Averoy	NOR	63.117	7.667	0.389
Ballstad	NOR	68.067	13.533	0.429
Bamble	NOR	59.017	9.667	0.597
Bekkjarvik	NOR	60.000	5.217	0.181
Bergneset	NOR	68.800	16.000	0.671
Bergsfjord	NOR	70.250	21.800	0.913
Bjugn	NOR	63.767	9.733	0.496
Bodo	NOR	67.283	14.383	0.570
Bokn	NOR	59.217	5.450	0.127
Borg Hbr.	NOR	59.200	10.950	0.605
Borkenes	NOR	68.767	16.183	0.629
Bovagen	NOR	60.700	4.933	0.216
Brattvag	NOR	62.600	6.450	0.419
Brekstad	NOR	63.683	9.667	0.616
Bremanger	NOR	61.850	4.950	0.977
Brettesnes	NOR	68.233	14.867	0.605
Bronnoysund	NOR	65.467	12.217	0.381
Deknepoll	NOR	61.917	5.133	0.879
Drammen	NOR	59.733	10.233	0.666
Drobak	NOR	59.650	10.633	0.633

Global Port	Country	Latitude	Longitude	Environmental Distance
Dryna	NOR	62.633	6.533	0.324
Dyroy	NOR	68.817	14.817	0.618
Egersund	NOR	58.450	6.000	0.521
Elnesvagen	NOR	62.850	7.150	0.467
Elvalandet	NOR	64.567	11.417	0.937
Engene	NOR	59.683	10.550	0.683
Espevaer	NOR	59.583	5.150	0.154
Espevik	NOR	59.333	5.683	0.927
Eydehamn	NOR	58.500	8.883	0.572
Fagerstrand	NOR	59.733	10.600	0.683
Farsund	NOR	58.100	6.817	0.977
Fedje	NOR	60.750	4.733	0.224
Festoy	NOR	62.367	6.333	0.750
Fevag	NOR	63.667	9.833	0.703
Finnfjord	NOR	70.817	23.083	0.989
Fiskarstranda	NOR	62.433	6.267	0.558
Floro	NOR	61.600	5.033	0.257
Fonnes	NOR	60.800	4.983	0.192
Foresvik	NOR	59.217	5.433	0.127
Fosen	NOR	59.317	5.367	0.625
Fosnavaag	NOR	62.350	5.633	0.287
Fredrikstad	NOR	59.200	10.967	0.605
Gjevingstangholmen	NOR	58.650	9.133	0.325
Gravdal	NOR	68.117	13.550	0.429
Greaker	NOR	59.267	11.033	0.625
Grimstad	NOR	58.333	8.600	0.540
Gronsfjord	NOR	58.017	7.033	0.341
Gurskebotn	NOR	62.217	5.650	0.949
Gursken	NOR	62.233	5.550	0.287
Haavik	NOR	59.317	5.317	0.588
Halden	NOR	59.117	11.367	0.614
Halsvik	NOR	60.833	5.083	0.897
Halvorshavn	NOR	59.583	10.617	0.633
Hareid	NOR	62.367	6.033	0.436
Harstad	NOR	68.800	16.550	0.694
Hasvik	NOR	70.483	22.150	0.990
Haugesund	NOR	59.417	5.267	0.265
Haugsholmen	NOR	62.167	5.400	0.278
Hellestrand	NOR	61.333	5.117	0.847
Helvig	NOR	58.100	6.750	0.977
Henningsvaer	NOR	68.150	14.217	0.600
Hestvika	NOR	63.567	9.167	0.444
Hilleren	NOR	60.167	5.083	0.160
Hitra	NOR	63.433	8.417	0.408
Hjorungavaag	NOR	62.350	6.083	0.437
Holm	NOR	59.100	11.383	0.614
Holmestrand	NOR	59.533	10.267	0.663
Hommelsto	NOR	65.533	12.333	0.408
Horten	NOR	59.417	10.500	0.679
Hurum	NOR	59.617	10.450	0.669
Husoy	NOR	61.017	4.700	0.259
Jelsa	NOR	59.333	6.033	0.220
Kaarsto	NOR	59.267	5.533	0.184
Kalvaag	NOR	61.767	4.883	0.277
Kambo	NOR	59.483	10.700	0.617
Karlsoy	NOR	70.000	19.900	0.920

Global Port	Country	Latitude	Longitude	Environmental Distance
Kilsund	NOR	58.550	8.983	0.325
Kjelstraum	NOR	60.800	4.950	0.224
Kollsnes	NOR	60.567	4.833	0.216
Kolvereid	NOR	64.883	11.583	0.351
Kopervik	NOR	59.283	5.300	0.711
Kragero	NOR	58.867	9.417	0.637
Kristiansand	NOR	58.150	8.000	0.385
Kristiansund	NOR	63.117	7.733	0.391
Langesund	NOR	59.000	9.750	0.583
Langevag	NOR	62.433	6.250	0.558
Larkollen	NOR	59.317	10.683	0.602
Larsnes	NOR	62.200	5.650	0.949
Larvik	NOR	59.050	10.033	0.601
Lauvsnes	NOR	64.500	10.900	0.358
Leirpollen	NOR	70.383	25.517	0.931
Lillesand	NOR	58.250	8.383	0.471
Lindesnes	NOR	57.983	7.050	0.375
Lodingen	NOR	68.417	16.000	0.645
Lysaker	NOR	59.917	10.633	0.650
Lysoysund	NOR	63.883	9.883	0.388
Maaloy	NOR	61.917	5.117	0.879
Magero	NOR	59.150	10.433	0.495
Mandal	NOR	58.033	7.467	0.342
Marnes	NOR	67.133	14.083	0.579
Mastrevik	NOR	60.800	4.967	0.224
Melbu	NOR	68.500	14.800	0.654
Melsomvik	NOR	59.217	10.350	0.495
Midsund	NOR	62.700	6.700	0.327
Mjosund(NOR)	NOR	63.233	8.500	0.691
Molde	NOR	62.733	7.167	0.592
Molstrevag	NOR	59.517	5.267	0.970
Moltustranda	NOR	62.300	5.650	0.287
Mongstad	NOR	60.817	5.033	0.936
More	NOR	62.467	6.150	0.314
Moss	NOR	59.433	10.667	0.609
Mosterhamn	NOR	59.700	5.400	0.965
Myre	NOR	69.083	15.950	0.683
Nusfjord	NOR	68.033	13.350	0.644
Oksfjord	NOR	70.233	22.300	1.006
Oslo	NOR	59.900	10.717	0.650
Ottersoy	NOR	64.850	11.283	0.344
Rafnes	NOR	59.100	9.600	1.016
Ramsund	NOR	68.483	16.517	0.959
Ramsvika	NOR	62.933	7.400	0.647
Randaberg	NOR	59.000	5.633	0.093
Raudeberg	NOR	61.983	5.100	0.307
Risnes	NOR	61.150	5.167	0.924
Risor	NOR	58.717	9.233	0.316
Rorvik	NOR	64.867	11.267	0.344
Rosfjord	NOR	58.050	6.983	0.285
Ryvingen	NOR	57.967	7.500	0.183
Saetrepollen	NOR	59.683	10.533	0.683
Salthella	NOR	60.000	5.117	0.181
Sande	NOR	59.583	10.250	0.663
Sandefjord	NOR	59.133	10.233	0.495
Sandnessjoen	NOR	66.017	12.633	0.595

Global Port	Country	Latitude	Longitude	Environmental Distance
Sandstad	NOR	63.517	9.067	0.554
Sarpsborg	NOR	59.267	11.100	0.625
Selje	NOR	62.050	5.367	0.278
Skaland	NOR	69.450	17.300	0.849
Skudeneshavn	NOR	59.133	5.267	0.127
Slagen	NOR	59.317	10.533	0.609
Slemmestad	NOR	59.783	10.500	0.657
Sogne	NOR	58.083	7.783	0.382
Sola	NOR	58.917	5.567	0.208
Solevaag	NOR	62.400	6.333	0.750
Solumstrand	NOR	59.717	10.283	0.666
Sondeled	NOR	58.717	9.200	0.325
Sortland	NOR	68.700	15.433	0.661
Sovik	NOR	65.917	12.433	0.443
Spjelkavik	NOR	62.450	6.367	0.753
Stamsund	NOR	68.117	13.850	0.631
Stavanger	NOR	58.967	5.733	0.164
Stokksund	NOR	64.033	10.033	0.370
Stokmarknes	NOR	68.567	14.917	0.551
Storasund	NOR	59.383	5.267	0.265
Straumen	NOR	63.333	8.100	0.413
Sture	NOR	60.617	4.850	0.216
Svelvik	NOR	59.617	10.417	0.669
Svolvaer	NOR	68.233	14.567	0.545
Tau	NOR	59.067	5.933	0.066
Telavag	NOR	60.250	5.000	0.235
Tjeldbergodden	NOR	63.417	8.700	0.519
Tjorvaag	NOR	62.283	5.750	0.280
Tofte	NOR	59.550	10.583	0.633
Tomrefjord	NOR	62.633	6.683	0.564
Tonsberg	NOR	59.267	10.417	0.639
Tovik	NOR	68.667	16.900	0.976
Tvedestrand	NOR	58.633	8.933	0.529
Ulsteinvik	NOR	62.350	5.850	0.280
Uthaug	NOR	63.733	9.600	0.398
Vadso	NOR	70.067	29.733	0.993
Valloy	NOR	59.267	10.500	0.636
Vats	NOR	59.483	5.750	0.200
Vestnes	NOR	62.633	7.067	0.852
Vigsnes	NOR	59.400	5.133	0.157
Voksa	NOR	62.233	5.450	0.301
Bluff	NZL	-46.617	168.367	0.872
Christchurch	NZL	-43.550	172.667	1.012
Dunedin	NZL	-45.883	170.517	0.923
Nelson(NZL)	NZL	-41.267	173.317	1.011
Port Chalmers	NZL	-45.817	170.617	0.623
Southport(NZL)	NZL	-46.600	168.350	0.872
Tarakohe	NZL	-40.850	172.900	0.669
Timaru	NZL	-44.383	171.250	0.756
Tiwai Point	NZL	-46.600	168.400	0.872
Rajin	PRK	42.183	130.317	0.906
Agnevo	RUS	50.517	142.067	0.952
Aleksandrovsk-Sakhalinskiy	RUS	50.883	142.117	0.920
Boshnyakovo	RUS	49.583	142.200	0.962
Burevestnik	RUS	44.950	147.617	0.591
De Kastri	RUS	51.467	140.783	0.708

Global Port	Country	Latitude	Longitude	Environmental Distance
Kamenka	RUS	65.883	44.183	0.848
Keret	RUS	66.283	33.567	1.018
Khasan	RUS	42.467	130.800	0.894
Khoe	RUS	51.283	142.167	0.965
Kholmsk	RUS	47.050	142.050	0.915
Korsakov	RUS	46.667	142.750	0.907
Kovda	RUS	66.683	32.867	1.005
Krasnogorsk	RUS	48.367	142.150	0.954
Mezen	RUS	65.850	44.250	0.848
Nelma	RUS	47.633	139.167	0.913
Nevelsk	RUS	46.667	141.850	0.937
Onega	RUS	63.917	38.100	0.983
Petropavlovsk-Kamchatskiy	RUS	53.017	158.633	0.717
Plastun	RUS	44.717	136.250	0.707
Podyapolskoye	RUS	42.933	132.317	0.802
Pogranichnoye	RUS	50.367	143.717	0.907
Poronaysk	RUS	49.217	143.117	0.681
Preobrazhenskoye	RUS	54.867	167.667	1.020
Severo Kurilsk	RUS	50.683	156.117	0.936
Shakhtersk	RUS	49.150	142.050	0.950
Siziman	RUS	50.750	140.417	1.011
Sovetskaya Gavan	RUS	49.033	140.333	0.464
Svetlaya	RUS	46.533	138.333	0.937
Tangi	RUS	51.233	142.167	0.965
Uglegorsk	RUS	49.067	142.017	0.950
Umba	RUS	66.667	34.300	0.957
Vanino	RUS	49.083	140.267	0.464
Vladivostok	RUS	43.117	131.883	0.817
Yasnomorskiy	RUS	46.750	141.900	0.682
Yuzhno Kurilsk	RUS	44.050	145.800	0.598
St. Pierre(SPM)	SPM	46.817	-56.167	0.703
Agnesberg	SWE	57.783	12.000	0.736
Bohus	SWE	57.850	12.033	0.732
Brofjorden	SWE	58.333	11.383	0.647
Donso	SWE	57.583	11.800	0.715
Edshultshall	SWE	58.117	11.467	0.489
Fjallbacka	SWE	58.600	11.283	0.613
Gota(SWE)	SWE	58.100	12.150	0.729
Gothenburg	SWE	57.700	11.950	0.736
Grebbestad	SWE	58.683	11.250	0.608
Gustavsberg	SWE	58.333	11.900	0.625
Henan	SWE	58.233	11.667	0.625
Hunnebostrand	SWE	58.433	11.300	0.610
Kungsbacka	SWE	57.483	12.083	0.755
Kungshamn	SWE	58.367	11.233	0.610
Lilla Edet	SWE	58.117	12.117	0.729
Lodose	SWE	58.033	12.150	0.729
Lysekil	SWE	58.267	11.433	0.647
Marstrand	SWE	57.883	11.583	0.571
Mossholmen	SWE	57.950	11.567	0.571
Munkedalhamn	SWE	58.433	11.667	0.631
Nol	SWE	57.933	12.133	0.732
Ockero	SWE	57.717	11.633	0.601
Ramsvik	SWE	58.433	11.267	0.610
Ronnang	SWE	58.083	11.667	0.621
Roro	SWE	57.767	11.617	0.595

Global Port	Country	Latitude	Longitude	Environmental Distance
Ryxo	SWE	58.367	11.433	0.627
Skarhamn	SWE	57.983	11.550	0.649
Skredsvik	SWE	58.383	11.650	0.631
Smogen	SWE	58.350	11.233	0.610
Stallbacka	SWE	58.300	12.300	0.746
Stensjo	SWE	58.400	11.400	0.627
Stenungsund	SWE	58.083	11.817	0.667
Stromstad	SWE	58.933	11.167	0.585
Surte	SWE	57.833	12.017	0.728
Traslovslage	SWE	57.050	12.267	0.947
Trollhattan	SWE	58.283	12.283	0.746
Uddevalla	SWE	58.350	11.917	0.610
Vanersborg	SWE	58.383	12.333	0.751
Varberg	SWE	57.100	12.250	0.947
Vargon	SWE	58.350	12.383	0.753
Vasterlanda	SWE	58.100	12.117	0.729
Wallhamn	SWE	58.000	11.700	0.653
Afognak	USA	58.000	-152.833	0.454
Anacortes	USA	48.517	-122.617	0.560
Anchorage	USA	61.217	-149.883	0.864
Angoon	USA	57.483	-134.567	0.332
Astoria	USA	46.183	-123.833	0.603
Bartlett Cove	USA	58.467	-135.817	0.348
Bayway	USA	40.630	-74.200	0.972
Bellingham	USA	48.750	-122.500	0.732
Castle Is.	USA	56.650	-133.167	0.231
Chatham(USA)	USA	57.517	-134.950	0.554
Chenega	USA	60.267	-148.067	0.311
Cherry Point	USA	48.867	-122.750	0.718
Chignik	USA	56.300	-158.400	0.755
Cold Bay	USA	55.183	-162.700	0.586
Cordova	USA	60.550	-145.767	0.901
Craig	USA	55.467	-133.150	0.172
Dutch Hbr.	USA	53.900	-166.533	0.695
Eastport	USA	44.900	-66.983	0.594
Edmonds	USA	47.817	-122.367	0.976
Eureka	USA	40.802	-124.163	0.871
Everett(WA)	USA	47.983	-122.217	0.855
False Pass	USA	54.833	-163.400	0.864
Ferndale	USA	48.833	-122.717	0.710
Fort Bragg	USA	39.433	-123.817	0.916
Friday Hbr.	USA	48.533	-123.000	0.518
Gloucester(MA USA)	USA	42.617	-70.667	0.597
Grays Harbor	USA	46.933	-124.060	0.658
Gustavus	USA	58.400	-135.733	0.348
Haines	USA	59.233	-135.450	0.603
Hawk Inlet	USA	58.100	-134.733	0.503
Hingham	USA	42.233	-70.883	0.990
Homer	USA	59.633	-151.500	0.567
Hoonah	USA	58.117	-135.433	0.512
Hydaburg	USA	55.200	-132.817	0.510
Icy Strait Point	USA	58.100	-135.600	0.398
Johnstown Harbour	USA	44.710	-75.468	0.306
Juneau	USA	58.300	-134.417	0.657
Kake	USA	56.917	-133.867	0.768
Kenai	USA	60.550	-151.267	0.814

Global Port	Country	Latitude	Longitude	Environmental Distance
Ketchikan	USA	55.350	-131.650	0.174
King Cove	USA	55.033	-162.317	0.697
Klawock	USA	55.550	-133.100	0.110
Kodiak	USA	57.783	-152.400	0.733
Longview	USA	46.133	-122.933	0.874
Manchester(USA)	USA	47.550	-122.533	0.791
March Point	USA	48.500	-122.567	0.560
Metlakatla	USA	55.133	-131.567	0.430
Mukilteo	USA	47.950	-122.300	0.855
Naknek	USA	58.733	-157.033	0.784
Nantucket Is.	USA	41.283	-70.100	0.709
New Bedford	USA	41.633	-70.917	0.966
Newport(Oreg)	USA	44.633	-124.050	0.692
Nikishka	USA	60.733	-151.300	0.579
Nikiski	USA	60.683	-151.383	0.606
Orca	USA	60.583	-145.717	1.014
Pelican	USA	57.950	-136.217	0.908
Perth Amboy	USA	40.504	-74.273	1.005
Petersburg	USA	56.817	-132.950	0.297
Point Judith	USA	41.367	-71.483	0.976
Point Wells	USA	47.783	-122.400	0.976
Port Angeles	USA	48.133	-123.417	0.477
Port Gamble	USA	47.867	-122.583	0.888
Port Lions	USA	57.867	-152.883	0.454
Port Townsend	USA	48.117	-122.750	0.825
Portland(ME USA)	USA	43.650	-70.233	0.376
Portsmouth(NH USA)	USA	43.067	-70.700	0.377
Provincetown	USA	42.050	-70.183	0.551
Longview	USA	46.083	-122.933	0.874
Sand Point	USA	55.317	-160.483	0.741
Sandwich(USA)	USA	41.767	-70.483	0.814
Sandy Point(USA)	USA	48.817	-122.783	0.491
Seldovia	USA	59.433	-151.717	0.720
Sesuit Hbr.	USA	41.750	-70.150	0.673
Seward	USA	60.117	-149.433	0.569
Sitka	USA	57.050	-135.333	0.298
Skagway	USA	59.450	-135.317	0.977
Susitna	USA	61.467	-150.500	0.883
Tacoma	USA	47.250	-122.417	0.916
Tatitlek	USA	60.850	-146.683	0.678
Tenakee Springs	USA	57.783	-135.217	0.405
Togiak	USA	59.083	-160.500	0.883
Tolstoi Bay	USA	55.667	-132.517	0.394
Tyonek	USA	61.067	-151.150	0.824
Valdez	USA	61.133	-146.350	0.866
Westport(WA USA)	USA	46.883	-124.100	0.666
Whittier	USA	60.783	-148.667	0.837
Willapa	USA	46.733	-124.067	0.602
Wrangell	USA	56.467	-132.367	0.249
Yakutat	USA	59.550	-139.750	0.538

Appendix E. List of global ports that have highest environmental similarity to Port McNeill. NIS originating from these ports have the highest potential for survival if introduced at Port McNeill.

Global Port	Country	Latitude	Longitude	Environmental Distance
St-Pierre et Miquelon		46.817	-56.167	1.010
Caleta Olivia	ARG	-46.433	-67.517	0.899
Caleta Paula	ARG	-46.470	-67.500	0.899
Comodoro Rivadavia	ARG	-45.857	-67.482	0.867
Punta Loyola	ARG	-51.600	-69.017	0.283
Punta Quilla	ARG	-50.118	-68.413	0.348
Rio Grande(ARG)	ARG	-53.793	-67.704	0.640
San Julian	ARG	-49.250	-67.667	0.422
Santa Cruz(ARG)	ARG	-50.133	-68.383	0.348
Ushuaia	ARG	-54.802	-68.226	0.648
Crozet Is.	ATF	-46.333	51.500	1.017
Port aux Francais	ATF	-49.350	70.200	1.017
Macquarie Is.	AUS	-54.583	158.967	0.996
Argentia	CAN	47.300	-53.983	1.000
Bamberton	CAN	48.583	-123.517	0.483
Bay Roberts	CAN	47.567	-53.217	0.959
Beaver Cove	CAN	50.533	-126.850	0.103
Bridgewater(CAN)	CAN	44.367	-64.500	0.974
Campbell River	CAN	50.033	-125.233	0.829
Canaport	CAN	45.270	-66.050	0.839
Chemainus	CAN	48.917	-123.700	0.626
Chevery Harbour	CAN	50.454	-59.621	0.991
Clarks Hbr.	CAN	43.417	-65.633	0.584
Comox	CAN	49.667	-124.917	0.712
Constance Bank	CAN	48.350	-123.367	0.296
Cowichan Bay	CAN	48.750	-123.600	0.626
Crofton	CAN	48.867	-123.633	0.626
Dildo	CAN	47.567	-53.567	0.962
Englewood	CAN	50.533	-126.867	0.103
Esquimalt	CAN	48.433	-123.433	0.296
Fishing East	CAN	44.450	-58.783	0.941
Fortune	CAN	47.067	-55.833	1.000
Harbour Grace	CAN	47.683	-53.217	0.959
Harmac	CAN	49.133	-123.850	0.791
Hibernia Platform	CAN	46.751	-48.794	0.883
Jedway	CAN	52.300	-131.217	0.473
La Have	CAN	44.283	-64.350	0.974
Ladysmith	CAN	48.983	-123.783	0.773
Long Hbr.	CAN	47.450	-53.817	1.000
Lunenburg	CAN	44.367	-64.300	0.974
Margaretsville	CAN	45.050	-65.067	0.712
Masset	CAN	54.000	-132.150	0.257
Nanaimo	CAN	49.167	-123.933	0.791
New Hbr.	CAN	44.467	-64.083	1.005
Plumper Sound	CAN	48.767	-123.200	0.473
Port de Grave	CAN	47.600	-53.200	0.959
Port Edward	CAN	54.233	-130.300	0.666
Port Hardy	CAN	50.717	-127.483	0.097
Port McNeill	CAN	50.600	-127.083	0.000

Global Port	Country	Latitude	Longitude	Environmental Distance
Port Simpson	CAN	54.583	-130.417	0.295
Prince Rupert	CAN	54.317	-130.367	0.669
Riverport	CAN	44.283	-64.333	0.974
Shelburne	CAN	43.667	-65.317	0.591
Sidney	CAN	48.650	-123.383	0.430
St Lawrence Seaway (Not a port)	CAN	47.632	-70.402	0.945
St. Augustin	CAN	51.222	-58.645	0.991
Tasu Bay	CAN	52.767	-132.050	0.673
Tofino	CAN	49.133	-125.900	0.436
Ucluelet	CAN	48.917	-125.567	0.346
Union Bay	CAN	49.583	-124.867	0.712
Victoria(CAN)	CAN	48.417	-123.383	0.296
White Rose Oil Field harbour	CAN	46.789	-48.015	0.771
Ancud	CHL	-41.867	-73.833	0.700
Cabo Negro	CHL	-52.950	-70.783	0.398
Calbuco	CHL	-41.750	-73.150	0.672
Caleta Clarencia	CHL	-52.900	-70.150	0.437
Castro	CHL	-42.483	-73.767	0.711
Chacabuco	CHL	-45.467	-72.833	0.442
Chaiten	CHL	-42.917	-72.717	0.770
Chonchi	CHL	-42.617	-73.783	0.750
Gregorio	CHL	-52.633	-70.183	0.175
Guarello	CHL	-50.350	-75.333	0.182
Porvenir(CHL)	CHL	-53.283	-70.367	0.405
Puerto Aguirre	CHL	-45.167	-73.517	0.577
Puerto Aisen	CHL	-45.383	-72.683	0.533
Puerto Cisnes	CHL	-44.733	-72.700	0.536
Puerto Melinka	CHL	-43.900	-73.733	0.337
Puerto Montt	CHL	-41.467	-72.950	0.817
Puerto Natales	CHL	-51.717	-72.517	0.439
Puerto Percy	CHL	-52.917	-70.283	0.169
Puerto Quellon	CHL	-43.150	-73.617	0.324
Puerto Quemchi	CHL	-42.150	-73.483	0.655
Puerto Williams	CHL	-54.933	-67.617	0.611
Punta Arenas	CHL	-53.167	-70.900	0.607
Punta Delgada	CHL	-52.450	-69.533	0.533
San Vicente	CHL	-36.733	-73.150	0.742
Talcahuano	CHL	-36.683	-73.100	0.742
Asa	DNK	57.150	10.417	0.993
Asaa	DNK	57.133	10.400	0.993
Frederikshavn	DNK	57.433	10.550	1.017
Hanstholm	DNK	57.117	8.583	0.814
Hirtshals	DNK	57.600	9.967	0.866
Saeby	DNK	57.333	10.517	1.017
Skagen	DNK	57.717	10.600	1.018
Thyboron	DNK	56.700	8.217	0.907
Understed	DNK	57.383	10.500	1.017
Mare Hbr.	FLK	-51.917	-58.467	0.394
Stanley Harbour	FLK	-51.683	-57.833	0.433
Antifer	FRA	49.667	0.167	0.971
Audierne	FRA	48.017	-4.533	0.924
Barfleur	FRA	49.667	-1.250	0.971

Global Port	Country	Latitude	Longitude	Environmental Distance
Boulogne	FRA	50.733	1.617	1.019
Carteret	FRA	49.367	-1.800	0.956
Courseulles sur Mer	FRA	49.333	-0.450	1.020
Dahouet	FRA	48.583	-2.567	0.944
Dielette	FRA	49.550	-1.850	0.948
Erquy	FRA	48.633	-2.467	0.991
Fecamp	FRA	49.767	0.367	0.949
Le Havre	FRA	49.483	0.117	0.971
Le Legue	FRA	48.533	-2.717	0.944
Ouistreham	FRA	49.283	-0.250	0.995
Paimpol	FRA	48.783	-3.050	0.887
Port Barrier	FRA	48.633	-2.417	0.991
Saint Quay Portrieux	FRA	48.650	-2.833	0.895
St. Valery en Caux	FRA	49.867	0.717	0.949
Dalur	FRO	61.767	-6.667	0.430
Fuglafjordur	FRO	62.250	-6.817	0.380
Gota(FRO)	FRO	62.183	-6.700	0.386
Hosvik	FRO	62.150	-6.933	0.455
Hvalba	FRO	61.600	-6.950	0.405
Hvalvik	FRO	62.183	-7.000	0.483
Klaksvik	FRO	62.233	-6.583	0.388
Kollafjordur	FRO	62.117	-6.900	0.455
Midvagur	FRO	62.033	-7.183	0.427
Nordskali	FRO	62.200	-6.983	0.481
Runavik	FRO	62.100	-6.717	0.386
Saltangara	FRO	62.117	-6.700	0.386
Sandvagur	FRO	62.050	-7.133	0.438
Skalafjordur	FRO	62.200	-6.850	0.480
Skali	FRO	62.150	-6.767	0.386
Skopun	FRO	61.900	-6.867	0.426
Sorvagur	FRO	62.083	-7.417	0.380
Strendur	FRO	62.117	-6.750	0.386
Streymnes	FRO	62.183	-7.017	0.483
Toftir	FRO	62.083	-6.717	0.386
Torshavn	FRO	62.000	-6.750	0.386
Tvoroyri	FRO	61.550	-6.800	0.405
Vagur	FRO	61.467	-6.800	0.373
Vestmanna	FRO	62.150	-7.167	0.428
Aberdeen(GBR)	GBR	57.150	-2.067	0.719
Aberdovey	GBR	52.533	-4.050	0.909
Aberlady Bay	GBR	56.017	-2.850	0.423
Aberystwyth	GBR	52.400	-4.100	0.926
Alderney	GBR	49.717	-2.200	0.934
Alnwick	GBR	55.400	-1.700	0.465
Annan	GBR	54.983	-3.267	0.909
Arbroath	GBR	56.550	-2.583	0.783
Ardersier	GBR	57.567	-4.033	0.763
Ardrishaig	GBR	56.000	-5.433	0.654
Ardrossan(GBR)	GBR	55.633	-4.817	0.848
Ayr	GBR	55.467	-4.633	0.768
Ballantrae	GBR	55.100	-5.000	0.776
Ballycastle	GBR	55.217	-6.233	0.399

Global Port	Country	Latitude	Longitude	Environmental Distance
Ballylumford	GBR	54.833	-5.783	0.406
Baltasound	GBR	60.750	-0.833	0.350
Banff	GBR	57.667	-2.517	0.711
Bangor(GBR)	GBR	54.667	-5.667	0.403
Barcaldine	GBR	56.517	-5.400	0.670
Barrow-in-Furness	GBR	54.100	-3.217	0.759
Barry	GBR	51.400	-3.267	0.970
Beaumaris	GBR	53.267	-4.083	0.602
Benbecula	GBR	57.417	-7.383	0.444
Berwick-upon-Tweed	GBR	55.767	-2.000	0.449
Blyth	GBR	55.117	-1.483	0.464
Borth	GBR	52.483	-4.050	0.926
Braefoot Bay	GBR	56.033	-3.300	1.010
Bressay	GBR	60.133	-1.083	0.350
Bridlington	GBR	54.083	-0.183	0.612
Brixham	GBR	50.400	-3.500	0.885
Broadford	GBR	57.233	-5.900	0.285
Brodick	GBR	55.567	-5.100	0.383
Bruichladdich	GBR	55.767	-6.367	0.408
Buckie	GBR	57.683	-2.950	0.651
Bunnahabhainn Bay	GBR	55.883	-6.117	0.605
Burghead	GBR	57.700	-3.500	0.795
Burntisland	GBR	56.050	-3.233	0.903
Burray	GBR	58.850	-2.900	0.336
Caernarfon	GBR	53.150	-4.267	0.873
Cairnryan	GBR	54.967	-5.017	0.752
Campbeltown	GBR	55.417	-5.583	0.397
Carrickfergus	GBR	54.650	-5.883	0.917
Casquets	GBR	49.733	-2.383	0.908
Castlebay	GBR	56.933	-7.467	0.470
Cemaes Bay	GBR	53.417	-4.450	0.574
Cockenzie	GBR	55.967	-2.950	0.830
Colonsay	GBR	56.050	-6.183	0.397
Conwy	GBR	53.300	-3.850	0.643
Craignure	GBR	56.467	-5.700	0.381
Creetown	GBR	54.900	-4.367	0.755
Cromarty	GBR	57.683	-4.033	0.735
Cullivoe	GBR	60.700	-1.000	0.354
Dover	GBR	51.117	1.333	1.018
Dundee	GBR	56.467	-2.967	0.418
Dundrum	GBR	54.267	-5.850	0.773
Dunvegan	GBR	57.450	-6.583	0.713
Eyemouth	GBR	55.867	-2.083	0.382
Findochty	GBR	57.700	-2.900	0.651
Fishguard	GBR	52.017	-4.983	0.602
Fraserburgh	GBR	57.683	-2.000	0.362
Garlieston	GBR	54.800	-4.367	0.832
Girvan	GBR	55.250	-4.867	0.406
Glencripesdale	GBR	56.667	-5.817	1.017
Glensanda	GBR	56.567	-5.533	0.575
Granton	GBR	55.983	-3.217	0.892
Great Yarmouth	GBR	52.600	1.733	0.944

