STUDY ON THE FUNCTIONING OF PORTS IN PRODUCTION AND LOGISTICS FOR EXPORT PROMOTION OF MARINE PRODUCTS

by

Masamitsu Nakaizumi[1] (Ph.D.), Shinpei Nagano[2], Takehito Horie[3] and Akira Nagano[4](Ph.D.)

ABSTRACT

The Japanese Government is working with the private sector to double exports of domestic marine products. In this paper, we elucidate the current status regarding the functioning of fishing ports, seaports and airports in the export of marine products, and discuss ways to improve their production and logistics functions so as to promote exports. Fishing ports and seaports on the one hand, seaports and airports on the other, play important production and logistics functions from producers to consumers, as bases for the production of marine products, including hygiene management measures, and as bases for transportation, including measures to preserve freshness, respectively. Expanding high-value products, namely live, fresh and chilled products and value-added and ready-to-eat products such as fillets will be effective for expanding exports. We should be stimulating exports to East Asian countries using short international shipping routes traversed by ferries and RORO (roll-on, roll-off) ships, which offer fast loading and boarding for vehicles and freight from seaports in the producing regions, as well as exports all around the world by air from these regions, after strengthening measures to preserve freshness. It can be assumed that if seaports in the producing regions could offer efficient logistics functions that maintain a high level of freshness, this will lead to promotion of exports. It will also be important to link the production functions of fishing ports with a high level of hygiene management to the logistics functions of seaports.

1. INTRODUCTION

The Japanese government has teamed up with the private sector to double exports of marine products in an initiative to popularize Japanese culture and culinary tradition around the world. However, there has been a lack of research on the production and logistics required for these exports. Marine products differ greatly from other products in some respects, such as the measures that must be taken to manage hygiene (HACCP management, etc.), and the requirements for measures to preserve freshness in products can only be stored for very short periods. Such considerations would appear to have a substantial effect on the process of selecting the seaports and airports to be used for export, as well as means of transport.

The authors have analyzed existing statistical data and survey data, conducted our own site surveys, and conducted interviews with those concerned with the fishery and shipping industries to learn the current functioning of fishing ports, seaports, and airports with respect to conditions in the export of marine products. In this paper, we discuss how to improve the functioning of fishing ports and seaports so as to promote exports of marine products.

2. DETAILS OF RESEARCH

In this study, we have used FAO FishStat, the UN Comtrade Database and Japanese trade statistics to tabulate the exports of marine products (according to both volume and value) in terms of commodity items, the customs clearance locations, the export destination countries and means of transport. Also, using our analysis of data from commodity flow (movement) surveys of containerized freight and air freight, we have calculated the fractions of exports represented by the locations of production and in

[1] Professor, Tokyo University of Marine Science and Technology, Japan. mnakai0@kaiyodai.ac.jp
[2] Researcher, TS Visual Research Co., Ltd., Japan
[3] Team Leader, Alpha Hydraulic Engineering Consultants Co., Ltd., Japan
[4] President, Japan Construction Engineers' Association, Japan

terms of container types, as well as lots. The means of transport used, routes, lead times, costs, and forms of freight were estimated on the basis of materials collected from and interviews with producers, processors, shipping companies, customs offices and site surveys.

The above process was the basis for a discussion of the following items:

i. Current status in production and trade of marine products around the world and Japan
ii. Current status in the functioning of fishing ports, seaports, and airports vis-à-vis exports of marine products
iii. How to improve the functioning of fishing ports and seaports in order to promote exports of marine products

3. CURRENT STATUS IN PRODUCTION AND TRADE OF MARINE PRODUCTS AROUND THE WORLD AND JAPAN

3.1 World Trade in Marine Products

The worldwide annual per-person consumption of marine products is gradually but definitely increasing, sustained by increases in aquaculture production volumes all over the world (Figure 1) and exports and imports of marine products.

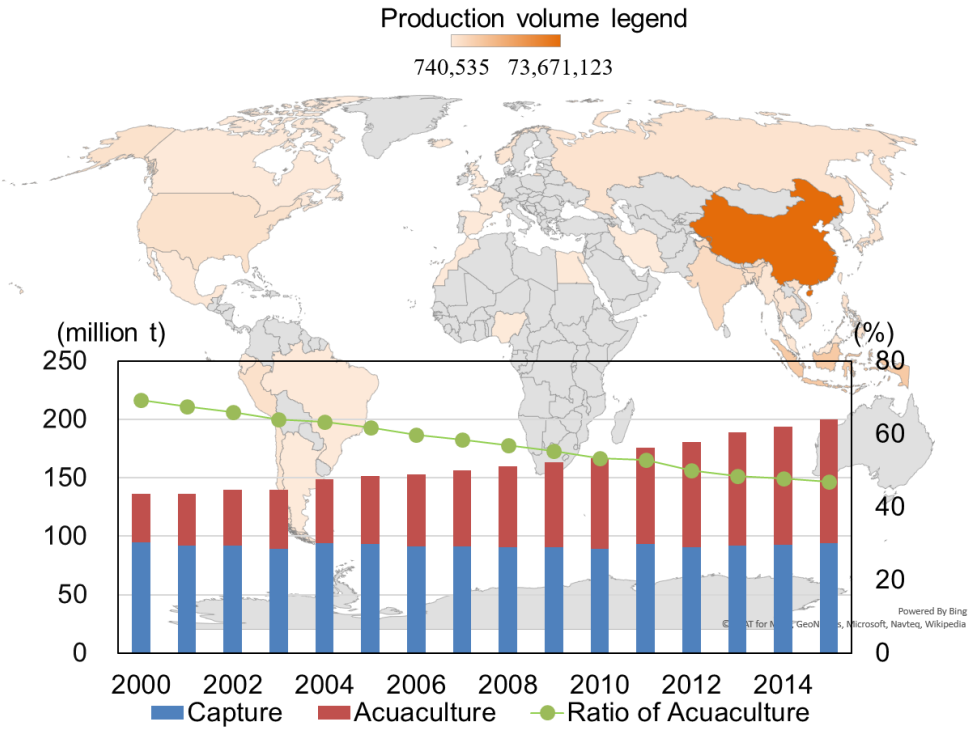
Per-person consumption of marine products

World 13.5kg(1990) → 19.0kg(2013) Japan 71.4kg(1990) → 48.6kg(2013)

Amounts for marine product trade

World (exports) US$55 billion(2000) →US$139 billion (2013)
World (imports) US$61 billion(2000) →US$135 billion (2013)

Considering these by region (Figure 2), we see that this is mainly within-region trade, in Europe and

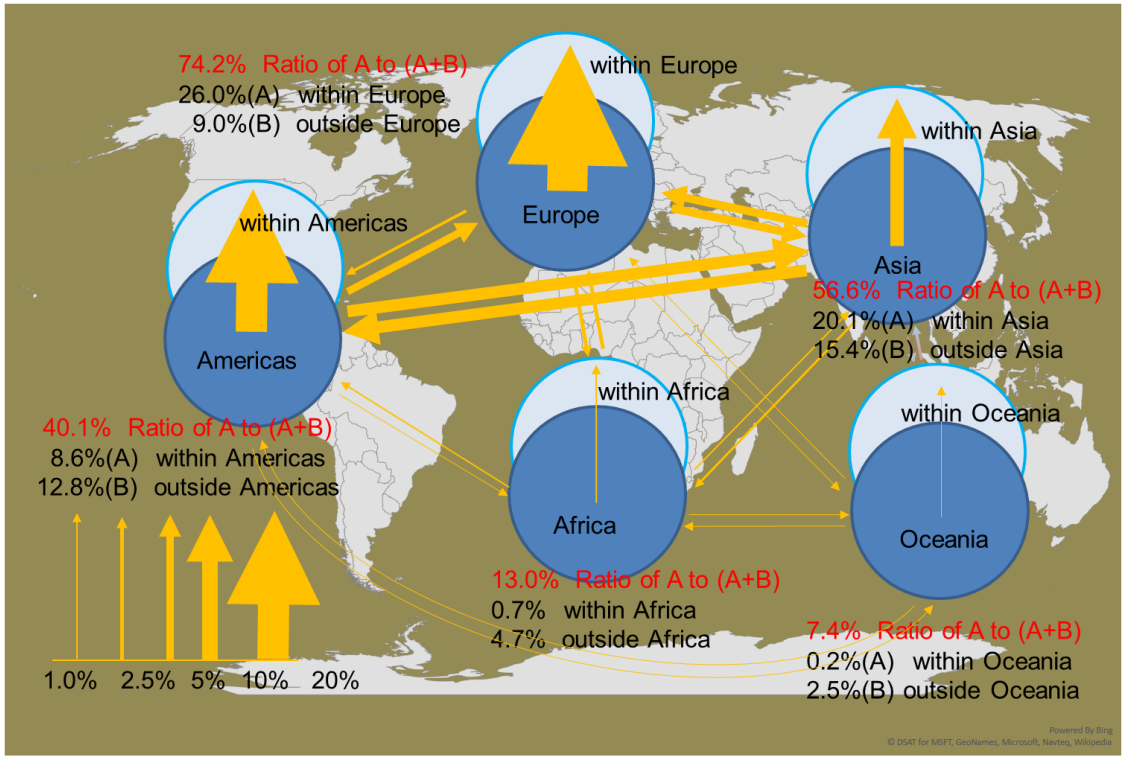


Source: FAO FishStat Online Query Panels

Figure 1: Trends in World Marine Production (Capture and Aquaculture)

Asia. Fresh and chilled products in particular are imported and exported between nations that are relatively close to each other. Trade within Europe makes up over 60% of the above totals.

