A Framework for Geographical Research on Modern Fisheries in Japan

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Abstract

This paper aims to review and present a framework for geographical research on modern fisheries through the examination of previous studies and the author's survey on Choshi. Geographical studies firstly must explain the development of modern fisheries centered on large fishing ports, since this is the way modern fisheries in Japan have developed. Large ports are cores of the fishing industries because of large quantity of fish, and they are the most important nodal points of fish distribution in production areas.

The framework of "modern fisheries' space", integrating large fishing ports and their related space, is sufficient to explain the spatial structure of modern fisheries.

The modern fisheries' space consists of fishing space, fish landing and processing space, and fish distribution (consumers') space. These sub-spaces have been formed around the distribution routes of fish. The characteristics of such spaces are derived from the seasonality and periodicity of fishing.

The basic structure of modern fisheries' space is similar to the distribution space of commodity goods in commercial society, which consists of areas of production, nodal points of distribution and areas of consumption. It is a structural characteristic of modern fisheries' space that resources in the production areas are aquatic organisms moving seasonally and periodically, and that limits of production have been conquered by accumulation and development of technology and facilities in the space.

Key words: modern fishery, fish landing, spatial structure, distribution, Choshi

I. INTRODUCTION

This paper presents a framework for geographical features of modern fisheries in Japan. Geographical features here refer to the spatial components and their relationship.

Modern fisheries in Japan have developed in earnest since the mid 1920's when the motorization of fishing boats remarkably advanced (SHIMADA, 1964). As fishing boats became larger with motorization and enlarged their operating areas, they came to require fishing ports with enough facilities for anchorage, preparation of fishing boats and quick distribution of fish landed by boats (AONO, 1941; NOSE, 1980). Many facilities have become concentrated in large fishing ports and their surrounding areas (UCHIDA, 1935). Factories for fish processing, for example, tend to locate intensively in the surrounding areas of large fishing ports (YAMASHITA and TSUDA, 1977). As the quantity of fish landed increases, the related facilities locate more intensively at the ports and their surrounding areas (SHIMADA, 1977).

In regard to modern fisheries in Japan, ports of fish landing by boats do not always coincide with their mother ports (HIYAMA, 1964). A mother port is the port of a fishing headquarters, and is not always a fishing base. Fishing bases, especially fish landing ports, are usually large fishing ports. In other words, large fishing ports have intensified their functions as landing places of fish on a large scale, while other ports have reduced their functions (Doi, 1977). This functional differentiation is one of the most remarkable geographical features of the development of modern fisheries in Japan.

Modern fisheries are capitalistic in nature, and their development has greatly influenced the expansion of the large fishing ports. Geographical studies on modern fisheries should therefore focus on those fishing ports with a large quantity of fish landing.

This paper reviews previous studies and their problems from the viewpoint of fisheries based on large fishing ports. Subsequently, the paper gives an example of the spatial components of fisheries based on Choshi Fishing Port. Last of all, a basic model of the spatial structure of modern fisheries is proposed, and the model is examined from the geographical viewpoints in relation to possible future problems.

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II. LARGE FISHING PORTS AND THEIR RELATED SPACE

1. Previous studies

Japan has many ports with annual fish landings of more than 30,000 tons (Fig. 1). Previous geographical studies, however, discussed only a few ports of long-distance fisheries among them. Fishing ports were mostly regarded as bases for long-distance fisheries rather than as important centers of modern fisheries, although such long-distance fisheries were in fact the most advanced. The main ports previously studied were Hachinohe, Kesennuma, Ishinomaki, Shiogama, Misaki, Shimizu, Yaizu, Shimonoiseki, Hakata, Nagasaki, Yamakawa and Makurazaki.

The geographical areas which previous studies have discussed can be divided into marine area and land area. The marine area consists of fishing grounds and fishing ports. The land area includes fishing ports, their surrounding regions and consumers' area. These two areas meet at the fishing ports.