Global Port	Country	Latitude	Longitude	Environmental Distance
Grimsby	GBR	53.583	-0.067	0.633
Guernsey	GBR	49.450	-2.533	0.902
Hartlepool	GBR	54.700	-1.200	0.446
Heysham	GBR	54.033	-2.917	0.931
Holyhead	GBR	53.317	-4.617	0.545
Immingham	GBR	53.633	-0.183	0.633
Inchkeith	GBR	56.033	-3.150	0.781
Irvine	GBR	55.600	-4.683	0.848
Islay Is.	GBR	55.800	-6.267	0.682
Isle of Whithorn	GBR	54.700	-4.367	0.489
Jersey	GBR	49.183	-2.117	0.966
Jura Is.	GBR	55.850	-6.083	0.605
Kilkeel	GBR	54.067	-6.000	0.411
Killingholme	GBR	53.667	-0.233	0.633
Killyleagh	GBR	54.400	-5.650	1.016
Kilroot	GBR	54.717	-5.750	0.403
Kinlochbervie	GBR	58.450	-5.033	0.356
Kirkcaldy	GBR	56.117	-3.150	0.781
Kirkwall	GBR	59.000	-2.983	0.325
Kishorn	GBR	57.383	-5.600	0.971
Kyle of Lochalsh	GBR	57.283	-5.733	0.606
Kyleakin	GBR	57.267	-5.733	0.606
Kylesku	GBR	58.250	-5.017	0.798
Lamlash	GBR	55.533	-5.067	0.383
Largo Bay	GBR	56.217	-2.933	0.423
Larne	GBR	54.850	-5.783	0.406
Leith	GBR	55.983	-3.167	0.819
Lerwick	GBR	60.150	-1.133	0.350
Llanddulas	GBR	53.300	-3.650	0.691
Loch Aline	GBR	56.533	-5.783	0.590
Loch Aline Pier	GBR	56.533	-5.783	0.590
Loch Carnan	GBR	57.333	-7.250	0.419
Lochboisdale	GBR	57.150	-7.300	0.455
Lochinver	GBR	58.150	-5.250	0.935
Lochmaddy	GBR	57.600	-7.133	0.413
Lossiemouth	GBR	57.717	-3.283	0.777
Lowestoft	GBR	52.467	1.750	0.967
Lundy Is.	GBR	51.167	-4.650	0.753
Lyness	GBR	58.833	-3.183	0.337
Macduff	GBR	57.667	-2.500	0.711
Magheramorne	GBR	54.817	-5.767	0.403
Mallaig	GBR	57.000	-5.833	0.618
Maryport	GBR	54.717	-3.500	0.766
Methil	GBR	56.183	-3.000	0.423
Mid Yell Voe	GBR	60.600	-1.067	0.346
Millom	GBR	54.183	-3.267	0.807
Montrose	GBR	56.700	-2.467	0.395
Mostyn	GBR	53.317	-3.233	0.875
Mull of Galloway	GBR	54.633	-4.850	0.435
Nairn	GBR	57.583	-3.867	0.781
Newlyn	GBR	50.133	-5.550	0.997
Nigg	GBR	57.700	1.283	0.555

Global Port	Country	Latitude	Longitude	Environmental Distance
North Killingholme	GBR	53.650	-0.233	0.633
North Shields	GBR	55.017	-1.433	0.461
North Sunderland	GBR	55.583	-1.650	0.476
Oban	GBR	56.417	-5.483	0.684
Orbost	GBR	57.383	-6.567	0.591
Oulton Broad	GBR	52.483	1.733	0.943
Padstow	GBR	50.550	-4.933	0.960
Paull	GBR	53.717	-0.217	0.633
Penmaenmawr	GBR	53.267	-3.950	0.649
Penzance	GBR	50.133	-5.533	0.997
Peterhead	GBR	57.500	-1.783	0.359
Point Lynas	GBR	53.417	-4.283	0.574
Poole	GBR	50.717	-1.983	0.935
Port Askaig	GBR	55.850	-6.100	0.605
Port Ellen	GBR	55.617	-6.217	0.401
Port Penrhyn	GBR	53.233	-4.100	0.602
Portavadie	GBR	55.867	-5.300	0.683
Portavogie	GBR	54.450	-5.433	0.414
Porthmadog	GBR	52.917	-4.133	0.876
Portnockie	GBR	57.700	-2.867	0.651
Portpatrick	GBR	54.850	-5.117	0.411
Portree	GBR	57.400	-6.183	0.767
Portrush	GBR	55.217	-6.667	0.793
Redcar	GBR	54.617	-1.067	0.446
Rye	GBR	50.933	0.767	0.983
Salcombe	GBR	50.217	-3.783	0.899
Salt End	GBR	53.733	-0.233	0.609
Sanday	GBR	59.217	-2.500	0.332
Sandhaven	GBR	57.683	-2.017	0.362
Sandwick	GBR	60.000	-1.233	0.348
Sark	GBR	49.433	-2.367	0.920
Scalloway	GBR	60.133	-1.267	0.350
Scarborough(GBR)	GBR	54.283	-0.383	0.611
Scrabster	GBR	58.617	-3.533	0.619
Seaham	GBR	54.833	-1.317	0.448
Seaton Sluice	GBR	55.083	-1.467	0.464
Shapinsay	GBR	59.050	-2.850	0.330
Silloth	GBR	54.867	-3.400	0.892
Sizewell	GBR	52.217	1.600	0.994
Snape Bridge	GBR	52.150	1.500	0.994
South Killingholme	GBR	53.633	-0.200	0.633
South Shields	GBR	55.000	-1.433	0.461
St. Helier	GBR	49.183	-2.117	0.966
St. Kilda	GBR	57.817	-8.567	0.501
St. Margaret's Hope	GBR	58.833	-2.950	0.336
St. Monans	GBR	56.200	-2.767	0.405
St. Peter Port	GBR	49.450	-2.533	0.902
Stockton	GBR	54.624	-1.153	0.452
Stornoway	GBR	58.200	-6.383	0.407
Strangford	GBR	54.383	-5.600	0.985
Stranraer	GBR	54.917	-5.033	0.411
Stromness	GBR	58.967	-3.300	0.359

Global Port	Country	Latitude	Longitude	Environmental Distance
Stronsay	GBR	59.117	-2.617	0.331
Sullom Voe	GBR	60.450	-1.333	0.522
Sunderland	GBR	54.917	-1.367	0.448
Tayport	GBR	56.450	-2.883	0.418
Tenby	GBR	51.700	-4.717	0.610
Thurso	GBR	58.583	-3.517	0.619
Tiree Is.	GBR	56.517	-6.800	0.430
Tobermory(GBR)	GBR	56.617	-6.050	0.622
Tofts Voe	GBR	60.500	-1.183	0.349
Troon	GBR	55.550	-4.683	0.848
Tyne	GBR	55.000	-1.433	0.461
Ullapool	GBR	57.900	-5.167	0.851
Vidlin Voe	GBR	60.383	-1.133	0.335
Warkworth	GBR	55.333	-1.567	0.465
Whitby	GBR	54.483	-0.617	0.614
Whitehaven	GBR	54.550	-3.583	0.843
Wick	GBR	58.433	-3.083	0.340
Wigtown	GBR	54.867	-4.433	0.755
Workington	GBR	54.650	-3.567	0.843
Kangilinnguit	GRL	61.200	-48.100	0.979
Narsaq Kujalleq	GRL	60.000	-44.667	1.017
Castletown	IOM	54.067	-4.650	0.498
Douglas	IOM	54.150	-4.467	0.532
Peel	IOM	54.233	-4.700	0.479
Port St. Mary	IOM	54.067	-4.733	0.498
Ramsey	IOM	54.317	-4.383	0.513
Arklow	IRL	52.800	-6.150	0.730
Baltimore(IRL)	IRL	51.450	-9.400	0.871
Bantry	IRL	51.700	-9.467	0.963
Buncrana	IRL	55.133	-7.450	0.792
Burtonport	IRL	55.000	-8.433	0.632
Cahirciveen	IRL	51.967	-10.333	0.818
Castletownbere	IRL	51.650	-9.900	0.844
Cobh	IRL	51.850	-8.283	0.968
Dingle	IRL	52.133	-10.267	0.912
Dublin	IRL	53.350	-6.217	0.490
Dun Laoghaire	IRL	53.300	-6.133	0.490
Dungarvan	IRL	52.083	-7.600	0.963
Fenit	IRL	52.267	-9.850	0.819
Galway	IRL	53.267	-9.050	0.956
Greenore	IRL	54.033	-6.133	0.799
Killala	IRL	54.217	-9.217	0.944
Killybegs	IRL	54.633	-8.433	0.805
Moville	IRL	55.183	-7.033	0.563
Rathmullen	IRL	55.100	-7.533	0.793
Ringaskiddy	IRL	51.833	-8.317	0.984
Rosslare	IRL	52.250	-6.333	0.714
Skull	IRL	51.517	-9.533	0.979
Spiddle	IRL	53.250	-9.300	0.887
Valentia	IRL	51.933	-10.300	0.818
Ventry	IRL	52.117	-10.200	0.912
Waterford	IRL	52.117	-6.917	0.978

Global Port	Country	Latitude	Longitude	Environmental Distance
Wexford	IRL	52.333	-6.417	0.714
Whiddy Is.	IRL	51.683	-9.533	0.889
Whitegate	IRL	51.833	-8.250	0.959
Wicklow	IRL	52.983	-6.033	0.500
Akranes	ISL	64.317	-22.083	0.507
Bildudalur	ISL	65.683	-23.600	0.926
Blonduos	ISL	65.667	-20.300	0.924
Bolungavik	ISL	66.167	-23.233	0.920
Bordeyri	ISL	65.217	-21.150	0.901
Borgarnes	ISL	64.533	-21.917	0.877
Dalvik	ISL	65.967	-18.517	1.007
Djupivogur	ISL	64.667	-14.250	0.650
Dyrholaey	ISL	63.400	-19.133	0.651
Eskifjordur	ISL	65.083	-13.983	1.015
Eyrarbakki	ISL	63.867	-21.150	0.739
Flateyri	ISL	66.050	-23.483	1.009
Gardabaer	ISL	64.067	-21.933	0.681
Grenivik	ISL	65.950	-18.200	0.932
Grindavik	ISL	63.833	-22.433	0.623
Grundarfjordur	ISL	64.917	-23.217	0.802
Grundartangi	ISL	64.350	-21.783	0.936
Gufunes	ISL	64.150	-21.817	0.738
Hafnarfjordur	ISL	64.067	-21.917	0.681
Hellisandur	ISL	64.900	-23.900	0.694
Hesteyri	ISL	66.350	-22.850	0.982
Hjalteyri	ISL	65.850	-18.200	0.932
Hofdhakaupstadur	ISL	65.833	-20.317	0.939
Hofn	ISL	64.267	-15.217	0.652
Hofsos	ISL	65.883	-19.400	0.894
Holmavik	ISL	65.700	-21.683	0.932
Hrisey	ISL	66.033	-18.417	0.944
Husavik	ISL	66.050	-17.367	0.955
Hvaleyri	ISL	64.333	-21.733	0.916
Hvammstangi	ISL	65.400	-20.950	0.991
Isafjordur	ISL	66.083	-23.100	0.920
Keflavik	ISL	64.000	-22.550	0.446
Kopasker	ISL	66.283	-16.450	0.913
Kopavogur	ISL	64.100	-21.883	0.681
Korsnes(ISL)	ISL	64.117	-21.900	0.681
Kroksfjardarnes	ISL	65.450	-21.933	0.845
Neskaupstadur	ISL	65.150	-13.683	1.015
Njardhvik	ISL	65.583	-13.850	0.929
Olafsfjordur	ISL	66.083	-18.633	0.955
Olafsvik	ISL	64.900	-23.717	0.829
Patrekshofn	ISL	65.583	-23.983	0.840
Raufarhofn	ISL	66.450	-15.900	0.907
Reykholar	ISL	65.450	-22.217	0.858
Reykjanes	ISL	63.800	-22.700	0.430
Reykjavik	ISL	64.150	-21.948	0.681
Rifshofn	ISL	64.883	-23.667	0.829
Sandgerdhi	ISL	64.050	-22.717	0.451
Sandur	ISL	64.917	-23.817	0.833

Global Port	Country	Latitude	Longitude	Environmental Distance
Saudarkrokur	ISL	65.750	-19.600	0.995
Stokkseyri	ISL	63.833	-21.083	0.767
Straumsvik	ISL	64.050	-22.050	0.474
Sudhureyri	ISL	66.133	-23.533	0.905
Thingeyri	ISL	65.867	-23.483	0.950
Thorlakshofn	ISL	63.850	-21.333	0.755
Thorshofn	ISL	66.200	-15.333	0.878
Vestmannaeyjar	ISL	63.433	-20.267	0.319
Vlissingen	NLD	52.450	4.583	0.922
Aaheim	NOR	62.050	5.517	0.964
Aakrehamn	NOR	59.250	5.167	0.634
Aalesund	NOR	62.467	6.167	0.619
Abelvaer	NOR	64.733	11.167	0.395
Andenes	NOR	69.317	16.133	0.484
Arendal	NOR	58.467	8.767	0.945
Aukra	NOR	62.783	6.967	0.389
Avaldsnes	NOR	59.350	5.267	0.919
Averoy	NOR	63.117	7.667	0.395
Ballstad	NOR	68.067	13.533	0.697
Bekkjarvik	NOR	60.000	5.217	0.575
Bergneset	NOR	68.800	16.000	0.513
Bergsfjord	NOR	70.250	21.800	0.623
Billefjord	NOR	70.367	25.100	0.772
Bjugn	NOR	63.767	9.733	0.596
Bodo	NOR	67.283	14.383	0.571
Bokn	NOR	59.217	5.450	0.638
Borkenes	NOR	68.767	16.183	0.546
Bovagen	NOR	60.700	4.933	0.520
Brattvag	NOR	62.600	6.450	0.404
Brekstad	NOR	63.683	9.667	0.716
Brettesnes	NOR	68.233	14.867	0.596
Bronnoysund	NOR	65.467	12.217	0.374
Dryna	NOR	62.633	6.533	0.653
Dyroy	NOR	68.817	14.817	0.558
Elnesvagen	NOR	62.850	7.150	0.846
Espevaer	NOR	59.583	5.150	0.622
Fedje	NOR	60.750	4.733	0.508
Fevag	NOR	63.667	9.833	1.020
Finnfjord	NOR	70.817	23.083	0.671
Fiskarstranda	NOR	62.433	6.267	0.873
Floro	NOR	61.600	5.033	0.609
Fonnes	NOR	60.800	4.983	0.727
Foresvik	NOR	59.217	5.433	0.638
Fosnavaag	NOR	62.350	5.633	0.469
Gjevingstangholmen	NOR	58.650	9.133	0.976
Gravdal	NOR	68.117	13.550	0.697
Gronsfjord	NOR	58.017	7.033	0.977
Gursken	NOR	62.233	5.550	0.469
Hammerfest	NOR	70.667	23.667	0.709
Hareid	NOR	62.367	6.033	0.772
Harstad	NOR	68.800	16.550	0.543
Hasvik	NOR	70.483	22.150	0.673

Global Port	Country	Latitude	Longitude	Environmental Distance
Haugesund	NOR	59.417	5.267	0.833
Haugsholmen	NOR	62.167	5.400	0.484
Havoysund	NOR	70.983	24.583	0.698
Henningsvaer	NOR	68.150	14.217	0.506
Hestvika	NOR	63.567	9.167	0.367
Hilleren	NOR	60.167	5.083	0.573
Hitra	NOR	63.433	8.417	0.377
Hjorungavaag	NOR	62.350	6.083	0.772
Hommelsto	NOR	65.533	12.333	0.357
Honningsvaag	NOR	70.983	25.983	0.713
Husoy	NOR	61.017	4.700	0.514
Jelsa	NOR	59.333	6.033	0.848
Kaarsto	NOR	59.267	5.533	0.805
Kalvaag	NOR	61.767	4.883	0.492
Karlsoy	NOR	70.000	19.900	0.999
Kilsund	NOR	58.550	8.983	0.976
Kjelstraum	NOR	60.800	4.950	0.508
Kollsnes	NOR	60.567	4.833	0.520
Kolvereid	NOR	64.883	11.583	0.395
Kristiansund	NOR	63.117	7.733	0.391
Langevag	NOR	62.433	6.250	0.873
Lauvsnes	NOR	64.500	10.900	0.410
Lindesnes	NOR	57.983	7.050	1.013
Lodingen	NOR	68.417	16.000	0.551
Lysoysund	NOR	63.883	9.883	0.388
Mandal	NOR	58.033	7.467	0.982
Marnes	NOR	67.133	14.083	0.552
Mastrevik	NOR	60.800	4.967	0.508
Mehamn	NOR	71.000	27.833	0.749
Melbu	NOR	68.500	14.800	0.825
Midsund	NOR	62.700	6.700	0.629
Mjosund(NOR)	NOR	63.233	8.500	0.787
Molde	NOR	62.733	7.167	0.909
Moltustranda	NOR	62.300	5.650	0.469
More	NOR	62.467	6.150	0.619
Myre	NOR	69.083	15.950	0.482
North Cape	NOR	71.167	25.767	0.717
Nusfjord	NOR	68.033	13.350	0.446
Oksfjord	NOR	70.233	22.300	0.701
Ottersoy	NOR	64.850	11.283	0.398
Ramsund	NOR	68.483	16.517	0.977
Ramsvika	NOR	62.933	7.400	0.945
Randaberg	NOR	59.000	5.633	0.649
Raudeberg	NOR	61.983	5.100	0.472
Risor	NOR	58.717	9.233	0.959
Rorvik	NOR	64.867	11.267	0.398
Rosfjord	NOR	58.050	6.983	0.918
Ryvingen	NOR	57.967	7.500	0.775
Salthella	NOR	60.000	5.117	0.575
Sandnessjoen	NOR	66.017	12.633	0.458
Sandstad	NOR	63.517	9.067	0.609
Selje	NOR	62.050	5.367	0.484

Global Port	Country	Latitude	Longitude	Environmental Distance
Skaland	NOR	69.450	17.300	0.986
Skudeneshavn	NOR	59.133	5.267	0.638
Sola	NOR	58.917	5.567	0.802
Sondeled	NOR	58.717	9.200	0.976
Sortland	NOR	68.700	15.433	0.481
Sovik	NOR	65.917	12.433	0.359
Stamsund	NOR	68.117	13.850	0.464
Stavanger	NOR	58.967	5.733	0.802
Stokksund	NOR	64.033	10.033	0.411
Stokmarknes	NOR	68.567	14.917	0.795
Storasund	NOR	59.383	5.267	0.833
Straumen	NOR	63.333	8.100	0.377
Sture	NOR	60.617	4.850	0.520
Svolvaer	NOR	68.233	14.567	0.789
Tau	NOR	59.067	5.933	0.669
Telavag	NOR	60.250	5.000	0.806
Tjeldbergodden	NOR	63.417	8.700	0.610
Tjorvaag	NOR	62.283	5.750	0.469
Tomrefjord	NOR	62.633	6.683	0.839
Ulsteinvik	NOR	62.350	5.850	0.469
Uthaug	NOR	63.733	9.600	0.374
Vardo	NOR	70.383	31.100	0.852
Vats	NOR	59.483	5.750	0.783
Vigsnes	NOR	59.400	5.133	0.633
Voksa	NOR	62.233	5.450	0.452
Bluff	NZL	-46.617	168.367	0.801
Nelson(NZL)	NZL	-41.267	173.317	1.013
Port Chalmers	NZL	-45.817	170.617	0.866
Southport(NZL)	NZL	-46.600	168.350	0.801
Tarakohe	NZL	-40.850	172.900	0.957
Timaru	NZL	-44.383	171.250	0.792
Tiwai Point	NZL	-46.600	168.400	0.801
Preobrazhenskoye	RUS	54.867	167.667	0.888
Adak	USA	51.850	-176.650	0.825
Afognak	USA	58.000	-152.833	0.835
Akutan	USA	54.133	-165.750	0.746
Anacortes	USA	48.517	-122.617	0.287
Angoon	USA	57.483	-134.567	0.730
Astoria	USA	46.183	-123.833	0.955
Bartlett Cove	USA	58.467	-135.817	0.941
Castle Is.	USA	56.650	-133.167	0.734
Chatham(USA)	USA	57.517	-134.950	0.501
Chenega	USA	60.267	-148.067	0.561
Chignik	USA	56.300	-158.400	0.968
Cold Bay	USA	55.183	-162.700	0.771
Craig	USA	55.467	-133.150	0.587
Dutch Hbr.	USA	53.900	-166.533	0.714
Eastport	USA	44.900	-66.983	0.529
Eureka	USA	40.802	-124.163	0.710
False Pass	USA	54.833	-163.400	0.673
Fort Bragg	USA	39.433	-123.817	0.544
Friday Hbr.	USA	48.533	-123.000	0.335

Global Port	Country	Latitude	Longitude	Environmental Distance
Grays Harbor	USA	46.933	-124.060	0.675
Gustavus	USA	58.400	-135.733	0.941
Hawk Inlet	USA	58.100	-134.733	0.867
Homer	USA	59.633	-151.500	0.489
Hoonah	USA	58.117	-135.433	0.564
Hydaburg	USA	55.200	-132.817	0.215
Icy Strait Point	USA	58.100	-135.600	0.822
Johnstown Harbour	USA	44.710	-75.468	0.862
Juneau	USA	58.300	-134.417	0.944
Kake	USA	56.917	-133.867	0.504
Ketchikan	USA	55.350	-131.650	0.770
King Cove	USA	55.033	-162.317	0.811
Kiska Hbr.	USA	51.983	177.567	0.811
Klawock	USA	55.550	-133.100	0.641
Kodiak	USA	57.783	-152.400	0.637
Manchester(USA)	USA	47.550	-122.533	0.200
March Point	USA	48.500	-122.567	0.287
Metlakatla	USA	55.133	-131.567	0.307
Monterey	USA	36.600	-121.883	0.890
Newport(Oreg)	USA	44.633	-124.050	0.501
Nikishka	USA	60.733	-151.300	0.746
Nikiski	USA	60.683	-151.383	0.711
Petersburg	USA	56.817	-132.950	0.801
Port Angeles	USA	48.133	-123.417	1.014
Port Lions	USA	57.867	-152.883	0.835
Portland(ME USA)	USA	43.650	-70.233	0.997
Portsmouth(NH USA)	USA	43.067	-70.700	1.012
Sand Point	USA	55.317	-160.483	0.608
Sandy Point(USA)	USA	48.817	-122.783	0.468
Seldovia	USA	59.433	-151.717	0.948
Seward	USA	60.117	-149.433	0.960
Sitka	USA	57.050	-135.333	0.655
Tenakee Springs	USA	57.783	-135.217	0.768
Tolstoi Bay	USA	55.667	-132.517	0.313
Unalaska	USA	53.850	-166.517	0.725
Willapa	USA	46.733	-124.067	0.958
Wrangell	USA	56.467	-132.367	0.778
Yakutat	USA	59.550	-139.750	0.944

Appendix F. List of global ports that have highest environmental similarity to Fraser Surrey. NIS originating from these ports have the highest potential for survival if introduced at Fraser Surrey.

Global Port	Country	Latitude	Longitude	Environmental Distance
St-Pierre et Miquelon		46.817	-56.167	0.667
Caleta Olivia	ARG	-46.433	-67.517	1.006
Caleta Paula	ARG	-46.470	-67.500	1.006
Comodoro Rivadavia	ARG	-45.857	-67.482	1.006
Puerto Deseado	ARG	-47.750	-65.894	0.993
Punta Quilla	ARG	-50.118	-68.413	0.980
San Julian	ARG	-49.250	-67.667	1.003
Santa Cruz(ARG)	ARG	-50.133	-68.383	0.980
Nieuwpoort	BEL	51.134	2.748	0.927
Ostend	BEL	51.230	2.923	0.900
Wielingen	BEL	51.383	3.383	0.974
Zandvoorde	BEL	51.217	2.967	0.936
Zeebrugge	BEL	51.323	3.216	0.791
Argentia	CAN	47.300	-53.983	0.606
Aulds Cove	CAN	45.650	-61.433	0.504
Bagotville	CAN	48.350	-70.883	0.678
Baie Verte	CAN	49.933	-56.200	0.806
Bathurst	CAN	47.617	-65.633	0.641
Bay Bulls	CAN	47.300	-52.733	0.752
Bay de Verde	CAN	48.083	-52.900	0.777
Bay Roberts	CAN	47.567	-53.217	0.539
Beaver Hbr.	CAN	44.867	-62.400	0.344
Belle Hbr.	CAN	47.667	-55.333	0.156
Belledune	CAN	47.917	-65.850	0.427
Belleoram	CAN	47.517	-55.417	0.156
Bic	CAN	48.367	-68.750	0.517
Big Hbr.	CAN	46.167	-60.417	1.002
Black Cape	CAN	48.117	-65.817	0.493
Blanc Sablon	CAN	51.417	-57.133	0.920
Bonaventure	CAN	48.283	-53.433	0.092
Bonavista	CAN	48.650	-53.117	0.756
Bridgewater(CAN)	CAN	44.367	-64.500	0.338
Bull Arm	CAN	47.767	-53.800	0.111
Burgeo	CAN	47.600	-57.617	0.082
Burin	CAN	47.033	-55.167	0.578
Burlington(NF)	CAN	49.767	-56.017	0.156
Butchers Cove	CAN	48.833	-54.000	0.576
Campbell River	CAN	50.033	-125.233	0.867
Campbellton	CAN	48.017	-66.667	0.462
Canaport	CAN	45.270	-66.050	0.685
Canso Hbr.	CAN	45.333	-61.000	0.176
Cap aux Meules	CAN	47.383	-61.867	0.189
Cape Tormentine	CAN	46.100	-63.767	0.370
Caraquet	CAN	47.800	-65.017	0.345
Carbonear	CAN	47.733	-53.233	0.134
Carleton	CAN	48.100	-66.133	0.477
Carmanville	CAN	49.400	-54.283	0.230
Cartwright	CAN	53.700	-57.017	0.605
Catalina	CAN	48.517	-53.067	0.756

Global Port	Country	Latitude	Longitude	Environmental Distance
Chandler	CAN	48.350	-64.667	0.329
Charlottetown(CAN)	CAN	46.217	-63.117	0.339
Chatham(CAN)	CAN	47.033	-65.467	0.683
Chemainus	CAN	48.917	-123.700	1.005
Cheticamp	CAN	46.633	-61.017	0.495
Chevery Harbour	CAN	50.454	-59.621	0.797
Clarks Hbr.	CAN	43.417	-65.633	0.716
Cole Hbr.	CAN	45.250	-61.283	0.356
Come by Chance	CAN	47.800	-54.017	0.000
Comox	CAN	49.667	-124.917	0.921
Conception Bay Harbour	CAN	47.567	-53.017	0.961
Cowichan Bay	CAN	48.750	-123.600	1.005
Crofton	CAN	48.867	-123.633	1.005
Dalhousie	CAN	48.067	-66.367	0.513
Digby	CAN	44.633	-65.750	0.698
Dildo	CAN	47.567	-53.567	0.580
Dingwall(CAN)	CAN	46.900	-60.450	0.167
Duncan Bay	CAN	50.083	-125.283	0.846
Eastern Passage	CAN	44.600	-63.483	0.593
Englee Hbr.	CAN	50.717	-56.117	0.847
Fishing East	CAN	44.450	-58.783	0.347
Forestville	CAN	48.800	-69.067	0.472
Fort Chimo (Kuujjuaq)	CAN	58.150	-68.300	0.965
Fortune	CAN	47.067	-55.833	0.590
Gaspe	CAN	48.833	-64.483	0.318
Georgetown(CAN)	CAN	46.183	-62.533	0.597
Glace Bay	CAN	46.200	-59.950	0.133
Grand Bank	CAN	47.100	-55.750	0.139
Grande Anse	CAN	48.400	-70.833	0.678
Grindstone	CAN	47.383	-61.850	0.189
Gros Cacouna	CAN	47.933	-69.517	0.669
Halifax	CAN	44.633	-63.550	0.817
Hantsport	CAN	45.067	-64.167	0.855
Harbour Breton	CAN	47.483	-55.800	0.106
Harbour Grace	CAN	47.683	-53.217	0.539
Harmac	CAN	49.133	-123.850	0.973
Havre St. Pierre	CAN	50.233	-63.600	0.303
Hawkes Bay	CAN	50.617	-57.167	0.561
Hibernia Platform	CAN	46.751	-48.794	0.920
Holyrood	CAN	47.400	-53.133	0.209
Jedway	CAN	52.300	-131.217	0.923
La Baie	CAN	48.317	-70.867	0.595
La Have	CAN	44.283	-64.350	0.338
La Scie	CAN	49.967	-55.583	0.973
Ladysmith	CAN	48.983	-123.783	0.956
L'Anse-au-Loup	CAN	51.517	-56.833	0.751
Les Mechins	CAN	49.017	-66.983	0.810
Lewisporte	CAN	49.250	-55.050	0.791
Liscomb	CAN	45.000	-62.000	0.318
Long Hbr.	CAN	47.450	-53.817	0.606
Long Pond	CAN	47.517	-52.967	0.698
Louisburg	CAN	45.917	-59.967	0.167

