

Seafood Supply Chain in Japan and the Sultanate of Oman

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Abstract

This paper delves into the organization of domestically caught seafood and its supply chains in Japan and Oman. A diligent comparison is motivated by the traditionally significant role of individual fishermen in both countries in food security as well as the provision of nutritious food to households. The study is based on a field survey of individual fishermen, supplemented with direct interviews with other stakeholders (i.e. government and NGOs) in both national fisheries. The comparative analysis sheds light on the organization of on-shore and off-shore activities that involve several intermediary stages between producers and consumers. Results suggest numerous, and still different reasons for the current situation faced by individual fishermen and households in Japan and Oman.

JEL Code: Q22.

Keywords: Japan, Oman, fishery sector, on-shore, seafood, individual fishermen, fisheries cooperative, comparative organizational culture.

Introduction

Fishery and aquaculture belong to the most ancient professions in Japan and the Sultanate of Oman. Fishing, as an economic activity, is rooted deep in the cultural and social fabric of both countries. In the case of Oman, it had been the prime source of livelihood for almost 80% of the population before the discovery of oil (World Bank Group, 2015). Oman enjoys a specific climate and easy access for her people to either the Gulf of Oman or the Arabian Sea, which makes fishing a natural response to seek subsistence given the choice between agriculture and fisheries. Omani fishermen have direct access to the Arabian Sea and the Indian Ocean through a 3,165 km long coastline. All coastal settlements have cultivated fishing as their major traditional lifeline.

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From time immemorial, the inhabitants of the coasts in Japan and Oman have used wooden vessels to catch fish for household consumption, barter, and trade (Agius, 2010; Blumenthal, 1976). Any excess supply of fish was cured using salting and drying processes and was taken to the inlands for trade. Batinah Governorate has been famous as the origin of artisanal fisheries in Oman (Al Habsi, 2012). A similar role in the national fishery sector has been enjoyed by Miyazaki Prefecture for many years, with Aoshima as the most productive fishermen cooperative in Japan, (Fisheries Cooperative Statistical Yearbook 2020).

In Japan, dependence on fishing as a source of nutrients has always been the highest among the advanced economies. Not only the location of her islands in the Pacific Ocean, but also the presence of mountains (i.e. non-agrarian land) has been contributory for this favourable situation.

In the current research, we study the manner of domestic production of seafood, and the organization of its supply chain activities in both Japan and Oman. Given fishermen at the fulcrum of this chain, we also answer some key questions about the situation of individual fishermen to establish key linkages between the production, organization, and the supply chain management of fishing activities in both Japan and Oman.

The paper is structured as follows. The next section (Section II) presents briefly the current situation of the fisheries sector in Japan and Oman. Section III describes and compares the organization of the effort of individual fishermen in Japan and Oman. Section IV concludes the findings with a final remark.

Fishermen's Current Situation in Oman and Japan, in Brief

Japanese society and the underlying economic system have been in the process of an unprecedented adjustment to the implosion of the population. The ageing of society and associated modifications to the manner in which production, distribution, and consumption are organized have already started. Contemporary problems in fisheries are numerous. One of them is a disproportionately lower income level of individual fishermen in Japan, when compared with other sectors. Negative effects in the form of discouraging new entrants have been observed for many years. Official statistics for Japan

allow us to recognize the declining number of fishermen and the diminishing fishing fleet since 1995 (Table 1 and Table 2). Local fishermen communities, organized in the form of cooperatives, suffer from the abovementioned demographic trends.

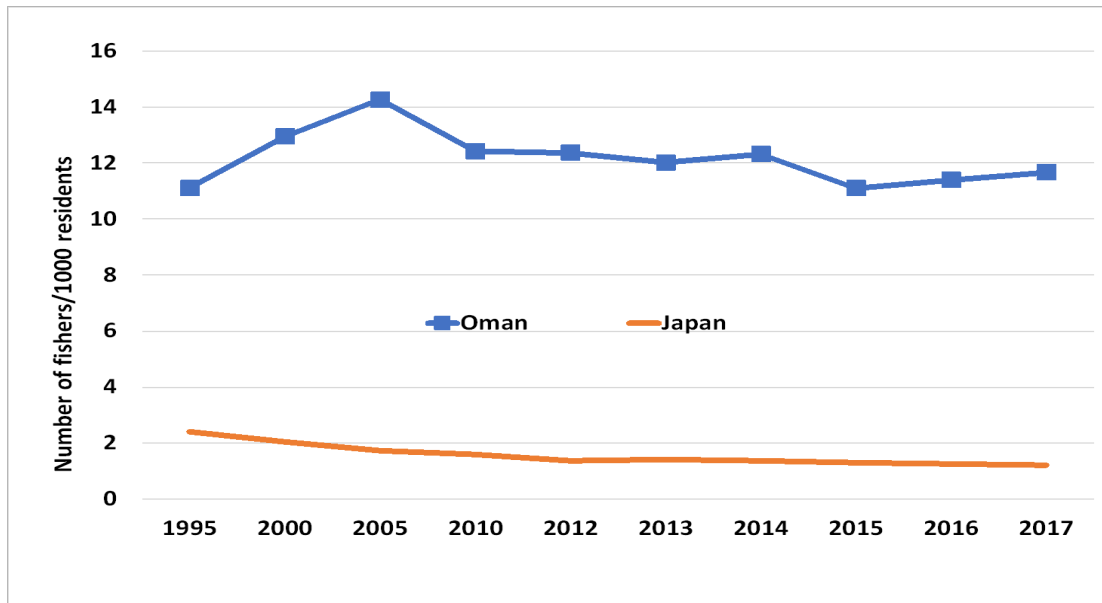
Table 1 Number of Fishermen in Japan and Oman 1995-2017.