1) Studies on the marine areas

AONO (1953) compiled his studies on the bases of skipjack fishery, which examined fishing grounds, places providing bait for skipjack, facilities of ports, relation to other industries, capital and workers with fishing techniques. He concluded that bases of long-distance skipjack pole and line fishery developed only where other industries were underdeveloped in respect to abundant capital and many skilled workers of fishing.

YAMASHITA (1957) and Doi (1959) studied the trawl fishery and its four bases of Nagasaki, Hakata, Tobata and Shimonoseki. Their research showed that the development of these four bases depended on the accessibility to good fishing grounds, scale of facilities, accessibility to consumer markets and the historical background of fisheries management.

Doi (1965) studied skipjack pole and line fishery based on the ports of Makurazaki and Yamakawa, and concluded that fish landing on both ports increased because of the increase of both local and visiting fishing boats and the development of the processing industry of dried skipjack.

FURUKAWA (1959, 1960) studied tuna fishery in long-distance waters and its bases such as Misaki and Yaizu. He paid attention to the concentration of boats and workers in ports and the development of fish processing industries. FURUKAWA (1965, 1966) concluded that the bases of long-distance tuna fishery were close to large markets and were located in areas where fish distribution or processing industries were well developed.

2) Studies on the land areas

YAMASHITA (1966) studied location of the factories of fish processing in the surrounding areas of the fishing ports such as Hachinohe, Kesennuma, Ishinomaki and Shiogama. It turned out that many factories of fish processing, mainly of refrigeration, were located around the ports, and the center of fish processing moved when the market moved. It was also pointed out that the early stage of development of fish processing had been closely related to the development of local offshore fisheries, and when fish for processing were in short supply, fish was imported from elsewhere.

KUSUHARA (1976) studied the quantity of landed fish and the facilities related to fishing at Misaki, Shimizu, Yaizu and Mochimune. He found that the landed quantity of frozen tuna at large fishing ports depended on the capacity of fish refrigerators around the ports and the accessibility to markets.

AZUMI (1989) and TAKASA (1979) also studied large fishing ports where frozen tuna was landed. AZUMI (1989) pointed through the cases of Shimizu and Yaizu that many fish refrigerators were concentrated in the surrounding areas of large fishing ports. TAKASA (1979) studied the distribution of frozen fish from Yaizu Fishing Port from the viewpoint of the organization of the Yaizu Fish Market. He noted that several large buyers, who controlled fish markets in big cities in Japan, had taken the initiative in marketing.

TAKASA (1982) pointed out that the concentration of fish landing at limited ports is due to the large quantity of landing by trawlers and round haul netters. He also mentioned that a large quantity of fish landing requires facilities for fresh fish as well as refrigeration facilities for frozen fish.

2. Spatial components of modern fisheries

Previous studies showed that geographical studies of modern fisheries need systematic analysis of the fishery-related areas surrounding large fishing ports. These areas extend from the fishing grounds to fish consumers' areas.

This paper presents a model of modern fisheries in Japan with respect to the spatial structure of the fishery-related areas. The meaning of spatial structure in this paper is the location and function of spatial
Figure 1. Ports of fish landing more than 30,000 tons in Japan, 1984.
*: The numbers of ports are arranged in the order of the scale of fish landing.
List of fishing ports:
Figure 2. The interrelated areas of modern fisheries.
Areas of modern fisheries:
A: Fish landing ports, B: Operating sea areas (fishing grounds), C: Mother ports of fishing boats, D: Fish shipment-processing areas,
E: Fish consumers areas (fish markets), F: Fish supplying areas.

components as well as integration of each component in
the whole space. This framework will explain areal
features of modern fisheries from geographical view-
points.

Since modern fisheries are regarded as systematic
industries based on large fishing ports, the whole space
of modern fisheries consists of the interrelated spaces
around large ports. These spaces are fishing space,
landing and processing space, and market space
(Fig. 2). A fishing port is defined, in this paper, as 'a
complex of a port and its related facilities, which provides
goods and services for fishing boats and fishermen, and
which has market facilities for fish distribution.'