Global Port	Country	Latitude	Longitude	Environmental Distance
Lower Cove	CAN	48.517	-59.100	0.237
Lower Island Cove	CAN	48.000	-52.983	0.777
Lunenburg	CAN	44.367	-64.300	0.338
Main Brook	CAN	51.183	-56.017	0.286
Margaretsville	CAN	45.050	-65.067	0.642
Marystown	CAN	47.167	-55.150	0.578
Masset	CAN	54.000	-132.150	0.951
Matane	CAN	48.850	-67.533	0.996
Meteghan	CAN	44.200	-66.167	0.379
Millbank	CAN	47.050	-65.450	0.683
Mont Louis	CAN	49.233	-65.733	0.613
Montague	CAN	46.167	-62.633	0.632
Moosonee	CAN	51.267	-80.650	0.709
Mulgrave	CAN	45.583	-61.383	0.504
Nanaimo	CAN	49.167	-123.933	0.973
New Hbr.	CAN	44.467	-64.083	0.296
New Mills	CAN	47.950	-66.167	0.504
Newcastle(NB)	CAN	47.000	-65.550	0.682
North Sydney	CAN	46.200	-60.250	0.784
Nova Scotia Power Corporation Wharf	CAN	45.582	-61.352	0.324
Parrsboro	CAN	45.383	-64.333	0.412
Paspebiac	CAN	48.033	-65.233	0.430
Perce	CAN	48.500	-64.217	0.447
Pictou	CAN	45.683	-62.717	0.659
Plumper Sound	CAN	48.767	-123.200	0.992
Point Tupper	CAN	45.600	-61.367	0.504
Pointe Noire(CAN)	CAN	50.167	-66.467	0.629
Port Alfred	CAN	48.333	-70.867	0.595
Port aux Basques	CAN	47.567	-59.117	0.060
Port Cartier	CAN	50.017	-66.867	0.338
Port de Grave	CAN	47.600	-53.200	0.539
Port Edward	CAN	54.233	-130.300	0.588
Port Hastings	CAN	45.650	-61.400	0.504
Port Hawkesbury	CAN	45.617	-61.350	0.504
Port Mellon	CAN	49.517	-123.483	0.641
Port Menier	CAN	49.817	-64.350	0.230
Port Saunders	CAN	50.633	-57.300	0.744
Port Simpson	CAN	54.583	-130.417	0.981
Port Union	CAN	48.500	-53.083	0.756
Powell River	CAN	49.867	-124.550	0.878
Prince Rupert	CAN	54.317	-130.367	0.610
Pugwash	CAN	45.867	-63.667	0.269
Ramea Is.	CAN	47.517	-57.417	0.193
Richibucto	CAN	46.683	-64.867	0.693
Riverport	CAN	44.283	-64.333	0.338
Roberts Bank	CAN	49.017	-123.133	0.972
Saint John(CAN)	CAN	45.267	-66.067	0.373
Seven Islands (Sept-Iles)	CAN	50.100	-66.383	0.629
Shediac	CAN	46.233	-64.533	0.364
Sheet Hbr.	CAN	44.850	-62.450	0.344
Shelburne	CAN	43.667	-65.317	0.678
Ship Harbour	CAN	44.750	-62.750	0.421

Global Port	Country	Latitude	Longitude	Environmental Distance
Shippegan	CAN	47.750	-64.700	0.344
Souris	CAN	46.350	-62.250	0.312
South Nelson	CAN	46.983	-65.550	0.682
Springdale	CAN	49.500	-56.067	0.228
Squamish	CAN	49.683	-123.167	0.612
St Lawrence Seaway (Not a port)	CAN	47.632	-70.402	1.002
St. Andrews(CAN)	CAN	45.067	-67.050	0.992
St. Augustin	CAN	51.222	-58.645	0.797
St. Barbe Hbr.	CAN	51.200	-56.767	0.325
St. George's Hbr.(CAN)	CAN	48.450	-58.483	0.090
St. Jean	CAN	48.250	-70.183	0.581
St. John's(CAN)	CAN	47.563	-52.711	0.720
St. Peter's	CAN	45.650	-60.867	0.914
Stephenville	CAN	48.517	-58.533	0.089
Strait of Canso	CAN	45.333	-61.000	0.328
Summerside	CAN	46.400	-63.783	0.662
Sydney(NS)	CAN	46.150	-60.200	0.875
Tasu Bay	CAN	52.767	-132.050	0.645
Tilt Cove	CAN	49.883	-55.617	0.973
Tiverton(CAN)	CAN	44.400	-66.217	0.471
Tommy's Arm	CAN	49.433	-55.783	0.679
Turf Point	CAN	48.433	-58.467	0.090
Twillingate	CAN	49.683	-54.750	0.843
Union Bay	CAN	49.583	-124.867	0.921
Valleyfield Harbour (Newfoundland)	CAN	49.121	-53.608	0.569
Wabana	CAN	47.633	-52.917	0.698
Walton(CAN)	CAN	45.233	-64.017	0.575
Whiffen Head	CAN	47.767	-54.017	0.000
White Rose Oil Field harbour	CAN	46.789	-48.015	0.878
Witless Bay	CAN	47.283	-52.767	0.752
Woodfibre	CAN	49.667	-123.250	0.668
Yarmouth(CAN)	CAN	43.833	-66.117	0.494
Cabo Negro	CHL	-52.950	-70.783	0.821
Caleta Clarencia	CHL	-52.900	-70.150	0.795
Chacabuco	CHL	-45.467	-72.833	0.839
Chaiten	CHL	-42.917	-72.717	1.006
Porvenir(CHL)	CHL	-53.283	-70.367	0.845
Puerto Aguirre	CHL	-45.167	-73.517	0.998
Puerto Aisen	CHL	-45.383	-72.683	0.822
Puerto Cisnes	CHL	-44.733	-72.700	0.851
Puerto Natales	CHL	-51.717	-72.517	0.796
Punta Delgada	CHL	-52.450	-69.533	0.731
Huludao	CHN	40.717	120.983	0.919
Abbenfleth	DEU	53.683	9.500	0.831
Amrum Is.	DEU	54.633	8.350	0.554
Baltrum	DEU	53.733	7.400	0.628
Bardenfleth	DEU	53.150	8.550	0.810
Beidenfleth	DEU	53.867	9.433	0.819
Bensersiel	DEU	53.683	7.583	0.761
Blexen	DEU	53.533	8.533	0.771
Blumenthal	DEU	53.183	8.567	0.794
Borkum	DEU	53.583	6.667	0.631

Global Port	Country	Latitude	Longitude	Environmental Distance
Brake	DEU	53.333	8.483	0.806
Bremen	DEU	53.083	8.783	0.811
Bremerhaven	DEU	53.550	8.583	0.771
Brokdorf	DEU	53.867	9.333	0.819
Brunsbuttel	DEU	53.900	9.133	0.819
Burg	DEU	53.983	9.283	0.819
Busum	DEU	54.133	8.867	0.737
Butzfleth	DEU	53.650	9.517	0.840
Cuxhaven	DEU	53.867	8.700	0.889
Dagebull	DEU	54.733	8.733	0.651
Einswarden	DEU	53.517	8.517	0.771
Elmshorn	DEU	53.750	9.650	0.831
Elsfleth	DEU	53.233	8.467	0.806
Emden	DEU	53.350	7.183	0.964
Farge	DEU	53.200	8.517	0.794
Fischerhutte	DEU	54.150	9.367	0.789
Freiburg	DEU	53.817	9.300	0.835
Friedrichstadt	DEU	54.383	9.083	0.696
Ganspe	DEU	53.200	8.550	0.794
Gluckstadt	DEU	53.783	9.417	0.831
Hamburg	DEU	53.550	9.967	0.834
Harlesiel	DEU	53.633	7.750	0.751
Helgoland	DEU	54.150	7.883	0.583
Hemmoor	DEU	53.700	9.133	0.834
Hochdonn	DEU	54.017	9.300	0.796
Holmer Siel	DEU	54.533	8.867	0.671
Hornum	DEU	54.750	8.300	0.542
Horumersiel	DEU	53.667	8.017	0.594
Husum(DEU)	DEU	54.483	9.050	0.675
Itzehoe	DEU	53.933	9.517	0.814
Juist	DEU	53.683	7.000	0.753
Krautsand	DEU	53.767	9.383	0.831
Langeoog	DEU	53.750	7.533	0.631
Lemwerder	DEU	53.167	8.600	0.810
List	DEU	55.017	8.433	0.523
Neuenfelde	DEU	53.500	9.817	0.820
Neuhaus	DEU	53.800	9.033	0.834
Norddeich	DEU	53.633	7.167	0.727
Nordenham	DEU	53.483	8.483	0.790
Norderney	DEU	53.700	7.167	0.753
Nordstrand	DEU	54.483	8.917	0.688
Oldenburg	DEU	53.150	8.233	0.818
Oslebshausen	DEU	53.133	8.733	0.811
Ostermoor	DEU	53.917	9.183	0.819
Otterndorf	DEU	53.817	8.900	0.724
Rendsburg	DEU	54.317	9.667	0.793
Ruthenstrom	DEU	53.733	9.400	0.831
Schacht-Audorf	DEU	54.300	9.717	0.793
Schulau	DEU	53.567	9.700	0.836
Schwarzenhutten	DEU	53.700	9.167	0.834
Stade	DEU	53.600	9.483	0.833
Stadersand	DEU	53.617	9.533	0.840

Global Port	Country	Latitude	Longitude	Environmental Distance
Tonning	DEU	54.317	8.950	0.719
Utersen	DEU	53.667	9.650	0.840
Wangerooge	DEU	53.783	7.900	0.623
Wesermunde	DEU	53.533	8.583	0.771
Wewelsfleth	DEU	53.850	9.400	0.819
Wilhelmshaven	DEU	53.517	8.150	0.594
Wischhafen	DEU	53.783	9.333	0.835
Wyk	DEU	54.700	8.583	0.575
Aalborg	DNK	57.050	9.917	0.573
Aarhus	DNK	56.150	10.217	0.952
Anholt	DNK	56.717	11.517	0.933
Asa	DNK	57.150	10.417	0.554
Asaa	DNK	57.133	10.400	0.554
Ballen	DNK	55.817	10.650	0.974
Bogense	DNK	55.567	10.083	0.978
Ebeltoft	DNK	56.200	10.667	0.918
Endelave	DNK	55.750	10.267	1.006
Esbjerg	DNK	55.467	8.433	0.503
Fano Is.	DNK	55.417	8.417	0.503
Fredericia	DNK	55.567	9.750	0.949
Frederikshavn	DNK	57.433	10.550	0.554
Glatved	DNK	56.300	10.850	0.893
Grenaa	DNK	56.413	10.913	0.893
Hadsund	DNK	56.717	10.117	0.854
Hals	DNK	56.983	10.317	0.807
Hanstholm	DNK	57.117	8.583	0.527
Havneby	DNK	55.100	8.567	0.527
Hirtshals	DNK	57.600	9.967	0.561
Hobro	DNK	56.633	9.800	0.851
Horsens	DNK	55.850	9.867	0.992
Juelsminde	DNK	55.717	10.017	0.978
Kolby Kaas	DNK	55.800	10.533	0.974
Kolding	DNK	55.500	9.500	1.009
Kongsdal	DNK	56.683	10.067	0.854
Laeso	DNK	57.217	10.700	0.576
Lemvig	DNK	56.550	8.300	0.841
Lyngs Odde	DNK	55.517	9.750	0.965
Lyngsbaek Bridge	DNK	56.233	10.617	0.969
Mariager	DNK	56.650	9.983	0.850
Middelfart	DNK	55.500	9.733	0.965
Nordby	DNK	55.450	8.400	0.503
Norresundby	DNK	57.067	9.917	0.573
Randers	DNK	56.467	10.050	0.850
Ribe	DNK	55.317	8.767	0.598
Ringkobing	DNK	56.083	8.233	0.697
Saeby	DNK	57.333	10.517	0.554
Skaerbaek	DNK	55.517	9.617	1.010
Skagen	DNK	57.717	10.600	0.539
Strandby	DNK	57.483	10.517	0.549
Strib	DNK	55.533	9.767	0.949
Studstrup	DNK	56.250	10.350	0.948
Thyboron	DNK	56.700	8.217	0.574

Global Port	Country	Latitude	Longitude	Environmental Distance
Understed	DNK	57.383	10.500	0.554
Vejle	DNK	55.717	9.550	0.982
Boulogne	FRA	50.733	1.617	1.006
Calais	FRA	50.967	1.850	1.013
Dunkirk	FRA	51.050	2.350	0.910
Gravelines	FRA	50.983	2.133	0.904
Mardyck	FRA	51.000	2.233	0.912
Hosvik	FRO	62.150	-6.933	1.006
Kollafjordur	FRO	62.117	-6.900	1.006
Midvagur	FRO	62.033	-7.183	0.991
Sandvagur	FRO	62.050	-7.133	1.004
Vestmanna	FRO	62.150	-7.167	0.992
Aberdeen(GBR)	GBR	57.150	-2.067	0.767
Aberdovey	GBR	52.533	-4.050	0.886
Aberlady Bay	GBR	56.017	-2.850	0.875
Aberystwyth	GBR	52.400	-4.100	0.910
Alnwick	GBR	55.400	-1.700	0.900
Annan	GBR	54.983	-3.267	0.821
Arbroath	GBR	56.550	-2.583	0.775
Ardersier	GBR	57.567	-4.033	0.761
Ardrishaig	GBR	56.000	-5.433	0.788
Ardrossan(GBR)	GBR	55.633	-4.817	0.859
Avonmouth	GBR	51.500	-2.717	0.973
Ayr	GBR	55.467	-4.633	0.779
Ballantrae	GBR	55.100	-5.000	0.865
Ballylumford	GBR	54.833	-5.783	1.002
Banff	GBR	57.667	-2.517	0.745
Barcaldine	GBR	56.517	-5.400	0.793
Barrow-in-Furness	GBR	54.100	-3.217	0.716
Beaumaris	GBR	53.267	-4.083	0.893
Berwick-upon-Tweed	GBR	55.767	-2.000	0.896
Blyth	GBR	55.117	-1.483	0.911
Borth	GBR	52.483	-4.050	0.910
Braefoot Bay	GBR	56.033	-3.300	0.974
Bridlington	GBR	54.083	-0.183	0.818
Bridport(GBR)	GBR	50.717	-2.767	1.004
Brightlingsea	GBR	51.783	1.033	0.856
Brighton(GBR)	GBR	50.817	-0.100	0.971
Brodick	GBR	55.567	-5.100	0.977
Buckie	GBR	57.683	-2.950	0.796
Bunnahabhainn Bay	GBR	55.883	-6.117	0.847
Burghead	GBR	57.700	-3.500	0.744
Burntisland	GBR	56.050	-3.233	0.852
Caernarfon	GBR	53.150	-4.267	0.873
Cairnryan	GBR	54.967	-5.017	0.833
Campbeltown	GBR	55.417	-5.583	0.992
Canvey Is.	GBR	51.517	0.633	1.008
Carrickfergus	GBR	54.650	-5.883	0.959
Cemaes Bay	GBR	53.417	-4.450	0.940
Clacton	GBR	51.800	1.150	0.856
Cockenzie	GBR	55.967	-2.950	0.731
Conwy	GBR	53.300	-3.850	0.839

Global Port	Country	Latitude	Longitude	Environmental Distance
Creetown	GBR	54.900	-4.367	0.756
Cromarty	GBR	57.683	-4.033	0.746
Cromer	GBR	52.933	1.300	0.902
Dover	GBR	51.117	1.333	0.897
Dundee	GBR	56.467	-2.967	0.886
Dundrum	GBR	54.267	-5.850	0.827
Dunvegan	GBR	57.450	-6.583	0.961
Eyemouth	GBR	55.867	-2.083	0.936
Faversham	GBR	51.333	0.900	0.942
Felixstowe	GBR	51.950	1.317	0.863
Findochty	GBR	57.700	-2.900	0.796
Fishguard	GBR	52.017	-4.983	0.976
Fleetwood	GBR	53.933	-3.000	0.943
Folkestone	GBR	51.083	1.200	0.973
Fraserburgh	GBR	57.683	-2.000	1.007
Garlieston	GBR	54.800	-4.367	0.844
Girvan	GBR	55.250	-4.867	0.976
Glensanda	GBR	56.567	-5.533	0.756
Granton	GBR	55.983	-3.217	0.836
Great Oakley	GBR	51.900	1.250	0.863
Great Yarmouth	GBR	52.600	1.733	0.858
Grimsby	GBR	53.583	-0.067	0.769
Hartlepool	GBR	54.700	-1.200	0.931
Harwich	GBR	51.950	1.283	0.863
Herne Bay	GBR	51.367	1.117	1.004
Heysham	GBR	54.033	-2.917	0.781
Holyhead	GBR	53.317	-4.617	0.959
Hunstanton	GBR	52.933	0.500	0.807
Ilfracombe	GBR	51.200	-4.117	0.997
Immingham	GBR	53.633	-0.183	0.769
Inchkeith	GBR	56.033	-3.150	0.732
Irvine	GBR	55.600	-4.683	0.859
Islay Is.	GBR	55.800	-6.267	0.898
Isle of Whithorn	GBR	54.700	-4.367	0.922
Jura Is.	GBR	55.850	-6.083	0.847
Killingholme	GBR	53.667	-0.233	0.769
Kirkcaldy	GBR	56.117	-3.150	0.732
Kyle of Lochalsh	GBR	57.283	-5.733	0.798
Kyleakin	GBR	57.267	-5.733	0.798
Lamlash	GBR	55.533	-5.067	0.977
Largo Bay	GBR	56.217	-2.933	0.875
Larne	GBR	54.850	-5.783	1.002
Leigh	GBR	51.550	0.650	1.008
Leith	GBR	55.983	-3.167	0.716
Littlehampton	GBR	50.800	-0.533	0.971
Llanddulas	GBR	53.300	-3.650	0.785
Llanelli	GBR	51.667	-4.167	1.010
Loch Aline	GBR	56.533	-5.783	0.780
Loch Aline Pier	GBR	56.533	-5.783	0.780
Lossiemouth	GBR	57.717	-3.283	0.783
Lowestoft	GBR	52.467	1.750	0.865
Macduff	GBR	57.667	-2.500	0.745

Global Port	Country	Latitude	Longitude	Environmental Distance
Magheramorne	GBR	54.817	-5.767	1.014
Mallaig	GBR	57.000	-5.833	0.848
Maryport	GBR	54.717	-3.500	0.720
Methil	GBR	56.183	-3.000	0.875
Millom	GBR	54.183	-3.267	0.750
Montrose	GBR	56.700	-2.467	0.930
Mostyn	GBR	53.317	-3.233	0.787
Mull of Galloway	GBR	54.633	-4.850	0.991
Nairn	GBR	57.583	-3.867	0.739
Nigg	GBR	57.700	1.283	0.869
North Killingholme	GBR	53.650	-0.233	0.769
North Shields	GBR	55.017	-1.433	0.910
North Sunderland	GBR	55.583	-1.650	0.895
Oban	GBR	56.417	-5.483	0.800
Orbost	GBR	57.383	-6.567	0.833
Oulton Broad	GBR	52.483	1.733	0.857
Paull	GBR	53.717	-0.217	0.769
Penmaenmawr	GBR	53.267	-3.950	0.843
Peterhead	GBR	57.500	-1.783	1.006
Point Lynas	GBR	53.417	-4.283	0.940
Poole	GBR	50.717	-1.983	0.989
Port Askaig	GBR	55.850	-6.100	0.847
Port Penrhyn	GBR	53.233	-4.100	0.893
Portavadie	GBR	55.867	-5.300	0.790
Portbury	GBR	51.500	-2.733	0.973
Porthmadog	GBR	52.917	-4.133	0.851
Portishead	GBR	51.483	-2.767	0.973
Portnockie	GBR	57.700	-2.867	0.796
Portpatrick	GBR	54.850	-5.117	1.001
Portrush	GBR	55.217	-6.667	0.877
Ramsgate	GBR	51.333	1.417	0.889
Redcar	GBR	54.617	-1.067	0.931
Richborough	GBR	51.300	1.350	0.889
Salt End	GBR	53.733	-0.233	0.794
Sandhaven	GBR	57.683	-2.017	1.007
Scarborough(GBR)	GBR	54.283	-0.383	0.836
Scrabster	GBR	58.617	-3.533	0.810
Seaham	GBR	54.833	-1.317	0.921
Seaton Sluice	GBR	55.083	-1.467	0.911
Shoreham	GBR	50.833	-0.250	0.971
Silloth	GBR	54.867	-3.400	0.828
Sizewell	GBR	52.217	1.600	0.858
Snape Bridge	GBR	52.150	1.500	0.858
South Killingholme	GBR	53.633	-0.200	0.769
South Shields	GBR	55.000	-1.433	0.910
St. Monans	GBR	56.200	-2.767	0.902
Stockton	GBR	54.624	-1.153	1.002
Stranraer	GBR	54.917	-5.033	1.001
Sullom Voe	GBR	60.450	-1.333	0.867
Sunderland	GBR	54.917	-1.367	0.921
Tayport	GBR	56.450	-2.883	0.886
Tenby	GBR	51.700	-4.717	0.963

Global Port	Country	Latitude	Longitude	Environmental Distance
Thurso	GBR	58.583	-3.517	0.810
Tobermory(GBR)	GBR	56.617	-6.050	0.823
Troon	GBR	55.550	-4.683	0.859
Tyne	GBR	55.000	-1.433	0.910
Walton Bay	GBR	51.467	-2.817	0.973
Walton on the Naze	GBR	51.850	1.267	0.863
Warkworth	GBR	55.333	-1.567	0.900
Watchet	GBR	51.183	-3.333	0.962
Wells	GBR	52.967	0.850	0.873
Whitby	GBR	54.483	-0.617	0.840
Whitehaven	GBR	54.550	-3.583	0.801
Whitstable	GBR	51.367	1.033	1.004
Wigtown	GBR	54.867	-4.433	0.756
Workington	GBR	54.650	-3.567	0.801
Jablanac	HRV	44.700	14.867	0.782
Velika Stinica	HRV	44.717	14.867	0.782
Castletown	IOM	54.067	-4.650	0.958
Douglas	IOM	54.150	-4.467	0.920
Peel	IOM	54.233	-4.700	0.961
Port St. Mary	IOM	54.067	-4.733	0.958
Ramsey	IOM	54.317	-4.383	0.920
Buncrana	IRL	55.133	-7.450	0.944
Dungarvan	IRL	52.083	-7.600	1.012
Fenit	IRL	52.267	-9.850	0.982
Galway	IRL	53.267	-9.050	0.989
Greenore	IRL	54.033	-6.133	0.856
Killybegs	IRL	54.633	-8.433	0.886
Rathmullen	IRL	55.100	-7.533	0.958
Spiddle	IRL	53.250	-9.300	0.953
Akranes	ISL	64.317	-22.083	0.983
Bordeyri	ISL	65.217	-21.150	1.018
Borgarnes	ISL	64.533	-21.917	0.998
Dyrholaey	ISL	63.400	-19.133	0.785
Eyrarbakki	ISL	63.867	-21.150	0.781
Gardabaer	ISL	64.067	-21.933	0.805
Grindavik	ISL	63.833	-22.433	0.758
Grundarfjordur	ISL	64.917	-23.217	0.980
Gufunes	ISL	64.150	-21.817	0.854
Hafnarfjordur	ISL	64.067	-21.917	0.805
Hellisandur	ISL	64.900	-23.900	0.884
Hofn	ISL	64.267	-15.217	0.877
Hofsos	ISL	65.883	-19.400	0.974
Kopavogur	ISL	64.100	-21.883	0.805
Korsnes(ISL)	ISL	64.117	-21.900	0.805
Kroksfjardarnes	ISL	65.450	-21.933	0.996
Reykholar	ISL	65.450	-22.217	1.013
Reykjavik	ISL	64.150	-21.948	0.805
Stokkseyri	ISL	63.833	-21.083	0.714
Straumsvik	ISL	64.050	-22.050	1.016
Thorlakshofn	ISL	63.850	-21.333	0.840
Abashiri	JPN	44.017	144.283	0.228
Akkeshi	JPN	43.050	144.850	0.532

Global Port	Country	Latitude	Longitude	Environmental Distance
Esashi	JPN	44.933	142.600	0.590
Ishikariwan Shinko	JPN	43.217	141.300	1.002
Iwanai	JPN	42.983	140.517	0.763
Kushiro	JPN	42.983	144.367	0.552
Mashike	JPN	43.867	141.517	0.968
Monbetsu	JPN	44.350	143.367	0.204
Mori	JPN	42.117	140.583	0.984
Muroran	JPN	42.350	140.950	0.916
Nemuro	JPN	43.333	145.583	0.290
Otaru	JPN	43.200	141.017	1.005
Rumoi	JPN	43.950	141.633	0.968
Shiriya	JPN	41.400	141.467	0.888
Tokachi	JPN	42.300	143.333	0.255
Tomakomai	JPN	42.633	141.633	0.924
Wakkanai	JPN	45.417	141.700	0.695
Wanishi	JPN	42.333	141.000	0.816
Yoichi	JPN	43.217	140.783	0.959
Alkmaar	NLD	52.633	4.717	0.993
Almelo	NLD	52.367	6.633	0.781
Almere-Haven	NLD	52.333	5.217	0.837
Ameland	NLD	53.450	5.633	0.680
Appingedam	NLD	53.317	6.850	0.894
Balk	NLD	52.900	5.567	0.770
Breskens	NLD	51.400	3.567	0.985
Delfzijl	NLD	53.333	6.933	0.627
Den Helder	NLD	52.967	4.783	0.746
Den Oever	NLD	52.917	5.017	0.750
Deventer	NLD	52.250	6.150	0.817
Doesburg	NLD	52.017	6.133	0.828
Doetinchem	NLD	51.967	6.283	0.858
Domburg	NLD	51.567	3.500	0.816
Eemshaven	NLD	53.450	6.833	0.627
Europoort	NLD	51.950	4.083	0.830
Farmsum	NLD	53.317	6.933	0.627
Flushing	NLD	51.450	3.583	0.985
Franeker	NLD	53.183	5.550	0.713
Halfweg	NLD	52.383	4.750	1.018
Harlingen	NLD	53.183	5.417	0.706
Hasselt	NLD	52.583	6.083	0.777
Heemstede	NLD	52.350	4.600	0.992
Hengelo	NLD	52.267	6.767	0.793
Hillegom	NLD	52.300	4.583	0.992
Hook of Holland	NLD	51.983	4.117	0.812
Kampen	NLD	52.583	5.800	0.774
Katwijk aan Zee	NLD	52.200	4.400	0.823
Lauwersoog	NLD	53.400	6.217	0.872
Lelystad	NLD	52.500	5.433	0.806
Lemmer	NLD	52.850	5.683	0.765
Lisserbroek	NLD	52.267	4.567	0.992
Lochem	NLD	52.167	6.417	0.831
Makkum	NLD	53.067	5.400	0.706
Meppel	NLD	52.700	6.200	0.750

Global Port	Country	Latitude	Longitude	Environmental Distance
Monnickendam	NLD	52.467	5.033	0.837
Muiden	NLD	52.317	5.067	0.837
Nijkerk	NLD	52.217	5.483	0.826
Oostmahorn	NLD	53.383	6.167	0.749
Oostvoorne	NLD	51.917	4.083	0.830
Schagen	NLD	52.783	4.785	0.876
Scheveningen	NLD	52.100	4.267	0.823
Schiermonnikoog	NLD	53.483	6.150	0.643
'sGravenhage	NLD	52.083	4.300	0.823
Siddeburen	NLD	53.250	6.867	0.957
Sneek	NLD	53.033	5.667	0.713
Spaarndam	NLD	52.417	4.683	0.928
Staveren	NLD	52.867	5.350	0.754
Steenwijk	NLD	52.783	6.117	0.760
Terschelling	NLD	53.367	5.217	0.693
Texel	NLD	53.183	4.850	0.710
Urk	NLD	52.667	5.600	0.796
Vlissingen	NLD	52.450	4.583	0.784
Wagenborgen	NLD	53.250	6.933	0.953
Workum	NLD	52.983	5.433	0.710
Woudsend	NLD	52.933	5.617	0.770
Ymuiden	NLD	52.450	4.583	0.802
Zandvoort	NLD	52.367	4.533	0.802
Zutphen	NLD	52.133	6.200	0.832
Zwartsluis	NLD	52.633	6.067	0.777
Zwolle	NLD	52.517	6.117	0.777
Aakrehamn	NOR	59.250	5.167	0.616
Aalesund	NOR	62.467	6.167	0.620
Abelvaer	NOR	64.733	11.167	0.817
Andenes	NOR	69.317	16.133	1.017
Arendal	NOR	58.467	8.767	0.630
Asvall	NOR	59.017	9.600	0.236
Aukra	NOR	62.783	6.967	0.867
Avaldsnes	NOR	59.350	5.267	0.786
Averoy	NOR	63.117	7.667	0.841
Ballstad	NOR	68.067	13.533	0.590
Bamble	NOR	59.017	9.667	0.236
Bekkjarvik	NOR	60.000	5.217	0.658
Bergneset	NOR	68.800	16.000	0.965
Bjugn	NOR	63.767	9.733	0.985
Bodo	NOR	67.283	14.383	0.830
Bokn	NOR	59.217	5.450	0.608
Borg Hbr.	NOR	59.200	10.950	0.432
Borkenes	NOR	68.767	16.183	1.007
Bovagen	NOR	60.700	4.933	0.714
Brattvag	NOR	62.600	6.450	0.851
Brettesnes	NOR	68.233	14.867	0.844
Bronnoysund	NOR	65.467	12.217	0.847
Drammen	NOR	59.733	10.233	0.372
Drobak	NOR	59.650	10.633	0.375
Dryna	NOR	62.633	6.533	0.592
Dyroy	NOR	68.817	14.817	0.883

Global Port	Country	Latitude	Longitude	Environmental Distance
Egersund	NOR	58.450	6.000	0.798
Elnesvagen	NOR	62.850	7.150	0.831
Engene	NOR	59.683	10.550	0.425
Espevaer	NOR	59.583	5.150	0.624
Eydehamn	NOR	58.500	8.883	0.494
Fagerstrand	NOR	59.733	10.600	0.425
Fedje	NOR	60.750	4.733	0.725
Fevag	NOR	63.667	9.833	0.888
Fiskarstranda	NOR	62.433	6.267	0.887
Floro	NOR	61.600	5.033	0.611
Fonnes	NOR	60.800	4.983	0.594
Foresvik	NOR	59.217	5.433	0.608
Fosen	NOR	59.317	5.367	0.918
Fosnavaag	NOR	62.350	5.633	0.771
Fredrikstad	NOR	59.200	10.967	0.432
Gjevingstangholmen	NOR	58.650	9.133	0.489
Gravdal	NOR	68.117	13.550	0.590
Greaker	NOR	59.267	11.033	0.432
Grimstad	NOR	58.333	8.600	0.409
Gronsfjord	NOR	58.017	7.033	0.399
Gursken	NOR	62.233	5.550	0.771
Haavik	NOR	59.317	5.317	0.900
Halden	NOR	59.117	11.367	0.418
Halvorshavn	NOR	59.583	10.617	0.375
Hareid	NOR	62.367	6.033	0.812
Harstad	NOR	68.800	16.550	0.972
Haugesund	NOR	59.417	5.267	0.669
Haugsholmen	NOR	62.167	5.400	0.752
Henningsvaer	NOR	68.150	14.217	0.900
Hestvika	NOR	63.567	9.167	0.885
Hilleren	NOR	60.167	5.083	0.658
Hitra	NOR	63.433	8.417	0.861
Hjorungavaag	NOR	62.350	6.083	0.813
Holm	NOR	59.100	11.383	0.418
Holmestrand	NOR	59.533	10.267	0.388
Hommelsto	NOR	65.533	12.333	0.873
Horten	NOR	59.417	10.500	0.451
Hurum	NOR	59.617	10.450	0.399
Husoy	NOR	61.017	4.700	0.718
Jelsa	NOR	59.333	6.033	0.394
Kaarsto	NOR	59.267	5.533	0.525
Kalvaag	NOR	61.767	4.883	0.746
Kambo	NOR	59.483	10.700	0.427
Karlsoy	NOR	70.000	19.900	0.885
Kilsund	NOR	58.550	8.983	0.489
Kjelstraum	NOR	60.800	4.950	0.725
Kollsnes	NOR	60.567	4.833	0.714
Kolvereid	NOR	64.883	11.583	0.817
Kopervik	NOR	59.283	5.300	1.003
Kragero	NOR	58.867	9.417	0.476
Kristiansand	NOR	58.150	8.000	0.378
Kristiansund	NOR	63.117	7.733	0.844