Although the amount of annual per-person marine products consumption is tending downward among the Japanese public, Japan remains a key importer of marine products (#1 worldwide in 2000, #2 worldwide as of 2013). On the other hand, exports from Japan remain low despite efforts to promote exports for the purpose of the stability of domestic production prices resulting from the securing of new market.



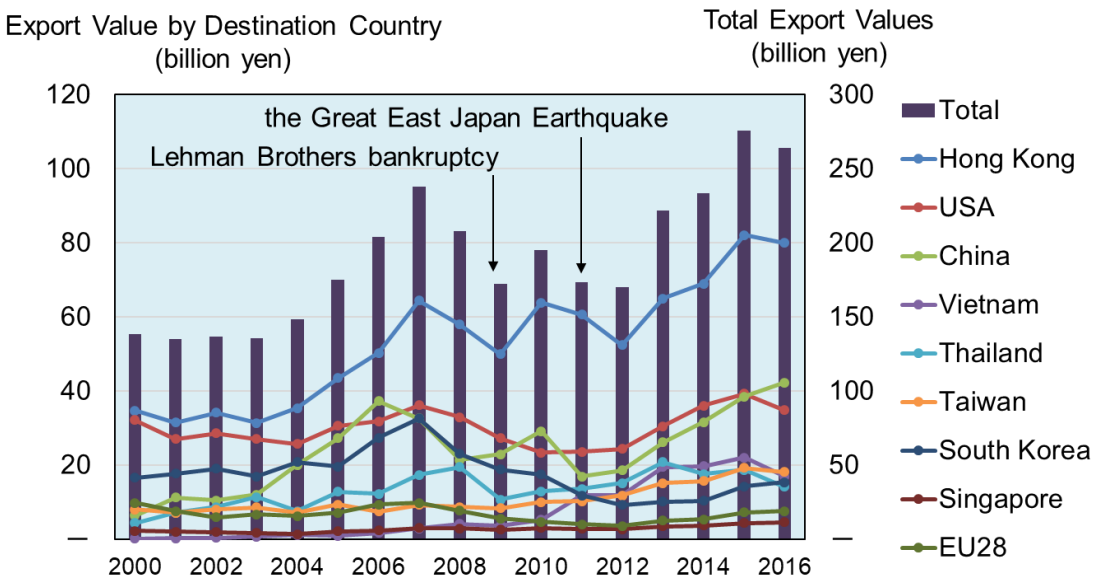
Source: UN Comtrade Database Database

Figure 2: Flows of Marine Product Trade Value by Region

3.2 Exports of Marine Products from Japan

Figure 3 presents the recent trends and current status in exports of marine products. Export figures plunged after the Great East Japan Earthquake in 2011, but have tended to increase in recent years, and have recovered to the levels predating the Lehman Brothers bankruptcy. If we break this down by export destination, we see that exports to South Korea, the EU and Russia have not returned to their peak in 2007, while they are increasing to new destinations such as Vietnam and Taiwan. Currently (as of 2014), Asian nations including Hong Kong, China, Thailand and Vietnam account for 77% of exports, and the USA, for 18%. In terms of species, exports are mostly scallops, pearls, mackerel, tuna, yellowtail and prepared foods, such as scallop adductor muscles, sea cucumber, and fish-paste products. Different nations import different items: pearls, scallop adductor muscles and dried sea cucumber are exported to Hong Kong; scallops and yellowtail to the USA; Scallops, Salmon and trout to China; and live fish and pollack to South Korea.

Due to fluctuations in domestic production, the value of the domestic production of scallops, mackerel, salmon, trout, farmed yellowtail, saury and other fish tends to vary widely. Therefore, they are exported in hopes of stabilizing the domestic prices. Exports of unshelled scallops (frozen) to China have grown; once those are processed, by shelling and placing in water, they are consumed domestically or exported to the USA. However, exports of scallops represent nearly 80% of Japanese domestic production and domestic consumption has fallen in half; hence, if we are to consider responding to the domestic consumption demand, it seems difficult going forward to increase exports at the current level of production. Salmon and trout are exported to China both dressed and semi-dressed; there, they are



Source: Japanese Trade Statistics

Figure 3: Trends in Exports of Marine Products from Japan

filleted or otherwise processed and exported to Europe or the USA. It is feared that domestic production of these will fall in the future. There is a high demand for sea cucumber, which seems strong demand as a high-grade component of Chinese cuisine and fetches high prices; as such, nearly 80% of domestic production is directed to export and there are also fears for these resources. Farmed yellowtail, whose export began in 2008, are filleted or otherwise processed and exported to the USA. Bonito and tuna are exported to Thailand, where they are canned.

Species, Shipping Temperatures and Form of Products	2007			2014		
	Volume (t)	Value (million yen)	Average Price (yen/kg)	Volume (t)	Value (million yen)	Average Price (yen/kg)
All Types (=Total)	**562,632**	**133,836**	**238**	**422,167**	**133,671**	**317**
Live Fish	6,120	6,720	1,098	2,685	2,938	1,094
Fresh and Chilled Fish	43,401	17,845	411	9,147	7,056	771
Frozen Fish	461,725	64,479	140	327,433	51,358	157
Fillets (fresh and chilled)	1,738	2,742	1,578	1,438	3,130	2,177
Fillets (frozen)	9,025	9,749	1,080	7,878	10,494	1,332
Fish (dried, salted and smoked)	822	1,680	2,044	631	665	1,054
Crustaceans (frozen)	5,753	4,761	828	1,377	1,179	856
Crustaceans (non-frozen)	649	745	1,148	382	1,268	3,319
Shellfish, Cephalopods and Mollusks (live, fresh, and chilled)	8,259	2,427	294	9,198	3,549	386
Shellfish, Cephalopods and Mollusks (frozen and others)	25,142	22,689	902	58,749	47,779	813
Invertebrates（live, fresh and chilled)	Included in the group of Shellfish, Cephalopods and Mollusks			1,638	1,075	656
Invertebrates（dried and others)				1,615	3,183	1,971

Source: Japanese Trade Statistics

Table 1: Comparison of Export Volume and Value and their Average Prices by Shipping Temperature and Form of Product (Japan)

Table 1 provides a comparison between the peak year (2007) and 2014 for yen-denominated exports of marine products, divided into live, fresh, frozen and round, and filleted. The value of the lowest-priced products (frozen) dropped from 50% to 40%, and the value of the high-priced products (fresh and chilled) fell by about one-half; meanwhile, the comparatively expensive mollusks and cephalopods (shellfish, squid, sea squirt, etc.) increased in export value by about 40%, thanks to the rise in exports of scallops.

Exports contribute to the stability of domestic production prices. Nevertheless, authorities must be alert for issues including future effects on the available resources, depending on fish species, and the hollowing of the domestic processing industry.

4. CURRENT STATUS IN THE FUNCTIONING OF FISHING PORTS, SEAPORTS AND AIRPORTS VIS-À-VIS EXPORTS OF MARINE PRODUCTS

4.1 Customs Clearance Locations for Export of Marine Products

Figure 4 shows the values of exports at the customs clearance locations (2014). The customs clearance locations can be regarded as generally either seaports or airports of origin. In terms of maritime freight, the amounts for the ports of Tokyo, Kawasaki and Yokohama and the ports of Osaka and Kobe, which serve a large number of regular international shipping routes to ports and harbors all over the world and are designated as international strategic ports, stand out from other locations. Following them are the ports of Tomakomai, Shimonoseki and Hakata, designated as international base ports that serve the key producing regions of Hokkaido (northern Japan), Chugoku and Kyushu (western Japan), respectively.

Shimonoseki and Hakata are superior locations for their proximity to the important export destination countries of South Korea and China. For air freight, Narita International Airport, Haneda International Airport and Kansai International Airport similarly serve many air routes connecting to destinations all over the world. New Chitose Airport and Fukuoka International Airport lie in key producing regions and many exports pass through them as well.

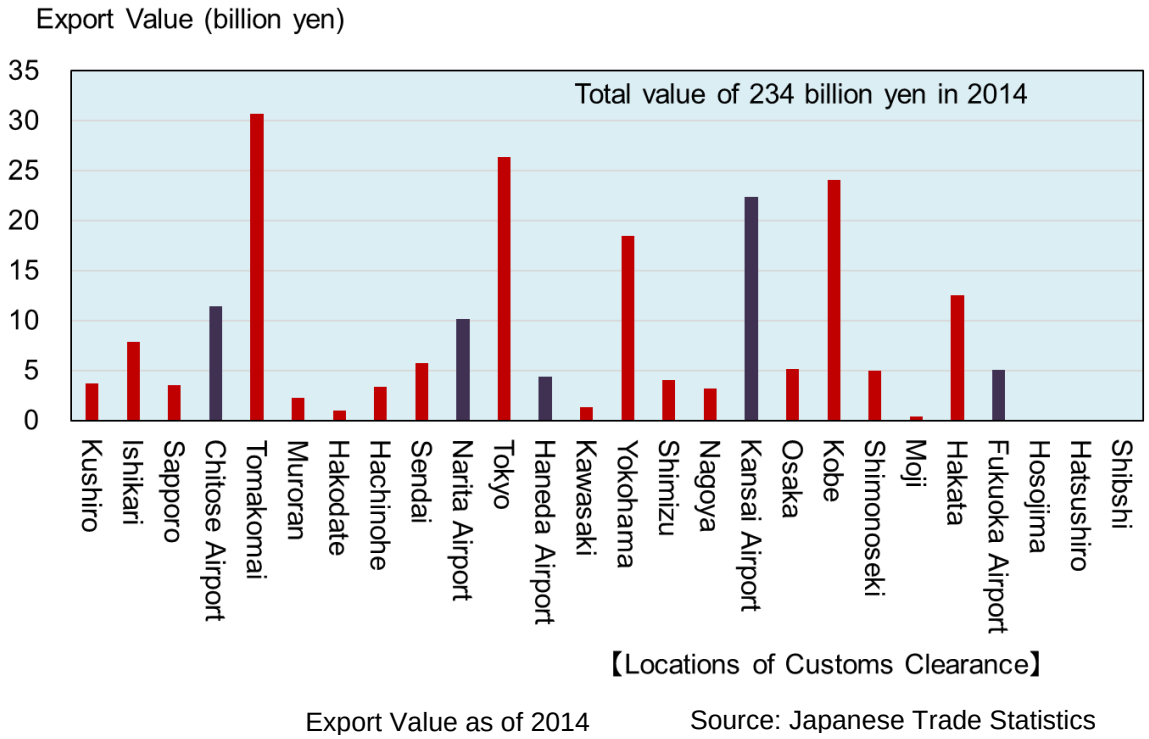


Figure 4: Value of Marine Products Exported through Customs Clearance Locations (Seaports and Airports in Japan)