	1995	2000	2005	2010	2015	2017	Per cent change 1995-2017
Japan	301,440	260,200	222,170	202,880	166,610	153,490	-49%
Oman	24,490	24,490	24,490	37,758	47,385	54,410	+122%

Source: Fisheries and Aquacultural Statistics, FAO Yearbook 2018.

In absolute terms (Table 1), and in relative terms (Figure 1), these statistics reveal a contrasting trend. Whilst the number of fishers has declined over time in Japan, it has significantly increased in the case of Oman. According to the most recently released statistical information available for Oman, there have been 49,299 individual fishermen in the Sultanate. They have been operating 23,232 registered small fishing boats. The catch has been delivered to as many as 127 landing sites with continuously improved quality of equipment, and facilities. There have been 24 specifically equipped seaports for fishermen in Oman (Muscat Daily, 2018). For the Sultanate, the reason for expanding seafood production capacity by increasing labor and capital endowments lies in growing domestic demand. It is mainly caused by the surge in the total population. Over a very short period, there has been a substantial inflow of expatriates, matching the locals at almost 1:1 ratio.

Figure 1 Number of fishermen per 1000 residents in Japan and Oman, 1995-2017.



Source: Authors, based on FAO's Fisheries and Aquacultural Statistics, FAO Yearbook 2018.

Figure 2, pertaining to the relative number of fishing vessels in Japan and Oman, indicates a similar trend. The number of fishing vessels has declined in Japan since 1995. This trend has continued in the most recent years. Table 2 shows that, in the case of Oman, the fishing fleet has more or less levelled off before 2010, but has increased significantly over the following decade. The reason for investment in the expansion of the seafood production (capture) capacity by 2.4 times between 2005 and 2017 also lies in the demographics of Oman. During the period 2000 to 2017, the population to be supplied with nutrients has increased more than twofold.

Table 2 Number of Fishing Vessels in Japan and Oman.

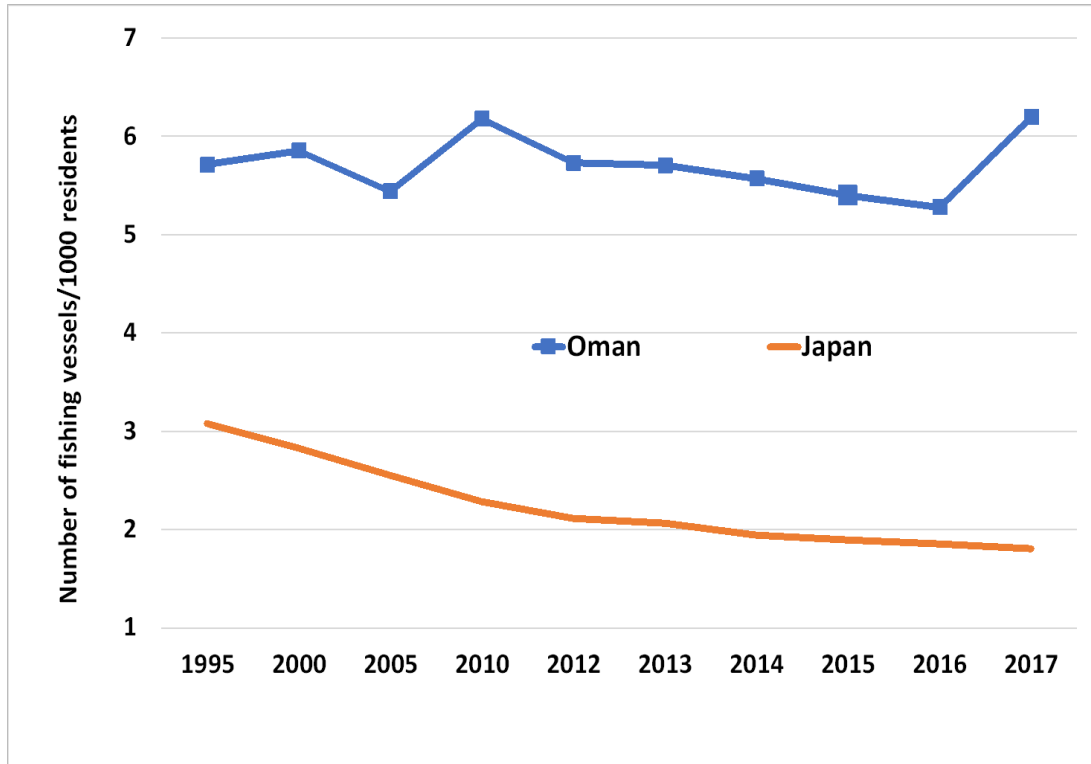
	1995	2000	2005	2010	2015	2017	Per cent change 1995-2017
Japan	372,090	347,142	317,332	283,925	235,769	224,575	-39%
Oman	10,452	11,134	10,263	15,352	19,091	24,050	+130%

Source: Fisheries and Aquacultural Statistics, FAO Yearbook 2020.

