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【実態調査】

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鹿児島県小規模卸売市場（種子島・東串良・内之浦）における
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Landing process and auction system at local fish markets of Tanegashima,
Higashikushira and Uchinoura Fisheries Cooperatives in Kagoshima

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Abstract

This study aimed to clarify landing process and operations at local fish market of Tanegashima, Higashikushira and Uchinoura Fishery Cooperatives. The auction systems are different in local fish markets. Middlemen fill out desirable purchase prices on the prescribed form and submit it to the office at Higashikushira and Uchinoura fisheries cooperatives. The staffs of fisheries cooperatives add the purchase prices up and make announces the sales prices. On the other hand, landings are auctioned individually at Tanegashima fisheries cooperative. Landing operations including weighing, auction, and making and dealing with slips are carried out with manual work. The labor shortage due to the declining and aging populations is serious issue in rural areas where the fishery is key industry.

Keywords : Landing process, auction system, local fish market

1. はじめに

四季折々の変化と温暖で湿潤な気候が特徴である日本の近海では、親潮と黒潮の2つの海流によって世界有数の漁場が形成され、約15,000種に及ぶ世界の海産魚類のうち約3,700種が生息していると言われる。生物多様性の高い豊かな海域から年間を通して多種多様な魚介類を漁獲し、動物性タンパク質を供給してきた水産業は、わが国の食料生産において重要な役割を担っている。こうした環境条件の下で多彩な海の幸に恵まれてきたことが日本の食文化の形成に大きく影響してきた¹⁾。

鹿児島県における海面漁業・養殖業は地域経済を支える重要な産業のひとつであり、平成30年の

生産量は 115,814 トンである²⁾。まき網，底曳網，定置網，刺網などの様々な漁業種類による海面漁業では，大小様々な魚類が混ざって漁獲されるため，魚種・サイズ選別した後に市場の競りにかけられ，仲買人，量販店などを通じて消費者のもとへ流通していく。鹿児島県における水産物流通は，卸売市場法，県卸売市場条例，県水産物小規模卸売市場条例に基づいてそれぞれ開設された鹿児島市中央卸売市場魚類市場（1 市場），地方卸売市場（13 市場），小規模卸売市場（41 市場）を拠点として行われている。漁業協同組合に併設された小規模卸売市場では，鮮魚や活魚が箱詰めあるいは 1 尾ごとに水揚げされ，その販売形態は多種多様である。普段の食生活に魚食が根付いている日本では，水産物の鮮度は魚価に大きく影響し，卸売市場を通じた水産物流通の迅速化とそれに伴う鮮度保持が求められる³⁾。

本研究では，水産物地方卸売市場に位置づけられる内之浦漁協，小規模卸売市場の種子島漁協，東串良漁協の 3 つの漁協を対象として，卸売市場における水揚げ物の取引業務について明らかにすることを目的とした。

2. 調査方法

2020 年 9 月 12 日に東串良漁協，10 月 1 日に種子島漁協，2021 年 3 月 15 日に内之浦漁協において漁協職員の説明の下で水揚げ作業および競りの工程を視察し，競り終了後には漁協の事務所内にある電算室において，競り結果の入力方法や伝票作成などについて聞き取り調査した。

3. 調査結果

1) 種子島漁協

種子島漁協では午前 6 時頃から水揚げ物の受け入れを始める。漁業者が漁船を着岸させて水揚げする場合とトラックで運搬して持ち込む場合があり，また，国上，東海，住吉集落および中種子での漁獲物については漁協のトラックで午前 7 時頃から回収して，8 時頃までに市場に搬入している。

市場に運び込まれた漁獲物は，漁協職員によって魚種およびサイズごと箱詰めされた後に計量される。カンパチなどの大型魚類の場合には箱詰めしないで 1 尾ずつそのままの状態に計量される。漁協職員は計量時に漁業者名，魚種名，数量を漁協の指定用紙（水揚げ伝票）に手書きで記録した後に，箱または魚体に直接，水揚げ順を示す番号札を貼り付けて市場内に陳列する。午前 9 時に開始される競りまでの間に，仲買人は魚の状態（皮膚，目，エラなど）を確認する。

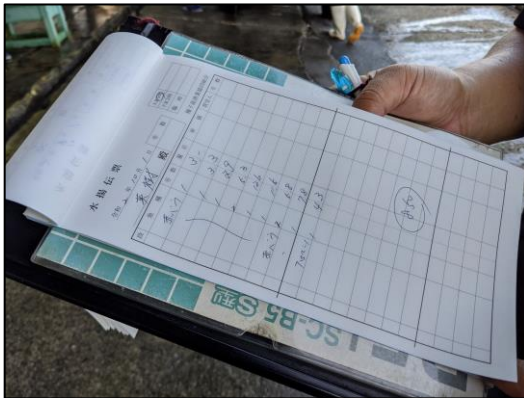
競りは漁協職員の場合内アナウンスによって開始される。番号札の順に競りが行われ，漁協職員が番号，魚種名を読み上げると，仲買人は縦長の小さな黒板にチョークで購入希望価格を漢字で記入して漁協職員に見せる。漁協職員は最高値の仲買人への販売を決定して，その仲買人の名前を読み上げて，水揚げ伝票に落札した仲買人名，販売価格を手書きで記入する。現在，登録されている仲買人は 27 社で，通常約 20 社の仲買人が競りに参加している。