Global Port	Country	Latitude	Longitude	Environmental Distance
Langesund	NOR	59.000	9.750	0.307
Langevag	NOR	62.433	6.250	0.887
Larkollen	NOR	59.317	10.683	0.448
Larvik	NOR	59.050	10.033	0.407
Lauvsnes	NOR	64.500	10.900	0.812
Leirpollen	NOR	70.383	25.517	0.747
Lillebukt	NOR	70.333	22.500	1.000
Lillesand	NOR	58.250	8.383	0.377
Lindesnes	NOR	57.983	7.050	0.406
Lodingen	NOR	68.417	16.000	0.916
Lysaker	NOR	59.917	10.633	0.366
Lysoysund	NOR	63.883	9.883	0.842
Magero	NOR	59.150	10.433	0.496
Mandal	NOR	58.033	7.467	0.353
Marnes	NOR	67.133	14.083	0.853
Mastrevik	NOR	60.800	4.967	0.725
Melbu	NOR	68.500	14.800	0.693
Melsomvik	NOR	59.217	10.350	0.496
Midsund	NOR	62.700	6.700	0.611
Molde	NOR	62.733	7.167	0.897
Moltustranda	NOR	62.300	5.650	0.771
More	NOR	62.467	6.150	0.620
Moss	NOR	59.433	10.667	0.424
Myre	NOR	69.083	15.950	0.995
Nusfjord	NOR	68.033	13.350	0.978
Oslo	NOR	59.900	10.717	0.379
Ottersoy	NOR	64.850	11.283	0.816
Rafnes	NOR	59.100	9.600	0.989
Ramsvika	NOR	62.933	7.400	0.925
Randaberg	NOR	59.000	5.633	0.598
Raudeberg	NOR	61.983	5.100	0.771
Risor	NOR	58.717	9.233	0.494
Rorvik	NOR	64.867	11.267	0.816
Rosfjord	NOR	58.050	6.983	0.407
Ryvingen	NOR	57.967	7.500	0.557
Saetrepollen	NOR	59.683	10.533	0.425
Salthella	NOR	60.000	5.117	0.658
Sande	NOR	59.583	10.250	0.388
Sandefjord	NOR	59.133	10.233	0.496
Sandnessjoen	NOR	66.017	12.633	0.931
Sarpsborg	NOR	59.267	11.100	0.432
Selje	NOR	62.050	5.367	0.752
Skaland	NOR	69.450	17.300	0.793
Skudeneshavn	NOR	59.133	5.267	0.608
Slagen	NOR	59.317	10.533	0.424
Slemmestad	NOR	59.783	10.500	0.376
Sogne	NOR	58.083	7.783	0.358
Sola	NOR	58.917	5.567	0.516
Solumstrand	NOR	59.717	10.283	0.372
Sondeled	NOR	58.717	9.200	0.489
Sortland	NOR	68.700	15.433	0.972
Sovik	NOR	65.917	12.433	0.882

Global Port	Country	Latitude	Longitude	Environmental Distance
Stamsund	NOR	68.117	13.850	0.954
Stavanger	NOR	58.967	5.733	0.492
Stokksund	NOR	64.033	10.033	0.818
Stokmarknes	NOR	68.567	14.917	0.600
Storasund	NOR	59.383	5.267	0.669
Straumen	NOR	63.333	8.100	0.866
Sture	NOR	60.617	4.850	0.714
Svelvik	NOR	59.617	10.417	0.399
Svolvaer	NOR	68.233	14.567	0.600
Tau	NOR	59.067	5.933	0.585
Telavag	NOR	60.250	5.000	0.604
Tjeldbergodden	NOR	63.417	8.700	1.007
Tjorvaag	NOR	62.283	5.750	0.769
Tofte	NOR	59.550	10.583	0.375
Tomrefjord	NOR	62.633	6.683	0.854
Tonsberg	NOR	59.267	10.417	0.487
Tovik	NOR	68.667	16.900	0.866
Tvedestrand	NOR	58.633	8.933	0.353
Ulsteinvik	NOR	62.350	5.850	0.769
Uthaug	NOR	63.733	9.600	0.856
Vadso	NOR	70.067	29.733	0.886
Valloy	NOR	59.267	10.500	0.481
Vats	NOR	59.483	5.750	0.445
Vigsnes	NOR	59.400	5.133	0.615
Voksa	NOR	62.233	5.450	0.786
Tarakohe	NZL	-40.850	172.900	0.987
Rajin	PRK	42.183	130.317	0.565
Agnevo	RUS	50.517	142.067	0.441
Aleksandrovsk-Sakhalinskiy	RUS	50.883	142.117	0.773
Amgu	RUS	45.817	137.667	0.496
Anadyr	RUS	64.733	177.533	1.008
Archangel	RUS	64.533	40.500	0.758
Bolshoy Kamen	RUS	43.133	132.333	0.952
Boshnyakovo	RUS	49.583	142.200	0.479
Burevestnik	RUS	44.950	147.617	0.214
De Kastri	RUS	51.467	140.783	0.247
Kamenka	RUS	65.883	44.183	0.492
Kandalaksha	RUS	67.133	32.433	0.840
Keret	RUS	66.283	33.567	0.975
Khasan	RUS	42.467	130.800	0.504
Khoe	RUS	51.283	142.167	0.413
Kholmsk	RUS	47.050	142.050	0.329
Kolguyev Is.	RUS	68.767	49.233	0.830
Korsakov	RUS	46.667	142.750	0.345
Kovda	RUS	66.683	32.867	0.766
Krasnogorsk	RUS	48.367	142.150	0.372
Lazarev	RUS	52.233	141.517	0.498
Livadiya	RUS	42.850	132.700	0.955
Magadan	RUS	59.633	150.833	0.913
Mezen	RUS	65.850	44.250	0.492
Moryak-Rybolov	RUS	43.333	134.783	0.811
Moskalvo	RUS	53.583	142.500	0.530

Global Port	Country	Latitude	Longitude	Environmental Distance
Nakhodka	RUS	42.800	132.900	0.973
Nelma	RUS	47.633	139.167	0.333
Nevelsk	RUS	46.667	141.850	0.376
Okhotsk	RUS	59.350	143.167	0.720
Olga	RUS	43.767	135.233	0.828
Onega	RUS	63.917	38.100	0.635
Ossora	RUS	59.267	163.133	0.810
Petropavlovsk-Kamchatskiy	RUS	53.017	158.633	0.454
Plastun	RUS	44.717	136.250	0.188
Podyapolskoye	RUS	42.933	132.317	0.300
Pogranichnoye	RUS	50.367	143.717	0.394
Poronaysk	RUS	49.217	143.117	0.416
Rudnaya Pristan	RUS	44.300	135.850	0.665
Severo Kurilsk	RUS	50.683	156.117	0.867
Shakhtersk	RUS	49.150	142.050	0.375
Siziman	RUS	50.750	140.417	0.467
Slavyanka	RUS	42.917	131.467	1.014
Sovetskaya Gavan	RUS	49.033	140.333	0.293
Svetlaya	RUS	46.533	138.333	0.358
Tangi	RUS	51.233	142.167	0.413
Uglegorsk	RUS	49.067	142.017	0.375
Umba	RUS	66.667	34.300	0.723
Ust-Kara	RUS	69.200	65.000	0.977
Ust-Penzhino	RUS	62.500	165.150	0.836
Vanino	RUS	49.083	140.267	0.293
Vitino	RUS	66.900	32.333	0.850
Vladivostok	RUS	43.117	131.883	0.300
Vostochnyy	RUS	42.750	133.067	0.942
Yasnomorskiy	RUS	46.750	141.900	0.424
Yuzhno Kurilsk	RUS	44.050	145.800	0.333
St. Pierre(SPM)	SPM	46.817	-56.167	0.556
Agnesberg	SWE	57.783	12.000	0.782
Bohus	SWE	57.850	12.033	0.748
Brofjorden	SWE	58.333	11.383	0.638
Donso	SWE	57.583	11.800	0.826
Edshultshall	SWE	58.117	11.467	0.565
Fjallbacka	SWE	58.600	11.283	0.545
Gota(SWE)	SWE	58.100	12.150	0.728
Gothenburg	SWE	57.700	11.950	0.782
Grebbestad	SWE	58.683	11.250	0.511
Gustavsberg	SWE	58.333	11.900	0.552
Henan	SWE	58.233	11.667	0.596
Hunnebostrand	SWE	58.433	11.300	0.572
Kungsbacka	SWE	57.483	12.083	0.813
Kungshamn	SWE	58.367	11.233	0.572
Lilla Edet	SWE	58.117	12.117	0.728
Lodose	SWE	58.033	12.150	0.728
Lysekil	SWE	58.267	11.433	0.638
Marstrand	SWE	57.883	11.583	0.632
Mossholmen	SWE	57.950	11.567	0.632
Munkedalhamn	SWE	58.433	11.667	0.579
Nol	SWE	57.933	12.133	0.748

Global Port	Country	Latitude	Longitude	Environmental Distance
Ockero	SWE	57.717	11.633	0.664
Ramsvik	SWE	58.433	11.267	0.572
Ronnang	SWE	58.083	11.667	0.619
Roro	SWE	57.767	11.617	0.661
Ryxo	SWE	58.367	11.433	0.591
Skarhamn	SWE	57.983	11.550	0.685
Skredsvik	SWE	58.383	11.650	0.579
Smogen	SWE	58.350	11.233	0.572
Stallbacka	SWE	58.300	12.300	0.723
Stensjo	SWE	58.400	11.400	0.591
Stenungsund	SWE	58.083	11.817	0.667
Stromstad	SWE	58.933	11.167	0.427
Surte	SWE	57.833	12.017	0.759
Trollhattan	SWE	58.283	12.283	0.723
Uddevalla	SWE	58.350	11.917	0.518
Vanersborg	SWE	58.383	12.333	0.715
Vargon	SWE	58.350	12.383	0.712
Vasterlanda	SWE	58.100	12.117	0.728
Wallhamn	SWE	58.000	11.700	0.668
Afognak	USA	58.000	-152.833	0.455
Anchorage	USA	61.217	-149.883	0.624
Angoon	USA	57.483	-134.567	0.549
Astoria	USA	46.183	-123.833	1.009
Bar Hbr.	USA	44.383	-68.200	0.855
Bartlett Cove	USA	58.467	-135.817	0.315
Bayway	USA	40.630	-74.200	0.941
Bellingham	USA	48.750	-122.500	0.979
Bridgeport	USA	41.150	-73.183	0.915
Camden(ME USA)	USA	44.217	-69.067	0.870
Castle Is.	USA	56.650	-133.167	0.539
Chatham(USA)	USA	57.517	-134.950	0.900
Chenega	USA	60.267	-148.067	0.692
Cherry Point	USA	48.867	-122.750	0.974
Chignik	USA	56.300	-158.400	0.703
Cold Bay	USA	55.183	-162.700	0.684
Cordova	USA	60.550	-145.767	0.907
Craig	USA	55.467	-133.150	0.625
Dutch Hbr.	USA	53.900	-166.533	0.853
East Boothbay	USA	43.850	-69.583	0.953
Eastport	USA	44.900	-66.983	0.900
Gloucester(MA USA)	USA	42.617	-70.667	0.574
Greenport	USA	41.100	-72.350	0.940
Gustavus	USA	58.400	-135.733	0.315
Haines	USA	59.233	-135.450	0.428
Hawk Inlet	USA	58.100	-134.733	0.577
Homer	USA	59.633	-151.500	0.909
Hoonah	USA	58.117	-135.433	0.842
Hydaburg	USA	55.200	-132.817	1.012
Icy Strait Point	USA	58.100	-135.600	0.513
Johnstown Harbour	USA	44.710	-75.468	0.390
Juneau	USA	58.300	-134.417	0.695
Kenai	USA	60.550	-151.267	0.662

Global Port	Country	Latitude	Longitude	Environmental Distance
Ketchikan	USA	55.350	-131.650	0.477
King Cove	USA	55.033	-162.317	0.782
Klawock	USA	55.550	-133.100	0.600
Kodiak	USA	57.783	-152.400	0.963
Metlakatla	USA	55.133	-131.567	0.946
Naknek	USA	58.733	-157.033	0.519
Nantucket Is.	USA	41.283	-70.100	0.722
New Bedford	USA	41.633	-70.917	0.906
Nikishka	USA	60.733	-151.300	0.837
Nikiski	USA	60.683	-151.383	0.887
Nome	USA	64.517	-165.417	0.987
Northeast Hbr.(USA)	USA	44.300	-68.283	0.837
Northville	USA	40.983	-72.650	0.939
Perth Amboy	USA	40.504	-74.273	0.975
Petersburg	USA	56.817	-132.950	0.489
Plymouth(MA USA)	USA	41.950	-70.667	1.015
Point Judith	USA	41.367	-71.483	0.847
Port Angeles	USA	48.133	-123.417	0.764
Port Lions	USA	57.867	-152.883	0.455
Portland(ME USA)	USA	43.650	-70.233	0.455
Portsmouth(NH USA)	USA	43.067	-70.700	0.420
Provincetown	USA	42.050	-70.183	0.554
Riverhead	USA	40.917	-72.667	0.965
Rockland	USA	44.100	-69.117	0.933
Sag Hbr.	USA	41.017	-72.300	0.939
Sand Point	USA	55.317	-160.483	1.004
Sandwich(USA)	USA	41.767	-70.483	0.778
Seldovia	USA	59.433	-151.717	0.680
Sesuit Hbr.	USA	41.750	-70.150	0.670
Seward	USA	60.117	-149.433	0.458
Sitka	USA	57.050	-135.333	0.574
Skagway	USA	59.450	-135.317	0.909
South Bristol	USA	43.850	-69.550	0.953
St. Michael(AK USA)	USA	63.467	-162.017	0.805
Susitna	USA	61.467	-150.500	0.658
Tatitlek	USA	60.850	-146.683	0.363
Tenakee Springs	USA	57.783	-135.217	0.579
Togiak	USA	59.083	-160.500	0.646
Tolstoi Bay	USA	55.667	-132.517	0.918
Tyonek	USA	61.067	-151.150	0.614
Valdez	USA	61.133	-146.350	0.679
Whittier	USA	60.783	-148.667	0.713
Willapa	USA	46.733	-124.067	1.007
Wrangell	USA	56.467	-132.367	0.497
Yakutat	USA	59.550	-139.750	0.429

Appendix G. List of global ports that have highest environmental similarity to Fraser Port. NIS originating from these ports have the highest potential for survival if introduced at Fraser Port.

Global Port	Country	Latitude	Longitude	Environmental Distance
Atucha	ARG	-33.957	-59.251	0.751
Buenos Aires	ARG	-34.590	-58.378	0.928
Caleta Cordova	ARG	-45.717	-67.350	0.785
Caleta Olivia	ARG	-46.433	-67.517	0.792
Caleta Paula	ARG	-46.470	-67.500	0.792
Camarones	ARG	-44.450	-65.700	0.724
Campana	ARG	-34.157	-58.966	0.754
Comodoro Rivadavia	ARG	-45.857	-67.482	0.816
Escobar	ARG	-34.350	-58.767	0.909
Lima(ARG)	ARG	-33.977	-59.187	0.751
Mar del Plata	ARG	-38.033	-57.545	0.896
Necochea	ARG	-38.575	-58.721	0.958
Puerto Deseado	ARG	-47.750	-65.894	0.607
Puerto Madryn	ARG	-42.739	-65.047	1.011
Rio Gallegos	ARG	-51.617	-69.221	0.856
San Fernando(ARG)	ARG	-34.450	-58.533	0.904
Tigre	ARG	-34.433	-58.550	0.904
Zarate	ARG	-34.091	-59.021	0.754
Barry Beach	AUS	-38.717	146.383	0.806
Bell Bay	AUS	-41.133	146.867	0.896
Burnie	AUS	-41.058	145.905	0.921
Georgetown(AUS)	AUS	-41.100	146.817	0.840
Hobart	AUS	-42.838	147.289	0.920
Inspection Head	AUS	-41.150	146.817	0.922
Macquarie Hbr.	AUS	-42.167	145.333	0.810
Port Huon	AUS	-43.167	147.000	0.842
Port Latta	AUS	-40.854	145.387	0.935
Port Welshpool	AUS	-38.700	146.450	0.806
Triabunna	AUS	-42.450	147.933	0.661
Ulverstone	AUS	-41.233	146.167	0.887
Bruges	BEL	51.222	3.221	0.545
Nieuwpoort	BEL	51.134	2.748	0.683
Oostkamp	BEL	51.150	3.250	0.721
Ostend	BEL	51.230	2.923	0.708
Wielingen	BEL	51.383	3.383	0.592
Zandvoorde	BEL	51.217	2.967	0.657
Zeebrugge	BEL	51.323	3.216	0.666
Balchik	BGR	43.383	28.183	0.851
Lesport	BGR	43.167	27.817	0.913
Nessebar	BGR	42.667	27.733	0.916
Pomorie	BGR	42.533	27.650	0.986
Varna	BGR	43.200	27.917	0.842
Aulds Cove	CAN	45.650	-61.433	0.819
Bathurst	CAN	47.617	-65.633	0.911
Beaver Hbr.	CAN	44.867	-62.400	0.838

Global Port	Country	Latitude	Longitude	Environmental Distance
Belle Hbr.	CAN	47.667	-55.333	0.961
Belleoram	CAN	47.517	-55.417	0.961
Bic	CAN	48.367	-68.750	0.988
Big Hbr.	CAN	46.167	-60.417	0.887
Black Cape	CAN	48.117	-65.817	0.956
Bonaventure	CAN	48.283	-53.433	0.991
Bull Arm	CAN	47.767	-53.800	0.990
Campbell River	CAN	50.033	-125.233	0.616
Canso Hbr.	CAN	45.333	-61.000	0.952
Cape Tormentine	CAN	46.100	-63.767	1.007
Carbonear	CAN	47.733	-53.233	0.968
Carleton	CAN	48.100	-66.133	1.006
Carmanville	CAN	49.400	-54.283	0.983
Charlottetown(CAN)	CAN	46.217	-63.117	0.982
Chatham(CAN)	CAN	47.033	-65.467	0.901
Chemainus	CAN	48.917	-123.700	0.861
Cheticamp	CAN	46.633	-61.017	0.822
Cole Hbr.	CAN	45.250	-61.283	0.823
Comox	CAN	49.667	-124.917	0.737
Cowichan Bay	CAN	48.750	-123.600	0.861
Crofton	CAN	48.867	-123.633	0.861
Dalhousie	CAN	48.067	-66.367	0.990
Dartmouth(NS)	CAN	44.667	-63.583	0.801
Digby	CAN	44.633	-65.750	0.610
Duncan Bay	CAN	50.083	-125.283	0.243
Eastern Passage	CAN	44.600	-63.483	0.632
Fishing East	CAN	44.450	-58.783	0.921
Fraser River Port	CAN	49.200	-122.917	0.000
Georgetown(CAN)	CAN	46.183	-62.533	0.833
Glace Bay	CAN	46.200	-59.950	1.006
Grand Bank	CAN	47.100	-55.750	0.956
Gros Cacouna	CAN	47.933	-69.517	0.978
Halifax	CAN	44.633	-63.550	0.649
Hantsport	CAN	45.067	-64.167	0.679
Harbour Breton	CAN	47.483	-55.800	1.007
Harmac	CAN	49.133	-123.850	0.691
Holyrood	CAN	47.400	-53.133	0.912
Hubbards	CAN	44.633	-64.067	0.818
Ladysmith	CAN	48.983	-123.783	0.694
Liscomb	CAN	45.000	-62.000	0.833
Liverpool(NS)	CAN	44.050	-64.717	0.901
Meteghan	CAN	44.200	-66.167	0.802
Millbank	CAN	47.050	-65.450	0.901
Montague	CAN	46.167	-62.633	0.821
Mulgrave	CAN	45.583	-61.383	0.819
Nanaimo	CAN	49.167	-123.933	0.691
New Mills	CAN	47.950	-66.167	1.010
Newcastle(NB)	CAN	47.000	-65.550	0.912

Global Port	Country	Latitude	Longitude	Environmental Distance
North Sydney	CAN	46.200	-60.250	0.734
Parrsboro	CAN	45.383	-64.333	0.883
Paspebiac	CAN	48.033	-65.233	0.988
Pictou	CAN	45.683	-62.717	0.787
Plumper Sound	CAN	48.767	-123.200	1.003
Point Tupper	CAN	45.600	-61.367	0.819
Port Edward	CAN	54.233	-130.300	0.958
Port Hastings	CAN	45.650	-61.400	0.819
Port Hawkesbury	CAN	45.617	-61.350	0.819
Port Mellon	CAN	49.517	-123.483	0.705
Powell River	CAN	49.867	-124.550	0.200
Prince Rupert	CAN	54.317	-130.367	0.922
Pugwash	CAN	45.867	-63.667	0.937
Richibucto	CAN	46.683	-64.867	0.880
Richmond(CAN)	CAN	49.150	-123.167	0.127
Roberts Bank	CAN	49.017	-123.133	0.163
Saint John(CAN)	CAN	45.267	-66.067	0.894
Sechelt	CAN	49.467	-123.750	0.106
Sheet Hbr.	CAN	44.850	-62.450	0.838
Ship Harbour	CAN	44.750	-62.750	0.792
Souris	CAN	46.350	-62.250	0.987
South Nelson	CAN	46.983	-65.550	0.912
St. Andrews(CAN)	CAN	45.067	-67.050	0.820
St. Peter's	CAN	45.650	-60.867	0.809
Summerside	CAN	46.400	-63.783	0.816
Sydney(NS)	CAN	46.150	-60.200	0.793
Tasu Bay	CAN	52.767	-132.050	0.935
Tiverton(CAN)	CAN	44.400	-66.217	0.760
Tommy's Arm	CAN	49.433	-55.783	0.944
Union Bay	CAN	49.583	-124.867	0.737
Vancouver(CAN)	CAN	49.283	-123.117	0.039
Walton(CAN)	CAN	45.233	-64.017	0.813
Woodfibre	CAN	49.667	-123.250	0.625
Yarmouth(CAN)	CAN	43.833	-66.117	0.617
Ancud	CHL	-41.867	-73.833	0.991
Castro	CHL	-42.483	-73.767	0.953
Chaiten	CHL	-42.917	-72.717	0.752
Chonchi	CHL	-42.617	-73.783	0.934
Coronel	CHL	-37.033	-73.167	0.932
Corral	CHL	-39.867	-73.417	0.930
Lirquen	CHL	-36.717	-72.983	0.884
Lota	CHL	-37.100	-73.167	0.932
Penco	CHL	-36.717	-73.000	0.931
Puerto Aguirre	CHL	-45.167	-73.517	0.881
Puerto Aisen	CHL	-45.383	-72.683	0.944
Puerto Cisnes	CHL	-44.733	-72.700	0.921
Puerto Montt	CHL	-41.467	-72.950	0.735
Bayuquan	CHN	40.267	122.100	0.764

Global Port	Country	Latitude	Longitude	Environmental Distance
Beiliang	CHN	38.967	121.800	0.855
Caofeidian Port	CHN	38.963	118.517	0.914
Huludao	CHN	40.717	120.983	0.741
Longyan	CHN	37.400	122.617	0.939
Penglai	CHN	37.817	120.717	0.890
Shidao	CHN	36.883	122.467	0.890
Weihai	CHN	37.500	122.150	0.938
Yantai	CHN	37.567	121.433	0.985
Abbenfleth	DEU	53.683	9.500	0.295
Amrum Is.	DEU	54.633	8.350	0.553
Baltrum	DEU	53.733	7.400	0.552
Bardenfleth	DEU	53.150	8.550	0.271
Beidenfleth	DEU	53.867	9.433	0.311
Bensersiel	DEU	53.683	7.583	0.414
Blexen	DEU	53.533	8.533	0.311
Blumenthal	DEU	53.183	8.567	0.287
Borkum	DEU	53.583	6.667	0.598
Brake	DEU	53.333	8.483	0.276
Bremen	DEU	53.083	8.783	0.270
Bremerhaven	DEU	53.550	8.583	0.311
Brokdorf	DEU	53.867	9.333	0.311
Brunsbuttel	DEU	53.900	9.133	0.311
Burg	DEU	53.983	9.283	0.311
Burgstaaken	DEU	54.417	11.200	1.002
Busum	DEU	54.133	8.867	0.347
Butzfleth	DEU	53.650	9.517	0.283
Cuxhaven	DEU	53.867	8.700	0.223
Dagebull	DEU	54.733	8.733	0.450
Ditzum	DEU	53.317	7.267	0.383
Eckernforde	DEU	54.483	9.850	0.757
Einswarden	DEU	53.517	8.517	0.311
Elmshorn	DEU	53.750	9.650	0.295
Elsfleth	DEU	53.233	8.467	0.276
Emden	DEU	53.350	7.183	0.274
Farge	DEU	53.200	8.517	0.287
Fischerhutte	DEU	54.150	9.367	0.352
Flensburg	DEU	54.800	9.433	0.652
Freiburg	DEU	53.817	9.300	0.290
Friedrichstadt	DEU	54.383	9.083	0.398
Ganspe	DEU	53.200	8.550	0.287
Gelting	DEU	54.733	9.900	0.592
Gluckstadt	DEU	53.783	9.417	0.295
Hamburg	DEU	53.550	9.967	0.290
Harlesiel	DEU	53.633	7.750	0.388
Heiligenhafen	DEU	54.367	10.983	1.002
Helgoland	DEU	54.150	7.883	0.556
Hemmoor	DEU	53.700	9.133	0.291
Hochdonn	DEU	54.017	9.300	0.345

Global Port	Country	Latitude	Longitude	Environmental Distance
Holmer Siel	DEU	54.533	8.867	0.420
Holtenau	DEU	54.367	10.150	0.757
Hornum	DEU	54.750	8.300	0.564
Horumersiel	DEU	53.667	8.017	0.516
Husum(DEU)	DEU	54.483	9.050	0.417
Itzehoe	DEU	53.933	9.517	0.317
Juist	DEU	53.683	7.000	0.490
Kappeln	DEU	54.667	9.933	0.714
Kiel	DEU	54.317	10.133	0.760
Krautsand	DEU	53.767	9.383	0.295
Laboe	DEU	54.400	10.217	0.752
Langeoog	DEU	53.750	7.533	0.511
Lemwerder	DEU	53.167	8.600	0.271
List	DEU	55.017	8.433	0.596
Lubeck	DEU	53.867	10.667	0.893
Neuenfelde	DEU	53.500	9.817	0.308
Neuhaus	DEU	53.800	9.033	0.291
Neustadt	DEU	54.100	10.817	0.892
Norddeich	DEU	53.633	7.167	0.513
Nordenham	DEU	53.483	8.483	0.293
Norderney	DEU	53.700	7.167	0.494
Nordstrand	DEU	54.483	8.917	0.401
Oldenburg	DEU	53.150	8.233	0.264
Oldersum	DEU	53.317	7.333	1.019
Olpenitz	DEU	54.650	9.983	0.902
Orth	DEU	54.450	11.050	1.002
Oslebshausen	DEU	53.133	8.733	0.270
Ostermoor	DEU	53.917	9.183	0.311
Otterndorf	DEU	53.817	8.900	0.444
Puttgarden	DEU	54.500	11.233	0.850
Rendsburg	DEU	54.317	9.667	0.347
Ruthenstrom	DEU	53.733	9.400	0.295
Schacht-Audorf	DEU	54.300	9.717	0.347
Schleswig	DEU	54.517	9.567	0.783
Schlutup	DEU	53.883	10.783	0.886
Schulau	DEU	53.567	9.700	0.288
Schwarzenhutten	DEU	53.700	9.167	0.291
Stade	DEU	53.600	9.483	0.293
Stadersand	DEU	53.617	9.533	0.283
Tonning	DEU	54.317	8.950	0.368
Travemunde	DEU	53.967	10.900	0.887
Utersen	DEU	53.667	9.650	0.283
Wangerooge	DEU	53.783	7.900	0.493
Wesermunde	DEU	53.533	8.583	0.311
Wewelsfleth	DEU	53.850	9.400	0.311
Wilhelmshaven	DEU	53.517	8.150	0.516
Wischhafen	DEU	53.783	9.333	0.290
Wismar	DEU	53.900	11.467	0.869

Global Port	Country	Latitude	Longitude	Environmental Distance
Wyk	DEU	54.700	8.583	0.519
Aabenraa	DNK	55.033	9.433	0.692
Aalborg	DNK	57.050	9.917	0.525
Aarhus	DNK	56.150	10.217	0.604
Aarosund	DNK	55.267	9.717	0.772
Aeroskobing	DNK	54.883	10.417	0.895
Anholt	DNK	56.717	11.517	0.759
Asa	DNK	57.150	10.417	0.641
Asaa	DNK	57.133	10.400	0.641
Asnaesvaerkets Havn	DNK	55.667	11.083	0.637
Assens	DNK	55.267	9.900	0.683
Augustenborg	DNK	54.950	9.867	0.606
Avedore	DNK	55.600	12.483	0.981
Bagenkop	DNK	54.750	10.667	0.957
Ballen	DNK	55.817	10.650	0.783
Bandholm	DNK	54.833	11.500	0.755
Bogense	DNK	55.567	10.083	0.765
Copenhagen	DNK	55.700	12.617	0.981
Dragor	DNK	55.583	12.683	0.981
Ebeltoft	DNK	56.200	10.667	0.755
Egernsund	DNK	54.900	9.600	0.650
Elsinore	DNK	56.033	12.617	0.816
Endelave	DNK	55.750	10.267	0.797
Enstedvaerkets Havn	DNK	55.017	9.433	0.692
Esbjerg	DNK	55.467	8.433	0.642
Faaborg	DNK	55.100	10.233	0.773
Fakse Ladeplads	DNK	55.217	12.167	0.951
Fano Is.	DNK	55.417	8.417	0.642
Fredericia	DNK	55.567	9.750	0.740
Frederikshavn	DNK	57.433	10.550	0.643
Frederikssund	DNK	55.833	12.050	0.633
Frederiksvaerk	DNK	55.967	12.017	0.631
Gedser	DNK	54.567	11.933	0.940
Glatved	DNK	56.300	10.850	0.745
Graasten	DNK	54.917	9.617	0.650
Grenaa	DNK	56.413	10.913	0.745
Guldborg	DNK	54.867	11.750	0.769
Gulfhavn	DNK	55.200	11.250	0.761
Haderslev	DNK	55.250	9.500	0.772
Hadsund	DNK	56.717	10.117	0.563
Hals	DNK	56.983	10.317	0.649
Halsskov	DNK	55.333	11.100	0.892
Hanstholm	DNK	57.117	8.583	0.866
Hardeshoj	DNK	55.000	9.683	0.768
Havneby	DNK	55.100	8.567	0.581
Hellerup	DNK	55.733	12.583	0.988
Hirtshals	DNK	57.600	9.967	0.771
Hobro	DNK	56.633	9.800	0.573