When analyzing information provided in Figure 1, Figure 2, Figure 3, and Figure 4, one can recognize a number of characteristics of the fisheries sector in Japan and Oman. While the number of fishermen in Japan has declined from 2000 to 2017, the average capture per fisherman has increased continuously. This is a vivid sign of efficient and successful substitution of labor with capital. Such a situation means that the loss resulting from employing fewer fishermen is netted off by utilizing modern technologies and specialized equipment. Together, these factors allow for maintaining or even improving productivity per fisherman. Since 2012, this ratio has been 'above-20' tons per fisherman per year (Figure 4).

Productivity in Omani fisheries is much lower than the productivity in Japan. It remains around 5 tons per year. This is a result of smaller-scale individual fishing efforts in Oman than in Japan. However, when it comes to total domestic production per citizen (in Japan) and per resident (in Oman), the Omani fisheries sector has been able to provide relatively more. Accordingly, the production per resident in Oman was recorded at 75 kg per year, while in Japan it was 25 kg per year (Figure 3). It argues well for Oman to become a potential exporter of fish and derivative products, while it sees Japan as a giant importer of seafood in the future. A question remains if the current level of fisheries sector production in Oman would be sustainable in the long run. These kinds of considerations are common among the experts and the politicians at the local and global level due to environmental concerns and sustainability of sufficient income in the post-oil era.

Figure 2 Number of fishing vessels in Japan and Oman per 1000 residents.



Source: Authors, based on *Fisheries and Aquacultural Statistics, FAO Yearbook 2017 and Statistical Yearbook (2018)*, National Centre for Statistics and Information, Sultanate of Oman.

The fisheries and demographic statistics combined provide other interesting insights into the nature of individual fishermen efforts in Japan, and in Oman. Not only the scale of operations but also the saturation of capital in the fishermen's mobile workplace seem to be very different. These are large-scale fishing corporations that dominate Japanese fisheries responsible for the 15-ton gaps presented in Figure 4. Even at individual fishermen level the ability to catch (i.e., fishing boats capacity and fishing equipment), and then to keep the catch fresh (i.e., refrigeration), and then to deliver the catch to markets (i.e., fisheries cooperative facilitation) reveal a bigger potential and actual output by Japanese.

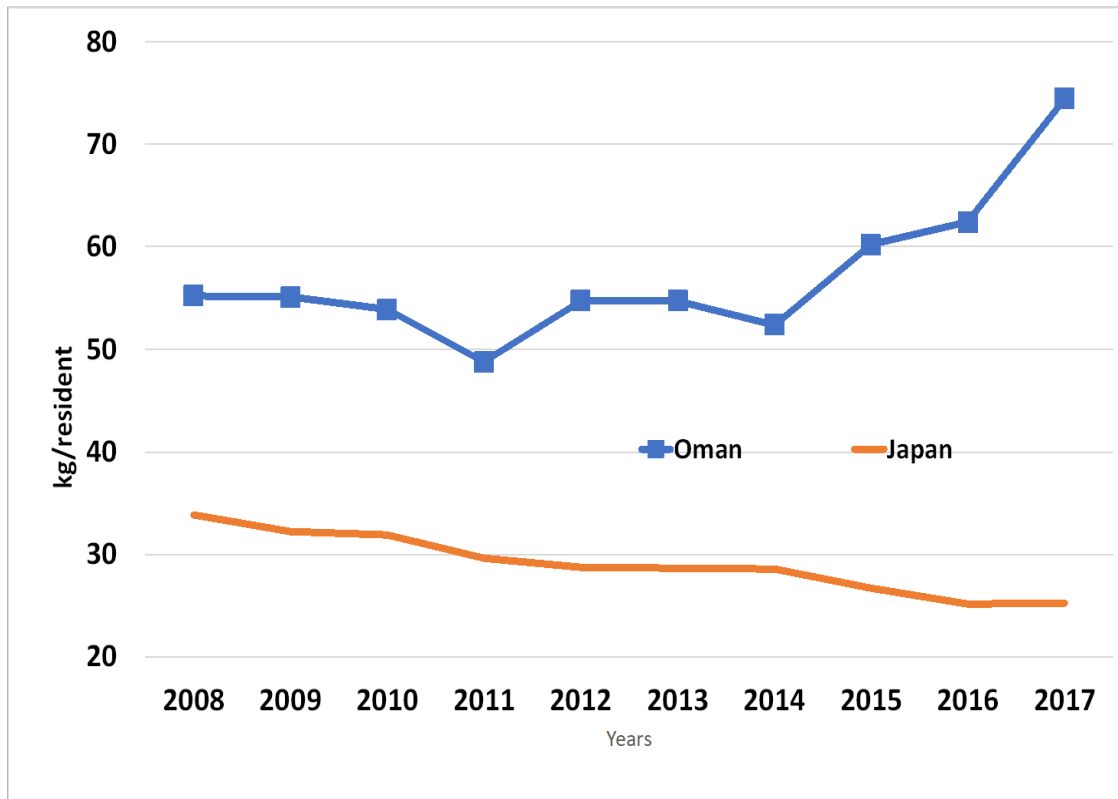
Table 3 Capture production (Fish, crustaceans, mollusks, etc.) in thousand tons, and relative, per one citizen in Japan and per one resident in Oman, 2009-2017