水揚げ物の選別，箱詰め



水揚げ物の計量



計量時に記入する水揚げ伝票



陳列された水揚げ物を確認する仲買人



競りの様子



競り結果を用紙に記入する

図1 種子島漁協での水揚げ作業および競り

2) 東串良漁協

東串良漁協では、午前6時頃から漁業者が魚種・サイズごとに箱詰めした漁獲物を搬入し始める。漁協職員は箱ごとに計量し、水揚げ順を示す番号札を貼り付けて市場内に陳列する。午前7時から仲買人が市場に集まり、水揚げされた魚の状態を確認する。

午前8時までに仲買人は漁協指定の用紙に各水揚げ物の希望購入価格を記入して、購入を希望しない水揚げ物については価格を記入しないで空欄にして漁協の事務所に提出する。漁協職員は、仲買人

から提出された用紙を机の上に並べて、水揚げ番号順に各仲買人の価格を確認しながら、最高値を記入した仲買人の名前を場内アナウンスで発表する。最高値を記入した仲買人が複数いた場合には、じゃんけんによって決定する。

仲買人の多くは東串良漁協での競りの終了後に、高山漁協へ移動して競りに参加しており、その後、鹿屋市地方卸売市場での競りに参加する仲買人もいる。東串良漁協、高山漁協で購入した水産物を鹿屋市地方卸売市場で販売したり、あるいは東串良漁協、高山漁協、鹿屋市地方卸売市場の3つの市場で購入した水産物を合わせて、東京などの大都市の顧客の要望に対応している。



水揚げ物の計量



陳列された水揚げ物と仲買人



用紙を提出する仲買人



競りの結果を発表する漁協職員

図2 東串良漁協での水揚げ作業および競り

3) 内之浦漁協

内之浦漁協では午前6時頃から水揚げ物の受け入れを開始しており、販売業務は通常、9時半～11時頃に終了するが、水揚げ量が多い時には15時頃まで続くことがある。内之浦湾に設置された定置網で漁獲された鮮魚、活魚が水揚げ物の多くを占めており、内之浦漁港に入港した漁船は着岸しながら漁獲物を種類、サイズごとに選別し箱詰めして市場に水揚げする。

内之浦漁協では、市場内における取引業務の一部に電子機器を使用している。市場に搬入された水揚げ物は、漁協職員が台秤で計量して計測値を読み上げるとともに、電子機器に生産者コード、魚種コード、重量を入力する。同一の生産者の水揚げ物の計量が続くときには、魚種コード、重量コード

のみを入力する。計量時には、台秤に魚を直接載せる場合、魚を入れたプラスチック製かごを載せる場合があり、かごの場合には漁協職員が台秤の計測値からかごの重量を差し引いた値を読み上げる。計量が終わった後、鮮魚は木製の台（10×2の合計20の区画に仕切られている）に、活魚は水槽に移される。

ある程度の量の水揚げ物の計量が終わると、漁協職員は電子端末を事務所内のパソコンに接続してデータを転送し、水揚げ番号、魚種名、重量が記載された用紙を作成して水揚げ物に貼付する。仲買人は魚類の状態を見ながら、漁協が指定する入札用紙に希望購入価格を記入して、締め切り時間までに事務所に提出する。漁協職員は、仲買人から提出された入札用紙のデータをパソコンに速やかに入力し、すべてのデータ入力が終わった時点で自動集計がされ、集計結果を印刷して落札結果を場内アナウンスで発表する。

競りは木製の台および活魚水槽ごとに行われるため、台の上または水槽の中が魚類で満たされた時点で競りが行われる。市場には次から次へと漁獲物が運ばれてくるため、競りの時刻は特に決められているのではなく、漁獲物の搬入、計量、競り、出荷が常時繰り返されている。

仲買人の登録数は35社であるが、競りに参加しているのは通常約20社であり、内之浦漁協の水産物販売金額の約半数が大手仲買人4社で占められている。過去に業務効率を改善するために、電子秤や仲買人が入札価格を入力する携帯端末の導入を検討したが、実用化には至らなかった経緯がある。