4.2 Measures to Manage Hygiene in Fishing Ports and Processing Plants

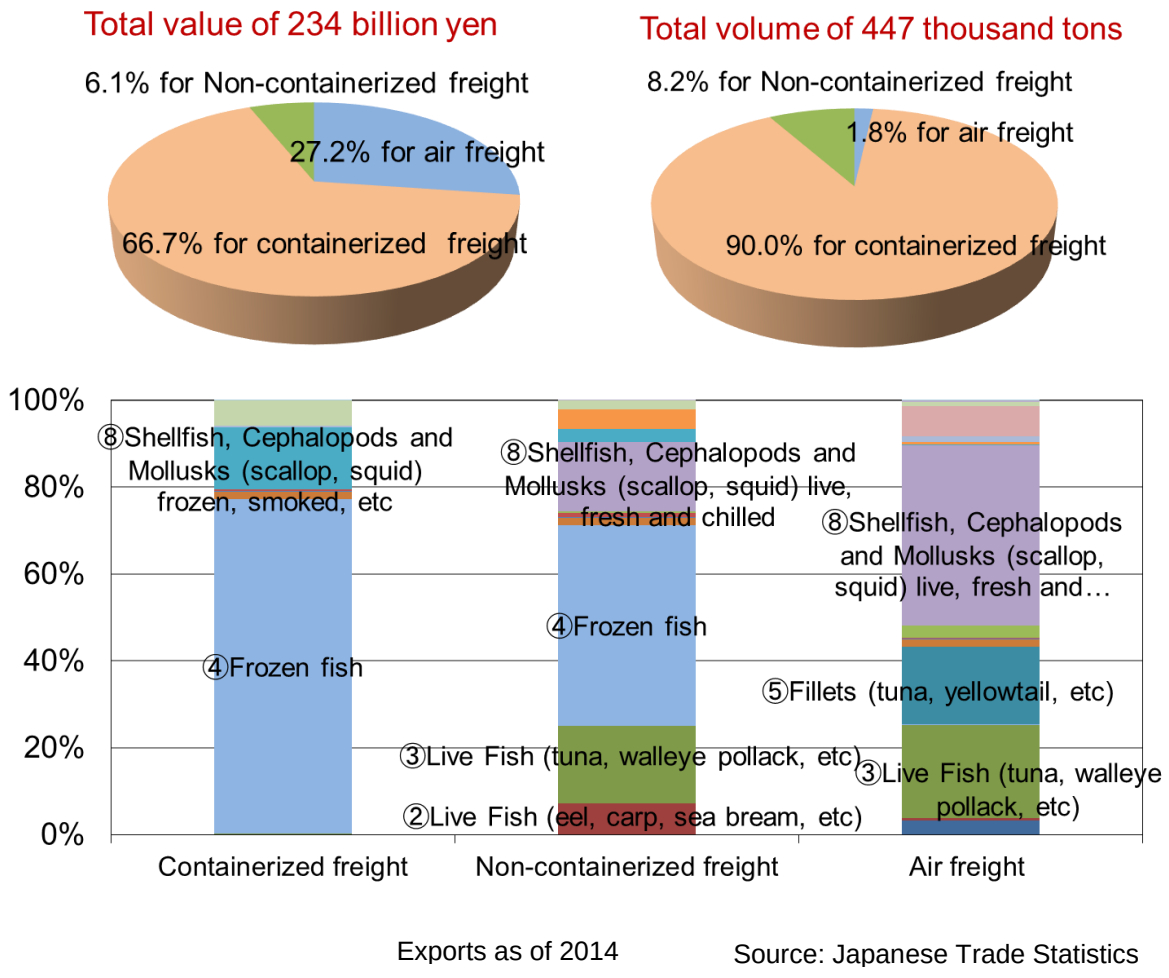
Much has been done to manage hygiene, particularly in production base fishing ports, with the objective of increasing domestic consumption and promoting exports of Japanese marine products. This has taken the form of both hardware and procedures. Facilities have been upgraded, including sheds erected on wharfs and equipped with clean sea water supply facilities, closed-structure sorting and auctioning hall, etc., while regular testing and inspections and other soft countermeasures are conducted. Since production base fishing ports handle a large amount of fish, have emphasized facilities capable of maintaining high-level hygiene. Over 60% of production base fishing ports now have such facilities.

Export of marine products requires registration and certification of the processing facilities that handle products for export, as required by the destination countries. Notably, the strict Hazard Analysis and Critical Point (HACCP, i.e. hygiene management) standards are required for exports to the EU and the USA. Most of the certificated facilities for export to the EU and registered facilities for export to the USA are located in or near production base fishing ports.

4.3 Transport Means Used, by Fish Species, Shipping Temperature, and Form of Product

Figure 5 shows the means of transport used for export, and the marine products by fish species, shipping temperature, and form of products, for each transport means.

Containerized freight maritime transport is the most commonly used means for carrying freight out of the seaports of origin, but in terms of value, air freight transport accounts for nearly 30% of the total. Containerized freight maritime transport is used for marine products (frozen) and prepared foods, non-containerized freight maritime transport (ferries, RORO ships, live fish carriers, etc.) is used for live fish and other marine products (fresh, chilled, frozen), and air freight transport is used for live fish, other marine products (fresh, chilled, fillets), prepared foods, pearls, ornamental fish and others.



Exports as of 2014 Source: Japanese Trade Statistics

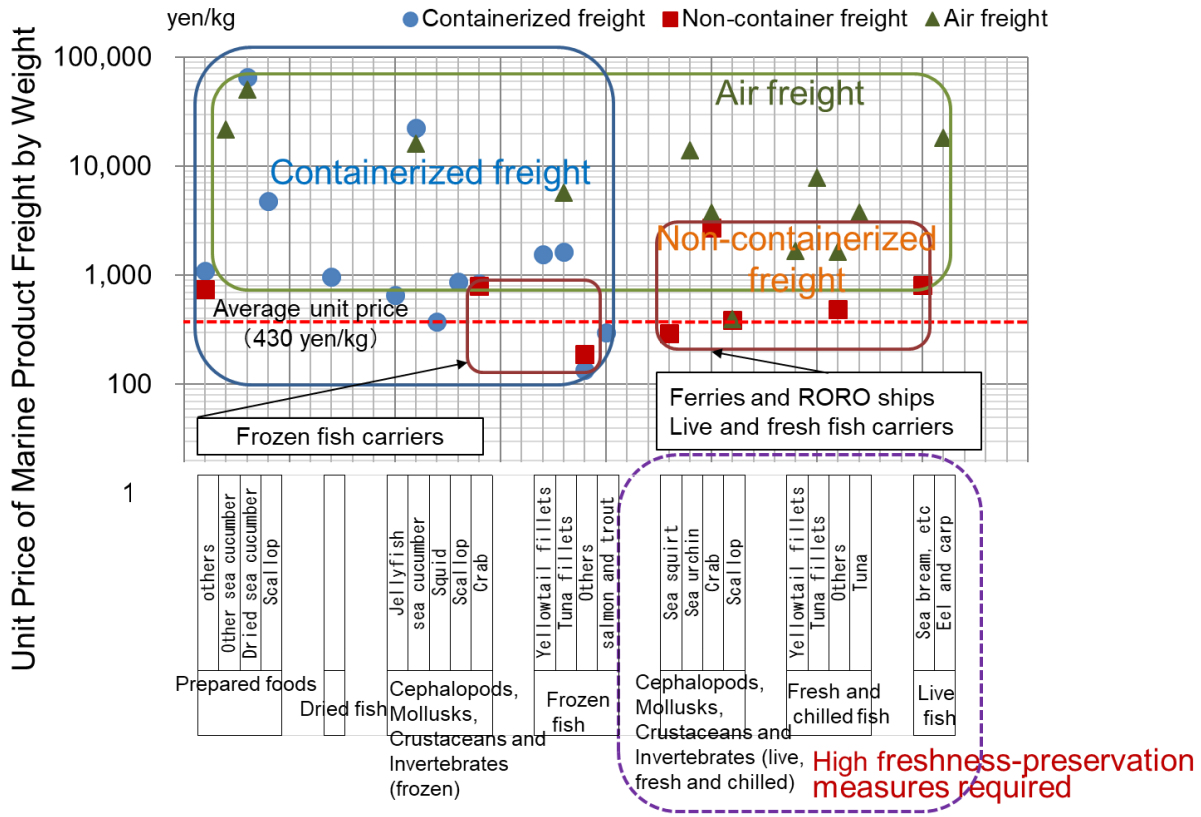
Figure 5: Means of Transport, Classified by Species, Shipping Temperature and Form of Product

Appropriate management of temperatures over a low range, including frozen, is critical for marine products. Thus, reefer containers account for over 90% of the containers used. Fresh or chilled marine products are packed into styrofoam boxes with cold storage and refrigerating agent in other maritime freight, or into refrigerated trucks on ferries or RORO ships. They are also packed into Styrofoam boxes for air transport. Of exports shipped in consolidated form, 99% of maritime containers are FCL freight, and 92% of air freight is less than load (LCL).