The components of fishing space are fish landing ports
(A), operating sea areas (B), and mother ports of boats
(C). Fish landing ports are also bases for the operation
of boats. On operating sea areas, fishing boats search
out and catch fish for sale. Headquarters of fishing boats
are usually located in their mother ports or head offices
of their managers, and they do not always coincide with
fish landing ports.

The components of fish landing-processing space are
fish landing ports (A) and their surrounding areas of
fish processing (D). In their areas, there are many
fishermen and traders using the ports, and there also
exist many related facilities such as refrigerators and
factories for fish processing.

The components of fish market space are process-
ing areas (D), consumers' areas (E) and areas of
supplying material fish for processing (F). The fish
consumers' areas (E) are distribution areas of fresh fish
or processed marine products from the processing areas
(D). Fish supplying areas (F) are mostly the surrounding
areas of the other fishing ports. Fish should be supplied
from distant areas (F) when fish for processing are in
short supply.

III. SPATIAL STRUCTURE OF
CHOSHI FISHERIES

Choshi (No. 2 of Fig. 1) is one of the most represent-
itive cities among Japanese fisheries. The population of Choshi
was about 90 thousand in 1986. There are several
sub-ports of Choshi Fishing Port and the surrounding
area related to fisheries (Fig. 3).

Spatial components of fisheries based on Choshi
Fishing Port were partly examined by the author
(SHINOHARA, 1989, 1991, 1992a). Referring to these
studies and other information from interviews on Choshi
and its fisheries, this chapter describes the spatial
structure of fisheries based on Choshi Fishing Port in
1986, when 703,565 tons of fishes were landed. This
quantity was the second largest among all fishing ports
in Japan in that year. At Choshi, only fresh fish were
landed in 1986.

1. Fishing, fish landing and processing, fish
market space

Main fish at Choshi were spotlined sardine, chub
mackerel, saury, skipjack and tuna in 1986. Spotlined
sardine, chub mackerel and saury were landed in large
quantity, while other fishes were relatively expensive
and landed in a small quantity.
Fishing space of Choshi consists of two kinds. One is the offshore space, mainly composed of Choshi Fishing Port, fishing grounds on the offshore sea of Choshi, and headquarters of offshore fisheries. The offshore fisheries include round haul net fishery in adjacent sea, saury stick-held dip net fishery, skipjack pole and line fishery, and tuna long line fishery. The former two were the main offshore fisheries in 1986. The round haul netters catch spotlined sardine, chub mackerel, saury, skipjack and tuna. Saury stick-held dip netters catch saury during nights in autumn. These fishing boats land fish intensively in the limited season.

The other space is the coastal space, which mainly consists of Choshi Fishing Port, fishing grounds on the bottom of the coastal sea of Choshi, and local fishing headquarters around Choshi. The main coastal fisheries are trawl fisheries, and they land fish such as shrimps and flatfish all the year around except summer. The large quantity of cheap fish landed at Choshi Fishing Port is derived from the offshore fishing space. In contrast, the coastal fishing space produces a relatively small quantity of many kinds of expensive fish.

Landing and processing space of Choshi consists of several sub-ports and their surrounding areas. These areas can be divided into two kinds of space related either to offshore or to coastal fisheries. In these areas, there are Choshi Fishing Port Market, fresh fish shippers, fish processors, offshore or coastal fishermen, and other traders related to fish. The other traders include refrigerating stores, shipbuilders, painters of boats, suppliers and repairers of machines, electronic devices, and fishing nets and gears, stations of refueling fishing boats, ice makers, fish landing assistants, port or off-port transporters, fish box sellers, and so on. These traders and their facilities play functions in central management of offshore fisheries, shipment of fresh fish, landing of a large quantity of offshore fish, supplement of fishing workers, processing and refrigerating of a large quantity of fish. The core facilities of this area are Choshi Fishing Port Market No. 1, No. 2, and No. 3. Markets No. 1 and No. 3 serve as the management centers of fisheries and landing places of saury and other expensive fish. Market No. 2 is the landing place of a large quantity of cheap fish such as spotlined sardine and chub mackerel. Several public institutions are also located in this area around Choshi Fishing Port Market.