	2009	2011	2013	2015	2017	% change 2009-2017
Japan (thousand tons)	4,126.5	3,790.6	3,651.1	3,395.2	3,204.3	-22%
Japan:capture production per 1 citizen, kg	32.2 kg	29.6 kg	28.6 kg	26.7 kg	25.2 kg	-21%
Oman (thousand tons)	158.55	158.56	206.16	257.02	347.53	+119%
Oman:capture production per 1 resident, kg	55.1 kg	48.7 kg	54.7 kg	60.2 kg	74.4 kg	+35%

Source: Authors, based on Fisheries and Aquacultural Statistics, FAO Yearbook 2017 and Statistical Yearbook (2018), National Centre for Statistics and Information, Sultanate of Oman.

In the real terms of fish production (Rows 2 & 4 in Table 3), one can notice the strikingly different level of production. The comparison of data for Japan over time indicates that domestic seafood production has declined considerably over the last 10 years. However, in the case of Oman, it has substantially increased over the same period. Increased output of the domestic fishery sector was fueled by a dynamic expansion of domestic demand. No other country experienced a two-fold increase in population, as was the case with Oman between 2000 and 2017. Some of the observed seafood output expansion in real and in relative terms should be attributed to government policies and actions. Oman enjoys one of the biggest oil and gas reserves in the world (WDI 2020), the wise management by late Sultan Qaboos bin Said has opened a new chapter of diversification of the domestic production structure. The ultimate goal of the Government of Oman is to make the Omani economy independent of its non-renewable resources. The 2014-2017 expansion of the fisheries sector seems to be the first positive development in the intended direction. Not only the self-sufficiency ratio of the fisheries in Oman, which is above 100%, but also the growing potential of seafood exports add to the stability of the exchange rate regime in the future.

Figure 3 Domestic fisheries sector output in Japan and Oman per 1000 residents, 2009-2017.

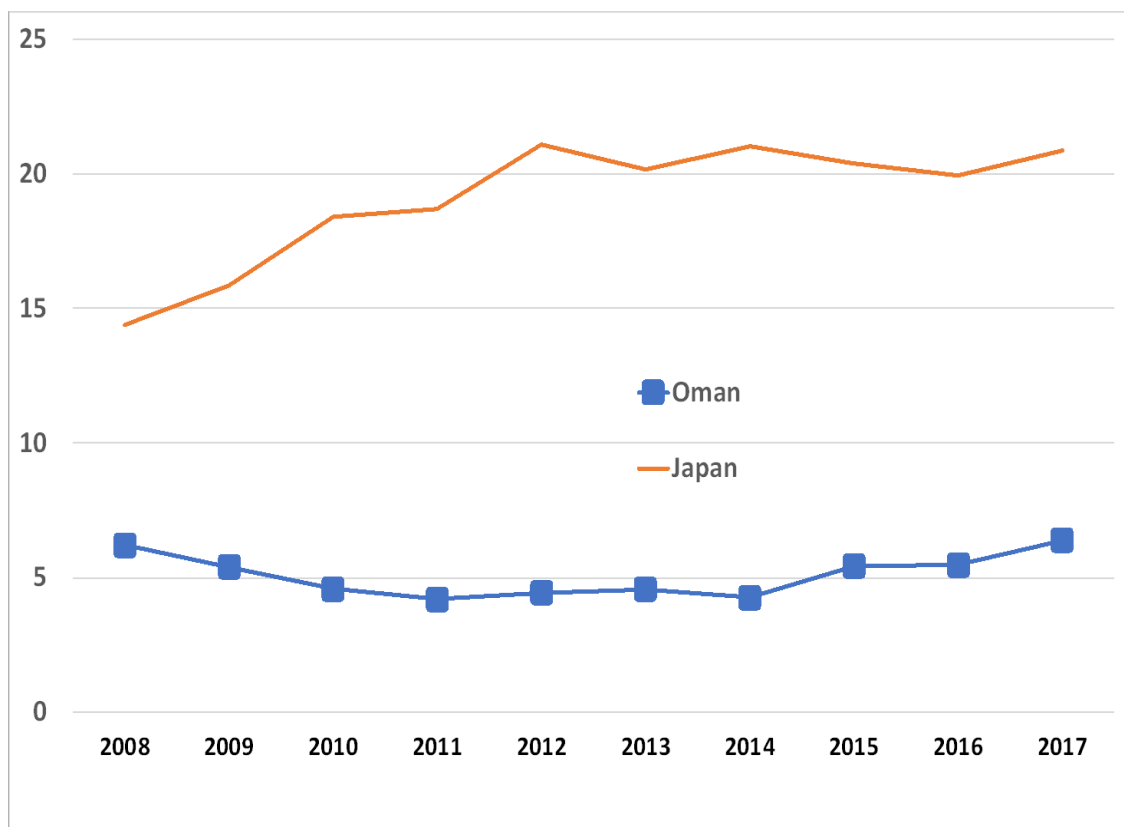


Source: Authors, based on Fisheries and Aquacultural Statistics, FAO Yearbook 2017 and Statistical Yearbook (2018), National Centre for Statistics and Information, Sultanate of Oman.