The unit price of marine product freight – classified by species, shipping temperature, and form of product – was calculated (as of 2014) and plotted, by means of transport, with the former on the vertical axis and the latter on the horizontal axis, in Figure 6. The marine products exported were also subdivided by the means of transport. Air freight transport was employed for expensive items and for carrying items quickly that must remain fresh, such as live fish, fresh products and chilled products. Containerized freight maritime transport was used for frozen, dried and prepared foods.

When relatively "medium- to low-priced" products, live, fresh and chilled, were sent by non-containerized freight maritime transport in export to neighboring countries, ferries and RORO ships (carrying live fish transport vehicles, refrigerated trucks, or palletized freight placed in the hold) were used for nearby routes, as well as live fish carriers, fresh and frozen fish carriers.

Pearls, coral and ornamental fish are excluded



Figures as of 2014 Source: Japanese Trade Statistics and others

Figure 6: Unit Price of Marine Product Freight, Classified by Species, Shipping Temperature and Form of Product

4.4 Characteristics of Different Means of Transport

The freight transportation costs by weight for each means of transport for marine products (as of 2016), the travel time for maritime transport and the flight time for air transport were estimated on the basis of materials received from shipping companies and airlines, site surveys and interviews with those concerned. The costs were plotted for each means of transport on the vertical axis versus the times plotted on the horizontal axis of Figure 7.

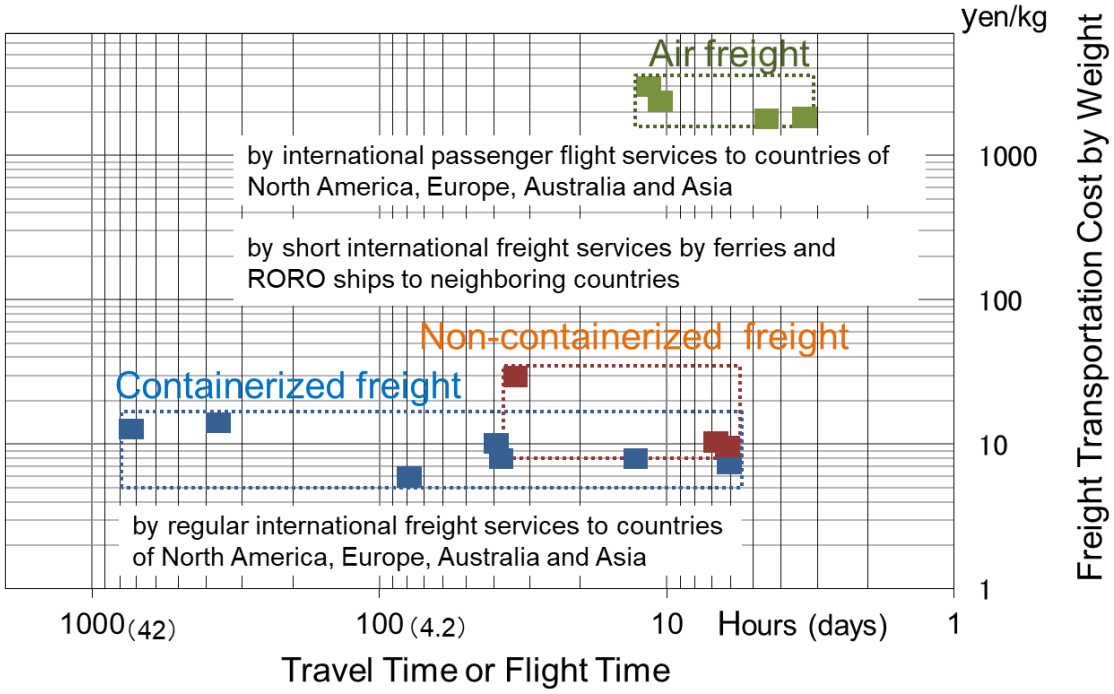


Figure 7: Freight Transportation Cost by Weight, and Travel or Flight Time

The freight transport conditions were estimated as follows.

[Freight transport conditions]

Air freight (consolidated, direct-flight freight): From New Chitose/Narita/Kansai/Fukuoka to China/Hong Kong/North America/Europe/Australia

Maritime freight (containerized): From Tokyo/Yokohama/Osaka/Hanshin/Hakata, by 20-ft reefer container to South Korea/China/Hong Kong/North America/Australia

Maritime freight (non-containerized): From Hakata or Shimonoseki by ferry (25 t refrigerated truck or live fish transport vehicle on board) to South Korea or China

In the figure, we will see that containerized freight maritime transport is low-cost and the travel time is long, from 6 hours to about one month; in contrast, air freight transport is expensive, but the flight time is short, from 3.5 to 13 hours. Non-containerized freight maritime transport offers comparatively medium to low costs, and travel time is relatively short, 6 hours to about 1.5 days.

Turning to the size of the lots transported, the average weight of freight carried by the various services was calculated using data from sources. This was 98 freight tons for containerized freight maritime transport and 380 kg for air. Air freight lots are regarded as much smaller than the large lots in containerized freight maritime transport. As for non-containerized freight maritime transport, the surveys and interviews with those concerned indicated that for refrigerated trucks and live fish transport vehicles, the main vehicles were large, at about 25-t size.

Thus, the aforementioned results show that containerized freight maritime transport offers long travel times but low transportation costs and the capability to handle large lots; air freight transport has high costs and can handle only small lots, but allows short travel times. Non-containerized freight maritime transport has features that one could call intermediate between containerized freight and air freight transports.

4.5 Means of Transport Used for Export of Live, fresh and Chilled Marine Products

Table 2 summarizes the means of transport employed for exports of live, fresh and chilled marine products (2014), according to trade statistics. This shows that live fish were exported to the nearby countries of South Korea, Hong Kong and Taiwan, while very few went to China. This was because the formalities for obtaining the export certificates necessary for exporting live fish had not been adequately

Species, Shipping Temperature, Products Form	Export Destination Country	Export Value (million yen)	Means of Transport Used
Live Fish	South Korea	1,710	Sea breams transported from Shimonoseki, Hakata or Izuhara Port by ferry (carrying live fish transport vehicles), or from Uwajima Port by live fish carriers
	China	6	Live fish transported from Takamatsu or Uwajima Port by live fish carrier
	Hong Kong	129	Eels transported from Chubu or Fukuoka Airport
	Taiwan	497	Eels transported from Chubu or Fukuoka Airport
Fresh and Chilled Fish	South Korea	1,861	Pollack, sea bream, etc. transported from Shimonoseki Port by ferry (carrying refrigerated trucks, palletized freight placed in the hold, or containerized freight)
	China	174	Tuna transported from Fukuoka Airport
	Hong Kong	796	Fish transported from Fukuoka or Haneda Airport
	USA	911	Fish transported from Fukuoka, Haneda or Narita Airport
	Guam	1,686	Directly unloading tuna captured overseas at port in Guam
Fillets (fresh and chilled)	Hong Kong	310	Tuna transported from Haneda Airport
	USA	1,499	Yellowtail transported from Fukuoka Airport
	Canada	147	Yellowtail transported from Fukuoka Airport
Crustaceans (non-frozen)	South Korea	324	Crab transported from Shimonoseki or Hakata Port by ferry (carrying palletized freight placed in the hold)
	Taiwan	412	Crab transported from New Chitose Airport
	Hong Kong	110	Crab transported from New Chitose Airport
Shellfish, Cephalopods and Mollusks (live, fresh, and chilled)	South Korea	1,914	Live unshelled scallops transported from Shimonoseki or Hakata Port by ferry (carrying live fish transport vehicles or palletized freight placed in the hold)
	China	498	Live unshelled scallops transported from New Chitose Airport or from Shimonoseki or Hakata Port by ferry or RORO ship (carrying live fish transport vehicles or palletized freight placed in the hold)
	Hong Kong	703	Live unshelled scallops transported from New Chitose Airport
	Taiwan	199	Live unshelled scallops transported from New Chitose or Narita Airport
Invertebrates (live, fresh and chilled)	Hong Kong	241	Sea urchin transported from Narita Airport
	South Korea	444	Squirt transported from Shimonoseki or Hakata Port by ferry (carrying live fish transport vehicles or palletized freight placed in the hold)

Figures as of 2014

Table 2: Means of Transport Used for Exporting Live, Fresh and Chilled Marine Products

completed (the procedure outline was established in July 2014). Fish (fresh and chilled) saw a dramatic drop in South Korea, which could be attributed to the economic situation.