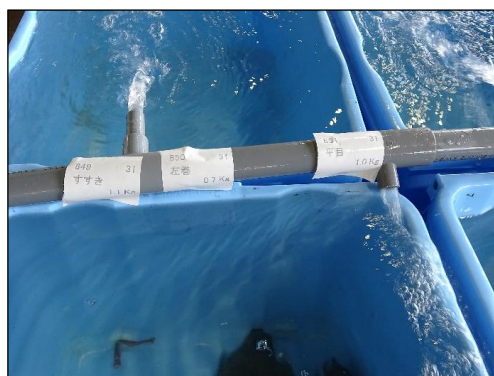
水揚げ物の計量



水揚げ物の計量



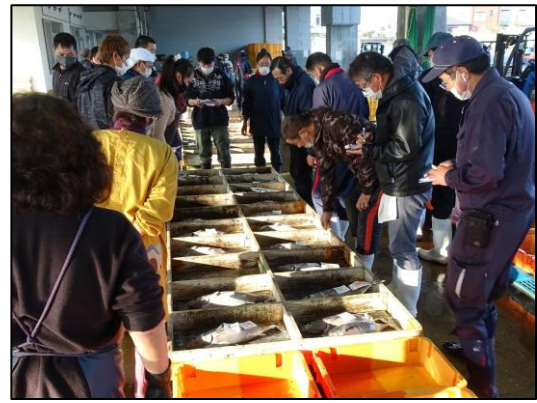
活魚水槽



活魚水槽に張り付けられた札



木製の台に陳列された鮮魚



陳列された水揚げ物と仲買人



仲買人が提出した用紙のデータ入力



競り結果の場内アナウンス

図3 内之浦漁協での水揚げ作業および競り

4. 考察

本研究では市場によって形態が異なる水揚げ作業を調べるために、水産物地方卸売市場の内之浦漁協、小規模卸売市場の種子島漁協、東串良漁協の3つの漁協で調査した。内之浦漁協、東串良漁協では、市場に搬入された水揚げ物に対して仲買人が希望価格を所定の用紙に記入して提出し、漁協職員は希望価格を集計して最高値を取りまとめて販売先を一括して公表している。一方、種子島漁協では水揚げ物が個別に競りにかけられる。そのため、競りの途中での仲買人同志の駆け引きによって様々な意思決定がされていることが予想される。例えば、競りの早い段階で希望の魚類を購入できた場合、あるいはできなかった場合によって、それ以降の競りでの購入意欲が変化している可能性がある。

現在、地方の人口減少、高齢化による人手不足は、水産業が盛んな地域、特に水産業が基幹産業である離島を数多く抱える鹿児島県などの小規模卸売市場において深刻な課題である。水揚げ作業では、漁獲物の計量、競り、会計処理などの一連の業務が手書きの伝票、パソコンへのデータ手入力によって行われている。市場内に漁獲物が搬入されてから競りが終了するまでは、市場内に漁獲物が陳列された状態が続くため、競り業務に長時間を要すると特に気温の高い夏季では漁獲物の鮮度低下が懸念される。

2020年6月に卸売市場法が改正され、水産物の輸出促進や輸送時間短縮による鮮度保持・物流の効率化が今後ますます求められる。また、2020年から日本国内で新型コロナウイルス感染症が拡大していることも新たな懸念事項のひとつである。普段から迅速に流通させることが求められる水産物では、

コロナ感染症拡大によって市場が急な閉鎖に追い込まれると、市場が再開されるまでの間に甚大な経済的損失が生じることが予想されるため、感染症対策は早急に講じなければならない課題である。

近年、ICT 技術は目覚ましく発展しており、携帯端末の導入やアプリの利用がしやすくなってきている。市場における取引業務において手書き伝票をデジタル化するシステムを構築することができれば、業務の効率化や省力化につながり、データの蓄積によって漁業者、漁協職員、仲買人は過去の競争結果を閲覧することで漁獲や販売における重要な情報として役立てることができる。また、携帯端末上で競争を行うことができれば、仲買人は市場外から参加できるため、市場内での密な状態を回避することができ、感染症対策が向上することが期待される。著者らは 2020 年から ICT を活用した市場業務のデジタル化に取り組んでおり、上記で示したことを社会実装させるために、開発を進めていきたいと考えている。

謝辞

本研究は、令和 2 年度かごしま発イノベーション創出支援事業補助金によって実施しました。また、卸売市場における現地調査を実施するにあたり、種子島漁業協同組合の浦添孫三郎代表理事組合長、東串良漁業協同組合の江野彰参事、内之浦漁業協同組合の志摩浩一参事に多大なご協力を頂きました。この場をお借りして心から感謝申し上げます。

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Sustainable Development Goals and the Coastal Fisheries of Fiji in the Pacific Islands

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持続可能な開発目標と太平洋島嶼国フィジーの沿岸漁業

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Abstract

The world is witnessing critical environmental problems. Since these problems are complex and linked to multiple factors, finding an immediate solution is difficult. Therefore, aiming for a reliable solution while taking all the measures and precautions to ensure sustainable development is necessary. To achieve sustainable development, the concept of Sustainable Development Goals (SDGs) was proposed by the United Nations in 2015. This study, focused on one of the most economically important bivalves in Fiji's coastal fisheries, outlined its features and current conditions and then assessed its relationship with the SDGs.