Unlike Japan, the Sultanate of Oman enjoys seafood production that exceeds the domestic demand. The population of Oman (including expatriates) stands at 4.6 million. Around 72% of its indigenous population is younger than 35 years (Statistical Yearbook, 2020). The annual fish production in 2019 was about 350 thousand tons, of which almost one-third was exported (Statistical Yearbook, 2020). There was around a 25% increase in total seafood production in 2019 (Statistical Yearbook, 2020). The two sources of fish produced in Oman are long-cherished traditional fishing, and recently developed aquaculture. The Japanese economic system has been very similar in this regard. Aquaculture has kept increasing its share in total seafood production in Japan. It has gained importance in improving self-sufficiency of the Japanese economy in the

provision of nutrients. Japan, however, remains number one on the list of developed economies with the lowest self-sufficiency ratio, at 37% (Japan Times 2019). Japan has also been the second biggest (after the U.S.) seafood importer in the world (Seafood Demand, 2019). The main suppliers of seafood for Japan have been the U.S., Russia, Canada, China, Vietnam, India, Indonesia, and the Philippines.

Figure 4 Domestic seafood production per one fisherman in Japan and Oman 2008-2017 in tons.



Source: Authors.

Oman has been a big exporter of seafood, with most of its exports (73%) destined for neighboring Gulf countries, followed by America (18.1%) (Statistical Yearbook, 2018, p. 165). However, at the same time, Oman is also an importer of fish and derivative products. Exports and re-exports of fish, and fishery products, in 2017 were valued at

USD 114.5 million, while imports amounted at USD 63 million amidst the average annual per capita consumption of about 28.7 kg (FAO, 2019)

The situation in the fisheries sector globally is about to change. In the case of Oman, there has been a transformation to adjust the lifestyle to modern technologies, albeit slowly (Bose et al., 2017). Fishing is still considered artisanal, and traditional. Most of the Omani fishermen do not have any access to devices such as GPS, fishfinder, sonar for depth calculation, or enabling technologies that integrate them forward with the market, or backward with suppliers.

In Japan, the situation has been driven significantly by negative demographic trends. These represent a serious challenge for all stakeholders. Substantial adjustments should be expected to take place.

Summarizing, there have been some similarities between Japan and Oman, in regard to the fisheries sector situation, barring the contrast in the average age of the population, and of the fishermen. Similarities concern the significance of the fisheries sector and the traditional manner of organizing fishing efforts in both countries in the past.

Organization of Seafood Supply Chain in Japan and Oman

The supply chain for domestically produced seafood in both Oman and Japan starts with an individual fisherman's effort. It ends with households' consumption after spending at retail outlets (Figure 5). The manner in which each national economic system organizes production and distribution of seafood is driven by a wide variety of factors. These include culture and traditions. For outsiders, it may appear that the initial stage of seafood production is organized in a similar manner in all countries. However, in reality, as we are about to reveal, there are significant differences in this regard between Oman and Japan.

Figure 5. Seafood supply chain stages in Japan and in the Sultanate of Oman.

Japanese supply chain for domestically produced seafood.

Individual Fishing Effort	JF cooperative intermediation	Auction at a regional market	Broker intermediation	Wholesaler intermediation	Retailer intermediation	Household consumption
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Omani supply chain for domestically produced seafood.

Individual Fishing Effort	Auction at a local Market or (alternatively) Truckers	Retailer intermediation	Household consumption
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Source: Authors.

In the 1970s, most of the fish in Oman was sold directly to the local customer in coastal regions. Rarely was any sale consummated involving two intermediaries (Donaldson, 1979). The motive of fishermen to sell the fish was secondary to meeting the requirements of self, the fishing crew, their families and relatives, and often neighbors. The personal relations between fishermen and buyers made them dispose of their catch more cheaply than the price they could have realized in the local market (Donaldson, 1979). Only in the situation of a large catch, motorized craft, availability of transport (i.e., donkey), did fishermen prefer to sell the catch to the local market (Donaldson, 1979). Donaldson (1979) mentions that until 1970, all fish brought to a market had to be sold by a public auction, where a tax of 13-14% was levied on each sale by the auctioneer on behalf of the Muscat Government. However, these restrictions were lifted after 1970. Trader transporters would have opportunities, when individual fishermen lacking motorized transport could not move their catch to the local markets themselves (Donaldson, 1979). Smaller traders, having access to limited capital, restricted their sales operations to the local markets, whilst the ones having access to a larger capital would reserve transport to carry fish to markets as far as Mutrah in Muscat for better deals (Donaldson, 1979).