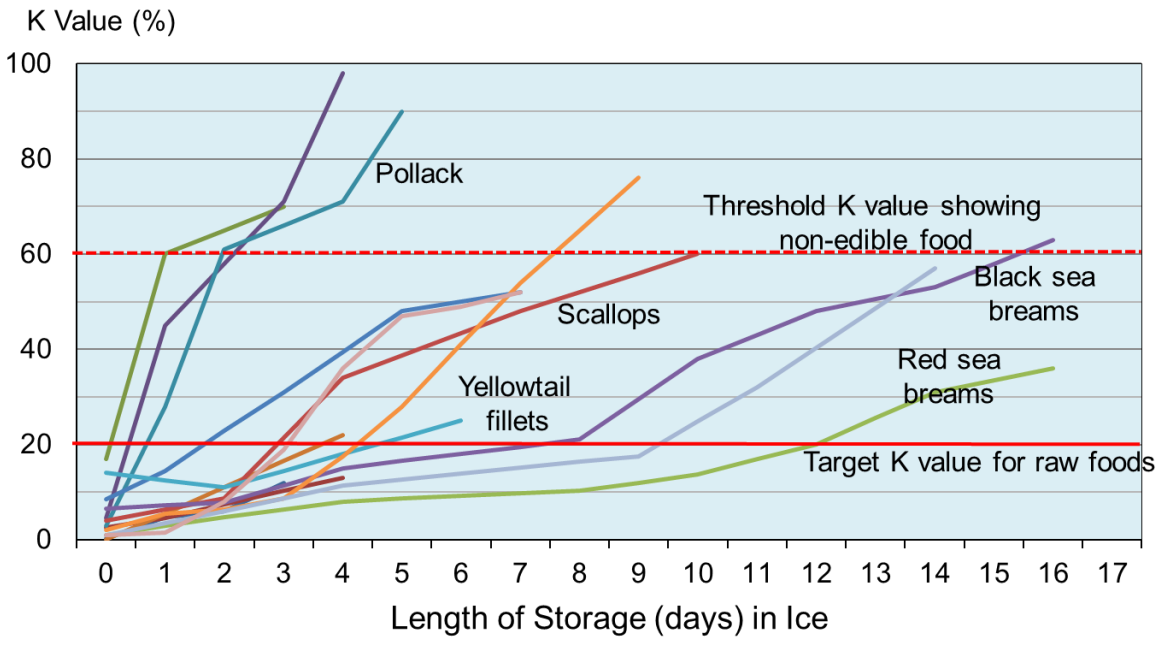
If we leave out the live, fresh and chilled marine products via air freight transport, we see that exports to South Korea (Busan) from the ports of Shimonoseki, Hakata, Izuhara, Uwajima and other ports make up a large part of exports, as shown in red in Table 2; exports to China account for but little. The means of maritime transport were ferries and RORO ships (carrying refrigerated trucks and live fish transport vehicles on board) from the ports of Shimonoseki and Hakata and live fish carriers and other carriers from Uwajima Port and other seaports.

Table 3 shows the frequency of service provided on regular short international shipping routes (ferries and RORO ships). For services from Shimonoseki, Hakata and Izuhara to South Korea and China, short shipping routes to these countries (shown in red in the table) are used. The reasons for this appear to be the fact that ferries and RORO ships can carry live fish transport vehicles and refrigerated trucks on board, and that since loading deadlines for vehicles and freight are closer to departure times and are faster for vehicles and freight, and the loading process is quick, this suits the need to maintain a high level of freshness during transportation.

	Shipping Company	Ports of Call	Type of Ship	Frequency per Week	Travel Time
Japan-South Korea	Sunstar Line Co., Ltd.	Busan-Tokyo-Yokohama-Osaka-Busan-Osaka	RORO Container loading	1 from Tokyo 2 from Osaka	Tokyo→Busan 41hrs
	Sunstar Line Co., Ltd.	Osaka-Busan-Osaka	Ferry (RORO) Container loading	3	Osaka→Busan 19hrs
	Kampu Ferry Co., Ltd.	Shimonoseki-Busan-Shimonoseki	Ferry Container loading	7 (every day)	Shimonoseki→Busan 12hrs
	Camellia Line Co., Ltd.	Hakata-Busan-Hakata	Ferry (RORO) Container loading	7 (every day)	Hakata→Busan 5.5hrs
	Sunstar Line Co., Ltd.	Busan-Tsuruga-Kanazawa-Masan-Busan	RORO Container loading	1	Kanazawa→Masan 20hrs
		Busan-Tsuruga-Kanazawa-Busan-Masan-Busan	RORO Container loading	1	Kanazawa→Busan 24hrs
	Daea Express Shipping	Izuhara-Busan-Hidakatsu-Busan-Izuhara	Ferry	7 (every day)	Izuhara→Busan 2hrs Hidakatsu→Busan 1hrs
Japan-China	Shanghai Ferry Co., Ltd.	Osaka-Shanghai-Osaka	Ferry Container loading	1	Osaka→Shanghai 46.5hrs
	Japan-China International Ferry Co., Ltd.	Osaka-Shanghai-Kobe-Shanghai-Osaka	Ferry Container loading	0.5 (every two weeks)	Osaka→Shanghai 47hrs
	Shanghai Super Express Co., Ltd.	Hakata-Shanghai-Hakata（2016.1以降休止）	RORO (Ferry) Container loading	2	Hakata→Shanghai 29hrs
	Orient Ferry Ltd.	Shimonoseki-Qingdao-Shimonoseki (canceled since2016)	Ferry Container loading	2	Shimonoseki→Qingdao 29hrs
	Suzhou Shimonoseki Ferry Co., Ltd.	Shimonoseki-Taicang-Shimonoseki	RORO Container loading	2	Shimonoseki→Taicang 33hrs
Japan-South Korea-Russia	DBS Cruise Ferry Co., Ltd.	Donghai-Vladivostok-Donghai-Sakai-Donghai-Vladivostok	Ferry Container loading	1	Sakai→Donghai 14hrs Donghai→Vladivostok 20hrs Sakai→Vladivostok 41hrs

Source: Materials from Shipping Companies

Table 3: Regular Short International Shipping Routes (Ferries and RORO Ships)



Note: scallops stored in 5℃

Figure 8: Spoilage of Marine Products versus Length of Storage (days) in Ice

4.6 Spoilage, Lead Times and Expansion of Use of Transportation Means

The “K value” indicates the level of decomposition of ATP for fish and is an index of the freshness of marine products. The lower the ATP decomposition, the lower the K value, and the better the freshness of the fish. Figure 8 provides a summary of the existing research findings on the change in K value that shows the falling freshness of marine products stored in ice. It was not clear how the fish were treated just after they expired or how they were stored in ice, but different species exhibit varying initial periods of freshness and speeds of spoilage.

The target K value for raw foods such as sashimi is 20% or less, so for export of fresh or chilled marine products, the lead time (defined in this paper as the time necessary to reach from producers to consumers) must be shorter than the period for which the marine products remain fresh. For example, previous research results have reported that bleeding the fish out or keeping it in slurry sea ice immediately after capture or harvest can delay spoilage. It is also assumed possible to delay spoilage of marine products during export, by the method of storing fish in ice immediately after capture or harvest and there onward.

Interviews with those concerned about export of live, fresh and chilled marine products yielded many concerns about the death of live fish and spoilage of fresh and chilled marine products, due to the time required to obtain the export certificates. It is assumed that streamlining the release of these certificates can shorten the lead time and increase the use of the means of transport.

4.7 Means and Routes of Transport of Marine Products from Production to Export

The fisheries and aquaculture statistics and trade statistics were analysed on the basis of the means of transport used and the relationship between the customs locations and the seaports and airports used. This revealed that the routes from producers to consumers and the means of transport used. Figure 9 presents the routes from the producers to export, using scallops as an example.

Scallops caught and harvested at nearby producing grounds are unloaded at production base fishing ports and packed for export in registered and certificated processing facilities located behind the fishing

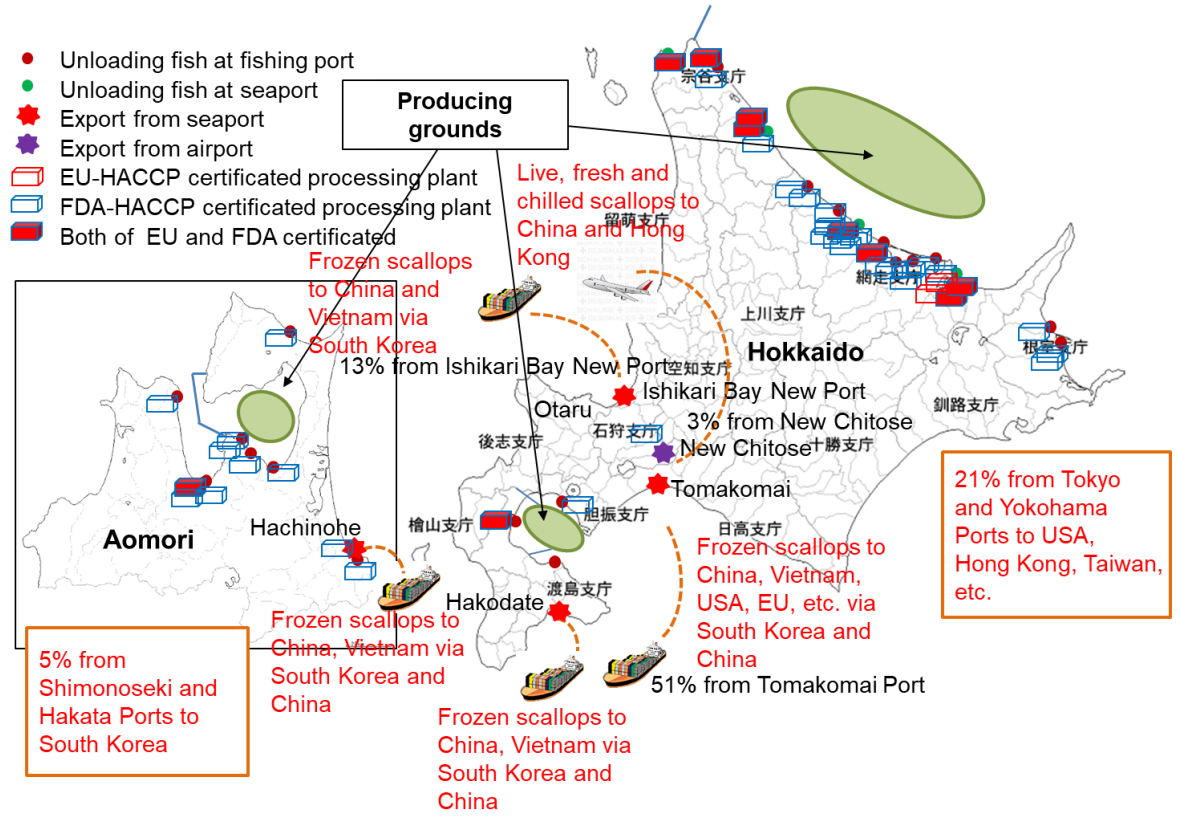


Figure 9: Means and Routes of Transport of Scallops from Production to Export

ports. Frozen scallops are exported from the ports of Tomakomai (51% in terms of value), Ishikari Bay New Port (13%), Tokyo, and Yokohama (21%). Live, fresh and chilled scallops are exported via New Chitose Airport to China and Hong Kong and from the ports of Shimonoseki and Hakata to South Korea.