Global Port	Country	Latitude	Longitude	Environmental Distance
Holbaek	DNK	55.717	11.717	0.649
Horsens	DNK	55.850	9.867	0.666
Hundested	DNK	55.967	11.850	0.891
Juelsminde	DNK	55.717	10.017	0.765
Kalundborg	DNK	55.683	11.083	0.644
Karrebaeksminde	DNK	55.167	11.633	0.802
Kastrup	DNK	55.633	12.650	0.981
Katholm	DNK	54.933	9.833	0.623
Kerteminde	DNK	55.450	10.667	0.707
Koge	DNK	55.450	12.200	0.805
Kolby Kaas	DNK	55.800	10.533	0.783
Kolding	DNK	55.500	9.500	0.681
Kongsdal	DNK	56.683	10.067	0.563
Korsor	DNK	55.333	11.133	0.892
Kyndby	DNK	55.817	11.883	0.891
Laeso	DNK	57.217	10.700	0.630
Lemvig	DNK	56.550	8.300	0.622
Lindo	DNK	55.467	10.533	0.707
Lyngs Odde	DNK	55.517	9.750	0.750
Lyngsbaek Bridge	DNK	56.233	10.617	0.617
Mariager	DNK	56.650	9.983	0.575
Marstal	DNK	54.850	10.517	0.920
Masnedo	DNK	55.000	11.900	0.781
Masnedsund	DNK	55.000	11.900	0.781
Middelfart	DNK	55.500	9.733	0.750
Naestved	DNK	55.233	11.750	0.774
Nakskov	DNK	54.833	11.133	0.779
Nordby	DNK	55.450	8.400	0.642
Norresundby	DNK	57.067	9.917	0.525
Nyborg	DNK	55.300	10.783	0.871
Nyhavn	DNK	55.683	12.583	0.981
Nykobing(Falster)	DNK	54.767	11.867	0.806
Nykobing(Sjaelland)	DNK	55.917	11.683	0.694
Odden	DNK	55.967	11.367	0.840
Odense	DNK	55.417	10.383	0.716
Omo	DNK	55.167	11.150	0.926
Orehoved	DNK	54.950	11.850	0.781
Ostby	DNK	55.733	12.033	0.633
Praesto	DNK	55.117	12.033	0.951
Randers	DNK	56.467	10.050	0.575
Ribe	DNK	55.317	8.767	0.527
Ringkobing	DNK	56.083	8.233	0.433
Ringsted	DNK	55.883	12.533	0.978
Rodbyhavn	DNK	54.650	11.350	0.802
Rudkobing	DNK	54.933	10.717	0.920
Saeby	DNK	57.333	10.517	0.643
Sakskobing	DNK	54.800	11.633	0.763
Skaelskor	DNK	55.250	11.283	0.761

Global Port	Country	Latitude	Longitude	Environmental Distance
Skaerbaek	DNK	55.517	9.617	0.680
Skagen	DNK	57.717	10.600	0.652
Snaptun	DNK	55.817	10.033	0.614
Soby	DNK	54.950	10.267	0.895
Sonderborg	DNK	54.917	9.783	0.623
Sprogo	DNK	55.333	10.967	0.871
Stevns Pier	DNK	55.317	12.450	0.967
Stigsnaesvaerkets Havn	DNK	55.217	11.250	0.761
Strandby	DNK	57.483	10.517	0.648
Strib	DNK	55.533	9.767	0.740
Studstrup	DNK	56.250	10.350	0.602
Svendborg	DNK	55.050	10.617	0.769
Thyboron	DNK	56.700	8.217	0.867
Tuborg Havn	DNK	55.717	12.583	0.981
Understed	DNK	57.383	10.500	0.643
Vedbaek	DNK	55.850	12.550	0.978
Vejle	DNK	55.717	9.550	0.691
Vordingborg	DNK	55.000	11.900	0.781
Astillero	ESP	43.400	-3.817	0.845
Bermeo	ESP	43.417	-2.717	0.982
Bilbao	ESP	43.311	-3.029	0.590
Camarinas	ESP	43.117	-9.183	0.881
Cangas	ESP	42.267	-8.767	0.938
Caraminal	ESP	42.600	-8.933	0.830
Castro Urdiales	ESP	43.400	-3.233	1.004
Cee	ESP	42.950	-9.167	0.876
Cillero	ESP	43.683	-7.600	0.871
Corcubion	ESP	42.950	-9.183	0.876
Cudillero	ESP	43.550	-6.150	1.012
Fene	ESP	43.467	-8.167	0.909
Ferrol	ESP	43.467	-8.267	0.867
Fuenterrabia	ESP	43.367	-1.800	0.866
Guernica	ESP	43.317	-2.667	0.913
Muros	ESP	42.750	-9.017	0.835
Orio	ESP	43.267	-2.117	0.942
Ortigueira	ESP	43.683	-7.833	0.633
Pasajes	ESP	43.333	-1.933	0.983
Puente Ceso	ESP	43.250	-8.900	0.988
Requejada	ESP	43.333	-4.083	0.760
Ribadesella	ESP	43.467	-5.067	0.997
Sada	ESP	43.367	-8.250	0.853
San Esteban de Pravia	ESP	43.567	-6.083	1.012
San Sebastian(ESP)	ESP	43.317	-1.983	0.983
Santa Eugenia de Riveira	ESP	42.550	-8.983	0.822
Vivero	ESP	43.667	-7.600	0.865
Antifer	FRA	49.667	0.167	0.844
Arcachon	FRA	44.667	-1.167	0.637
Barfleur	FRA	49.667	-1.250	0.916

Global Port	Country	Latitude	Longitude	Environmental Distance
Belz	FRA	47.667	-3.167	0.696
Benodet	FRA	47.883	-4.117	0.524
Boulogne	FRA	50.733	1.617	0.814
Brest	FRA	48.383	-4.483	0.443
Calais	FRA	50.967	1.850	0.691
Camaret	FRA	48.283	-4.600	0.852
Cancale	FRA	48.667	-1.850	0.846
Carteret	FRA	49.367	-1.800	0.942
Cherbourg	FRA	49.641	-1.614	0.787
Concarneau	FRA	47.867	-3.917	0.819
Corniguel	FRA	47.950	-4.117	0.707
Courseulles sur Mer	FRA	49.333	-0.450	0.807
Dahouet	FRA	48.583	-2.567	0.923
Deauville	FRA	49.350	0.067	0.699
Dielette	FRA	49.550	-1.850	0.947
Dieppe	FRA	49.933	1.083	0.712
Douarnenez	FRA	48.100	-4.333	0.841
Dunkirk	FRA	51.050	2.350	0.746
Erquy	FRA	48.633	-2.467	0.900
Etaples	FRA	50.517	1.633	0.463
Fecamp	FRA	49.767	0.367	0.871
Granville	FRA	48.833	-1.600	0.881
Gravelines	FRA	50.983	2.133	0.763
Gujan-Mestras	FRA	44.633	-1.050	0.720
Hendaye	FRA	43.367	-1.767	0.822
Hennebont	FRA	47.800	-3.267	0.648
Honfleur	FRA	49.417	0.233	0.697
Keroman	FRA	47.733	-3.367	0.533
La Pallice	FRA	46.167	-1.233	0.853
La Rochelle	FRA	46.150	-1.150	0.822
La Teste	FRA	44.617	-1.150	0.659
La Trinite sur Mer	FRA	47.583	-3.033	0.807
Lannion	FRA	48.733	-3.450	0.898
Le Guildo	FRA	48.633	-2.233	0.877
Le Havre	FRA	49.483	0.117	0.844
Le Legue	FRA	48.533	-2.717	0.923
Le Palais	FRA	47.350	-3.167	0.878
Le Treport	FRA	50.067	1.367	0.708
Le Verdon	FRA	45.550	-1.083	0.850
Loctudy	FRA	47.833	-4.167	0.859
Lorient	FRA	47.750	-3.367	0.881
Marans	FRA	46.317	-1.033	1.002
Mardyck	FRA	51.000	2.233	0.754
Marennes	FRA	45.817	-1.100	0.864
Montoir	FRA	47.333	-2.133	0.964
Morgat	FRA	48.217	-4.500	0.852
Morlaix	FRA	48.633	-3.883	0.824
Ouistreham	FRA	49.283	-0.250	0.816

Global Port	Country	Latitude	Longitude	Environmental Distance
Paimpol	FRA	48.783	-3.050	1.003
Paluden	FRA	48.583	-4.517	0.469
Piriac	FRA	47.383	-2.550	0.787
Pontrieux	FRA	48.700	-3.167	0.662
Pornic	FRA	47.117	-2.117	0.754
Port Barrier	FRA	48.633	-2.417	0.900
Port Joinville	FRA	46.733	-2.350	0.779
Quiberon	FRA	47.500	-3.117	0.829
Quimper	FRA	47.967	-4.117	0.566
Roscoff	FRA	48.717	-3.983	0.794
Royan	FRA	45.617	-1.033	0.893
Sables d'Olonne	FRA	46.500	-1.800	0.775
Saint Brevin	FRA	47.250	-2.150	0.771
Saint Maclou	FRA	49.367	0.417	0.928
Saint Quay Portrieux	FRA	48.650	-2.833	0.952
St. Malo	FRA	48.649	-2.025	0.877
St. Nazaire	FRA	47.267	-2.200	0.777
St. Valery en Caux	FRA	49.867	0.717	0.870
St. Valery sur Somme	FRA	50.183	1.650	0.712
Treguier	FRA	48.783	-3.233	0.800
Vannes	FRA	47.650	-2.750	0.701
Aberdeen(GBR)	GBR	57.150	-2.067	1.004
Aberdovey	GBR	52.533	-4.050	0.815
Aberystwyth	GBR	52.400	-4.100	0.807
Alderney	GBR	49.717	-2.200	0.956
Annan	GBR	54.983	-3.267	0.750
Appledore	GBR	51.050	-4.200	0.461
Arbroath	GBR	56.550	-2.583	0.914
Ardersier	GBR	57.567	-4.033	0.960
Ardrishaig	GBR	56.000	-5.433	0.960
Ardrossan(GBR)	GBR	55.633	-4.817	0.809
Avonmouth	GBR	51.500	-2.717	0.717
Ayr	GBR	55.467	-4.633	0.872
Ballantrae	GBR	55.100	-5.000	0.872
Banff	GBR	57.667	-2.517	1.019
Barcaldine	GBR	56.517	-5.400	0.997
Barnstaple	GBR	51.083	-4.067	0.942
Barrow on Humber	GBR	53.683	-0.383	0.772
Barrow-in-Furness	GBR	54.100	-3.217	0.847
Barry	GBR	51.400	-3.267	0.858
Barton on Humber	GBR	53.700	-0.433	0.851
Battlesbridge	GBR	51.617	0.567	0.788
Bedhampton	GBR	50.833	-1.000	0.423
Bee Ness	GBR	51.433	0.650	0.495
Belfast	GBR	54.600	-5.933	0.641
Bideford	GBR	51.017	-4.200	0.951
Bird Port	GBR	51.567	-2.967	0.971
Bo'ness	GBR	56.017	-3.600	0.978

Global Port	Country	Latitude	Longitude	Environmental Distance
Borth	GBR	52.483	-4.050	0.807
Boston(GBR)	GBR	52.967	-0.017	0.579
Braefoot Bay	GBR	56.033	-3.300	0.637
Bridport(GBR)	GBR	50.717	-2.767	0.789
Brightlingsea	GBR	51.783	1.033	0.772
Brighton(GBR)	GBR	50.817	-0.100	0.764
Briton Ferry	GBR	51.617	-3.833	0.706
Brixham	GBR	50.400	-3.500	1.005
Bromborough	GBR	53.350	-2.983	0.587
Burghead	GBR	57.700	-3.500	0.943
Burnham on Crouch	GBR	51.617	0.817	0.294
Burntisland	GBR	56.050	-3.233	0.603
Caernarfon	GBR	53.150	-4.267	0.818
Cairnryan	GBR	54.967	-5.017	0.891
Cantley	GBR	52.567	1.533	0.349
Canvey Is.	GBR	51.517	0.633	0.690
Carrickfergus	GBR	54.650	-5.883	0.561
Casquets	GBR	49.733	-2.383	0.969
Charlestown(England)	GBR	50.333	-4.750	0.829
Charlestown(Scotland)	GBR	56.033	-3.500	0.832
Chatham	GBR	51.400	0.550	0.721
Chepstow	GBR	51.650	-2.667	0.966
Christchurch	GBR	50.733	-1.750	0.758
Clacton	GBR	51.800	1.150	0.772
Cliffe	GBR	51.483	0.467	0.495
Cockenzie	GBR	55.967	-2.950	0.873
Colchester	GBR	51.883	0.917	0.474
Coleraine	GBR	55.133	-6.667	0.938
Connah's Quay	GBR	53.233	-3.067	0.792
Conwy	GBR	53.300	-3.850	0.980
Coryton	GBR	51.517	0.533	0.370
Cowes	GBR	50.767	-1.300	0.757
Creeksea	GBR	51.617	0.783	0.403
Creetown	GBR	54.900	-4.367	0.892
Cromarty	GBR	57.683	-4.033	0.988
Crombie	GBR	56.033	-3.567	0.978
Cromer	GBR	52.933	1.300	0.726
Dartmouth	GBR	50.350	-3.583	0.796
Dean Quarry	GBR	50.033	-5.083	0.851
Devonport(GBR)	GBR	50.367	-4.167	0.810
Dover	GBR	51.117	1.333	0.791
Dundrum	GBR	54.267	-5.850	0.902
Dunvegan	GBR	57.450	-6.583	0.870
Eastham	GBR	53.350	-2.967	0.587
Eling	GBR	50.900	-1.467	0.734
Ellesmere Port	GBR	53.283	-2.900	0.520
Exeter	GBR	50.717	-3.517	0.884
Exmouth(GBR)	GBR	50.617	-3.417	0.789

Global Port	Country	Latitude	Longitude	Environmental Distance
Fairlie	GBR	55.767	-4.867	0.864
Falmouth	GBR	50.167	-5.050	0.851
Fareham	GBR	50.850	-1.183	0.709
Faversham	GBR	51.333	0.900	0.718
Fawley	GBR	50.817	-1.333	0.760
Felixstowe	GBR	51.950	1.317	0.783
Fingringhoe	GBR	51.833	0.967	0.335
Fishbourne	GBR	50.733	-1.200	0.757
Fleetwood	GBR	53.933	-3.000	0.614
Folkestone	GBR	51.083	1.200	0.719
Fosdyke	GBR	52.867	-0.033	0.615
Fowey	GBR	50.333	-4.633	0.829
Freshwater Bay(GBR)	GBR	50.667	-1.517	0.752
Garlieston	GBR	54.800	-4.367	0.826
Garston	GBR	53.350	-2.900	0.487
Gillingham	GBR	51.483	0.550	0.369
Glasson Dock	GBR	54.000	-2.833	0.555
Glencripesdale	GBR	56.667	-5.817	0.984
Gosport	GBR	50.800	-1.117	0.595
Granton	GBR	55.983	-3.217	0.623
Great Oakley	GBR	51.900	1.250	0.783
Great Yarmouth	GBR	52.600	1.733	0.831
Grimsby	GBR	53.583	-0.067	0.999
Grovehurst Jetty	GBR	51.367	0.767	0.850
Guernsey	GBR	49.450	-2.533	0.978
Gweek	GBR	50.083	-5.200	0.529
Hamble	GBR	50.817	-1.300	0.757
Harwich	GBR	51.950	1.283	0.783
Hastings(GBR)	GBR	50.850	0.583	0.738
Hayle	GBR	50.183	-5.433	0.850
Herne Bay	GBR	51.367	1.117	0.696
Hessle	GBR	53.717	-0.433	0.851
Heysham	GBR	54.033	-2.917	0.707
Hoo	GBR	51.417	0.567	0.721
Hound Point	GBR	56.000	-3.367	0.816
Hull	GBR	53.750	-0.300	0.545
Hunstanton	GBR	52.933	0.500	0.679
Hunterston	GBR	55.750	-4.883	0.829
Ilfracombe	GBR	51.200	-4.117	0.748
Immingham	GBR	53.633	-0.183	0.999
Ince	GBR	53.283	-2.850	0.611
Inchkeith	GBR	56.033	-3.150	0.911
Inverkeithing	GBR	56.033	-3.400	0.817
Ipswich	GBR	52.050	1.167	0.468
Irvine	GBR	55.600	-4.683	0.809
Islay Is.	GBR	55.800	-6.267	0.978
Isle of Grain	GBR	51.433	0.700	0.541
Jersey	GBR	49.183	-2.117	0.935

Global Port	Country	Latitude	Longitude	Environmental Distance
Killingholme	GBR	53.667	-0.233	0.999
Killyleagh	GBR	54.400	-5.650	0.527
Kingsnorth	GBR	51.417	0.600	0.555
Kirkcaldy	GBR	56.117	-3.150	0.911
Kishorn	GBR	57.383	-5.600	0.961
Kylesku	GBR	58.250	-5.017	0.954
Lancaster	GBR	54.000	-2.850	0.555
Largs	GBR	55.800	-4.867	0.932
Leigh	GBR	51.550	0.650	0.690
Leith	GBR	55.983	-3.167	0.886
Littlehampton	GBR	50.800	-0.533	0.764
Liverpool	GBR	53.417	-3.000	0.651
Llanddulas	GBR	53.300	-3.650	0.931
Llanelli	GBR	51.667	-4.167	0.736
Lochinver	GBR	58.150	-5.250	0.902
Lossiemouth	GBR	57.717	-3.283	0.948
Lowestoft	GBR	52.467	1.750	0.815
Lundy Is.	GBR	51.167	-4.650	0.984
Lydney	GBR	51.717	-2.533	0.704
Lymington	GBR	50.767	-1.550	0.756
Macduff	GBR	57.667	-2.500	1.019
Maldon	GBR	51.733	0.667	0.577
Maryport	GBR	54.717	-3.500	0.870
Mevagissey	GBR	50.267	-4.783	0.830
Milford Haven	GBR	51.713	-5.062	0.413
Millom	GBR	54.183	-3.267	0.800
Milton Creek	GBR	51.367	0.767	0.850
Mistley	GBR	51.950	1.083	0.462
Mostyn	GBR	53.317	-3.233	0.762
Mullion Cove	GBR	50.017	-5.267	0.858
Nairn	GBR	57.583	-3.867	0.951
New Holland	GBR	53.700	-0.350	0.772
Newhaven	GBR	50.783	0.067	0.746
Newlyn	GBR	50.133	-5.550	0.989
Newport	GBR	51.567	-2.983	0.971
Newport(IOW)	GBR	50.700	-1.283	0.757
North Killingholme	GBR	53.650	-0.233	0.999
Norwich	GBR	52.633	1.283	0.808
Oakham Ness	GBR	51.417	0.650	0.495
Oban	GBR	56.417	-5.483	0.983
Otterham Quay	GBR	51.383	0.633	0.362
Oulton Broad	GBR	52.483	1.733	0.830
Padstow	GBR	50.550	-4.933	0.974
Par	GBR	50.350	-4.700	0.832
Paull	GBR	53.717	-0.217	0.999
Pembroke	GBR	51.693	-4.951	0.496
Penmaenmawr	GBR	53.267	-3.950	0.992
Penryn	GBR	50.167	-5.100	0.475

Global Port	Country	Latitude	Longitude	Environmental Distance
Penzance	GBR	50.133	-5.533	0.989
Plymouth	GBR	50.367	-4.183	0.810
Poole	GBR	50.717	-1.983	0.876
Port Talbot	GBR	51.583	-3.717	0.846
Portavadie	GBR	55.867	-5.300	0.933
Portbury	GBR	51.500	-2.733	0.717
Porthleven	GBR	50.083	-5.317	0.859
Porthmadog	GBR	52.917	-4.133	0.836
Porthoustock Quarry	GBR	50.050	-5.067	0.851
Portishead	GBR	51.483	-2.767	0.717
Portland(GBR)	GBR	50.567	-2.433	0.792
Portrush	GBR	55.217	-6.667	0.915
Portsmouth	GBR	50.800	-1.100	0.595
Queenborough	GBR	51.417	0.733	0.489
Rainham(Kent)	GBR	51.383	0.617	0.362
Ramsgate	GBR	51.333	1.417	0.786
Redbridge	GBR	50.933	-1.467	0.734
Richborough	GBR	51.300	1.350	0.786
Rochford	GBR	51.583	0.733	0.597
Rosyth	GBR	56.017	-3.450	0.873
Rothesay	GBR	55.833	-5.050	0.798
Ryde	GBR	50.733	-1.150	0.753
Rye	GBR	50.933	0.767	0.852
Salcombe	GBR	50.217	-3.783	1.017
Salt End	GBR	53.733	-0.233	1.013
Sark	GBR	49.433	-2.367	0.966
Sharpness	GBR	51.717	-2.483	0.903
Sheerness	GBR	51.433	0.733	0.389
Shell Haven	GBR	51.500	0.517	0.369
Shoreham	GBR	50.833	-0.250	0.764
Shotton Wharf	GBR	53.200	-3.033	0.990
Silloth	GBR	54.867	-3.400	0.761
Sizewell	GBR	52.217	1.600	0.801
Snape Bridge	GBR	52.150	1.500	0.801
South Killingholme	GBR	53.633	-0.200	0.999
Southampton	GBR	50.900	-1.400	0.343
Southend	GBR	51.533	0.717	0.692
St. Davids	GBR	56.033	-3.367	0.817
St. Helier	GBR	49.183	-2.117	0.935
St. Ives	GBR	50.217	-5.483	0.850
St. Peter Port	GBR	49.450	-2.533	0.978
Stangate Creek	GBR	51.383	0.700	0.870
Stanlow	GBR	53.283	-2.867	0.611
Strangford	GBR	54.383	-5.600	0.520
Sutton Bridge	GBR	52.767	0.200	0.978
Swansea	GBR	51.617	-3.933	0.706
Teignmouth	GBR	50.550	-3.500	0.791
Thamesport	GBR	51.433	0.700	0.541

Global Port	Country	Latitude	Longitude	Environmental Distance
Topsham	GBR	50.683	-3.633	1.018
Torquay	GBR	50.450	-3.533	0.796
Totnes	GBR	50.433	-3.683	0.621
Troon	GBR	55.550	-4.683	0.809
Truro	GBR	50.167	-5.033	0.851
Ullapool	GBR	57.900	-5.167	0.936
Walton Bay	GBR	51.467	-2.817	0.717
Walton on the Naze	GBR	51.850	1.267	0.783
Warrenpoint	GBR	54.100	-6.250	0.709
Watchet	GBR	51.183	-3.333	0.730
Wells	GBR	52.967	0.850	0.710
Wemyss Bay	GBR	55.883	-4.883	0.992
Weston Church Wall	GBR	53.317	-2.750	0.854
Weston Point	GBR	53.333	-2.767	0.854
Weymouth	GBR	50.617	-2.450	0.792
Whitehaven	GBR	54.550	-3.583	0.796
Whitstable	GBR	51.367	1.033	0.696
Wigtown	GBR	54.867	-4.433	0.892
Workington	GBR	54.650	-3.567	0.796
Yarmouth(GBR)	GBR	50.700	-1.500	0.756
Yelland	GBR	51.067	-4.150	0.717
Sukhumi	GEO	43.167	41.033	0.703
Jablanac	HRV	44.700	14.867	1.008
Kraljevica	HRV	45.283	14.567	0.997
Makarska	HRV	43.283	17.017	0.954
Maslenica	HRV	44.217	15.533	0.319
Omisalj	HRV	45.217	14.550	0.997
Opatija	HRV	45.333	14.317	0.873
Plomin	HRV	45.133	14.200	0.759
Pula	HRV	44.883	13.833	0.986
Rasa	HRV	45.033	14.067	0.843
Rijeka	HRV	45.317	14.433	1.001
Senj	HRV	45.000	14.883	0.967
Sv. Mikula	HRV	44.983	14.083	0.918
Sveti Juraj	HRV	44.933	14.917	0.967
Tar	HRV	45.317	13.600	0.926
Velika Stinica	HRV	44.717	14.867	1.008
Ballylongford	IRL	52.550	-9.467	0.633
Bantry	IRL	51.700	-9.467	0.605
Buncrana	IRL	55.133	-7.450	0.694
Castletownbere	IRL	51.650	-9.900	0.987
Cobh	IRL	51.850	-8.283	0.549
Cork	IRL	51.900	-8.467	0.784
Courtmacsherry	IRL	51.633	-8.717	0.585
Dingle	IRL	52.133	-10.267	0.933
Drogheda	IRL	53.717	-6.350	0.740
Dundalk	IRL	54.000	-6.383	0.535
Dungarvan	IRL	52.083	-7.600	0.857

Global Port	Country	Latitude	Longitude	Environmental Distance
Fenit	IRL	52.267	-9.850	0.945
Galway	IRL	53.267	-9.050	0.830
Glandore	IRL	51.567	-9.117	0.704
Glengariff	IRL	51.750	-9.533	0.651
Greenore	IRL	54.033	-6.133	0.658
Kenmare	IRL	51.867	-9.600	0.952
Killala	IRL	54.217	-9.217	0.648
Killybegs	IRL	54.633	-8.433	0.967
Kilrush	IRL	52.633	-9.500	0.666
Kinsale	IRL	51.700	-8.500	0.751
Moneypoint	IRL	52.600	-9.400	0.971
Newport(Co Mayo)	IRL	53.883	-9.550	0.801
Passage West	IRL	51.867	-8.333	0.542
Port Milford	IRL	55.100	-7.700	0.871
Rathmullen	IRL	55.100	-7.533	0.693
Ringaskiddy	IRL	51.833	-8.317	0.547
Skibbereen	IRL	51.550	-9.267	0.954
Skull	IRL	51.517	-9.533	0.908
Sligo	IRL	54.267	-8.467	0.919
Spiddle	IRL	53.250	-9.300	0.865
Tarbert Is.	IRL	52.583	-9.367	0.971
Union Hall	IRL	51.567	-9.133	0.789
Ventry	IRL	52.117	-10.200	0.933
Waterford	IRL	52.117	-6.917	0.874
Westport(IRL)	IRL	53.800	-9.533	0.871
Whiddy Is.	IRL	51.683	-9.533	0.614
Whitegate	IRL	51.833	-8.250	0.575
Youghal	IRL	51.933	-7.833	0.849
Akkeshi	JPN	43.050	144.850	0.899
Aomori	JPN	40.817	140.750	1.003
Esashi	JPN	44.933	142.600	0.941
Fukushima	JPN	41.467	140.267	1.011
Hachinohe	JPN	40.533	141.533	0.686
Hakodate	JPN	41.783	140.717	0.967
Hirono	JPN	37.233	141.017	0.749
Ishikari	JPN	43.250	141.350	0.623
Ishikariwan Shinko	JPN	43.217	141.300	0.989
Iwanai	JPN	42.983	140.517	1.007
Kamaishi	JPN	39.267	141.900	0.964
Kawauchi	JPN	41.167	141.000	0.646
Kuji	JPN	40.167	141.783	0.647
Kushiro	JPN	42.983	144.367	0.921
Mashike	JPN	43.867	141.517	0.970
Miyako	JPN	39.633	141.967	0.943
Mori	JPN	42.117	140.583	0.915
Muroran	JPN	42.350	140.950	0.903
Mutsu Ogawara	JPN	40.950	141.417	0.717
Nonai	JPN	40.833	140.817	1.003

Global Port	Country	Latitude	Longitude	Environmental Distance
Ofunato	JPN	38.983	141.750	0.732
Okuma	JPN	37.383	140.983	0.748
Ominato	JPN	41.233	141.183	0.931
Otaru	JPN	43.200	141.017	0.983
Otsuchi	JPN	39.350	141.900	0.949
Rumoi	JPN	43.950	141.633	0.970
Sekinehama	JPN	41.367	141.217	0.908
Shiriya	JPN	41.400	141.467	0.631
Shizuura	JPN	41.483	140.017	0.962
Tamagawa	JPN	40.083	141.833	0.647
Tomakomai	JPN	42.633	141.633	0.906
Tomioka	JPN	37.333	141.000	0.748
Wakkanai	JPN	45.417	141.700	0.714
Wanishi	JPN	42.333	141.000	0.669
Yoichi	JPN	43.217	140.783	0.982
Boryeong	KOR	36.330	126.511	0.976
Daesan	KOR	37.017	126.417	0.922
Dangjin	KOR	36.982	126.794	0.946
Gojeong	KOR	36.300	126.450	0.977
Incheon	KOR	37.467	126.600	0.905
Inchon	KOR	37.445	126.581	0.870
Pyeong Taek	KOR	36.993	126.792	0.955
Sokcho	KOR	38.233	128.550	0.933
Yeonpyung	KOR	37.600	125.717	0.895
Bijela	MTG	42.450	18.667	0.915
Hercegnovi	MTG	42.450	18.533	0.905
Kotor	MTG	42.417	18.767	1.006
Lipci	MTG	42.483	18.667	0.963
Risan	MTG	42.517	18.700	0.563
Tivat	MTG	42.433	18.700	0.757
Zelenika	MTG	42.450	18.583	0.897
Aalsmeer	NLD	52.250	4.750	0.576
Akkrum	NLD	53.050	5.833	0.882
Alkmaar	NLD	52.633	4.717	0.288
Almelo	NLD	52.367	6.633	0.398
Almere-Haven	NLD	52.333	5.217	0.345
Alphen aan den Rijn	NLD	52.133	4.633	0.417
Ameland	NLD	53.450	5.633	0.573
Appingedam	NLD	53.317	6.850	0.420
Balk	NLD	52.900	5.567	0.390
Beverwijk	NLD	52.483	4.633	0.626
Borssele	NLD	51.417	3.733	0.494
Breskens	NLD	51.400	3.567	0.560
Buitenhuizen	NLD	52.433	4.717	0.936
Delft	NLD	52.017	4.367	0.342
Delfzijl	NLD	53.333	6.933	0.548
Den Helder	NLD	52.967	4.783	0.517
Den Oever	NLD	52.917	5.017	0.475