The retail outlets of fish in Oman until 1976 were palm-frond stores, containing tools, rock salt and cured fish. During 1974 and 1976, stores with cement and bricks started emerging restricting cutting, cleaning, and displaying to the ground level. The lack

of clean running water affected the cleaning of tools and the fish (Donaldson, 1979). The other key operating characteristics of the fish retail and distribution activities during the 1970s can be exhibited by the following points (Donaldson, 1979):

- Supplies to the nearby settlements were made using donkeys as a means of transport.
- Supplies to the far-off settlements were made using motorized transport.
- Traders with motorized transport faced a higher risk in selling at distant coastal markets than those selling at local markets with a donkey.
- Traders with motorized transport had a better chance of profit while selling at the inland markets; however, the risk was there in case of the hired vehicle when the distance was long and the sources of supply were more than one.
- The market was always a suppliers' market, for the demand for fish was higher than the supply. The distributors and retailers were more dependent on the fishermen.
- Fish was not sold by weight but by pieces.
- The traders performed three main functions: the rapid disposal of fishermen's catches; the subdivision of large fish and the waste removal; and the curing of the surplus fish.
- In exceptional circumstances, the unsold fish was cured by the sun drying, wet salting, and dry salting processes to provide for periods of scarcity.

Oman has seen a rapid transformation in its fisheries industry since 1970. It was only 50 years ago that the Ministry of Agriculture and Fisheries was established. The Government of Oman, in its recent 8th 5-year plan, has disbursed 128 million OMR for advanced auction houses, cold storages, refrigerated vehicles, and other supply chain and delivery related mechanisms. The distribution and retail activities have benefited immensely from the establishment of new seaports, roads and fishing harbors. In addition, successful electrification and industrialization with a growing number of processing plants and ice factories has facilitated production and distribution of fish within Oman and other Gulf countries (World Bank Group, 2015). The number of fish processing plants that are key to promote retailing and distribution activities have increased to 59 in 2016 from 32 in 2010 (Statistical Yearbook, 2017).

After the year 2000, a number of initiatives were taken by the Government of Oman in compliance with the national economic plan "Oman Vision 2020". They were largely instrumental in the development of industrial estates, free economic zones,

fishermen harbors and well-structured landing sites besides supporting the growing fisheries sector (Al Busaidi et al., 2015). Since 2000, the fisheries sector in Oman comprised three sub-sectors: artisanal fisheries, commercial fisheries, and aquaculture production. The modern supply chain system in the Sultanate emerged subsequently.

The supply chain in Oman has been composed of fishermen, transporters, traders, processors, exporters, retailers, and consumers. However, over time, the dealings in the artisanal fisheries sector have not changed much. The change has been limited to improvements in the infrastructure and the transportation system. Both of these factors provided fishermen with better access to markets.

Belwal et al. (2015) observed that almost 70% of individual fishermen in Oman dispose of their catch within an hour after landing. Only 8% fishermen store their catch for more than three hours. This is mainly due to the lack of a proper preservation and supply chain mechanism and the absence of the necessary infrastructure like fish processing plants.

To sum up, the organization of fishing effort and the subsequent supply chain activities in Oman still reflect much of the old traditional system. These two major activities have started transforming and benefiting from modern technologies only recently. Together, these factors bring undeniable benefits to the underlying society. Omanis and expatriates enjoy easier access to high-quality seafood at very attractive prices. The situation in Japan is somehow different, in terms of prices, but not the quality of seafood where the former are considerably higher than Oman. Another similarity exists in the relatively low-income level of individual fishermen households. This stands in contrast with expensive seafood available from Japanese retailers, as absolute and relative prices are higher in Japan than in most other countries. A systematic review of the system in which individual fishermen in Japan operate may provide several hints on the factors responsible for the current situation.

The first clearly recognizable difference exhibits in the fishermen's style of working right at the beginning of the seafood supply chain. In Japan it is obligatory for individual fishermen to associate with the Japanese Fishery cooperative (JF). Omani fishermen should be, therefore, considered much more 'individual', when it comes to their off-shore, and on-shore efforts. The lack of economic freedom in the case of Japan has a long tradition and is often associated with communal lifestyle (Taylor 1983), and

preference to work in a group (Taylor 1983). Individualism is, therefore, one of the distinguishing characteristics of Omani fishermen, when compared with their Japanese counterparts, who organize their effort collectively.

In the Japanese system, there appear to be significant barriers to entry for anyone interested in becoming an individual fisherman. The cost of a fully equipped new ship of tonnage around 4-8 tons, for fishing bonito, amounts to 800-900 million Japanese yen. It is an equivalent of almost 8-9 million US dollars. Such an initial investment seems beyond the access of the majority of, if not all, members of local communities of the relatively and absolutely poor citizens. There is also an exit fee for dismantling fishing boats and ships of fishermen who retire. According to an interview with a retired bonito fisherman, (currently working as a recruiter for Miyazaki Prefectural Fisheries Training Center), the cost of dismantling an old fishing boat of tonnage around 4 tons, amounts to 300 thousand yen, which is an equivalent of almost 3 thousand US dollars.