4.8 Conclusions

We see from the preceding analysis that with regard to the export of marine products, fishing ports, seaports and airports on the one hand, and seaports and airports on the other, play important production and logistics functions from producers to consumers, as bases for the production of marine products, including hygiene management measures, and as bases for transportation, including measures to preserve freshness, respectively.

Expanding high-value products, namely live, fresh and chilled marine products, and value-added and ready-to-eat products such as fillets will be effective for expanding exports. We should be stimulating exports to East Asian countries using short international shipping routes traversed by ferries and RORO ships, which offer fast loading and boarding for vehicles and freight from seaports in the producing regions, as well as exports all around the world by air from these areas, after strengthening measures to preserve freshness.

5. HOW TO IMPROVE THE FUNCTIONING OF FISHING PORTS AND SEAPORTS IN ORDER TO PROMOTE EXPORT OF MARINE PRODUCTS

5.1 Current Exports from Hokkaido of Northern Japan

The amount of exports from seaports and airports in Hokkaido was ¥61.3 billion (26.2% of the total for Japan; all figures here for 2014). The amounts from the principal ports and airports were Tomakomai Port, ¥31.9 billion, Ishikari Bay New Port, ¥9.6 billion, and New Chitose Airport, ¥11.5 billion. The total exports of live, fresh and chilled marine products produced in Hokkaido was ¥4.9 billion; these amounted to ¥1.8 billion exported to Taiwan, Hong Kong and other destinations from New Chitose Airport. Exports to South Korea and China were mostly carried to Shimonoseki Port or Hakata Port (¥3.0 billion), overshadowing those exported from Ishikari Bay New Port and other ports in Hokkaido (¥160 million).

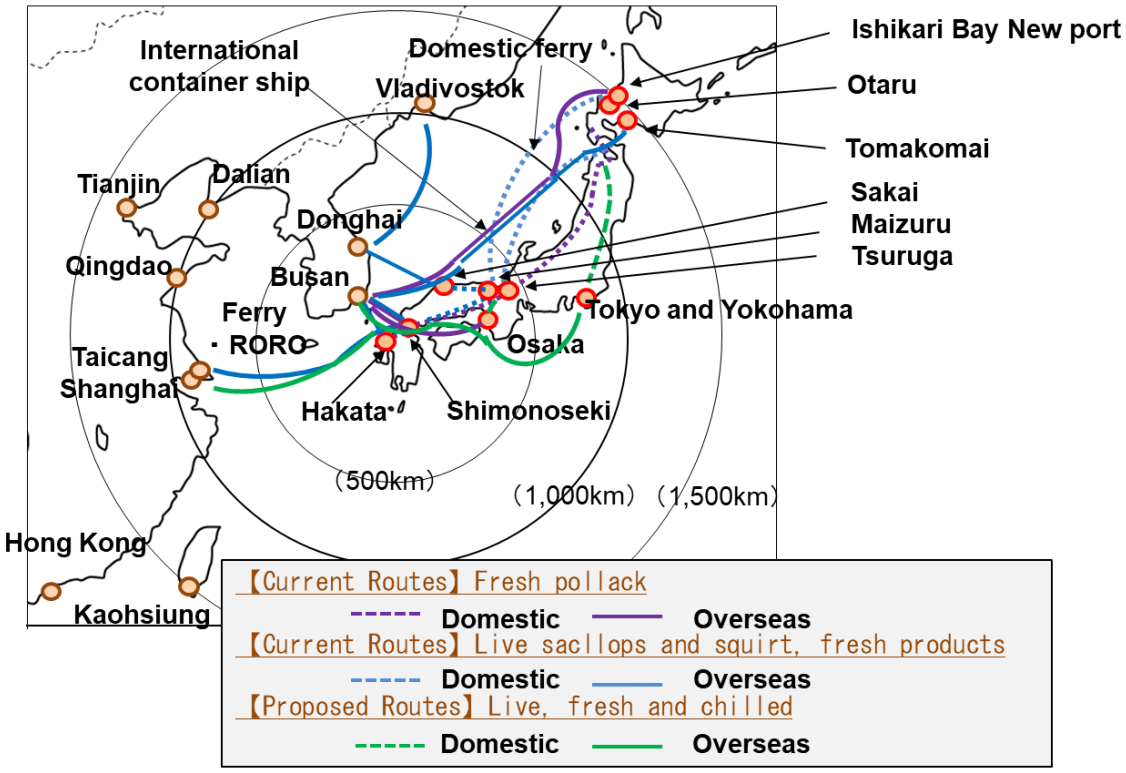


Figure 10: Means of Transport and Routes Used from Hokkaido to South Korea and China

	Species and Shipping Temperature	Means of Transport and Routes		Export Port	Export Destination Country	Export value (million yen) as of 2014	Form of Freight	Transport-ation Cost (thousand yen)	Lead Time (days to export)	Current Use	Potential for Expansion of Use
Current (as of 2014) Routes	Fresh Pollack	A	Producing regions → by refrigerated trucks → Shimonoseki Port → by ferry carrying refrigerated trucks or palletized freight placed in the hold (daily services) → Busan Port	Non-Hokkaido (Shimonoseki Port)	South Korea (Busan Port)	472	Refrigerated truck	810	4～4.5 (3)	High	
						131	Containerized freight	690	4～4.5 (3)	High	
		B	Producing region → by refrigerated trucks → Osaka Port → by ferry or RORO ship carrying reefer containerized freight (5services a week) → Busan Port	Non-Hokkaido (Osaka Port)	South Korea (Busan Port)	37	Containerized freight	530	4.5～5 (2)	Low	High
		C	Producing region → by refrigerated trucks → Ishikari Bay New Port → by full-container ship carrying reefer containerized freight (once a week) → Busan Port	Hokkaido (Ishikari Bay New Port)	South Korea (Busan Port)	25	Containerized freight	260	4～4.5 (1.5)※	Low	High
	Live Scallops and Live Squirt	D	Producing regions → by live fish transport vehicles → Otaru Port → by domestic ferry carrying live fish transport vehicles (daily service) → Tsuruga or Maizuru Port → by live fish transport vehicles → Shimonoseki or Hakata Port → by ferry carrying live fish transport vehicles (daily service) → Busan Port	Non-Hokkaido (Shimonoseki or Hakata Port)	South Korea (Busan Port)	2,277	Live fish transport vehicle	1,000	3～3.5 (2)	High	
		E	Producing regions → by live fish transport vehicles → Otaru Port → by domestic ferry carrying live fish transport vehicles (daily service) → Tsuruga or Maizuru Port → by live fish transport vehicles → Sakai Port → by ferry carrying live fish transport vehicles (once a week) → Donghai Port (Busan Port → Shimonoseki Port, on return way)	Non-Hokkaido (Sakai Port)	South Kore (Donghai Port)	89	Live fish transport vehicle	1,050	3～3.5 (2)	Low	
		F	Producing regions → by live fish transport vehicles → Otaru Port → by domestic ferry carrying live fish transport vehicles (daily service) → Tsuruga or Maizuru Port → by live fish transport vehicles → Shimonoseki Port → by ferry carrying live fish transport vehicles (twice a week) → Taicang Port	Non-Hokkaido (Shimonoseki Port)	China (Taicang Port)	116	Live fish transport vehicle	1,550	4～4.5 (2)	Low	High
	Fresh Marine Products (others)	G	Producing regions → Tomakomai Port → by full-container ship carrying reefer containerized freight (twice a week) → Busan Port	Hokkaido (Tomakomai Port)	South Korea (Bussan Port)	11	Containerized freight	260	4～4.5 (1.5)※	Low	High
Proposed Routes	Live, Fresh and Chilled Marine Products	H	Producing regions → Tokyo or Yokohama Port → by RORO ship carrying live fish transport vehicles, refrigerated trucks or reefer containerized freight (once a week) → (Osaka Port) → Busan Port	Non-Hokkaido (Tokyo or Yokohama Port)	South Korea (Busan Port)		Live fish transport vehicle	1,920	4～4.5 (1.5)		No possibility due to high transportati-on costs and long lead time
							Refrigerated truck	1,500	4～4.5 (1.5)		
							Containerized freight	500	5～5.5 (1.5)※		
		I	Producing regions → Osaka Port → by ferry carrying live fish transport vehicles, refrigerated trucks or reefer containerized freight (once or twice a week) → Shanghai Port	Non-Hokkaido (Osaka Port)	China (Shanghai Port)		Live fish transport vehicle	1,680	3.5～4 (2)		
							Refrigerated truck	1,360	3.5～4 (2)		Possible
							Containerized freight	530	4.5～5 (2)		possible

Table 4: Currently Used Means of Transport and Routes for Export of Live, Fresh and Chilled Marine Products Produced in Hokkaido to South Korea and China, and New Proposals

5.2 Potential for Expansion of Exports from Seaports in Hokkaido

The goal is to expand exports from seaports in Hokkaido, but currently, nearly all exports from Hokkaido leave from Shimonoseki Port or Hakata Port to South Korea or China, so it is important for us to clarify and examine the reasons for this. We examined materials from shipping companies, conducted a survey and interviewed those concerned about the current (as of 2014) status with regard to means of transport and routes used by all live, fresh and chilled marine products originating in Hokkaido, including exports from seaports outside Hokkaido, and about new proposals. Based on that, we estimated the transportation costs and lead times, the results of which are in Table 4.