Keywords: *Anadara*, Bivalves, Coastal Fisheries, Fiji, Pacific Islands, Resource Use, SDGs

1. Introduction

Presently, the world is witnessing critical environmental problems, such as global warming, hygiene and health problems represented by the novel coronavirus infection, and poverty problems due to the disparity between the northern and southern hemispheres, which require urgent attention. However, since these problems are complex and linked to multiple factors, finding immediate solution is difficult. Therefore, aiming for a reliable solution that ensures sustainable development is necessary. To achieve sustainable development, the concept of "Sustainable Development Goals" (SDGs) was proposed by the United Nations in 2015 (UN 2015). Under this initiative, 17 SDGs and 169 targets were proposed for the attainment of a sustainable and better world by 2030.

While the SDGs comprehensively summarize the global economic, social, and environmental goals, the progress in the attainment of sustainable development is still disappointingly slow. According to the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), the current "progress is being made in some areas of the Asia-Pacific region, but change must be accelerated. And it is retreating in some areas, so we have to reverse this" (ESCAP 2017a). In response, the ESCAP adopted the Asia-Pacific Roadmap at the 2017 ESCAP 73rd General Assembly (ESCAP 2017b). One of the main agendas was "to integrate the three pillars of society, economy, and environment in a well-balanced manner, and to put gender equality and women empowerment development at the center of policy issues in the region."

Most Pacific Island Countries (PICs) are comprised of small islands, characterized by limited development options, small population, and geographical isolation. The PICs have adapted to various social transformations such as Fiji. Comprised of more than 300 islands, this country is an attractive tourist destination in the South Pacific, making it the primary source of income, that also exhibits primary industry such as sugar cane, dalo, pineapple, cassava, and gingers. The land in the coastal villages is predominantly owned by indigenous extended family groups (Nishimura 2006) or land-owning units called "mataqali". Further, many villages are economically self-sufficient due to their reliance on the environmental resources such the ocean, coastal fisheries. The application of traditional knowledge and the role of customary and religious leaders has promoted sustainable resource use (Veitayaki 2002; Fache & Pauwels 2020). Women play a key role such as culture, marketing, and society in the coastal fisheries (Tawake et al. 2007; Vunisea 2016; Kleiber et al. 2019; Thomas et al. 2020; Vitukawalu et al. 2020). Along with other household chores, women collect invertebrates such as shellfish, octopuses, and fish, from nearby mangrove forests, tidal flats, seagrass beds and coral reefs for local consumption or to generate income by selling them commercially. Recent social transformations, such as global warming, globalization, and environmental pollution have affected the lives of those in these coastal communities and their fisheries; that demands that sustainable development must be pursued to safeguard their future.

To achieve sustainable development in coastal villages, understanding the relationship between coastal fisheries and the SDGs is important. In this study, we focused on one of the most economically important bivalves in Fiji's coastal fisheries, summarized its features based on known scientific research, socio-economic surveys and observations then assessed its relationship with the SDGs. Finally, concluding with some reflection on the way forward.

2. Bivalve Fishing

The bivalve of interest *Anadara* spp., which is a major catch of the Fiji coastal fisheries industry, is mainly fished by women and children, and rarely by men other than older ones. Fishing is conducted throughout the year at low tide by wading into ankle deep water and at high tide by boat. It takes several hours before the lowest tide in the day, and ends during high tide.

Anadara spp. is buried in shallow tidal flats and sandy mud bottoms, it consumes organic matter and filters oxygen from seawater. This bivalve connects the mantle rim, which is a part of the body

tissue, to form a water pipe-like hole to suck seawater. Even during low tides, the water pipe-like holes are created from the bottom of the sand and mud in the seawater with gaps between the sand and mud to feed and breathe. Women use their toes to feel the bivalves and visually locate the water pipe-like holes emerging from the bottom of the sand and mud, and then collect them with their bare hands. The average catch was approximately 2 kg of bivalves per fisherwoman per day (Mangubhai 2020).

Since locating small individuals is difficult through this fishing method, they are not collected by the fisherwomen in eastern Viti Levu Island, Fiji (Kawai et al. 2008). First mature size of *Anadara* spp. has studied for the fisheries in the Pacific area (SPC 2012; Saputra et al. 2019; Panta-Vélez et al. 2020). Thereby ensuring sustainable resource use. In addition, other than visual inspection, shellfish are collected through skin diving using underwater glasses at locations that exhibit sufficient quantities of water even during low tides. However, most women avoid fishing or fish only near their village during bad weather.

The collected shellfish are cooked for food, offered to other villagers and relatives and friends elsewhere, or transported to markets by truck or boats and sold in dozens. Normally, seaweeds, sea cucumbers, octopuses, sea urchins, and other shellfish (such as pen shells) are collected during *Anadara* fishing as well.

3. Coastal Bivalves Fisheries and SDGs

The coastal *Anadara* spp. fishery in Fiji closely relates to and demonstrate some SDGs and targets.