When there is an individual fisherman who wishes to become a member of a local fishery cooperative, there is a special *Qualification Screening Committee*. This committee comprises several members (usually between 8 and 16), who are the cooperative members, and representatives of the local (city) government office. One of the prerequisites of an application for membership is an accumulated working experience with another member of the cooperative of at least 3 to 5 years. Furthermore, a current member of the cooperative must introduce the candidate in the first place. An alternative way to become a member of a cooperative is the ownership of a fishing vessel, for which all other requirements and prerequisites do not apply. New members of a cooperative come from two cohorts. The first are graduates from the fishing training centers. The second are those who move from other sectors and meet the above-mentioned requirements.

Education of the prospective fishermen in Japan is strictly regulated by the government. This has been justified by the high risk associated with work in the sea and the need for expertise to operate special equipment. In Oman, two Fishermen Training Institutes have been established in Al Khaboura and Salalah. They provide occasional training to fishermen. However, the licensing of fishermen is not tied up with their technical education. In Japan, there are several categories of maritime skills. Japan has also classified these skills with levels, certifications and permits – in some cases. In the Japanese system of education, the lowest level of competence is denoted with a higher

number (usually starting at fifth, or fourth grade), while the highest proficiency is always labelled 'the first grade'. Training at the Miyazaki Prefectural Fisheries Training Center for new entrants takes one year. Prospective fishermen learn navigation, sailing with different categories of fishing ships, fishing techniques, and methods necessary to participate in fishing effort. They also learn about mechanics (engine operation technology) and gain technical skills in on-board equipment maintenance. A one-year program is designed for junior high school graduates. This cohort enters the training center at the age of 15. The school year for full-time students starts with Spring semester on the 1st of April and continues until the end of September. Education persists in the second semester from October to March. There is an alternative training program for other interested candidates, who move from other sectors of the national economy. Such candidates participate in training that can be flexibly managed, but they need to take two full semesters to obtain all the permits and certificates. Successful graduation from the training center brings a few certificates. All students are supposed to achieve the first (the highest) grade of Maritime Special Radio Operator. Aside from this 'special' radio operator category, prospective fishermen obtain 4th grade Maritime Radio Operator certificate. Then, students should also achieve the second grade of Permit of Boat Operator. The last element is based on a written examination. It is a certificate at 4th (or 5th, for students who are unable to reach the 4th level) grade of Maritime Officer.

There are certain organizational and formal requirements for members of a fishery cooperative. It is mandatory to spend at least 180 days per year in the ocean to maintain membership. Members must continue with fishing as their main source of income. In case of discovering connections between a JF member and organized crime organization [or other anti-social forces, like yakuza], such a member will be cast away, expelled from his JF cooperative.

Benefits for individual fishermen in Japan, who are associated with cooperatives are numerous. One of the crucial benefits is that fishermen simply can deliver their catch of fish, shellfish, and other seafood to designated seaports. This is where cooperative office staff takes over and individual fishermen receive a fixed price for their catch. The payment of the due amounts takes no more than two days. The delivered seafood is properly stored and becomes subject to further processing to be promptly delivered to the next intermediary.

Grading of the delivered catch is done by the cooperative staff on arrival. This is also when the catch is weighed and recorded for official reporting. Grading is based on species, size, and quality. Cooperatives maintain facilities for keeping seafood alive, or properly refrigerated. Individual fishermen in Japan use a standard semi-refrigeration method to keep their catch fresh. All ships and boats used for fishing purposes have a separate section under the deck for holding the perishable cargo. This underdeck container is filled with water and ice cubes on departure. It is sufficient to keep all types of seafood fresh and preserved. It is only the cooperative office that maintains refrigeration facilities, and not individual fishermen. Cooperatives also secure aquariums for marine species traded alive.

The price of seafood which is a basis for calculating the actual payment for fishermen is decided by a broker, when the products are sold (auctioned) at a local wholesale market. The amount of money realized on the sale of seafood is then subject to two deductions. The first one is a sales commission paid to the company organizing and administering auctions. Auction houses charge a customary commission of 6.3%. The remaining amount is transferred to the fishery cooperative, which delivered the product. Then the cooperative deducts 6.7%, as its intermediation commission. This fee finances administration and operations of the cooperative. The remaining 83% of the wholesale price is the money that goes to individual fishermen in Japan. In the case of selling products directly at local shops, a cooperative office uses the quote from the broker as a benchmark, and the price actually paid to fishermen is higher by 10% than this benchmark.

The third channel for seafood supply in Japan is the sales made by fishery cooperatives directly. There are supermarket brokers, who are allowed to buy directly from fishery cooperatives, by avoiding the auction system route. However, cooperative offices face a problem from these brokers, who negotiate aggressively to obtain substantial discounts. Therefore, in the current system in Japan, individual fishermen experience a substantial loss in income when selling directly to such brokers.

When sales are intended for restaurants and hotels, there is a separate business, not associated with the cooperative. However, this intermediary between individual fishermen and retailers must accept the selling price as decided by the members of the cooperative. This should be appreciated as a form of protection for individual fishermen

extended by the cooperative. The role of fisheries cooperatives is not restricted only to managing the catch and payments for seafood.