The conditions for transporting freight assumed for the estimates are as follows. The means of transport and routes are shown in Figure 10.

[Freight transport conditions]

> Actual weight 7 t (corresponding to volume of approximately 25 m^3) of marine products, or styrofoam boxes iced with refrigerating agent (box volume 0.034 m^3), 700 boxes in a 25-t live fish transport vehicle, in a refrigerated truck or in a 20-ft reefer container

The lead times marked a ※ in the table are of concern. When the issuance of export certificates requires 2-3 days, this lengthens the lead time by 0.5 - 1.5 days, and may impact the cost of maintaining freshness and transportation.

The means of transport and routes mostly used for shipping to South Korea at present are A and D, through Shimonoseki Port or Hakata Port, non-Hokkaido. The transportation costs for these are higher than for other means of transport and routes, but the lead times are around 3 - 4.5 days. Since carriers (live fish transport vehicles and refrigerated trucks) leave the ports of Shimonoseki and Hakata by these regular shipping routes every day, so one could assume that not only are these reasonable from an economic point of view, but they also allow a stable, dependable means of tranport. C and G are direct export routes from Ishikari Bay New Port and Tomakomai Port and are less costly, but they offer only the scant 1 and 2 services per week, respectively. Therefore, they are only used for a fraction of shipments. Very few shipments for China have been sent by route F through Shimonoseki Port, non-Hokkaido; route F costs 1.5 as much as route D, presumably the reason for the low use of this option.

The following are necessary conditions for expanding exports of live, fresh and chilled marine products from seaports in Hokkaido to South Korea:

i) A continuing loosening of import restrictions and further streamlining of the issuance of export certificates (both by national and local administrative agencies);
ii) Development and introduction of technologies related to export by container and more advanced methods for preserving freshness (by producers, exporters and port/harbor operators).

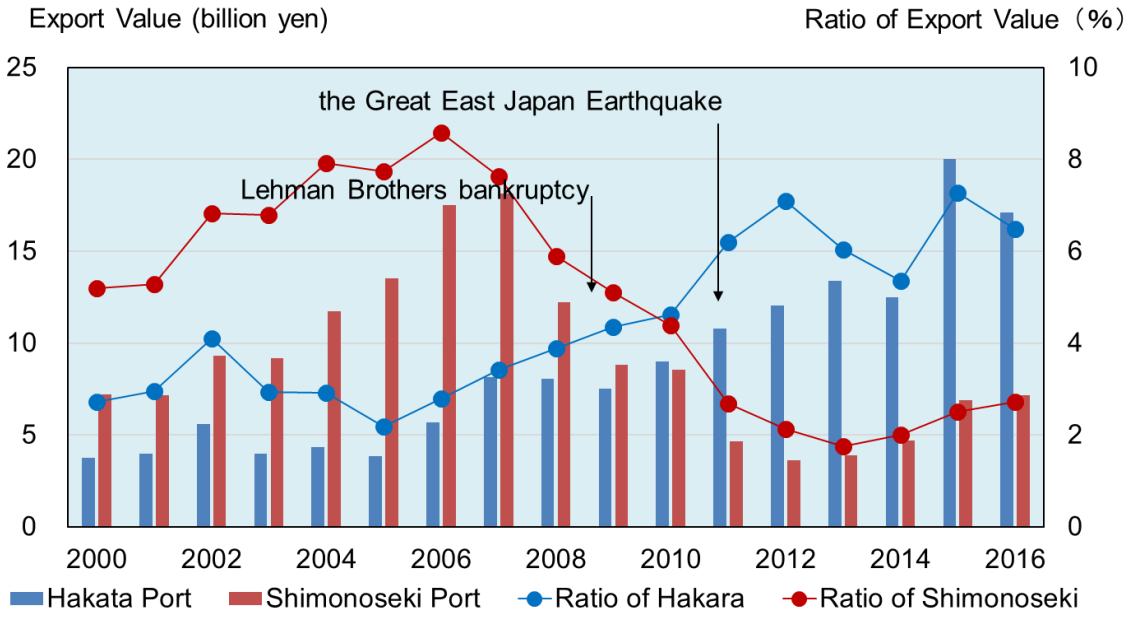
These would be expected to render feasible the use in earnest of full-container ships from Hokkaido. It is over 2,500 km from seaports in Hokkaido to China, requiring 1 - 1.5 days more than when shipping live, fresh and chilled marine products to South Korea; it is not realistic to look to these routes. So, presumably for China, while advocating for i) and ii) above, more exports to China should be sent via the ferry from Shimonoseki Port (F), and a ferry (I) from Osaka Port would be possible to use. A feasibility study on expanding or new uses of modes of transport and routes should be conducted going forward.

5.3 Current Exports from Kyushu, Chugoku and Shikoku of Western Japan

The amount of exports from seaports and airports in Kyushu, Chugoku and Shikoku are ¥29.5 billion (12.6% of the total for Japan; all figures here for 2014). The amounts from the principal seaports and airports were Hakata Port, ¥12.5 billion; Shimonoseki Port, ¥4.7 billion, and Fukuoka Airport, ¥5.0 billion. Live, fresh and chilled marine products are exported from Fukuoka Airport to the USA, China, Hong Kong, and Taiwan. A look at the trends in export figures (Figure 11) from the principal seaports of origin reveals that exports from Shimonoseki Port are at a low level compared with its former peak. On the other hand, Hakata Port has seen a growth trend despite the Lehman Brothers Shock and the 2011 Great East Japan Earthquake; it currently accounts for some 7% of all of Japan's exports in yen terms.

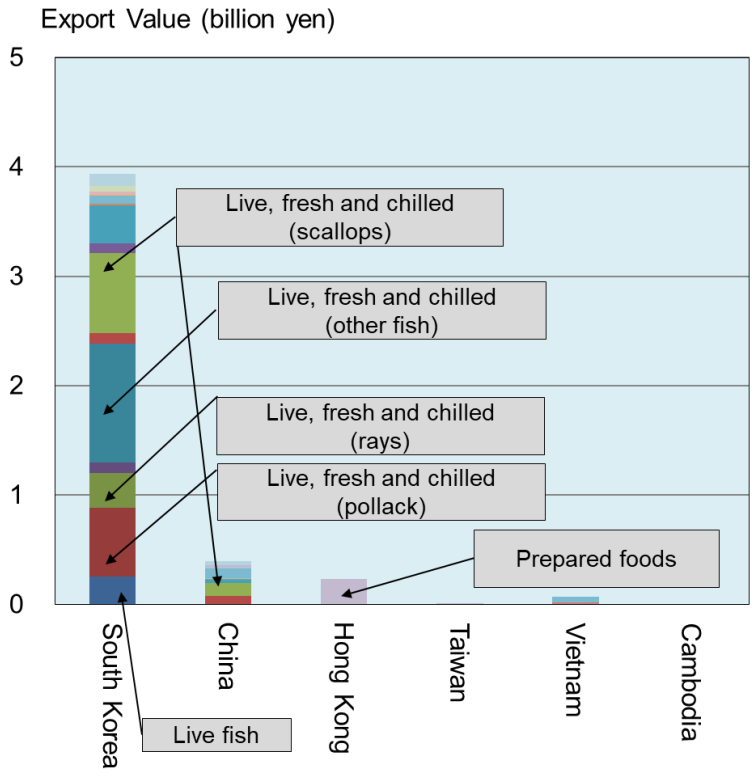
In terms of destination countries, the main export destinations from Shimonoseki Port (Figure 12) were South Korea (¥4.0 billion) and China (¥400 million); the great part of these (¥3.9 billion) were live, fresh and chilled marine products. About 50% of all exports were products of Kyushu, Chugoku and Shikoku,

while about 40% were from Hokkaido. The main destinations from Hakata Port (Figure 13) were South Korea (¥2.1 billion), China (¥600 million) and the USA (¥6.2 billion). Most of the products sent to South Korea and China were live, fresh and chilled marine products, and about 80% of these were from Hokkaido.