- *Anadara* spp. fishing enable women to earn an income by selling *Anadara* spp. commercially and provide employment opportunities, which fulfills Target 1 of SDG 1 to "Eradicate Extreme Poverty" and Target 1 of SDG 8 that emphasize the need for "Sustainable Economic Growth,".
- *Anadara* spp. is a daily household food item that is regularly fished within the sustainable limits of the marine protected areas established by the villagers. This fulfills Target 1 of SDG 2, "Universal Access to Safe and Nutritious Food" and Target 2 of SDG 12, "Sustainable Management and Use of Natural Resources,".
- Since women do most of the fishing and selling of *Anadara* spp., the fishery elevates the social status of women, thus, meeting Target 1 of SDG 5 to "End Discrimination against Women and Girls."
- *Anadara* spp. purifies water in the marine ecosystem by creating a flow of water through the action of the gill cilia; as well as consumes suspended matter. This satisfies Target 6 of SDG 6 to "Protect and Restore Water-related Ecosystems."
- *Anadara* spp., which feeds on land-derived or sea-derived organic matter transported by rivers into the sea, is fished by women in the coastal areas, transported to land, and consumed by humans. This considerably contributes to material circulation between land and sea, which fulfills Target 2 of SDG 14, "Protect and Restore Ecosystems" and Target 1 of SDG 15, "Conserve and Restore Terrestrial and Freshwater Ecosystems ".

- To conduct *Anadara* spp. fishing, adhering to the national and village regulations and laws is necessary. This ensures that villagers are aware of and abide by the law that protect the fishery. This corresponds to Target 3 of SDG 16 to "Promote the Rule of Law and Ensure Equal Access to Justice."
- Offering *Anadara* spp. to vulnerable villagers is an act of welfare (Kawai et al. 2021). Villagers live in close knit social units that look out for each other. Therefore, offering *Anadara* spp. to other villagers contributes to sustainable development in the community. This corresponds to Target 1 of SDG 2 for the need to maintain "Universal Access to Safe and Nutritious Food."
- In one village, *Anadara* spp. was being exported to the United States and Australia (Kawai et al. 2021). Effective *Anadara* spp. exports can assist in achieving Target 10 of SDG 17 to "Promote a Universal Trading System Under the WTO". If *Anadara* spp. exports increase further, building an equitable trading system at the domestic and international levels will be important for the sustainable development of not only *Anadara* spp. resources, but also the local community.
- Kawai et al. (2021) indicated that *Anadara* spp. fishing plays an important role in the sustainable development of Fiji coastal societies. However, coastal fisheries, including *Anadara* spp. fishing, have been influenced by various environmental factors and have recently been strongly influenced by social transformation worldwide. Consequently, the Fiji coastal fishery remains highly volatile and unstable to external factors. Thus, to ensure sustainable development of the coastal fisheries of Fiji in the future, countries, states, villages, universities, NGOs, etc., should coordinate to provide appropriate science based mitigative and adaptive methods and practices (Grafton et al. 2010; Lal & Holland 2010) that can respond to various impacts. This effort can fulfil Target 14 of SDG 17 to "Enhance Policy Coherence for Sustainable Development" and assist in developing the foundation for the sustainable use of *Anadara* spp. bivalves.

4. The Way Forward

In the Asia-Pacific region, efforts are still required to understand and better implement SDGs (ESCAP 2017a). ESCAP has emphasized its Asia-Pacific roadmap that "balances the three pillars of society, economy, and environment, with gender equality and women empowerment at the heart of the region's policy agenda." (ESCAP 2017b). This study has systematically demonstrated the strong association between a coastal fishery and the social, economic, and environmental factors, with women playing an instrumental role in fishing. This study on coastal *Anadara* spp. fishery has illustrated the extensive potential to achieve the SDGs and must be used as a model case for SDG research in the Pacific Island countries.

Similar studies should be done for each of the major coastal fisheries such as the trochus, beach de mer, seaweed, sea grapes, emperors, surgeon fish, parrot fish, rock cod, barracuda, turtles, and sharks to guide our resource management effort to fulfil the Asia Pacific road map. We need to know more about our target species and their role in the ecosystems and in our lives. This approach will allow us to better understand how much we have to do to ensure that our critical coastal fisheries

are sustainably used and how much we stand to lose if we fail to do what is right given the way the resources live and interact within their habitat and how we use the resources.

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Current status and Challenges of Agricultural Diversification Efforts by Fisherperson -A case study of Koshiki Island, Kagoshima Prefecture-

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漁業者による六次産業化の取り組みの効果と課題
～鹿児島県甑島を事例に～

鳥居享司、竹之内麻衣（鹿児島大学）

Abstract

Efforts by fisherperson to process and sell their own catches have long been widespread. However, in recent years, those efforts have been refocused as agricultural diversification. The purpose of this paper is to clarify the effects and challenges of agricultural diversification efforts by fisherperson. This paper considers the businesses “Kaiseimaru” and “Higasayama Fisheries” in the Koshiki area (Satsumasendai City, Kagoshima Prefecture) as a case study.