On a regular basis, often once per year, local communities of individual fishermen organize interesting and unique events (called *matsuri*). The reason for these special festivals is to sell abundant amounts of expensive seafood and in this way to keep the wholesale price high. This applies especially at the beginning of seasons for particular species like lobsters or crab.

To understand why Japanese society developed cooperatives in this sector of the national economy, one must remember that there is a substantial lack of market literacy among Japanese fishermen. Such a situation creates a great need for broad and far-reaching assistance by institutions, and the government. The most important form of support for poorly educated and initiative-lacking individual fishermen are, therefore, fishery cooperatives. These institutionalized forms of organizational and technical support act as the middlemen between fishermen and the next stage in the seafood supply chain domestically. The most important benefits for individual fishermen resulting from membership in such cooperatives are as follows:

- Pricing seafood, based on grading according to size and species,
- Stable prices received by individual fishermen for their catch,
- Timely payments of due amounts for seafood (Japanese standard in this regard is to transfer money on the next day after fish is delivered),
- Cooperatives welcome and accept the catch without any quantitative limits,
- Cooperatives accept all rare species of seafood, finding buyers for every type of food – even a unique product.

The system described in detail may serve well in times of overproduction and tight market demand. However, as the population in Japan prefers a fish-focused diet, the domestic demand is maintained at a relatively high level, in comparison with other advanced economies. There has been a recognized trend, noticed by all interviewed Japanese fishermen, concerning systematic decline in the quantity and quality (i.e. size) of the catch, no matter which species are concerned. This indicates a recent problem of depletion of these marine resources due to intensive fishing. Under such conditions, Japan is a ‘producers’ market’, with growing competition among consumers to obtain the desired seafood. This is a situation known very well from basic microeconomic analysis

of producer-consumer interaction under scarcity. Prices of seafood in Japan have a good microeconomic reason to remain relatively, and absolutely, higher than in Oman that enjoys overproduction. This specific situation in Japan does not seem to bring proportional benefits to individual fishermen, who remain the poorest among members of the society. This evident income inequality problem is, however, beyond the scope of the current analysis. However, it may represent an opportunity for an interesting and meaningful future research on the vital issue.

Conclusions

The paper presented the current situation of the domestically produced seafood and supply chain in Oman and Japan. It also offered a brief historical perspective for the Omani case. The description of every stage from producers (i.e. individual fishermen) to consumers (i.e. households) allowed for capturing the very nature of their respective situation. The real and relative statistics available for both countries aid in noticing trends present in both fisheries sectors since 1995. The situation of Japanese fishermen complies with the general demographic developments of population implosion. One could notice distinctly that the Japanese economy is able to substitute labor with capital effectively (comparing Figure 2, 3 and 4). This, in turn, allows production to be maintained at a stable level, and increases the productivity of the remaining labor. Contrary to this, the fisheries in Oman are still traditional and statistics indicate an increase in the number of both fishermen and the customers in recent years.

The Japanese fishermen seem to enjoy significantly more comfortable working conditions due to the obligatory association in JF cooperatives. Many of the recognized problems that hinder Omani fishermen activity have never been experienced by their Japanese counterparts. This is mainly due to JF cooperative pre-departure and post-landing assistance. However, there are significant restrictions imposed on individual fishermen in Japan. This means that the above-mentioned benefits are associated with rather significant costs. Japanese society seems to be perfectly fine working under such conditions, where individualism is reduced to the minimum (Taylor 1983), while communal behavior dominates most of the presented on-shore activities. The reported higher productivity of Japanese individual fishermen (Figure 4) should be related to the

high saturation of capital in the ‘workplace’. This characteristic is a consequence of the availability of different equipment utilized by fishermen in Japan and in Oman. The Sultanate seems to be still lagging behind in terms of fishing technology, even though its marine resources are among the richest in the world. A conclusion here is that there is still a great scope for improvement when it comes to efficiency. This, however, brings questions about the sustainability of the Omani fisheries sector. Individual interviews in both countries revealed widely recognized depletion of marine resources, at the current level of fishing intensity. The impression is that Japan suffers much more from reduced quantity and size of all species targeted. This places a great responsibility on governments to manage fishing efforts in a sustainable manner. Depletion, or local extinction of marine species are not easily reversible and are associated with substantial economic and social costs. While Japan may still revert to the larger import of seafood, based on revenue from its industrial products exports, Oman may not be able to follow a similar path. Low prices of crude oil that prevail in 2020 bring concerns about the sustainability of the current consumption level, and lifestyles. If there is another negative factor in the form of depletion of Omani marine resources, the situation may turn really grave.

The current situation and prospects for Japan may also be considered as problematic. The growing productivity due to substitution of labor by capital has its limits. The domestic seafood production will continue the negative trend already observed over a couple of years. The primary reason is no newcomers to the profession. This is due to relatively low remuneration for a substantial risk and effort required to work as a fisherman. The demographic implosion in Japan expected over the next few decades calls for actions aimed at supporting fisheries. Some see a solution in a foreign labor force, operating Japanese fishing vessels, while the central government promotes robotics, as a solution for all consequences of an aging society. Will we eat in the future seafood caught by robots, fish-bots, or androids?

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