The shipment areas of marine products from Choshi differ by kind of fish. Cheap fresh fish and a small quantity of fresh fish such as flatfish are shipped to the Tokyo metropolitan area. Expensive fresh fish such as skipjack and tuna and a large quantity of fresh fish such as chub mackerel and saury are distributed to the area extending from Kanto district to Kinki and Tohoku districts. Salted split saury is shipped to the same area as that of expensive fresh fish. Salted mackerel is shipped even to Hokkaido and the eastern Kyushu districts. Frozen spotlined sardine, frozen chub mackerel and frozen saury are shipped to aquaculture areas of Kinki, Tohoku, Shikoku, and Kyushu districts. The supplement areas providing material fish for processing extend over...
the whole country and even to the world. For example, the shipment areas of chub mackerel to Choshi in 1986 were Katsuura (Chiba Prefecture), Onahama, Ishinomaki, Onagawa, Kesennuma, Kuji, Hachinohe, Niigata, Sakai, Hakata, Karatsu, Matsuura, Nagasaki, Akune, Maku-razaki, and so on. Since 1987, fish for salted mackerel has been imported from North Europe, especially Norway.

2. Structure of fisheries’ space

Figure 4 shows the relations between components of fisheries’ space based on Choshi Fishing Port. The space mainly consists of two different types of space characterized by kind of fish. One is organized around the distribution channel of cheap fish. The other is organized around the distribution channel of expensive fish.

The fisheries’ space around the distribution channel of spotlined sardine and chub mackerel has the largest range of the fisheries’ space of which Choshi is the center. This space consists of offshore fishing space, the areas around Choshi Fishing Port Market No. 2, the consumers’ areas of processed marine products, mainly in Kyushu, Shikoku and Kinki districts (Western Japan), and fishing ports mainly situated in the north of Choshi, which provide fish for processing. The space around the distribution channel of saury is similar to this space, although its landing place is Markets No. 1 and No. 3. The fisheries’ space around the distribution channel of coastal fishes has the smallest range of fisheries’ space of which Choshi is the center. This space mainly consists of coastal fishing space, Choshi Fishing Port Market No. 1 and No. 3, the area of fresh fish shippers, and consumers’ areas of fresh fish, mainly in the Tokyo metropolitan area. This space is similar to that of skipjack and tuna, which are, however, produced in the offshore fishing space and have larger consumers’ areas.

The two types of fisheries’ space of Choshi partly overlap, but their features are different. One is the fisheries’ space around the distribution channel of a large quantity of cheap fish, and the other is the fisheries’ space around the distribution channel of a small quantity of relatively expensive fish. At Choshi, the central management area of fisheries is located in the latter space, while the landing area of a large quantity of fish belongs to the former space. The former space is newly developed according to the increase of landed fish, composing the fisheries’ space in Choshi with the latter space which had already existed.

The space around the distribution channel of cheap fish characterizes Choshi Fishing Port as a large fishing port in terms of quantity of fish landed. From

![Diagram of fisheries' space](image-url)
technological viewpoint, this space has been developed by the modernization of fishing boats and facilities of fishing port market as well as the improvement of fish refrigeration and cold storage.

The quantity of cheap fish landed at Choshi is limited by the capacity of facilities, the institutions of fisheries, the seasonal and periodical fluctuations of fish population, and perishability of fresh fish. In the Choshi fisheries' space around the distribution channel of cheap fish, fishermen and traders cope with these natural and social limitations by improvement of technology and accumulation of facilities.