Kaiseimaru diversified its business by utilizing the subsidy project of Satsumasendai City. In addition to Banded blue sprat gillnets, rock oyster farming, restaurant management, and marine tourism business have improved income. Higasayama Fisheries also established a new processing plant utilizing the subsidization from the project of Satsumasendai City.

As a result of the analysis, the following matters became clear. Financial support from local government has certainly lowered the hurdles for fisherperson to undertake agricultural diversification efforts. However, it is not easy for a fishery management entity, which lacks management resources such as funds and labor, to expand the scope of management. The labor force of the family is insufficient to expand the scale of the business, and an employed labor force is needed. However, in remote island areas where the population is declining and aging is notable, they must rely on external technical intern trainees. Furthermore, it is difficult for fisherperson to perform the entire process from production to sale by themselves in terms of time and ability. They are professionals in fishery operation, but often lack experience and knowledge in sales and product development, so support from outside experts is required.

Keywords; Agricultural Diversification, Koshiki Island, Financial Support

1. Research background and objectives

Efforts by fisherperson to process and sell their own catches have long been widespread. However, in recent years, those efforts have been refocused as agricultural diversification.

The Ministry of Agriculture, Forestry and Fisheries defines the “sixth industrialization” as “efforts to encourage growth in the agriculture, forestry and fisheries as the primary industry, manufacturing as the secondary industry, and retailing as the tertiary industry in a comprehensive

and integrated manner, thereby exploiting local resources to generate new additional value,” and based on these efforts, aims to raise the income levels and secure employment in rural areas. In 2010, the Act on the Creation of New Businesses in Agriculture, Forestry and Fisheries using Local Resources and the Promotion of Use of Local Agricultural, Forestry and Fishery Products (Sixth Industrialization Act) was established, based on which policies relating to the “sixth industrialization,” such as agricultural, forestry and fishery workers expanding their business to processing and sales, have been implemented with the aim of stimulating business operation in agriculture, forestry and fisheries. Specific examples of the sixth industrialization include seafood processing, direct selling of fisheries products, fisherperson’s restaurants, fisherperson’s guest houses, orientation/tourist fishing, recreational fishing, and diving. It is not new for fisherperson to engage in these businesses. Running businesses such as fishery processing and recreational fishing and setting up fisherperson’s markets have been traditional secondary businesses in fisheries. However, with the establishment of the Sixth Industrialization Act in 2010, these businesses are now encouraged as government policy. Some of the outcomes of these efforts are summarized in the Collection of Cases of Sixth Industrialization Efforts, in which increases in sales are highlighted.

However, the sales scale of agricultural diversification by fisherperson has been almost flat since 2015 (Table 1). Despite various policy supports, the scale of the industry has not expanded. What are the challenges of the sixth industrialization efforts, which are expected to bring income growth to fisherperson?

The purpose of this paper is to clarify the effects and challenges of agricultural diversification efforts by fisherperson. This paper considers the businesses “Kaiseimaru” and “Higasayama Fisheries” in the Koshiki area (Satsumasendai City, Kagoshima Prefecture) as a case study. Kaiseimaru is a management entity that operates Banded blue sprat gillnets, shellfish farming, restaurants, and marine tourism businesses by fisherperson. Higasayama Fisheries is a management body that operates Banded blue sprat gillnets and a processing industry and consists of one fisherperson, his son, and an employed labor force. Both companies are developing their activities with support from the budget for promoting agricultural diversification from the local government, and are good examples to clarify the purpose of this research.

Table-1 Changes in annual sales of fishery-related businesses

	Processing business		Direct sales business		Guest house Restaurant (100 million yen)
	Total amount (100 million yen)	Per business (Ten thousand yen)	Total amount (100 million yen)	Per business (Ten thousand yen)	
2011	1,339	–	276	–	–
2012	1,543	9,920	311	5,084	–
2013	1,719	11,515	313	5,127	–
2014	1,724	11,546	332	5,229	–
2015	1,847	12,096	365	5,503	124
2016	1,783	11,591	373	5,512	144
2017	1,745	11,449	375	5,485	152
2018	1,769	11,572	399	4,813	175