Global Port	Country	Latitude	Longitude	Environmental Distance
Deventer	NLD	52.250	6.150	0.375
Doesburg	NLD	52.017	6.133	0.367
Doetinchem	NLD	51.967	6.283	0.351
Domburg	NLD	51.567	3.500	0.614
Eemshaven	NLD	53.450	6.833	0.548
Europoort	NLD	51.950	4.083	0.497
Farmsum	NLD	53.317	6.933	0.548
Flushing	NLD	51.450	3.583	0.560
Flushing East	NLD	51.450	3.667	0.384
Foxhol	NLD	53.167	6.717	0.738
Franeker	NLD	53.183	5.550	0.436
Gouda	NLD	52.017	4.700	0.737
Groningen	NLD	53.233	6.533	0.912
Haarlem	NLD	52.383	4.650	0.816
Halfweg	NLD	52.383	4.750	0.235
Harlingen	NLD	53.183	5.417	0.524
Hasselt	NLD	52.583	6.083	0.406
Heemstede	NLD	52.350	4.600	0.223
Hengelo	NLD	52.267	6.767	0.388
Hillegom	NLD	52.300	4.583	0.223
Hoogezand	NLD	53.167	6.750	0.744
Hook of Holland	NLD	51.983	4.117	0.507
Kaag	NLD	52.200	4.533	0.226
Kampen	NLD	52.583	5.800	0.386
Katwijk aan Zee	NLD	52.200	4.400	0.464
Koog aan den Zaan	NLD	52.450	4.817	0.799
Kootstertille	NLD	53.217	6.083	0.736
Lauwersoog	NLD	53.400	6.217	0.375
Leeuwarden	NLD	53.200	5.783	0.722
Leiden	NLD	52.150	4.467	0.238
Leiderdorp	NLD	52.133	4.517	0.226
Lelystad	NLD	52.500	5.433	0.330
Lemmer	NLD	52.850	5.683	0.417
Lisserbroek	NLD	52.267	4.567	0.223
Lochem	NLD	52.167	6.417	0.366
Loppersum	NLD	53.317	6.733	0.519
Maarssen	NLD	52.167	5.167	0.612
Makkum	NLD	53.067	5.400	0.524
Meppel	NLD	52.700	6.200	0.423
Middelburg	NLD	51.500	3.617	0.359
Midwolda	NLD	53.183	6.983	0.486
Monnickendam	NLD	52.467	5.033	0.345
Muiden	NLD	52.317	5.067	0.345
Nijkerk	NLD	52.217	5.483	0.359
Odijk	NLD	52.033	5.217	1.005
Oostmahorn	NLD	53.383	6.167	0.364
Oostvoorne	NLD	51.917	4.083	0.497
Pijnacker	NLD	52.000	4.417	0.342

Global Port	Country	Latitude	Longitude	Environmental Distance
Sas van Goes	NLD	51.500	3.900	0.859
Schagen	NLD	52.783	4.785	0.256
Scheveningen	NLD	52.100	4.267	0.464
Schiermonnikoog	NLD	53.483	6.150	0.584
'sGravenhage	NLD	52.083	4.300	0.464
Siddeburen	NLD	53.250	6.867	0.463
Sneek	NLD	53.033	5.667	0.436
Spaarndam	NLD	52.417	4.683	0.182
Staveren	NLD	52.867	5.350	0.443
Steenwijk	NLD	52.783	6.117	0.419
Stellendam	NLD	51.800	4.017	1.004
Stroobos	NLD	53.233	6.217	0.714
Terneuzen	NLD	51.333	3.817	0.796
Terschelling	NLD	53.367	5.217	0.611
Texel	NLD	53.183	4.850	0.590
Uithoorn	NLD	52.233	4.833	0.576
Urk	NLD	52.667	5.600	0.354
Utrecht	NLD	52.083	5.117	0.767
Velsen	NLD	52.467	4.633	0.609
Vlissingen	NLD	52.450	4.583	0.810
Wagenborgen	NLD	53.250	6.933	0.460
Warmond	NLD	52.183	4.483	0.226
Waterhuizen	NLD	53.183	6.633	0.769
Wemeldinge	NLD	51.517	4.000	0.984
West Graftdijk	NLD	52.550	4.783	0.335
Westerbroek	NLD	53.183	6.683	0.769
Westzaan	NLD	52.450	4.783	0.799
Winschoten	NLD	53.133	7.017	0.481
Wognum	NLD	52.067	5.017	0.767
Workum	NLD	52.983	5.433	0.479
Wormerveer	NLD	52.467	4.783	0.936
Woubrugge	NLD	52.167	4.633	0.417
Woudsend	NLD	52.933	5.617	0.390
Yerseke	NLD	51.500	4.050	0.982
Ymuiden	NLD	52.450	4.583	0.456
Zaandam	NLD	52.433	4.833	0.799
Zandvoort	NLD	52.367	4.533	0.456
Zeist	NLD	52.083	5.233	1.005
Zoutkamp	NLD	53.333	6.300	0.673
Zuidbroek	NLD	53.167	6.867	0.638
Zutphen	NLD	52.133	6.200	0.366
Zwartsluis	NLD	52.633	6.067	0.406
Zwolle	NLD	52.517	6.117	0.406
Aalefjaer	NOR	58.233	8.033	0.957
Abelsnes	NOR	58.233	6.650	1.001
Agnefest	NOR	58.117	7.050	0.934
Arendal	NOR	58.467	8.767	0.644
Asvall	NOR	59.017	9.600	0.852

Global Port	Country	Latitude	Longitude	Environmental Distance
Austevoll	NOR	60.100	5.250	0.917
Avaldsnes	NOR	59.350	5.267	0.743
Bamble	NOR	59.017	9.667	0.852
Bokn	NOR	59.217	5.450	1.007
Borg Hbr.	NOR	59.200	10.950	0.694
Brevik	NOR	59.050	9.717	1.013
Dalen	NOR	59.067	9.700	1.013
Drammen	NOR	59.733	10.233	0.828
Drobak	NOR	59.650	10.633	0.802
Egersund	NOR	58.450	6.000	0.715
Elnesvagen	NOR	62.850	7.150	0.955
Engene	NOR	59.683	10.550	0.749
Espevik	NOR	59.333	5.683	0.948
Eydehamn	NOR	58.500	8.883	0.621
Fagerstrand	NOR	59.733	10.600	0.749
Farsund	NOR	58.100	6.817	0.958
Fonnes	NOR	60.800	4.983	0.896
Foresvik	NOR	59.217	5.433	1.007
Fosen	NOR	59.317	5.367	0.787
Fredrikstad	NOR	59.200	10.967	0.694
Gjevingstangholmen	NOR	58.650	9.133	0.702
Greaker	NOR	59.267	11.033	0.700
Grimstad	NOR	58.333	8.600	0.717
Gronsfjord	NOR	58.017	7.033	0.801
Haavik	NOR	59.317	5.317	0.764
Halden	NOR	59.117	11.367	0.717
Halsvik	NOR	60.833	5.083	0.947
Halvorshavn	NOR	59.583	10.617	0.802
Haugesund	NOR	59.417	5.267	0.742
Helvig	NOR	58.100	6.750	0.958
Holm	NOR	59.100	11.383	0.717
Holmestrand	NOR	59.533	10.267	0.797
Horten	NOR	59.417	10.500	0.706
Hurum	NOR	59.617	10.450	0.781
Jelsa	NOR	59.333	6.033	0.948
Kaarsto	NOR	59.267	5.533	0.826
Kambo	NOR	59.483	10.700	0.712
Kilsund	NOR	58.550	8.983	0.702
Kopervik	NOR	59.283	5.300	0.814
Kragero	NOR	58.867	9.417	0.738
Kristiansand	NOR	58.150	8.000	0.766
Langesund	NOR	59.000	9.750	0.780
Larkollen	NOR	59.317	10.683	0.678
Larvik	NOR	59.050	10.033	0.692
Lillesand	NOR	58.250	8.383	0.743
Lindesnes	NOR	57.983	7.050	0.776
Lysaker	NOR	59.917	10.633	0.828
Magero	NOR	59.150	10.433	0.712

Global Port	Country	Latitude	Longitude	Environmental Distance
Mandal	NOR	58.033	7.467	0.835
Melsomvik	NOR	59.217	10.350	0.712
Mongstad	NOR	60.817	5.033	0.972
Moss	NOR	59.433	10.667	0.719
Oslo	NOR	59.900	10.717	0.804
Rafnes	NOR	59.100	9.600	0.918
Randaberg	NOR	59.000	5.633	0.987
Risor	NOR	58.717	9.233	0.721
Rosfjord	NOR	58.050	6.983	0.843
Ryvingen	NOR	57.967	7.500	0.861
Saetrepollen	NOR	59.683	10.533	0.749
Sande	NOR	59.583	10.250	0.797
Sandefjord	NOR	59.133	10.233	0.712
Sarpsborg	NOR	59.267	11.100	0.700
Skudeneshavn	NOR	59.133	5.267	1.007
Slagen	NOR	59.317	10.533	0.719
Slemmestad	NOR	59.783	10.500	0.814
Sogne	NOR	58.083	7.783	0.800
Sola	NOR	58.917	5.567	0.871
Solumstrand	NOR	59.717	10.283	0.828
Sondeled	NOR	58.717	9.200	0.702
Stavanger	NOR	58.967	5.733	0.867
Storasund	NOR	59.383	5.267	0.742
Svelvik	NOR	59.617	10.417	0.781
Tau	NOR	59.067	5.933	0.967
Telavag	NOR	60.250	5.000	0.802
Tofte	NOR	59.550	10.583	0.802
Tonsberg	NOR	59.267	10.417	0.640
Tvedestrand	NOR	58.633	8.933	0.725
Valloy	NOR	59.267	10.500	0.642
Vats	NOR	59.483	5.750	1.013
Christchurch	NZL	-43.550	172.667	0.450
Dunedin	NZL	-45.883	170.517	0.730
Lyttelton	NZL	-43.617	172.717	0.539
New Plymouth	NZL	-39.067	174.083	1.004
Opua	NZL	-35.300	174.133	1.015
Picton(NZL)	NZL	-41.267	174.000	0.820
Port Chalmers	NZL	-45.817	170.617	0.673
Tarakohe	NZL	-40.850	172.900	0.844
Wanganui	NZL	-39.950	175.000	0.970
Kosong(PRK)	PRK	38.600	128.350	0.936
Rajin	PRK	42.183	130.317	0.882
Agigea	ROM	44.083	28.617	0.902
Cernavoda	ROM	44.350	28.033	0.944
Constantza	ROM	44.167	28.650	0.902
Luminitza	ROM	44.350	28.633	0.912
Mangalia	ROM	43.817	28.583	1.019
Sulina	ROM	45.150	29.650	0.939

Global Port	Country	Latitude	Longitude	Environmental Distance
Anapa	RUS	44.883	37.300	0.989
Gelendzhik	RUS	44.567	38.117	0.867
Khasan	RUS	42.467	130.800	0.939
Novorossiysk	RUS	44.733	37.783	0.891
Sochi	RUS	43.583	39.733	0.980
Sovetskaya Gavan	RUS	49.033	140.333	0.920
Tuapse	RUS	44.083	39.067	0.933
Vanino	RUS	49.083	140.267	0.920
Yasnomorskiy	RUS	46.750	141.900	0.852
Agnesberg	SWE	57.783	12.000	0.544
Angelholm	SWE	56.250	12.867	0.738
Backviken	SWE	55.900	12.717	0.978
Bastad	SWE	56.417	12.833	0.793
Bohus	SWE	57.850	12.033	0.601
Brofjorden	SWE	58.333	11.383	0.483
Donso	SWE	57.583	11.800	0.496
Edshultshall	SWE	58.117	11.467	0.658
Falkenberg	SWE	56.883	12.500	0.716
Fjallbacka	SWE	58.600	11.283	0.555
Gota(SWE)	SWE	58.100	12.150	0.638
Gothenburg	SWE	57.700	11.950	0.544
Grebbestad	SWE	58.683	11.250	0.598
Gustavsberg	SWE	58.333	11.900	0.600
Halmstad	SWE	56.667	12.850	0.736
Helsingborg	SWE	56.050	12.683	0.825
Henan	SWE	58.233	11.667	0.537
Hoganas	SWE	56.200	12.550	0.751
Hunnebostrand	SWE	58.433	11.300	0.525
Klagshamn	SWE	55.517	12.883	0.947
Kopparverkshamn	SWE	56.017	12.717	0.825
Kungsbacka	SWE	57.483	12.083	0.495
Kungshamn	SWE	58.367	11.233	0.525
Landskrona	SWE	55.867	12.833	0.819
Lilla Edet	SWE	58.117	12.117	0.638
Limhamn	SWE	55.583	12.933	0.971
Lodose	SWE	58.033	12.150	0.638
Lomma	SWE	55.683	13.067	0.839
Lysekil	SWE	58.267	11.433	0.483
Malmo	SWE	55.617	13.000	0.823
Marstrand	SWE	57.883	11.583	0.638
Mossholmen	SWE	57.950	11.567	0.638
Munkedalhamn	SWE	58.433	11.667	0.562
Nol	SWE	57.933	12.133	0.601
Ockero	SWE	57.717	11.633	0.629
Raa	SWE	55.983	12.750	0.819
Ramsvik	SWE	58.433	11.267	0.525
Ronnang	SWE	58.083	11.667	0.508
Roro	SWE	57.767	11.617	0.642

Global Port	Country	Latitude	Longitude	Environmental Distance
Ryxo	SWE	58.367	11.433	0.545
Skarhamn	SWE	57.983	11.550	0.501
Skredsvik	SWE	58.383	11.650	0.562
Smogen	SWE	58.350	11.233	0.525
Stallbacka	SWE	58.300	12.300	0.650
Stensjo	SWE	58.400	11.400	0.545
Stenungsund	SWE	58.083	11.817	0.526
Stromstad	SWE	58.933	11.167	0.694
Surte	SWE	57.833	12.017	0.580
Traslovslage	SWE	57.050	12.267	0.613
Trollhattan	SWE	58.283	12.283	0.650
Uddevalla	SWE	58.350	11.917	0.651
Vanersborg	SWE	58.383	12.333	0.667
Varberg	SWE	57.100	12.250	0.613
Vargon	SWE	58.350	12.383	0.673
Vasterlanda	SWE	58.100	12.117	0.638
Wallhamn	SWE	58.000	11.700	0.525
Bekdash	TKM	41.533	52.600	0.987
Amasra	TUR	41.750	32.383	0.957
Ambarli	TUR	40.967	28.700	0.851
Ayancik	TUR	41.917	34.367	0.755
Bandirma	TUR	40.350	27.967	0.924
Bartin	TUR	41.633	32.333	0.852
Beykoz	TUR	41.133	29.083	1.020
Buyukdere	TUR	41.183	29.050	0.974
Cekmece	TUR	40.983	28.550	0.956
Cide	TUR	41.883	32.917	0.771
Darica	TUR	40.750	29.383	0.983
Derince	TUR	40.750	29.817	0.849
Diliskelesi	TUR	40.767	29.533	0.901
Edincik	TUR	40.350	27.867	0.924
Erdek	TUR	40.400	27.783	0.785
Eregli	TUR	41.300	31.450	0.910
Eregli(Sea of Marmara)	TUR	40.967	27.967	0.871
Gebze	TUR	40.767	29.433	0.983
Gemlik	TUR	40.433	29.150	0.893
Giresun	TUR	40.917	38.383	0.957
Golcuk	TUR	40.717	29.800	0.849
Haydarpasa	TUR	41.000	29.017	1.018
Hereke	TUR	40.700	29.617	0.901
Igneada	TUR	41.833	28.017	0.868
Igsas	TUR	40.750	29.750	0.849
Inebolu	TUR	41.983	33.750	0.846
Istanbul	TUR	41.000	28.967	0.957
Karabiga	TUR	40.400	27.300	1.016
Karacabey	TUR	40.233	28.367	0.974
Kartal	TUR	40.883	29.183	0.949
Kiyikoy	TUR	41.633	28.117	0.865

Global Port	Country	Latitude	Longitude	Environmental Distance
Kumport	TUR	40.967	28.683	0.851
Kurucasile	TUR	41.833	32.700	0.942
Maltepe	TUR	40.900	29.150	1.018
Marport	TUR	40.967	28.667	0.851
Mudanya	TUR	40.450	28.867	0.909
Pazar	TUR	41.200	40.867	0.829
Pendik	TUR	40.900	29.250	0.949
Podima	TUR	41.483	28.283	0.868
Saraylar	TUR	40.650	27.667	0.906
Selvi Burnu	TUR	41.150	29.067	1.020
Sile	TUR	41.167	29.617	0.979
Silivri	TUR	41.050	28.267	0.897
Sinop	TUR	42.000	35.150	0.907
Surmene	TUR	40.933	40.167	0.935
Tavsancil	TUR	40.783	29.583	0.901
Tekirdag	TUR	40.950	27.500	0.886
Tutunciftlik	TUR	40.750	29.783	0.849
Tuzla	TUR	40.809	29.348	0.983
Uskudar	TUR	41.017	29.017	0.896
Yalova	TUR	40.667	29.250	0.814
Yarimca	TUR	40.733	29.767	0.849
Zeytinburnu	TUR	40.750	29.767	0.849
Zonguldak	TUR	41.450	31.783	0.741
Belgorod-Dnestrovskiy	UKR	46.183	30.350	0.950
Chernomorsk	UKR	45.500	32.667	0.792
Dneprobugskiy	UKR	46.750	31.917	0.920
Ilichevsk	UKR	46.300	30.650	0.939
Izmail	UKR	45.333	28.850	0.937
Kherson	UKR	46.617	32.600	0.926
Kiliya	UKR	45.433	29.267	0.943
Nikolayev	UKR	46.967	31.967	0.967
Ochakov	UKR	46.600	31.550	0.910
Odessa	UKR	46.483	30.750	0.939
Oktyabrsk	UKR	46.833	31.950	0.920
Sevastopol	UKR	44.617	33.367	0.834
Skadovsk	UKR	46.100	32.917	0.820
Ust-Dunaysk	UKR	45.467	29.833	0.824
Vilkovo	UKR	45.400	29.600	0.938
Yalta	UKR	44.500	34.167	0.648
Yevpatoriya	UKR	45.183	33.383	0.766
Yuzhnyy	UKR	46.600	31.017	0.936
La Paloma	URY	-34.650	-54.150	0.732
Astoria	USA	46.183	-123.833	0.551
Bar Hbr.	USA	44.383	-68.200	0.897
Bayway	USA	40.630	-74.200	0.512
Bellingham	USA	48.750	-122.500	0.253
Block Is.	USA	41.233	-71.583	0.840
Boothbay	USA	43.833	-69.650	0.886

Global Port	Country	Latitude	Longitude	Environmental Distance
Brayton Point	USA	41.700	-71.200	0.988
Bridgeport	USA	41.150	-73.183	0.533
Bristol(USA)	USA	41.667	-71.267	0.945
Camden(ME USA)	USA	44.217	-69.067	0.893
Cherry Point	USA	48.867	-122.750	0.231
City Is.	USA	40.850	-73.783	0.987
Clinton	USA	41.267	-72.533	0.836
Coos Bay	USA	43.383	-124.200	0.823
Davisville	USA	41.617	-71.400	0.820
East Boothbay	USA	43.850	-69.583	0.864
Edmonds	USA	47.817	-122.367	0.336
Everett(WA)	USA	47.983	-122.217	0.311
Ferndale	USA	48.833	-122.717	0.309
Gloucester(MA USA)	USA	42.617	-70.667	0.621
Grays Harbor	USA	46.933	-124.060	0.960
Greenport	USA	41.100	-72.350	0.523
Hingham	USA	42.233	-70.883	0.786
Jamestown(RI USA)	USA	41.500	-71.367	0.847
Jonesport	USA	44.550	-67.617	0.939
Ketchikan	USA	55.350	-131.650	0.985
Klawock	USA	55.550	-133.100	0.985
Longview	USA	46.133	-122.933	0.277
Mamaroneck	USA	40.933	-73.733	0.665
Melville	USA	41.583	-71.283	0.824
Morro Bay	USA	35.367	-120.850	0.990
Moss Landing	USA	36.800	-121.783	0.989
Mukilteo	USA	47.950	-122.300	0.311
Nantucket Is.	USA	41.283	-70.100	0.562
New Bedford	USA	41.633	-70.917	0.545
New Haven	USA	41.250	-72.900	0.849
Newport(RI)	USA	41.483	-71.333	0.847
Northeast Hbr.(USA)	USA	44.300	-68.283	0.868
Northport	USA	40.933	-73.367	0.894
Northville	USA	40.983	-72.650	0.540
Oyster Bay	USA	40.883	-73.517	0.949
Patchogue	USA	40.767	-73.017	0.930
Perth Amboy	USA	40.504	-74.273	0.519
Plymouth(MA USA)	USA	41.950	-70.667	0.554
Point Judith	USA	41.367	-71.483	0.578
Point Wells	USA	47.783	-122.400	0.336
Port Angeles	USA	48.133	-123.417	0.467
Port Chester	USA	40.983	-73.650	0.949
Port Gamble	USA	47.867	-122.583	0.341
Port Townsend	USA	48.117	-122.750	0.373
Portland(ME USA)	USA	43.650	-70.233	0.767
Portsmouth(NH USA)	USA	43.067	-70.700	0.770
Portsmouth(RI USA)	USA	41.600	-71.233	0.815
Provincetown	USA	42.050	-70.183	0.644

Global Port	Country	Latitude	Longitude	Environmental Distance
Longview	USA	46.083	-122.933	0.277
Riverhead	USA	40.917	-72.667	0.535
Rockland	USA	44.100	-69.117	0.879
Sag Hbr.	USA	41.017	-72.300	0.545
Salem(MA USA)	USA	42.517	-70.883	0.910
Sandwich(USA)	USA	41.767	-70.483	0.545
Seattle	USA	47.633	-122.333	0.347
Sesuit Hbr.	USA	41.750	-70.150	0.576
South Bristol	USA	43.850	-69.550	0.864
Sparrow's Point	USA	39.200	-76.467	0.655
Stamford	USA	41.017	-73.533	0.885
Tacoma	USA	47.250	-122.417	0.289
Tiverton(USA)	USA	41.633	-71.200	0.885
Virginia Beach	USA	36.850	-75.950	0.933
Westport(WA USA)	USA	46.883	-124.100	0.502
Wildwood	USA	38.967	-74.817	0.675
Willapa	USA	46.733	-124.067	0.547
Woods Hole	USA	41.517	-70.667	0.862
Yarmouth(USA)	USA	43.800	-70.200	0.929

Appendix H. List of global ports that have highest environmental similarity to Stewart. NIS originating from these ports have the highest potential for survival if introduced at Stewart.

Global Port	Country	Latitude	Longitude	Environmental Distance
Eckero	ALD	60.217	19.600	0.720
Farjsundet	ALD	60.233	20.017	0.516
Finstrom	ALD	60.250	19.917	0.503
Langnasudd	ALD	60.117	20.300	0.515
Mariehamn	ALD	60.100	19.933	0.465
Ramallo	ARG	-33.497	-60.011	1.983
Rio Gallegos	ARG	-51.617	-69.221	1.608
Kerguelen Is.	ATF	-49.500	69.500	1.204
Hobart	AUS	-42.838	147.289	1.644
Launceston	AUS	-41.436	147.136	1.620
Margate(AUS)	AUS	-43.033	147.267	1.983
Port Huon	AUS	-43.167	147.000	1.765
Korneuburg	AUT	48.367	16.333	1.442
Linz	AUT	48.317	14.300	1.210
Vienna	AUT	48.217	16.367	1.538
Antwerp	BEL	51.245	4.411	1.294
Baasrode	BEL	51.050	4.167	1.321
Balen	BEL	51.167	5.167	1.286
Boom	BEL	51.083	4.367	1.302
Bruges	BEL	51.222	3.221	1.810
Brussels	BEL	50.828	4.315	1.273
Buggenhout	BEL	51.017	4.200	1.313
Burcht	BEL	51.200	4.333	1.289
Chatelineau	BEL	50.417	4.517	1.194
Dendermonde	BEL	51.033	4.117	1.321
Doel	BEL	51.317	4.267	1.299
Engis	BEL	50.583	5.400	1.164
Ertvelde	BEL	51.200	3.783	1.316
Geel	BEL	51.150	4.967	1.288
Genk	BEL	50.941	5.502	1.245
Ghent	BEL	51.088	3.745	1.322
Grimbergen	BEL	50.933	4.367	1.295
Grobbendonk	BEL	51.200	4.750	1.264
Haren(BEL)	BEL	50.900	4.383	1.295
Hemiksem	BEL	51.150	4.336	1.302
Hermalle sous Huy	BEL	50.550	5.367	1.164
Hingene	BEL	51.117	4.267	1.314
Hoboken	BEL	51.167	4.333	1.313
Humbeek	BEL	50.967	4.383	1.295
Kallo	BEL	51.250	4.283	1.291
Kapelle op den Bos	BEL	51.017	4.367	1.302
Kruibeke	BEL	51.167	4.317	1.313
Kwaadmechelen	BEL	51.100	5.150	1.286
Lanaken	BEL	50.883	5.650	1.245
Langerbrugge	BEL	51.117	3.750	1.322

Global Port	Country	Latitude	Longitude	Environmental Distance
Liefkenshoek	BEL	51.300	4.283	1.299
Liege	BEL	50.635	5.570	1.185
Lillo	BEL	51.300	4.300	1.299
Lixhe	BEL	50.733	5.700	1.214
Maasmechelen	BEL	50.967	5.700	1.243
Marly	BEL	50.883	4.383	1.295
Mechelen	BEL	51.033	4.467	1.302
Melle	BEL	51.000	3.800	1.287
Merksem	BEL	51.233	4.483	1.294
Nameche	BEL	50.467	4.983	1.169
Niel	BEL	51.117	4.333	1.313
Olen(BEL)	BEL	51.150	4.867	1.288
Oostkamp	BEL	51.150	3.250	1.680
Puurs	BEL	51.067	4.267	1.313
Rieme	BEL	51.167	3.767	1.326
Ruisbroek	BEL	50.783	4.283	1.273
Rumst	BEL	51.067	4.417	1.302
Rupelmonde	BEL	51.133	4.283	1.314
Schelle	BEL	51.133	4.317	1.313
Schoten	BEL	51.250	4.500	1.294
Seilles	BEL	50.500	5.083	1.083
Sint-Kruis-Winkel	BEL	51.150	3.800	1.326
Temse	BEL	51.133	4.217	1.313
Terdonk	BEL	51.150	3.783	1.326
Terhagen	BEL	51.083	4.383	1.302
Tessenderlo	BEL	51.067	5.083	1.286
Tielrode	BEL	51.117	4.217	1.313
Tisselt	BEL	51.033	4.367	1.302
Val St. Lambert	BEL	50.567	5.467	1.164
Verbrande Brug	BEL	50.950	4.383	1.295
Vilvoorde	BEL	50.950	4.417	1.295
Willebroek	BEL	51.050	4.350	1.302
Wintham	BEL	51.100	4.283	1.314
Wondelgem	BEL	51.083	3.717	1.322
Zelzate	BEL	51.200	3.800	1.316
Zutendaal	BEL	50.917	5.567	1.245
Zwyndrecht(BEL)	BEL	51.217	4.333	1.289
Kozloduy	BGR	43.783	23.717	1.978
Lom	BGR	43.833	23.200	1.873
Rousse	BGR	43.833	25.967	1.888
Silistra	BGR	44.100	27.250	1.870
La Paz(BOL)	BOL	-16.483	-68.150	0.942
Amherstburg	CAN	42.100	-83.083	1.767
Arctic Bay/Ikpiarjuk	CAN	72.977	-85.165	1.352
Baddeck	CAN	46.100	-60.733	1.174
Baie Verte	CAN	49.933	-56.200	1.595
Bath(CAN)	CAN	44.167	-76.767	1.417
Batiscan	CAN	46.517	-72.233	1.130

Global Port	Country	Latitude	Longitude	Environmental Distance
Bayside	CAN	45.167	-67.133	1.219
Becancour	CAN	46.400	-72.383	1.195
Bella Coola	CAN	52.383	-126.767	0.172
Belleville	CAN	44.133	-77.367	1.334
Big Hbr.	CAN	46.167	-60.417	1.637
Botwood	CAN	49.150	-55.317	1.428
Bowmanville	CAN	43.900	-78.667	1.178
Boylston	CAN	45.450	-61.517	1.307
Britt	CAN	45.767	-80.583	0.973
Brockville	CAN	44.600	-75.633	1.440
Bronte	CAN	43.400	-79.700	1.204
Bruce Mines	CAN	46.267	-83.717	0.759
Burlington(ONT)	CAN	43.317	-79.750	1.283
Cardinal	CAN	44.783	-75.333	1.469
Chicoutimi	CAN	48.433	-71.083	1.049
Clarenville	CAN	48.167	-53.950	1.167
Clarkson	CAN	43.500	-79.600	1.224
Cobourg	CAN	43.950	-78.167	1.294
Colborne	CAN	44.000	-77.883	1.300
Collingwood	CAN	44.500	-80.233	1.165
Contrecoeur	CAN	45.883	-73.200	1.329
Corner Brook	CAN	48.950	-57.933	1.170
Cornwall(CAN)	CAN	45.017	-74.717	1.442
Corunna(CAN)	CAN	42.883	-82.450	1.347
Cote Ste-Catherine	CAN	45.407	-73.575	1.441
Country Hbr.	CAN	45.217	-61.733	1.303
Courtright	CAN	42.800	-82.450	1.338
Dartmouth(NS)	CAN	44.667	-63.583	1.647
Devon Is.	CAN	75.000	-85.000	1.535
Erieau	CAN	42.250	-81.933	1.670
Fort Erie	CAN	42.933	-78.950	1.644
Fraser Surrey Docks	CAN	49.177	-122.916	1.057
Fredericton	CAN	45.950	-66.650	1.116
Gananoque	CAN	44.317	-76.150	1.499
Glovertown	CAN	48.667	-54.050	1.346
Goderich	CAN	43.750	-81.750	1.146
Gold River(CAN)	CAN	49.683	-126.117	0.987
Goose Bay	CAN	53.350	-60.417	0.571
Grise Fiord/Ausuittuq	CAN	76.417	-83.017	1.352
Grondines	CAN	46.750	-72.033	1.019
Halifax	CAN	44.633	-63.550	1.920
Hamilton(CAN)	CAN	43.233	-79.850	1.216
Hawkes Bay	CAN	50.617	-57.167	1.801
Hay River	CAN	60.850	-115.700	0.796
Houston(CAN)	CAN	54.400	-126.650	0.217
Hubbards	CAN	44.633	-64.067	1.648
Humberstone	CAN	42.900	-79.250	1.604
Ile-aux-Coudres	CAN	47.421	-70.393	1.767