The modernization of boats, especially round haul netters, enabled fish landing at many ports other than Choshi Fishing Port. By this modernization, local fishermen can specialize in their fisheries through the year, and moreover, the external fishing boats can land fish extensively at Choshi. By the modernization of facilities and institutions, a large quantity of fresh fish can be landed intensively and economically at Choshi. By the improvement of fish refrigeration and cold storage, fish processors and shippers in Choshi can now use a large quantity of fresh fish without waste all the year round.

Increase of landed quantity at Choshi Fishing Port was realized by the development of technology and accumulation of facilities in spite of large quantity, seasonal variation, periodicity and perishability of fresh fish. One remarkable example is the large-scale accumulation of factories for fish processing and refrigeration in Choshi. The factories process and refrigerate a large quantity of material fish from Choshi Fishing Port economically, and they distribute a lot of their maritime products from Choshi all the year round.

When the landed quantity decreased at Choshi Fishing Port after 1986, the connections between fish landing-processing areas in Choshi began to weaken. This is because the fish processors and traders began to buy fish from other areas in order to stabilize and increase their production. The fisheries' space around Choshi has, therefore, incorporated other fishing areas to supplement fish for processing since 1986, when the quantity of landed fish at Choshi began to decline by the periodicity of fish population.

IV. CONCLUSION

The space of Choshi fisheries is an example of the basic structure of the space around a fishing port with

![A basic model of the structure of modern fisheries' space.](image-url)
a large landed quantity and also suggests the basic spatial structure of modern fisheries in Japan. Figure 5 shows a basic model of the modern fisheries’ space deduced from the example of the Choshi fisheries’ space. This model is similar to spatial organization models presented by COULL (1993). COULL’s models are of world modern fisheries, but they are not sufficiently integrated and pay little attention to mother ports of fish landing boats, kind of fish, fish shipment-processing areas, kind of fish trader, and supplement of fish for processing from other ports and areas. These weak points are improved in the model of Figure 5.

In the case of Choshi, though its fishing space does not extend to distant fishing grounds, the related space of Choshi Fishing Port has developed well with its fish distribution space extending all over Japan. According to the previous studies discussed in Chapter I and II, in the case of fisheries’ space around a port of long-distance fisheries, the fishing space includes the long-distance fishing grounds and fishing bases in foreign countries. The related space of the fishing port is large and well developed, and the fish distribution space extends all over Japan or even to the world.

In the case of fisheries’ space around a port of coastal fisheries, the fishing space is limited within the areas of coastal fishing grounds and local fishing headquarters. The related space of the fishing port is small, and the fish distribution space is less developed.

As mentioned above, the analysis of modern fisheries from viewpoint of spatial structure is applicable to explain complicated areal relations between components of modern fisheries. Applying the model of Figure 5 to many cases, it is possible to explain the areal characteristics of modern fisheries both in Japan and in other countries.

The basic structure of modern fisheries’ space is similar to the distribution space of commodity goods in a monetary society, which consists of the areas of production, the nodes of distribution and the areas of consumption. It is one of the structural characteristics of modern fisheries that the resources are organisms moving seasonally and periodically in the production areas and the limits of production are surmounted by improvement of technology and accumulation of facilities in the fisheries’ space. This also means that the modern fisheries cope with the seasonal and periodical changes of the biological resources by the development of spaces centered on large ports of fish landing.

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日本における近代水産業の地理学的研究法

篠原秀一* 

本稿は、従来の諸研究と銭子における調査結果をもとに、日本における近代的な水産業の地理学的研究に対する1つの枠組みを提示した。日本における近代的な水産業は、地理学的には生産の根拠地である漁港を中心に発達してきた。特に、大規模な水揚漁港は、水産域の中心であり、水産物の流通する空間における最も重要な基本的である。水産物の流通する空間、すなわち水産関連空間は、水揚げされる魚の流通経路の周辺に形成され、漁獲空間、水産物水揚げ・加工空間、水産物消費（市場）空間の3つの重要空間に大別される。この空間構成は、各