Source: Ministry of Agriculture, Forestry and Fisheries

2. Efforts of agricultural diversification in Koshiki Island

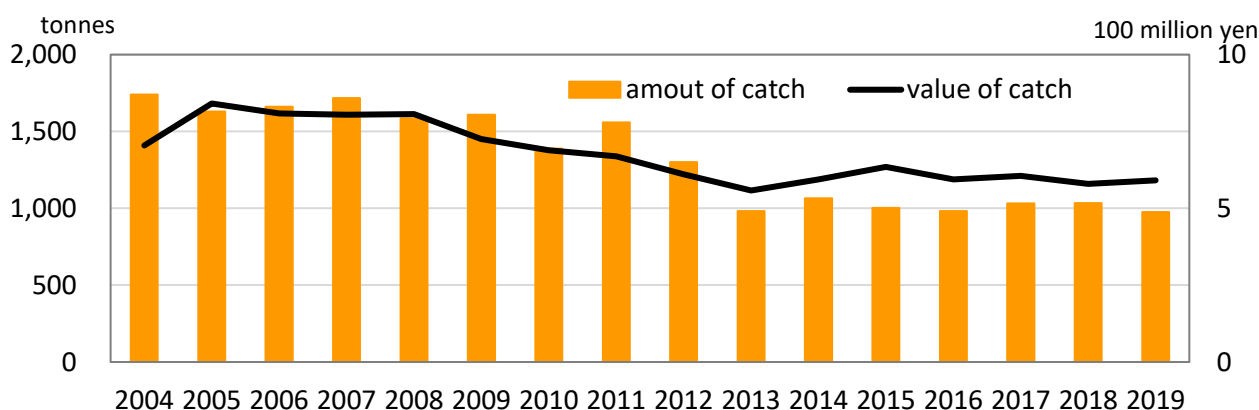
1) Overview of Koshiki Island Fisheries Cooperative Association

The Koshiki Island Fisheries Cooperative Association (FCA) was established in 2003 by the merger of four FCAs in the Koshiki Island area. As of March 2020, there were 189 regular members and 469 associate members of this FCA.

One of the best fishing grounds in Kagoshima Prefecture occurs in the waters around Koshiki Island, and shellfish and algae collection, fish farming, and fishing using set nets, gillnets, and hook and line have been practiced since ancient times. Among them, fishing for Banded blue sprat with gillnets is the core fishery, accounting for 56% of the catch quantity and 40% of the income.

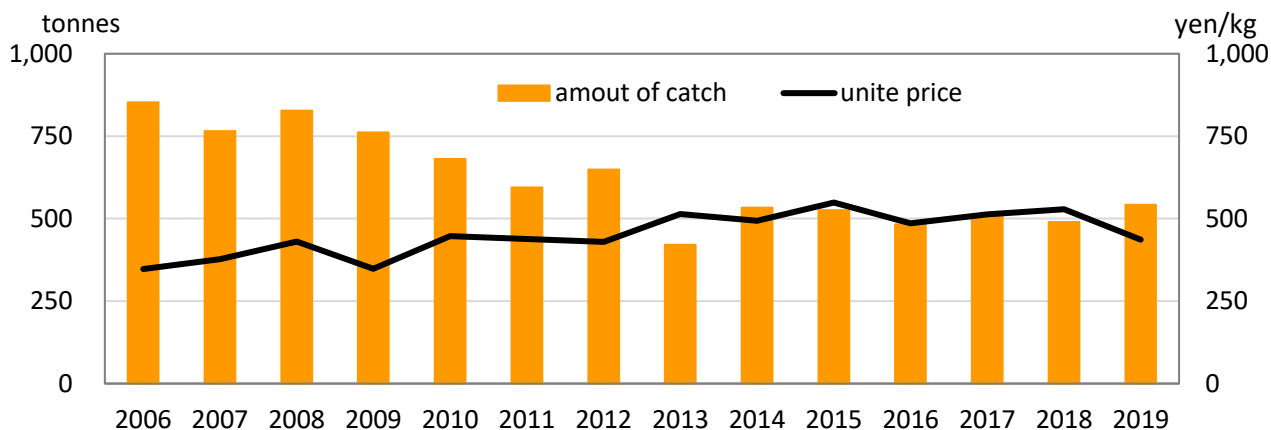
Although the catch from fishing boat fishery is declining, it has remained almost flat since 2013, reaching about 976 tonnes and about 590 million yen in 2019 (Fig. 1). Looking at the trends in the Banded blue sprat fishery, as with other fisheries, the catch is on a downward trend. The unit price of Banded blue sprat shows a slight upward trend, and has risen from 450 to 550 yen/kg in recent years (Fig. 2).

Figure-1 Changes in Amount and Value of Catch for Fishing Boat Fishery



Source: Koshiki FCA (2004-2019), Business Report

Figure-2 Changes in the Catch and Unit Price of Banded blue sprat



Source: Koshiki FCA (2004-2019), Business Report

2) Efforts for agricultural diversification of Kaiseimaru

Mr. A, the representative of Kaiseimaru, is aged in his mid-40s and runs a fishing boat fishery mainly on Banded blue sprat gillnets on Kamikoshiki Island. Since 2014, Kaiseimaru has been working on diversifying its business for the purpose of stabilizing management. In 2016, a restaurant was opened utilizing the “Agricultural Diversification Support Project” of Satsumasendai City.

(1) Fishing boat fishery

Mr. A’s main business is fishing boat fishing, which combines Banded blue sprat gillnets, small fish baskets, and skin diving according to the season. Among them, the Banded blue sprat gillnet fishing was the main pillar supporting Kaiseimaru; however, in recent years, due to the decrease in catch and increased production costs such as fuel oil, the profit margin has fallen. Mr. A felt a sense of crisis in management, so he decided to expand his activities into businesses other than fishing boat fishing.