Global Port	Country	Latitude	Longitude	Environmental Distance
Iona	CAN	45.967	-60.800	0.922
Isaac's Hbr.	CAN	45.167	-61.650	1.432
Killarney	CAN	45.967	-81.517	0.859
Kingston(CAN)	CAN	44.200	-76.500	1.478
Kingsville	CAN	42.017	-82.717	1.794
Kitimat	CAN	54.000	-128.700	0.569
Lanoraie	CAN	45.967	-73.183	1.329
Lauzon	CAN	46.817	-71.150	1.099
Leamington	CAN	42.050	-82.617	1.806
Levis	CAN	46.817	-71.183	1.180
Little Current	CAN	45.967	-81.917	1.168
Little Narrows	CAN	45.983	-60.983	0.922
Liverpool(NS)	CAN	44.050	-64.717	1.560
Long Sault	CAN	45.017	-74.900	1.373
Marathon	CAN	48.750	-86.383	0.205
Meldrum Bay	CAN	45.917	-83.100	0.792
Michipicoten Hbr.	CAN	47.950	-84.917	0.505
Midland	CAN	44.750	-79.933	1.128
Milltown	CAN	47.900	-55.783	1.304
Montreal	CAN	45.500	-73.550	1.470
Mooretown	CAN	42.850	-82.467	1.347
Moosonee	CAN	51.267	-80.650	1.875
Morrisburg	CAN	44.933	-75.183	1.359
Nanisivik	CAN	73.067	-84.550	1.352
Nanticoke	CAN	42.817	-80.067	1.533
Nelson(CAN)	CAN	49.467	-117.300	0.330
North Sydney	CAN	46.200	-60.250	1.948
Oakville	CAN	43.433	-79.667	1.193
Ocean Falls	CAN	52.350	-127.700	0.657
Oshawa	CAN	43.867	-78.833	1.176
Ottawa	CAN	45.400	-75.700	1.366
Owen Sound	CAN	44.583	-80.950	1.075
Parry Sound	CAN	45.367	-80.050	1.095
Pelee Island	CAN	41.750	-82.667	1.841
Picton(CAN)	CAN	44.000	-77.133	1.418
Pointe au Pic	CAN	47.617	-70.133	1.767
Pointe aux Trembles	CAN	45.633	-73.483	1.401
Pointe de la Prairie	CAN	47.423	-70.405	1.071
Port Alberni	CAN	49.233	-125.000	0.939
Port Alice	CAN	50.383	-127.450	0.893
Port Burwell	CAN	42.633	-80.800	1.521
Port Colborne	CAN	42.867	-79.250	1.619
Port Credit	CAN	43.550	-79.600	1.110
Port Dalhousie	CAN	43.200	-79.267	1.343
Port Dover	CAN	42.783	-80.200	1.495
Port Hope	CAN	43.950	-78.283	1.271
Port Hope Simpson	CAN	52.550	-56.300	1.070
Port Maitland	CAN	42.867	-79.583	1.571

Global Port	Country	Latitude	Longitude	Environmental Distance
Port McNicoll	CAN	44.750	-79.800	1.195
Port Mellon	CAN	49.517	-123.483	1.861
Port Stanley(CAN)	CAN	42.667	-81.217	1.527
Port Weller	CAN	43.233	-79.217	1.389
Prescott	CAN	44.717	-75.517	1.419
Quebec	CAN	46.817	-71.200	1.180
Rigolet	CAN	54.183	-58.417	1.555
Roddickton	CAN	50.867	-56.117	1.175
Rupert Inlet	CAN	50.550	-127.567	1.207
Sarnia	CAN	42.983	-82.417	1.329
Sault Ste. Marie	CAN	46.517	-84.333	0.822
Sombra	CAN	42.700	-82.467	1.342
Sonora	CAN	45.067	-61.917	1.316
Sorel	CAN	46.050	-73.117	1.359
Spragge	CAN	46.217	-82.667	0.988
Squamish	CAN	49.683	-123.167	1.784
St. Albans	CAN	47.867	-55.850	1.182
St. Andrews(CAN)	CAN	45.067	-67.050	1.713
St. Catharines	CAN	43.167	-79.267	1.319
St. Peter's	CAN	45.650	-60.867	1.690
St. Romuald	CAN	46.750	-71.233	1.180
St. Stephen(CAN)	CAN	45.200	-67.283	1.169
Ste. Croix	CAN	46.633	-71.733	1.117
Stewart(CAN)	CAN	55.917	-130.000	0.000
Sydney(NS)	CAN	46.150	-60.200	1.793
Tahsis	CAN	49.917	-126.667	0.941
Thessalon	CAN	46.250	-83.550	0.778
Thorold	CAN	43.083	-79.167	1.583
Three Rivers	CAN	46.350	-72.550	1.213
Thunder Bay	CAN	48.417	-89.217	0.352
Tobermory(CAN)	CAN	45.233	-81.650	0.808
Tommy's Arm	CAN	49.433	-55.783	1.819
Toronto	CAN	43.633	-79.383	1.129
Tracy	CAN	46.017	-73.167	1.310
Tuktoyaktuk	CAN	69.433	-133.050	1.626
Valleyfield	CAN	45.217	-74.083	1.424
Wallaceburg	CAN	42.600	-82.400	1.338
Welland	CAN	42.967	-79.217	1.539
Weymouth(CAN)	CAN	44.450	-66.017	1.060
Wheatley	CAN	42.083	-82.433	1.682
Whitby(CAN)	CAN	43.850	-78.917	1.108
Windsor(CAN)	CAN	42.317	-83.050	1.517
Woodfibre	CAN	49.667	-123.250	1.889
Zeballos	CAN	49.983	-126.850	1.127
Basle	CHE	47.550	7.567	1.324
Concepcion	CHL	-36.833	-73.050	1.838
Corral	CHL	-39.867	-73.417	1.774
Puerto Eden	CHL	-49.150	-74.450	1.400

Global Port	Country	Latitude	Longitude	Environmental Distance
Valdivia	CHL	-39.800	-73.233	1.522
Dandong	CHN	40.133	124.400	2.036
Fujin	CHN	47.250	132.017	1.565
Harbin	CHN	45.733	126.600	1.678
Heihe	CHN	50.233	127.467	1.346
Jiamusi	CHN	46.800	130.350	1.565
Panshi	CHN	42.917	126.033	1.616
Tongjiang	CHN	47.633	132.500	1.552
Chvaletice	CZE	50.017	15.433	1.184
Usti nad Labem	CZE	50.667	14.033	1.103
Aken	DEU	51.850	12.033	1.182
Andernach	DEU	50.417	7.383	1.254
Anklam	DEU	53.867	13.683	1.212
Aschaffenburg	DEU	49.950	9.167	1.248
Barth	DEU	54.367	12.733	1.078
Bendorf	DEU	50.417	7.583	1.230
Berlin	DEU	52.533	13.417	1.235
Berne(DEU)	DEU	53.183	10.500	1.055
Bingen	DEU	49.950	7.900	1.315
Bodenwerder	DEU	51.967	9.500	1.006
Boizenburg	DEU	53.383	10.733	1.055
Bonn	DEU	50.717	7.083	1.323
Brandenburg	DEU	52.400	12.517	1.196
Braunschweig	DEU	52.250	10.500	1.116
Brohl	DEU	50.417	7.300	1.117
Burgstaaken	DEU	54.417	11.200	1.273
Castrop Rauxel	DEU	51.550	7.300	1.219
Cologne	DEU	50.933	7.000	1.338
Deggendorf	DEU	48.833	12.967	1.202
Ditzum	DEU	53.317	7.267	1.871
Dormagen	DEU	51.100	6.950	1.329
Dortmund	DEU	51.533	7.450	1.213
Duisburg	DEU	51.433	6.750	1.289
Dusseldorf	DEU	51.250	6.767	1.319
Eckernforde	DEU	54.483	9.850	1.513
Eisenhuttenstadt	DEU	52.150	14.617	1.207
Emden	DEU	53.350	7.183	2.001
Emmerich	DEU	51.850	6.250	1.167
Erftstadt	DEU	50.800	6.750	1.250
Essen	DEU	51.450	7.017	1.234
Flensburg	DEU	54.800	9.433	1.609
Frankfurt	DEU	50.117	8.667	1.289
Geesthacht	DEU	53.433	10.383	1.037
Gelsenkirchen	DEU	51.500	7.083	1.234
Gelting	DEU	54.733	9.900	1.662
Germersheim	DEU	49.217	8.383	1.501
Gernsheim	DEU	49.750	8.467	1.394
Greifswald	DEU	54.100	13.383	1.110

Global Port	Country	Latitude	Longitude	Environmental Distance
Gromitz	DEU	54.150	10.983	1.251
Haren(DEU)	DEU	52.800	7.250	1.120
Havelberg	DEU	52.833	12.067	1.136
Heiligenhafen	DEU	54.367	10.983	1.273
Heringsdorf	DEU	53.967	14.167	1.315
Hohenhorn	DEU	53.467	10.367	1.037
Holtenau	DEU	54.367	10.150	1.514
Homberg	DEU	51.450	6.717	1.289
Hoya	DEU	52.800	9.133	1.085
Ibbenburen	DEU	52.283	7.733	1.084
Kappeln	DEU	54.667	9.933	1.547
Karlsruhe	DEU	49.050	8.333	1.520
Kehl	DEU	48.583	7.833	1.435
Kiel	DEU	54.317	10.133	1.510
Koblenz	DEU	50.333	7.583	1.159
Krefeld	DEU	51.333	6.567	1.289
Kroslin	DEU	54.133	13.750	0.926
Laboe	DEU	54.400	10.217	1.522
Ladebow	DEU	54.100	13.450	1.110
Lahnstein	DEU	50.300	7.617	1.159
Lauenburg	DEU	53.383	10.550	1.055
Lauterbach	DEU	54.333	13.517	0.880
Leer	DEU	53.217	7.450	1.164
Leeseringen	DEU	52.583	9.133	1.106
Leverkusen	DEU	51.017	7.033	1.224
Lubeck	DEU	53.867	10.667	1.416
Lubmin	DEU	54.117	13.600	1.129
Ludwigshafen am Rhein	DEU	49.467	8.450	1.467
Magdeburg	DEU	52.133	11.617	1.140
Mainz	DEU	50.000	8.283	1.301
Mannheim	DEU	49.483	8.467	1.467
Minden	DEU	52.300	8.900	1.104
Monheim	DEU	51.117	6.817	1.315
Moselkern	DEU	50.183	7.367	1.184
Mukran	DEU	54.483	13.583	0.849
Mulheim	DEU	50.950	7.050	1.327
Neckarsteinach	DEU	49.433	8.800	1.227
Neuss	DEU	51.200	6.700	1.319
Neuss/Dusseldorf	DEU	51.200	6.700	1.319
Neustadt	DEU	54.100	10.817	1.417
Neuwied	DEU	50.433	7.483	1.254
Nienburg	DEU	52.633	9.217	1.102
Nuremberg	DEU	49.450	11.050	1.147
Oldersum	DEU	53.317	7.333	1.379
Olpenitz	DEU	54.650	9.983	1.391
Orsoy	DEU	51.533	6.683	1.257
Orth	DEU	54.450	11.050	1.273
Osnabruck	DEU	52.267	8.033	1.066

Global Port	Country	Latitude	Longitude	Environmental Distance
Otterndorf	DEU	53.817	8.900	2.024
Papenburg	DEU	53.083	7.383	1.118
Passau	DEU	48.583	13.467	1.129
Peenemunde	DEU	54.117	13.767	0.926
Peine	DEU	52.317	10.217	1.102
Porz	DEU	50.883	7.050	1.327
Puttgarden	DEU	54.500	11.233	1.450
Regensburg	DEU	49.017	12.117	1.105
Remagen	DEU	50.567	7.217	1.223
Rheinhausen	DEU	51.417	6.733	1.289
Rinteln	DEU	52.200	9.083	1.079
Rosslau	DEU	51.900	12.267	1.180
Rostock	DEU	54.150	12.100	1.161
Ruhrort	DEU	51.450	6.733	1.289
Salzgitter	DEU	52.217	10.333	1.102
Sassnitz	DEU	54.517	13.633	0.849
Schleswig	DEU	54.517	9.567	1.478
Schlutup	DEU	53.883	10.783	1.431
Speyer	DEU	49.300	8.433	1.501
Stralsund	DEU	54.317	13.100	1.116
Sturzelberg	DEU	51.117	6.800	1.315
Stuttgart	DEU	48.783	9.200	1.248
Tangermunde	DEU	52.567	11.967	1.137
Travemunde	DEU	53.967	10.900	1.430
Ueckermunde	DEU	53.733	14.283	0.937
Urdingen	DEU	51.350	6.667	1.274
Vallendar	DEU	50.400	7.617	1.230
Vierow	DEU	54.100	13.567	1.129
Walsum	DEU	51.533	6.683	1.257
Warnemunde	DEU	54.183	12.083	1.204
Weissenthurm	DEU	50.417	7.483	1.254
Wesel	DEU	51.650	6.600	1.255
Wesseling	DEU	50.833	7.000	1.268
Westerende-Kirchloog	DEU	53.433	7.417	1.349
Wismar	DEU	53.900	11.467	1.442
Wolgast	DEU	54.050	13.783	0.926
Worms	DEU	49.633	8.350	1.431
Wurzburg	DEU	49.783	9.933	1.079
Aabenraa	DNK	55.033	9.433	1.578
Aarhus	DNK	56.150	10.217	1.696
Aarosund	DNK	55.267	9.717	1.550
Aeroskobing	DNK	54.883	10.417	1.395
Aggersund	DNK	57.017	9.283	0.707
Allinge	DNK	55.283	14.800	0.783
Anholt	DNK	56.717	11.517	1.597
Asnaesvaerkets Havn	DNK	55.667	11.083	1.619
Assens	DNK	55.267	9.900	1.573
Augustenborg	DNK	54.950	9.867	1.649

Global Port	Country	Latitude	Longitude	Environmental Distance
Avedore	DNK	55.600	12.483	1.286
Bagenkop	DNK	54.750	10.667	1.323
Ballen	DNK	55.817	10.650	1.555
Bandholm	DNK	54.833	11.500	1.514
Bogense	DNK	55.567	10.083	1.568
Copenhagen	DNK	55.700	12.617	1.286
Dragor	DNK	55.583	12.683	1.286
Ebeltoft	DNK	56.200	10.667	1.608
Egernsund	DNK	54.900	9.600	1.610
Elsinore	DNK	56.033	12.617	1.468
Endelave	DNK	55.750	10.267	1.527
Enstedvaerkets Havn	DNK	55.017	9.433	1.578
Faaborg	DNK	55.100	10.233	1.483
Fakse Ladeplads	DNK	55.217	12.167	1.316
Fredericia	DNK	55.567	9.750	1.603
Frederikssund	DNK	55.833	12.050	1.630
Frederiksvaerk	DNK	55.967	12.017	1.636
Fur	DNK	56.833	9.000	0.682
Gedser	DNK	54.567	11.933	1.327
Glatved	DNK	56.300	10.850	1.634
Graasten	DNK	54.917	9.617	1.610
Grenaa	DNK	56.413	10.913	1.634
Gudhjem	DNK	55.217	14.967	1.006
Guldborg	DNK	54.867	11.750	1.495
Gulfhavn	DNK	55.200	11.250	1.508
Haderslev	DNK	55.250	9.500	1.550
Hadsund	DNK	56.717	10.117	1.784
Hals	DNK	56.983	10.317	1.783
Halsskov	DNK	55.333	11.100	1.397
Hammeren	DNK	55.283	14.750	0.783
Hammerhavn	DNK	55.267	14.750	0.783
Hardeshoj	DNK	55.000	9.683	1.557
Hasle	DNK	55.183	14.700	0.795
Hellerup	DNK	55.733	12.583	1.283
Hobro	DNK	56.633	9.800	1.778
Holbaek	DNK	55.717	11.717	1.610
Horsens	DNK	55.850	9.867	1.628
Hundested	DNK	55.967	11.850	1.402
Hvalpsund	DNK	56.683	9.200	0.800
Juelsminde	DNK	55.717	10.017	1.568
Kalundborg	DNK	55.683	11.083	1.611
Karrebaeksminde	DNK	55.167	11.633	1.454
Kastrup	DNK	55.633	12.650	1.286
Katholm	DNK	54.933	9.833	1.632
Kerteminde	DNK	55.450	10.667	1.548
Koge	DNK	55.450	12.200	1.476
Kolby Kaas	DNK	55.800	10.533	1.555
Kolding	DNK	55.500	9.500	1.610

Global Port	Country	Latitude	Longitude	Environmental Distance
Kongsdal	DNK	56.683	10.067	1.784
Korsor	DNK	55.333	11.133	1.397
Kyndby	DNK	55.817	11.883	1.402
Lemvig	DNK	56.550	8.300	1.826
Lindo	DNK	55.467	10.533	1.548
Logstor	DNK	56.967	9.250	0.799
Lyngs Odde	DNK	55.517	9.750	1.587
Lyngsbaek Bridge	DNK	56.233	10.617	1.676
Mariager	DNK	56.650	9.983	1.777
Marstal	DNK	54.850	10.517	1.364
Masnedo	DNK	55.000	11.900	1.479
Masnedsund	DNK	55.000	11.900	1.479
Middelfart	DNK	55.500	9.733	1.587
Naestved	DNK	55.233	11.750	1.489
Nakskov	DNK	54.833	11.133	1.501
Nekso	DNK	55.067	15.150	0.867
Nyborg	DNK	55.300	10.783	1.424
Nyhavn	DNK	55.683	12.583	1.286
Nykobing(Falster)	DNK	54.767	11.867	1.462
Nykobing(Mors)	DNK	56.800	8.867	0.862
Nykobing(Sjaelland)	DNK	55.917	11.683	1.571
Odden	DNK	55.967	11.367	1.475
Odense	DNK	55.417	10.383	1.538
Omo	DNK	55.167	11.150	1.353
Orehoved	DNK	54.950	11.850	1.479
Ostby	DNK	55.733	12.033	1.630
Praesto	DNK	55.117	12.033	1.316
Randers	DNK	56.467	10.050	1.777
Ringsted	DNK	55.883	12.533	1.293
Rodbyhavn	DNK	54.650	11.350	1.525
Ronne	DNK	55.100	14.700	0.795
Rudkobing	DNK	54.933	10.717	1.364
Sakskobing	DNK	54.800	11.633	1.503
Skaelskor	DNK	55.250	11.283	1.508
Skaerbaek	DNK	55.517	9.617	1.611
Skarrehage	DNK	56.950	8.867	0.823
Skive	DNK	56.567	9.033	0.807
Snaptun	DNK	55.817	10.033	1.651
Soby	DNK	54.950	10.267	1.395
Sonderborg	DNK	54.917	9.783	1.632
Sprogo	DNK	55.333	10.967	1.424
Stege	DNK	54.983	12.283	0.859
Stevns Pier	DNK	55.317	12.450	1.300
Stigsnaesvaerkets Havn	DNK	55.217	11.250	1.508
Strib	DNK	55.533	9.767	1.603
Struer	DNK	56.500	8.600	1.245
Stubbekobing	DNK	54.883	12.033	0.623
Studstrup	DNK	56.250	10.350	1.698

Global Port	Country	Latitude	Longitude	Environmental Distance
Svaneke	DNK	55.133	15.150	0.867
Svendborg	DNK	55.050	10.617	1.488
Tejn	DNK	55.233	14.833	0.783
Thisted	DNK	56.950	8.700	0.852
Tuborg Havn	DNK	55.717	12.583	1.286
Vang	DNK	55.267	14.750	0.783
Vedbaek	DNK	55.850	12.550	1.293
Vejle	DNK	55.717	9.550	1.614
Vordingborg	DNK	55.000	11.900	1.479
Beasain	ESP	43.050	-2.183	1.844
Bekker	EST	59.450	24.667	0.831
Dirhami	EST	59.217	23.500	0.634
Forby	EST	59.000	23.167	0.663
Haapsalu	EST	58.950	23.533	0.873
Heltermaa	EST	58.867	23.067	0.776
Kuivastu	EST	58.583	23.400	0.793
Kunda	EST	59.517	26.550	0.577
Lehtma	EST	59.050	22.700	0.632
Loksa	EST	59.583	25.717	0.599
Meeruse	EST	59.450	24.683	0.844
Miiduranna	EST	59.500	24.817	0.575
Montu	EST	57.950	22.117	0.749
Muuga	EST	59.500	24.967	0.575
Narva Joesuu	EST	59.467	28.050	0.818
Paldiski	EST	59.350	24.050	0.600
Paljassaare	EST	59.450	24.700	0.844
Parnu	EST	58.383	24.483	0.926
Peetri	EST	59.450	24.733	0.844
Prangli Is.	EST	59.633	25.000	0.610
Rohukula	EST	58.900	23.417	0.777
Roomassaare	EST	58.217	22.517	0.763
Saaremaa Harbour	EST	58.533	22.233	0.749
Sillamae	EST	59.400	27.783	0.818
Tallinn	EST	59.450	24.750	0.844
Veere	EST	58.450	22.050	0.857
Virtsu	EST	58.583	23.550	0.868
Dalsbruk	FIN	60.033	22.517	0.836
Frojdbole	FIN	60.150	19.917	0.465
Galtby	FIN	60.183	21.583	0.587
Hamina	FIN	60.567	27.183	0.858
Hanko	FIN	59.817	22.967	0.593
Helsinki	FIN	60.167	24.950	0.903
Houtskar	FIN	60.217	21.367	0.576
Imatra	FIN	61.167	28.833	0.770
Inkoo	FIN	60.050	24.017	0.739
Isnas	FIN	60.400	26.000	0.787
Joensuu	FIN	62.600	29.750	0.690
Joutseno	FIN	61.133	28.483	0.770

Global Port	Country	Latitude	Longitude	Environmental Distance
Kalajoki	FIN	64.250	23.933	0.390
Kantvik	FIN	60.083	24.383	0.751
Kaskinen	FIN	62.383	21.217	0.437
Kaukas	FIN	61.067	28.217	0.770
Kaukopaa	FIN	61.250	28.867	0.736
Kemi	FIN	65.733	24.567	0.637
Kokkila	FIN	60.333	22.867	0.813
Kokkola	FIN	63.833	23.133	0.386
Korpo	FIN	60.150	21.550	0.587
Kotka	FIN	60.467	26.950	0.611
Koverhar	FIN	59.883	23.217	0.587
Kristiinankaupunki	FIN	62.267	21.317	0.748
Kronvik	FIN	63.050	21.517	0.666
Kuopio	FIN	62.850	27.500	0.720
Kustavi	FIN	60.567	21.333	0.780
Kuuslahti	FIN	63.117	27.750	0.752
Lapaluoto	FIN	64.667	24.417	0.638
Lappeenranta	FIN	61.067	28.250	0.770
Lappohja	FIN	59.900	23.267	0.581
Lappvik	FIN	59.900	23.267	0.581
Lauritsala	FIN	61.083	28.333	0.770
Loviisa	FIN	60.450	26.233	0.814
Luvia	FIN	61.333	21.567	0.751
Mantyluoto	FIN	61.583	21.500	0.756
Martinniemi	FIN	65.217	25.283	0.681
Maxmo	FIN	63.200	22.033	0.639
Merikarvia	FIN	61.850	21.467	0.718
Mjosund(FIN)	FIN	60.217	22.467	0.859
Mustola	FIN	61.067	28.300	0.770
Naantali	FIN	60.467	22.017	0.841
Nyhamn	FIN	62.167	21.333	0.748
Olkiluoto	FIN	61.250	21.500	0.777
Oulu	FIN	65.000	25.467	0.703
Parainen	FIN	60.283	22.300	0.844
Pateniemi	FIN	65.083	25.400	0.692
Perno	FIN	60.450	26.050	0.801
Pietarsaari	FIN	63.683	22.700	0.395
Pori	FIN	61.483	21.800	0.733
Puhos	FIN	62.100	29.917	0.704
Raahe	FIN	64.683	24.483	0.597
Rahja	FIN	64.200	23.733	0.621
Rauma	FIN	61.133	21.500	0.756
Ristiina	FIN	61.533	27.417	0.704
Roytta	FIN	65.767	24.150	0.618
Salo	FIN	60.383	23.167	0.793
Savonlinna	FIN	61.900	28.917	0.735
Siilinjarvi	FIN	63.083	27.667	0.736
Sipoo	FIN	60.367	25.317	0.800

Global Port	Country	Latitude	Longitude	Environmental Distance
Skogby	FIN	59.917	23.317	0.581
Skoldvik	FIN	60.300	25.550	0.827
Skuru	FIN	60.100	23.550	0.772
Stromma	FIN	60.183	22.900	0.813
Summa	FIN	60.533	27.117	0.858
Svartback	FIN	60.283	25.533	0.827
Taalintehdas	FIN	60.017	22.517	0.836
Tammisaari	FIN	59.983	23.433	0.810
Teijo	FIN	60.250	22.950	0.813
Tolkkinen	FIN	60.333	25.583	0.827
Tornio	FIN	65.850	24.150	0.647
Tupavuori	FIN	60.450	22.067	0.841
Turku	FIN	60.433	22.217	0.854
Uusikaupunki	FIN	60.800	21.400	0.789
Vaasa	FIN	63.100	21.617	0.666
Valkom	FIN	60.417	26.267	0.814
Varkaus	FIN	62.333	27.833	0.751
Vartsala	FIN	60.333	23.017	0.796
Vastanfjard	FIN	60.050	22.650	0.836
Veitsiluoto	FIN	65.700	24.617	0.637
Abbeville	FRA	50.100	1.850	1.398
Ambes	FRA	45.033	-0.600	1.885
Annay sous Lens	FRA	50.467	2.867	1.258
Bassens	FRA	44.900	-0.533	1.923
Bethune	FRA	50.533	2.633	1.257
Blaye	FRA	45.117	-0.667	1.904
Bonnieres	FRA	49.033	1.583	1.378
Bordeaux	FRA	44.833	-0.567	1.922
Caen	FRA	49.183	-0.350	1.600
Chalon-sur-Saone	FRA	46.783	4.833	1.563
Conflans	FRA	48.983	2.100	1.465
Cordemais	FRA	47.267	-1.883	1.701
Corniguel	FRA	47.950	-4.117	2.009
Donges	FRA	47.300	-2.067	1.838
Duclair	FRA	49.450	0.867	1.353
Elbeuf	FRA	49.283	1.117	1.343
Etaples	FRA	50.517	1.633	1.891
Fontenay le Comte	FRA	46.467	-0.783	1.835
Gaillon	FRA	49.167	1.317	1.336
Grand Couronne	FRA	49.367	0.983	1.353
Grigny	FRA	45.617	4.783	1.667
Harfleur	FRA	49.500	0.200	1.377
Ingrandes	FRA	47.400	-0.917	1.629
Izon	FRA	44.950	-0.367	1.907
La Mailleraye	FRA	49.483	0.767	1.321
Landerneau	FRA	48.433	-4.250	1.530
Lannion	FRA	48.733	-3.450	1.825
Le Pouzin	FRA	44.750	4.750	1.932

Global Port	Country	Latitude	Longitude	Environmental Distance
Le Trait	FRA	49.467	0.800	1.321
Les Andelys	FRA	49.250	1.433	1.319
Libourne	FRA	44.917	-0.233	1.919
Lille	FRA	50.650	3.083	1.259
Lille(FRA)	FRA	50.650	3.083	1.259
Lillebonne	FRA	49.517	0.533	1.279
Limay(FRA)	FRA	48.967	1.783	1.378
Lorient	FRA	47.750	-3.367	1.897
Lyon	FRA	45.767	4.833	1.670
Mantes	FRA	48.983	1.717	1.378
Montoir	FRA	47.333	-2.133	1.925
Nantes	FRA	47.233	-1.567	1.678
Nort-sur-Erdre	FRA	47.433	-1.500	1.656
Noyelles	FRA	50.183	1.717	1.532
Paimboeuf	FRA	47.283	-2.033	1.738
Paris	FRA	48.867	2.333	1.547
Pauillac	FRA	45.200	-0.750	1.898
Petit Couronne	FRA	49.367	1.000	1.353
Pontrieux	FRA	48.700	-3.167	1.954
Port Jerome	FRA	49.467	0.533	1.359
Radicatel	FRA	49.417	0.483	1.388
Redon	FRA	47.650	-2.067	1.657
Rouen	FRA	49.483	1.083	1.336
Saint Maclou	FRA	49.367	0.417	1.643
St. Etienne du Rouvray	FRA	49.367	1.117	1.336
St. Valery sur Somme	FRA	50.183	1.650	1.761
St. Wandrille	FRA	49.533	0.750	1.273
Strasbourg	FRA	48.567	7.700	1.435
Surgeres	FRA	46.100	-0.733	1.934
Tonnay Charente	FRA	45.950	-0.883	1.982
Treguier	FRA	48.783	-3.233	1.917
Vernon	FRA	49.083	1.483	1.348
Villeneuve-la-Garenne	FRA	48.917	2.300	1.547
Villeneuve-le-Roi	FRA	48.733	2.400	1.591
Villequier	FRA	49.500	0.667	1.339
Acton Grange	GBR	53.367	-2.633	1.207
Alloa	GBR	56.100	-3.800	1.038
Althorpe Wharf	GBR	53.567	-0.733	1.116
Anderton	GBR	53.267	-2.517	1.146
Appledore	GBR	51.050	-4.200	2.038
Aylesford	GBR	51.267	0.467	1.253
Barnstaple	GBR	51.083	-4.067	1.573
Barrow on Humber	GBR	53.683	-0.383	1.577
Barton	GBR	53.467	-2.367	1.148
Barton on Humber	GBR	53.700	-0.433	1.515
Battlesbridge	GBR	51.617	0.567	1.659
Beckingham	GBR	53.400	-0.833	1.097
Bedhampton	GBR	50.833	-1.000	2.040

Global Port	Country	Latitude	Longitude	Environmental Distance
Bee Ness	GBR	51.433	0.650	1.883
Belfast	GBR	54.600	-5.933	1.815
Beverley(GBR)	GBR	53.850	-0.433	1.091
Bideford	GBR	51.017	-4.200	1.610
Bird Port	GBR	51.567	-2.967	1.504
Bonawe	GBR	56.433	-5.233	1.244
Bo'ness	GBR	56.017	-3.600	1.355
Boston(GBR)	GBR	52.967	-0.017	1.741
Bowling	GBR	55.933	-4.500	0.912
Braefoot Bay	GBR	56.033	-3.300	1.837
Bridgwater	GBR	51.167	-3.000	1.469
Bristol	GBR	51.450	-2.633	1.466
Bromborough	GBR	53.350	-2.983	1.782
Burntisland	GBR	56.050	-3.233	2.015
Burton upon Stather	GBR	53.650	-0.683	1.125
Cantley	GBR	52.567	1.533	1.982
Cardiff	GBR	51.467	-3.183	1.510
Charlestown(Scotland)	GBR	56.033	-3.500	1.516
Chatham	GBR	51.400	0.550	1.720
Chepstow	GBR	51.650	-2.667	1.512
Cliffe	GBR	51.483	0.467	1.855
Colchester	GBR	51.883	0.917	1.848
Coleraine	GBR	55.133	-6.667	1.491
Connah's Quay	GBR	53.233	-3.067	1.588
Corpach	GBR	56.833	-5.117	1.125
Coryton	GBR	51.517	0.533	1.971
Coulport	GBR	56.067	-4.883	0.836
Creeksea	GBR	51.617	0.783	1.956
Crombie	GBR	56.033	-3.567	1.355
Dalbeattie	GBR	54.933	-3.817	1.247
Dalmuir	GBR	55.900	-4.433	0.849
Dingwall(GBR)	GBR	57.600	-4.417	1.059
Drax	GBR	53.733	-0.983	1.069
Dumbarton	GBR	55.933	-4.567	0.960
Dumfries	GBR	55.067	-3.617	1.323
Dunball	GBR	51.167	-2.983	1.507
Dunglass	GBR	55.933	-4.517	0.912
Dunoon	GBR	55.933	-4.917	1.337
Dunvegan	GBR	57.450	-6.583	1.935
Eastham	GBR	53.350	-2.967	1.782
Eling	GBR	50.900	-1.467	1.751
Ellesmere Port	GBR	53.283	-2.900	1.844
Exeter	GBR	50.717	-3.517	1.593
Fairlie	GBR	55.767	-4.867	1.550
Fareham	GBR	50.850	-1.183	1.758
Faslane Dock	GBR	56.067	-4.817	0.745
Fingringhoe	GBR	51.833	0.967	2.002
Finnart	GBR	56.117	-4.833	0.727