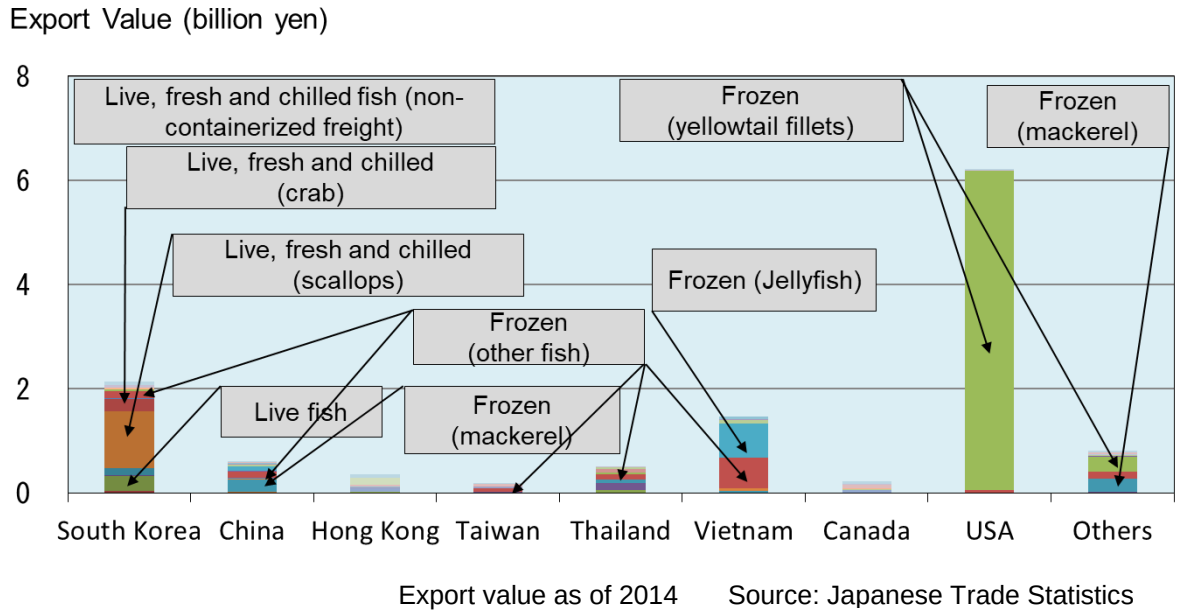
Export value as of 2014 Source: Japanese Trade Statistics

Figure 11: Trends in Yen-Denominated Exports from Shimonoseki and Hakata Ports



Export value as of 2014 Source: Japanese Trade Statistics

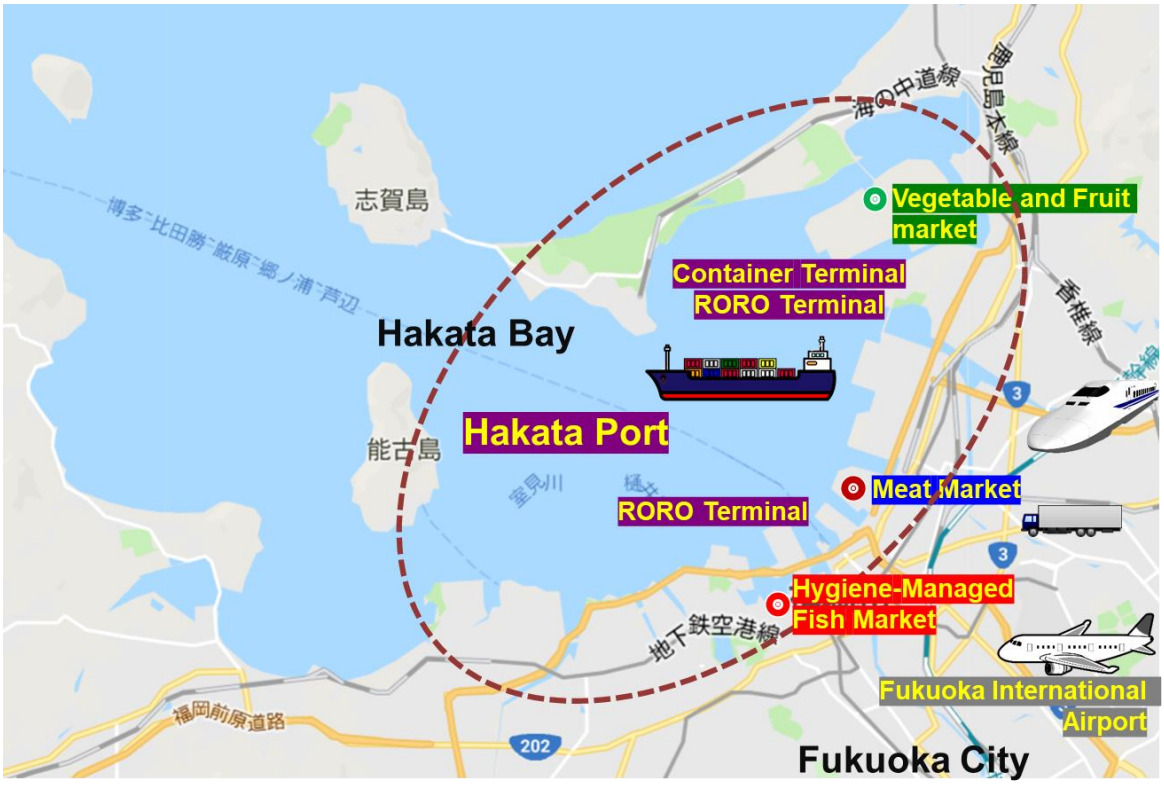
Figure 12: Yen-Denominated Exports from Shimonoseki Port, by Destination and Product Type



Export value as of 2014 Source: Japanese Trade Statistics

Figure 13: Yen-Denominated Exports from Hakata Port, by Destination and Product Type

In addition to serving regular international containerized freight routes, Hakata Port (Figure 14) provides international RORO service to Busan and Kaohsiung. There are also bases for marine, land and air freight modes gathered within a radius of 5 km. Its regular international shipping routes, that take advantage of its proximity to East Asia, along with its cooperation with multimodal transport, are superior in terms of high-speed and regularity of service.



Source: Google Map

Figure 14: Production and Logistics Functions Available at Hakata

5.4 Potential for Expansion of Exports from Seaports in Kyushu, Chugoku and Shikoku

With a wide set of services, including fish, agricultural produce and meat markets, Hakata, Fukuoka City, has established an export-oriented environment. However, even though a large volume of fresh fish come to Hakata Fishing Port by sea and by land from Kyushu, Chugoku and Shikoku, only a tiny portion of them are exported from Hakata Port. It will be the most effective way to export more marine products unloaded at the fishing ports in or adjoining the seaports like Hakata Port for the purpose of the stability and expansion of exports from these seaports, by reducing costs and time freight pickup and ensuring that freshness can be preserved. However, interviews with those concerned pointed out a breakdown of information necessary for addressing export at every stage from production to export.

The key advantages of the ports of Shimonoseki and Hakata are their proximity to South Korea, China and domestic producing regions, the speedy short shipping routes to export destination countries and their well-coordinated inspection system. In addition, Hakata Port has well-established regular international freight routes with Southeast Asia, Europe and North America. It has a strong connection with South Korea; nearly all its live, fresh and chilled marine products for export are bound for South Korea.

Regrettably, the South Korean economy is continuing to falter and South Korea continues to enforce restrictions on imports of marine products from Japan; these are impediments to expanding exports. As for exports to China, although an agreement was reached in July, 2014 on handling of certification for exports of live marine products, and the export environment was improved, partly because the Chinese apparel industry has moved its bases to Southeast Asia, the Shimonoseki – Qingdao ferry and the Hakata – Shanghai RORO services have been canceled since 2016 (Table 3). These were great setbacks to expansion of exports to China.

The necessary issues for increasing exports of live, fresh and chilled products from the ports of Shimonoseki and Hakata are the following: i) A continuing loosening of Korean and Chinese import restrictions and further streamlining of the issuance of export certification; and ii) Development and introduction of technologies related to export by container and more methods for preserving a high level of freshness. Addressing those issues can be expected to encourage use of ferries and RORO ships and enable both widespread use of full-container ships and the expansion of exports to China.

5.5 Conclusions

Following the ports of Tokyo, Kawasaki and Yokohama and the ports of Osaka and Kobe, the most important international strategic ports in Japan, as transportation bases for exporting marine products, are Tomakomai Port in Hokkaido, and the ports of Hakata and Shimonoseki in Kyushu, Chugoku and Shikoku (located in the key producing regions), which are the international base ports. The ports of Shimonoseki and Hakata have the advantage as they are the closest to export destination countries.

Depending on the characteristics of the means of transport (travel times, costs, lot size, etc.) used for exporting live and fresh marine products, it is the means of transport and the domestic and overseas routes that dictate whether or not seaports have the logistics function that can transport marine products economically and reliably within a lead time that can preserve the required freshness.

In order to expand exports of live and fresh marine products from producers, it will be necessary i) to loosen Korean and Chinese import restrictions and to streamline the issuance of export certificates; and ii) to develop and introduce transportation technologies for containerized freight and measures for for preserving a high level of freshness from the stage of fish catching or harvesting onward. Taking action on those issues will presumably promote use of ferries and RORO ships and enable widespread use of full-container ships for exports. It will also improve the functioning for promoting exports from the seaports.

It appears to be important for the production functions of fishing ports with high-level hygiene management and the logistics functions of seaports serving as transportation bases to work for expanding exports in collaboration. By sharing information between producers, exporters, fishing ports and seaport authorities—namely information on the live and fresh fish collected in a market, and about the demand at the destinations and the capabilities of means of transport—the logistics functions of seaports, on which the reliable and efficient export of live and fresh fish depends, will improve further.

6. IN CLOSING

Fishing ports and seaports on the one hand, and seaports and airports on the other, play important production and logistics functions from producers to consumers, as bases for the production of marine products, including hygiene management measures, and as bases for transportation, including measures to preserve freshness, respectively.

Expanding high-value products, namely live, fresh and chilled marine products, and value-added and ready-to-eat products such as fillets will be effective for expanding exports. We should be stimulating exports to East Asian countries using short shipping routes traversed by ferries and RORO ships, which offer fast loading and boarding for vehicles and freight from seaports in the producing regions, as well as exports all around the world by air from these regions, after strengthening measures to preserve freshness.

Depending on the characteristics of the means of transport (travel times, costs, lot size, etc.) used for exporting live and fresh marine products, it is the means of transport and the domestic and overseas routes that dictate whether or not seaports have the logistics functions that can transport marine products economically and reliably within a lead time that can preserve the required freshness.

The following points must be addressed in order to expand exports of live, fresh and chilled marine products from Japanese producers:

(1) Promoting improvement of fishing ports as production bases that deal with high-level hygiene management
(2) Firm linkage of the production functions of fishing ports with the logistics functions of seaports
(3) Loosening of import restrictions and streamlining of the issuance for export certificates
(4) Development and introduction of transportation technologies for containerized freight and measures for preserving a high level of freshness from the stage of fish catching or harvesting onward

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