Global Port	Country	Latitude	Longitude	Environmental Distance
Flixborough	GBR	53.617	-0.683	1.116
Fort William	GBR	56.817	-5.117	1.125
Fosdyke	GBR	52.867	-0.033	1.709
Frodsham	GBR	53.300	-2.733	1.279
Furnace	GBR	56.150	-5.183	1.361
Gainsborough	GBR	53.400	-0.767	1.092
Garelochhead	GBR	56.083	-4.833	0.756
Garston	GBR	53.350	-2.900	1.886
Gillingham	GBR	51.483	0.550	1.985
Glasgow	GBR	55.867	-4.283	0.855
Glasson Dock	GBR	54.000	-2.833	1.799
Glencripesdale	GBR	56.667	-5.817	1.565
Glenmallan	GBR	56.117	-4.817	0.716
Gloucester(GBR)	GBR	51.867	-2.217	1.279
Goole	GBR	53.700	-0.867	1.093
Gosport	GBR	50.800	-1.117	1.898
Gourock	GBR	55.950	-4.800	1.087
Grangemouth	GBR	56.033	-3.683	1.272
Granton	GBR	55.983	-3.217	2.004
Greenock	GBR	55.950	-4.733	1.118
Grove Wharf	GBR	53.600	-0.683	1.116
Grovehurst Jetty	GBR	51.367	0.767	1.645
Gunness	GBR	53.583	-0.717	1.116
Gunness Wharf	GBR	53.583	-0.683	1.116
Gweek	GBR	50.083	-5.200	2.032
Halling	GBR	51.367	0.008	1.300
Helensburgh	GBR	56.017	-4.733	1.025
Hessle	GBR	53.717	-0.433	1.515
Hoo	GBR	51.417	0.567	1.720
Hound Point	GBR	56.000	-3.367	1.571
Howdendyke	GBR	53.750	-0.867	1.093
Hull	GBR	53.750	-0.300	1.793
Hunterston	GBR	55.750	-4.883	1.590
Ince	GBR	53.283	-2.850	1.762
Inveraray	GBR	56.217	-5.083	1.103
Invergordon	GBR	57.683	-4.167	1.315
Inverkeithing	GBR	56.033	-3.400	1.567
Inverkip	GBR	55.917	-4.867	1.337
Inverness	GBR	57.500	-4.233	1.124
Ipswich	GBR	52.050	1.167	1.838
Irlam	GBR	53.433	-2.417	1.163
Irwell	GBR	53.467	-2.350	1.148
Isle of Grain	GBR	51.433	0.700	1.857
Keadby	GBR	53.600	-0.667	1.116
Kilcreggan	GBR	55.983	-4.817	1.087
King's Lynn	GBR	52.750	0.400	1.350
Kingsnorth	GBR	51.417	0.600	1.837
Kinlochleven	GBR	56.717	-4.983	0.728

Global Port	Country	Latitude	Longitude	Environmental Distance
Kirkcudbright	GBR	54.833	-4.050	1.356
Kishorn	GBR	57.383	-5.600	1.613
Knottingley	GBR	53.717	-1.233	1.041
Kylesku	GBR	58.250	-5.017	1.770
Lancaster	GBR	54.000	-2.850	1.799
Largs	GBR	55.800	-4.867	1.478
Latchford	GBR	53.383	-2.567	1.185
Liverpool	GBR	53.417	-3.000	1.726
Loch Striven	GBR	55.950	-5.083	1.211
Lochinver	GBR	58.150	-5.250	1.686
London	GBR	51.500	-0.067	1.340
Londonderry	GBR	54.983	-7.317	1.146
Longannet	GBR	56.050	-3.683	1.272
Lydney	GBR	51.717	-2.533	1.655
Maldon	GBR	51.733	0.667	1.768
Manchester(GBR)	GBR	53.467	-2.283	1.161
Middlesbrough	GBR	54.583	-1.217	1.227
Milton Creek	GBR	51.367	0.767	1.645
Mistley	GBR	51.950	1.083	1.893
Neap House	GBR	53.617	-0.667	1.116
New Holland	GBR	53.700	-0.350	1.577
Newburgh(GBR)	GBR	56.350	-3.250	1.194
Newport	GBR	51.567	-2.983	1.504
Newry	GBR	54.183	-6.333	1.359
Northwich	GBR	53.267	-2.533	1.146
Norwich	GBR	52.633	1.283	1.560
Oakham Ness	GBR	51.417	0.650	1.883
Old Kilpatrick	GBR	55.917	-4.450	0.849
Otterham Quay	GBR	51.383	0.633	1.991
Paisley	GBR	55.850	-4.433	0.846
Partington	GBR	53.433	-2.433	1.163
Pembroke	GBR	51.693	-4.951	1.983
Perth	GBR	56.400	-3.433	0.923
Port Glasgow	GBR	55.933	-4.683	0.999
Port Talbot	GBR	51.583	-3.717	1.567
Portree	GBR	57.400	-6.183	1.771
Portsmouth	GBR	50.800	-1.100	1.898
Preston(GBR)	GBR	53.750	-2.700	1.343
Queenborough	GBR	51.417	0.733	1.898
Rainham(Kent)	GBR	51.383	0.617	1.991
Redbridge	GBR	50.933	-1.467	1.751
Renfrew	GBR	55.867	-4.400	0.846
Ridham Dock	GBR	51.383	0.767	1.545
Rochester	GBR	51.400	0.500	1.383
Rochford	GBR	51.583	0.733	1.804
Rosneath	GBR	56.017	-4.800	0.860
Rosyth	GBR	56.017	-3.450	1.490
Rothesay	GBR	55.833	-5.050	1.634

Global Port	Country	Latitude	Longitude	Environmental Distance
Runcorn	GBR	53.350	-2.733	1.352
Selby(GBR)	GBR	53.783	-1.067	1.055
Shandon	GBR	56.050	-4.817	0.745
Sharpness	GBR	51.717	-2.483	1.592
Sheerness	GBR	51.433	0.733	1.978
Shell Haven	GBR	51.500	0.517	1.985
Shotton Wharf	GBR	53.200	-3.033	1.441
Sittingbourne	GBR	51.350	0.733	1.543
Snodland	GBR	51.333	0.450	1.285
South Strome	GBR	57.350	-5.567	1.379
St. Davids	GBR	56.033	-3.367	1.567
Stangate Creek	GBR	51.383	0.700	1.633
Stanlow	GBR	53.283	-2.867	1.762
Sutton Bridge	GBR	52.767	0.200	1.439
Tarbert	GBR	55.867	-5.433	1.329
Teesport	GBR	54.583	-1.167	1.257
Thamesport	GBR	51.433	0.700	1.857
Thorne	GBR	53.617	-0.967	1.120
Tilbury	GBR	51.450	0.333	1.487
Topsham	GBR	50.683	-3.633	1.505
Totnes	GBR	50.433	-3.683	1.827
Ullapool	GBR	57.900	-5.167	1.728
Warrenpoint	GBR	54.100	-6.250	1.719
Warrington	GBR	53.400	-2.600	1.185
Wemyss Bay	GBR	55.883	-4.883	1.398
Weston Church Wall	GBR	53.317	-2.750	1.530
Weston Point	GBR	53.333	-2.767	1.530
Winnington	GBR	53.283	-2.517	1.146
Wisbech	GBR	52.650	0.150	1.352
Yelland	GBR	51.067	-4.150	1.739
Kangerlussuaq	GRL	66.967	-50.950	0.748
Narsaq	GRL	60.900	-45.983	1.369
Narsarsuaq	GRL	61.150	-45.433	1.286
Budapest	HUN	47.500	19.033	1.754
Aughinish Is.	IRL	52.633	-9.050	1.290
Ballina(IRL)	IRL	54.117	-9.167	1.411
Ballylongford	IRL	52.550	-9.467	1.878
Cahiracon	IRL	52.650	-9.117	1.322
Cork	IRL	51.900	-8.467	1.708
Courtmacsherry	IRL	51.633	-8.717	2.000
Dernish Is.	IRL	52.683	-8.917	1.267
Donegal	IRL	54.650	-8.100	1.073
Drogheda	IRL	53.717	-6.350	1.660
Dundalk	IRL	54.000	-6.383	1.902
Foynes	IRL	52.617	-9.100	1.322
Foynes Is.	IRL	52.617	-9.117	1.322
Glandore	IRL	51.567	-9.117	1.826
Glengariff	IRL	51.750	-9.533	1.949

Global Port	Country	Latitude	Longitude	Environmental Distance
Kenmare	IRL	51.867	-9.600	1.545
Killadysert	IRL	52.667	-9.100	1.322
Killala	IRL	54.217	-9.217	1.970
Kilrush	IRL	52.633	-9.500	1.860
Kinsale	IRL	51.700	-8.500	2.029
Letterkenny	IRL	54.950	-7.750	1.190
Limerick	IRL	52.667	-8.633	1.160
Moneypoint	IRL	52.600	-9.400	1.566
New Ross	IRL	52.400	-6.950	1.281
Newport(Co Mayo)	IRL	53.883	-9.550	1.716
Passage West	IRL	51.867	-8.333	2.015
Port Milford	IRL	55.100	-7.700	1.618
Skibbereen	IRL	51.550	-9.267	1.614
Sligo	IRL	54.267	-8.467	1.486
Tarbert Is.	IRL	52.583	-9.367	1.566
Tralee	IRL	52.267	-9.700	1.479
Union Hall	IRL	51.567	-9.133	1.736
Westport(IRL)	IRL	53.800	-9.533	1.611
Akureyri	ISL	65.683	-18.050	1.404
Borgarnes	ISL	64.533	-21.917	1.731
Djupavik	ISL	65.950	-21.567	2.023
Grafaros	ISL	65.550	-19.400	1.325
Grundartangi	ISL	64.350	-21.783	1.833
Helguvik	ISL	64.383	-21.467	1.498
Hrafneyri	ISL	64.383	-21.533	1.508
Hvaleyri	ISL	64.333	-21.733	1.829
Krossanes	ISL	65.700	-18.117	1.497
Midsandur	ISL	64.400	-21.467	1.498
Seydhisfjordur	ISL	65.250	-13.917	1.967
Svalbardhseyri	ISL	65.750	-18.100	1.497
Pavia	ITA	45.183	9.133	2.036
Klaipeda	LTU	55.717	21.133	0.999
Engure	LVA	57.167	23.233	0.666
Labrags	LVA	56.983	21.367	0.851
Liepaja	LVA	56.517	21.017	1.011
Mersrags	LVA	57.367	23.133	0.708
Pavilosta	LVA	56.900	21.183	0.980
Riga	LVA	56.967	24.100	0.929
Roja	LVA	57.500	22.817	0.742
Salacgriva	LVA	57.750	24.367	0.857
Skulte	LVA	57.317	24.400	0.893
Ventspils	LVA	57.400	21.550	0.954
Chisinau	MDA	47.017	28.833	1.646
Risan	MTG	42.517	18.700	2.037
Aalsmeer	NLD	52.250	4.750	1.720
Aalst	NLD	51.383	5.450	1.229
Akkrum	NLD	53.050	5.833	1.416
Alblasserdam	NLD	51.867	4.617	1.180

Global Port	Country	Latitude	Longitude	Environmental Distance
Alkmaar	NLD	52.633	4.717	1.984
Alphen aan den Rijn	NLD	52.133	4.633	1.858
Ameide	NLD	51.950	4.950	1.189
Amsterdam	NLD	52.367	4.900	1.351
Appingedam	NLD	53.317	6.850	1.899
Arnhem	NLD	51.967	5.883	1.155
Assen	NLD	53.000	6.567	1.038
Axel Sassing	NLD	51.283	3.867	1.366
Bergambacht	NLD	51.933	4.783	1.189
Bergen-op-Zoom	NLD	51.500	4.267	1.358
Bergum	NLD	53.200	5.983	1.276
Beverwijk	NLD	52.483	4.633	1.654
Bolnes	NLD	51.900	4.567	1.180
Borssele	NLD	51.417	3.733	1.867
Bruinisse	NLD	51.667	4.100	1.282
Buitenhuizen	NLD	52.433	4.717	1.452
Capelle aan den Yssel	NLD	51.917	4.567	1.180
Culemborg	NLD	51.950	5.217	1.161
Deest	NLD	51.883	5.667	1.157
Delft	NLD	52.017	4.367	1.915
Den Bommel	NLD	51.717	4.283	1.252
Dintelmond	NLD	51.667	4.383	1.235
Dinteloord	NLD	51.633	4.367	1.239
Dodewaard	NLD	51.900	5.633	1.157
Dordrecht	NLD	51.800	4.650	1.180
Drachten	NLD	53.117	6.100	1.279
Druten	NLD	51.883	5.617	1.157
Eindhoven	NLD	51.433	5.500	1.229
Fijnaart	NLD	51.633	4.483	1.227
Flushing East	NLD	51.450	3.667	1.951
Foxhol	NLD	53.167	6.717	1.527
Geertruidenberg	NLD	51.717	4.867	1.189
Gendt	NLD	51.867	5.983	1.155
Gorinchem	NLD	51.817	4.983	1.188
Gouda	NLD	52.017	4.700	1.615
Grave	NLD	51.750	5.750	1.179
Groningen	NLD	53.233	6.533	1.375
Groot-Ammers	NLD	51.917	4.833	1.189
Grouw	NLD	53.100	5.850	1.286
Haarlem	NLD	52.383	4.650	1.532
Halfweg	NLD	52.383	4.750	2.026
Hansweert	NLD	51.450	4.000	1.482
Hardinxveld	NLD	51.817	4.850	1.189
Heemstede	NLD	52.350	4.600	2.045
Heerenveen	NLD	52.950	5.917	1.286
Heerewaarden	NLD	51.817	5.383	1.179
Heerjansdam	NLD	51.833	4.567	1.180
Heijen	NLD	51.683	5.983	1.174

Global Port	Country	Latitude	Longitude	Environmental Distance
Hellevoetsluis	NLD	51.817	4.133	1.295
Hendrik Ido Ambacht	NLD	51.850	4.617	1.180
Heusden	NLD	51.733	5.150	1.183
Hillegom	NLD	52.300	4.583	2.045
Hoogezand	NLD	53.167	6.750	1.519
Huissen	NLD	51.917	5.917	1.155
Kaag	NLD	52.200	4.533	2.031
Kinderdijk	NLD	51.883	4.633	1.180
Koog aan den Zaan	NLD	52.450	4.817	1.555
Kootstertille	NLD	53.217	6.083	1.535
Krimpen aan den Yssel	NLD	51.900	4.583	1.180
Lauwersoog	NLD	53.400	6.217	1.961
Leeuwarden	NLD	53.200	5.783	1.547
Leiden	NLD	52.150	4.467	2.018
Leiderdorp	NLD	52.133	4.517	2.031
Lekkerkerk	NLD	51.917	4.633	1.180
Lisserbroek	NLD	52.267	4.567	2.045
Lithoyen	NLD	51.817	5.433	1.179
Lobith	NLD	51.867	6.133	1.168
Loppersum	NLD	53.317	6.733	1.750
Maarssen	NLD	52.167	5.167	1.687
Maasbracht	NLD	51.133	5.867	1.267
Maashees	NLD	51.567	6.033	1.214
Maassluis	NLD	51.917	4.250	1.200
Maastricht	NLD	50.850	5.683	1.243
Made	NLD	51.683	4.800	1.196
Middelburg	NLD	51.500	3.617	1.923
Middelharnis	NLD	51.783	4.200	1.249
Midwolda	NLD	53.183	6.983	1.768
Millingen aan den Rijn	NLD	51.867	6.033	1.168
Moerdijk	NLD	51.700	4.617	1.202
Nieuw Lekkerland	NLD	51.883	4.633	1.180
Nieuwerkerk aan den Yssel	NLD	51.967	4.583	1.180
Nijmegen	NLD	51.833	5.833	1.179
Numansdorp	NLD	51.717	4.417	1.228
Odijk	NLD	52.033	5.217	1.408
Ooltgensplaat	NLD	51.683	4.333	1.234
Oosterhout	NLD	51.617	4.867	1.203
Oss	NLD	51.767	5.517	1.178
Ouderkerk	NLD	51.933	4.600	1.180
Oudewater	NLD	52.033	4.883	1.435
Ouwerkerk	NLD	51.633	3.983	1.342
Overschie	NLD	51.933	4.417	1.170
Paal	NLD	51.350	4.117	1.376
Papendrecht	NLD	51.833	4.633	1.180
Pijnacker	NLD	52.000	4.417	1.915
Raamsdonksveer	NLD	51.700	4.917	1.189

Global Port	Country	Latitude	Longitude	Environmental Distance
Renkum	NLD	51.967	5.733	1.155
Rhenen	NLD	51.950	5.567	1.157
Ridderkerk	NLD	51.867	4.583	1.180
Rijswijk	NLD	51.783	5.017	1.183
Roermond	NLD	51.200	5.983	1.257
Rotterdam	NLD	51.900	4.483	1.187
Sas van Ghent	NLD	51.233	3.800	1.330
Sas van Goes	NLD	51.500	3.900	1.621
Schiedam	NLD	51.900	4.400	1.180
'sGravendeel	NLD	51.767	4.600	1.180
'sHertogenbosch	NLD	51.700	5.300	1.194
Siddeburen	NLD	53.250	6.867	1.825
Sliedrecht	NLD	51.833	4.750	1.189
Slikkerveer	NLD	51.883	4.600	1.180
Sluiskil	NLD	51.300	3.833	1.370
Spijk	NLD	51.867	5.050	1.152
St. Annaland	NLD	51.617	4.100	1.225
Stavenisse	NLD	51.583	4.000	1.342
Stein	NLD	50.967	5.767	1.243
Stellendam	NLD	51.800	4.017	1.422
Stroobos	NLD	53.233	6.217	1.547
Swalmen	NLD	51.217	6.017	1.253
Tegelen	NLD	51.350	6.133	1.243
Terneuzen	NLD	51.333	3.817	1.671
Tiel	NLD	51.883	5.450	1.158
Tilburg	NLD	51.550	5.067	1.199
Uithoorn	NLD	52.233	4.833	1.720
Utrecht	NLD	52.083	5.117	1.572
Velsen	NLD	52.467	4.633	1.685
Venlo	NLD	51.367	6.167	1.243
Vlaardingen	NLD	51.900	4.350	1.180
Waalwijk	NLD	51.700	5.067	1.183
Wagenborgen	NLD	53.250	6.933	1.830
Wageningen	NLD	51.967	5.667	1.157
Walsoorden	NLD	51.450	4.033	1.475
Wanssum	NLD	51.533	6.083	1.214
Warmond	NLD	52.183	4.483	2.031
Wartena	NLD	53.150	5.900	1.162
Waterhuizen	NLD	53.183	6.633	1.499
Wemeldinge	NLD	51.517	4.000	1.464
Werkendam	NLD	51.800	4.900	1.189
West Graftdijk	NLD	52.550	4.783	1.920
Westerbroek	NLD	53.183	6.683	1.499
Westzaan	NLD	52.450	4.783	1.555
Willemstad(NLD)	NLD	51.683	4.400	1.213
Winschoten	NLD	53.133	7.017	1.775
Wognum	NLD	52.067	5.017	1.572
Wolphaartsdijk	NLD	51.533	3.817	1.391

Global Port	Country	Latitude	Longitude	Environmental Distance
Wormerveer	NLD	52.467	4.783	1.464
Woubrugge	NLD	52.167	4.633	1.858
Yerseke	NLD	51.500	4.050	1.465
Zaandam	NLD	52.433	4.833	1.555
Zaltbommel	NLD	51.800	5.200	1.186
Zeist	NLD	52.083	5.233	1.408
Zierikzee	NLD	51.633	3.883	1.396
Zoutkamp	NLD	53.333	6.300	1.585
Zuidbroek	NLD	53.167	6.867	1.620
Zuilichem	NLD	51.800	5.117	1.185
Zwijndrecht(NLD)	NLD	51.817	4.650	1.180
Aagotnes	NOR	60.400	5.017	1.063
Aaheim	NOR	62.050	5.517	1.536
Aakra	NOR	59.783	6.100	0.205
Aalefjaer	NOR	58.233	8.033	1.351
Aalvik	NOR	60.433	6.400	0.167
Aandalsnes	NOR	62.567	7.683	0.497
Aardal	NOR	61.233	7.683	0.402
Aardalstangen	NOR	61.233	7.700	0.402
Abelsnes	NOR	58.233	6.650	1.356
Agnefest	NOR	58.117	7.050	1.344
Alta	NOR	69.967	23.250	0.368
Anfiskaa	NOR	66.283	14.100	0.302
Askoy	NOR	60.400	5.167	0.926
Askvoll	NOR	61.350	5.067	1.287
Austevoll	NOR	60.100	5.250	1.450
Avaldsnes	NOR	59.350	5.267	1.858
Balholm	NOR	61.217	6.533	0.084
Ballangen	NOR	68.367	16.933	1.000
Balsfjord	NOR	69.317	19.350	0.410
Bergen	NOR	60.400	5.317	0.852
Bjugn	NOR	63.767	9.733	1.890
Bogen	NOR	68.517	17.000	0.802
Brekstad	NOR	63.683	9.667	1.752
Bremanger	NOR	61.850	4.950	1.343
Brevik	NOR	59.050	9.717	1.328
Bryggja	NOR	61.933	5.417	0.848
Buvika	NOR	63.317	10.183	0.630
Bygstad	NOR	61.383	5.667	0.481
Dalen	NOR	59.067	9.700	1.328
Deknepoll	NOR	61.917	5.133	1.388
Dirdal	NOR	58.783	6.233	0.439
Dolvik	NOR	60.317	5.250	0.936
Egersund	NOR	58.450	6.000	1.791
Eide	NOR	60.517	6.717	0.195
Eidfjord	NOR	60.467	7.067	0.352
Eikefet	NOR	60.700	5.550	0.358
Eikefjord	NOR	61.600	5.467	0.736

Global Port	Country	Latitude	Longitude	Environmental Distance
Eitrheimsneset	NOR	60.100	6.533	0.311
Elnesvagen	NOR	62.850	7.150	1.768
Elvalandet	NOR	64.567	11.417	1.395
Elvebakken	NOR	69.917	23.417	0.391
Espevik	NOR	59.333	5.683	1.380
Etne	NOR	59.667	5.950	0.408
Fagervika	NOR	66.117	12.850	1.118
Farsund	NOR	58.100	6.817	1.345
Feda	NOR	58.267	6.817	1.151
Festoy	NOR	62.367	6.333	1.492
Fevag	NOR	63.667	9.833	1.594
Fiborgtangen	NOR	63.717	11.167	0.278
Finneid	NOR	67.250	15.400	0.389
Finnsnes	NOR	69.233	17.967	0.752
Fiskarstranda	NOR	62.433	6.267	1.686
Fitjar	NOR	59.917	5.283	1.089
Flaam	NOR	60.833	7.133	0.660
Flekkefjord	NOR	58.300	6.667	0.983
Flora	NOR	62.300	7.350	0.452
Florvaag	NOR	60.450	5.217	0.794
Follafoss	NOR	63.983	11.100	0.186
Forde(Fordefjord)	NOR	61.450	5.850	0.358
Forde(Fuglesetfjord)	NOR	61.033	5.817	0.211
Fosen	NOR	59.317	5.367	1.671
Fusa	NOR	60.200	5.617	0.663
Garnes	NOR	60.433	5.483	0.494
Gaupne	NOR	61.417	7.300	0.088
Geiranger	NOR	62.100	7.217	0.719
Glaerem	NOR	63.017	8.517	0.386
Glomfjord	NOR	66.817	13.617	1.350
Gudvangen	NOR	60.867	6.833	0.502
Gullsmedvik	NOR	66.333	14.150	0.302
Gurskebotn	NOR	62.217	5.650	1.310
Haavik	NOR	59.317	5.317	1.716
Halsa	NOR	66.750	13.567	1.332
Halsvik	NOR	60.833	5.083	1.416
Hammerfall	NOR	67.417	15.533	0.759
Hareid	NOR	62.367	6.033	1.816
Haugesund	NOR	59.417	5.267	2.031
Haugsvik	NOR	61.833	5.000	0.891
Hekkelstrand	NOR	68.400	16.833	1.000
Hellestrand	NOR	61.333	5.117	1.402
Hellesylt	NOR	62.083	6.883	0.350
Helvig	NOR	58.100	6.750	1.345
Heroysund	NOR	59.917	5.783	0.510
Herre	NOR	59.100	9.533	0.916
Hjelmaas	NOR	60.583	5.350	0.907
Hjelset	NOR	62.767	7.500	0.901

Global Port	Country	Latitude	Longitude	Environmental Distance
Hjorungavaag	NOR	62.350	6.083	1.815
Holla	NOR	63.283	9.117	0.886
Holmedal	NOR	61.350	5.183	1.051
Hommelvik	NOR	63.417	10.800	0.154
Hoyanger	NOR	61.217	6.067	0.323
Hoylandsbygdi	NOR	59.767	5.783	0.686
Hoylandssundet	NOR	59.783	5.800	0.665
Husnes	NOR	59.867	5.767	0.510
Ikornnes	NOR	62.383	6.517	1.083
Innhavet	NOR	67.967	15.933	0.962
Jovik	NOR	69.600	19.833	1.471
Kaafjord	NOR	69.583	20.517	1.543
Kaupanger	NOR	61.183	7.233	0.049
Kirkenes	NOR	69.733	30.050	1.435
Kjopsvik	NOR	68.083	16.383	1.175
Knarrevik	NOR	60.367	5.167	0.926
Kongsmoen	NOR	64.883	12.433	0.292
Kopervik	NOR	59.283	5.300	1.599

Appendix I. Potential ballast-mediated NIS with high impact globally found at ports connected to Canadian Pacific coast top ports.

Species	Higher taxa	Ports				
		STEWART	FRASER RIVER PORTS	PORT MCNEILL	PRINCE RUPERT	VANCOUVER
Alexandrium ostenfeldii	Algae					
Alexandrium taylori	Algae		X			X
Amathia distans	Bryozoan					
Anadara inaequivalvis	Mollusc		X			X
Asparagopsis armata	Plant		X		X	X
Asterias amurensis	Echinoderms					X
Avrainvillea amadelpha	Algae					X
Balanus improvisus	Crustacean		X	X	X	X
Botryllus schlosseri	Tunicate	X	X	X	X	X
Botryllus violaceus	Tunicate	X	X	X	X	X
Brachidontes pharaonis	Mollusc		X			X
Callinectes sapidus	Crustacean		X			X
Carcinus maenas	Crustacean	X	X	X	X	X
Caulerpa racemosa var. cylindracea	Plant		X			X
Caulerpa taxifolia	Plant		X	X	X	X
Cercopagis pengoi	Crustacean		X			X
Chara connivens	Algae		X			X
Charybdis hellerii	Crustacean		X			X
Chattonella aff verruculosa	Algae		X			X
Cliona thoosina	Porifera					X
Codium webbiana	Algae		X			X
Corbula amurensis	Mollusc		X	X	X	X
Corbula gibba	Mollusc		X			X
Cordylophora caspia	Cnidarian		X	X	X	X
Coscinodiscus wailesii	Diatom		X		X	X
Crepidula fornicata	Mollusc		X	X	X	X
Cryptosula pallasiana	Bryozoan	X				
Dasya baillouviana	Algae		X			X
Didemnum cf. lahillei	Ascidian		X	X	X	X
Dreissena polymorpha	Mollusc		X	X		X
Elminius modestus	Crustacean		X			X
Eriocheir sinensis	Crustacean		X	X	X	X
Ficopomatus enigmaticus	Annelid		X	X	X	X
Gammarus tigrinus	Crustacean		X			X
Garveia Franciscana	Cnidarian		X	X	X	X
Geukensia demissa	Mollusc		X	X	X	X
Hemigrapsus penicillatus	Crustacean		X			X
Hemigrapsus sanguineus	Crustacean		X			X
Hemimysis anomala	Crustacean		X			
Heteromastus filiformis	Annelid		X	X	X	X

Species	Higher taxa	Ports				
		STEWART	FRASER RIVER PORTS	PORT MCNEILL	PRINCE RUPERT	VANCOUVER
Heterosiphonia japonica	Algae		X		X	X
Hydroides ezoensis	Annelid		X			X
Jassa marmorata	Crustacean		X	X	X	X
Lithoglyphus naticoides	Mollusc		X			
Littorina littorea	Mollusc		X	X	X	X
Lophocladia lallemandii	Algae		X			X
Maeotias marginata	Cnidarian		X	X	X	X
Marenzelleria neglecta	Annelid		X			X
Marenzelleria viridis	Annelid		X			X
Membranipora membranacea	Bryozoan		X			
Microspongium globosum	Algae					X
Mnemiopsis leidyi	Ctenophore					X
Moerisia lyonsi	Cnidarian		X			
Molgula manhattensis	Ascidian		X	X	X	X
Musculista senhousia	Mollusc		X	X	X	X
Mya arenaria	Mollusc	X				
Mya arenaria	Mollusc		X	X	X	X
Mytilopsis leucophaeata	Mollusc		X			X
Mytilopsis sallei	Mollusc		X		X	X
Mytilus galloprovincialis	Mollusc		X	X	X	X
Neogobius melanostomus	Fish		X			
Ostreopsis ovata	Algae		X			X
Percnon gibbesi	Crustacean		X			X
Perna viridis	Mollusc		X			X
Phyllorhiza punctata	Cnidarian		X		X	X
Polyandrocarpa zorritensis	Tunicate		X		X	X
Polydora ciliata	Annelid		X		X	X
Polydora cornuta	Annelid		X	X	X	X
Pontogammarus robustoides	Crustacean		X			