(2) Rock oyster farming

In 2014, Kagoshima Prefecture was looking for a fisherman to carry out trial aquaculture of rock oysters, so Mr. A started trial aquaculture with the prefecture. In October 2014, Mr. A received 300 rock oyster juvenile from the Fisheries Experiment Station and started aquaculture testing. Although Mr. A had experience in fish farming, he was new to oyster farming, so he tried to acquire aquaculture techniques under the guidance of the Fisheries Experiment Station. As a result of repeated trial and error over about three years, Mr. A acquired a specified demarcated fishing right in 2016 and started full-scale aquaculture of rock oysters after he had mastered the technique.

Annual production is 2,000 to 3,000 pieces. The busy season is from July to August, which is the shipping time. The main sales destination is the restaurant run by Mr. A, and the surplus is sold at events such as at a roadside station. Although sales are strong, there is no prospect of further scale expansion because Mr. A is training and shipping by himself. Since 2017, Mr. A has been conducting trial aquaculture of Japanese oyster, which has a different shipping time to rock oyster; however, he is still at an early stage in this process.

(3) Restaurant management

In July 2016, Mr. A opened the fisherman restaurant “Kaiseimaru”. Koshiki Island has a thriving fishing industry, but most of the fish caught are shipped outside the island, and there are few places where visiting tourists can taste local marine products. Mr. A thought that if he could provide tourists with Koshiki Island’s marine products, tourists’ satisfaction would increase and fisherperson would also be able to earn income, so he began to plan restaurant management. Because Satsumasendai City was conducting their “Agricultural Diversification Support Project,” Mr. A aimed to open a restaurant with a subsidy.

In March 2016, financial support from the government was decided, and the restaurant was

opened in July 2016. The restaurant is located a 10-minute walk from the main port, the departure and arrival point for high-speed boats and ferries. Business hours are from 11:00 to 15:00, and night business is open only for reservations and is closed irregularly. The marine products of Koshiki Island are provided, centering on Banded blue sprat and rock oyster caught by Mr. A himself. In preparation for poor fishing and bad weather, Mr. A has set up a farm cage near the rock oyster farm and has a system in place to supply marine products at any time. Mr. A's wife is in charge of store management (e.g. reservation, cooking, provision, customer service, and accounting). When the shop is busy, she temporarily hires 2 to 3 people.

The most popular are barbecue-style set meals (1,980 yen) that customers themselves bake and eat, as well as seafood bowls (1,500 yen), small shrimp bowls (1,000 yen), and Banded blue sprat pickled bowls (700 yen). The menu is structured according to the catch of the day, and the fact that the menu contents differ depending on the day is also a popular point. The busy season is from October to November, when the number of tourists increases, including the consecutive holidays in May, summer vacation, and autumn holidays. However, attracting tourists in winter, when the number of tourists to Koshiki Island is decreasing, is an issue.

(4) Marine tourism business

As Mr. A interacted with tourists at the Kaiseimaru, he began to feel that Koshiki Island lacked a hands-on tourist program, which was an obstacle to attracting families. He suggested to a tourist company on Koshiki Island that they incorporate playing on the beach into their package tours. Currently, he offers an "uninhabited island shore play tour" (10,800 yen per person) that includes beach play and a barbecue on an uninhabited island, and a "boat fishing experience" (6,500 yen per person) for beginners. The annual number of users is about 50 to 80.

(5) Achievements and issues of efforts

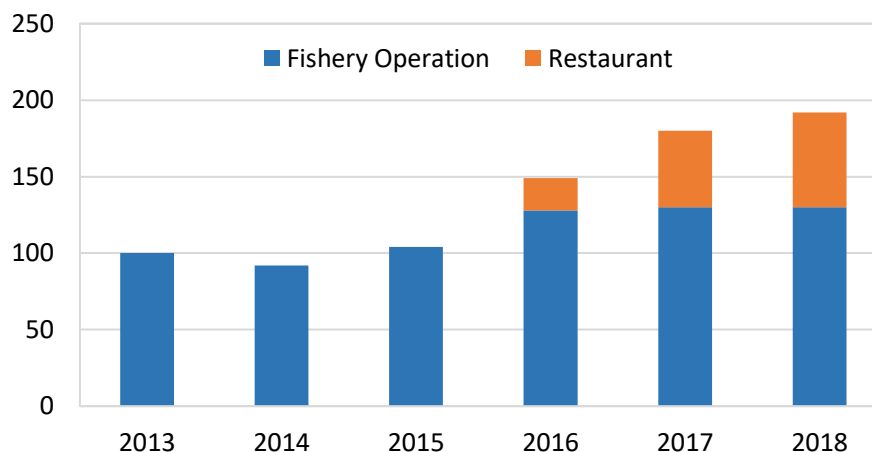
One of the effects of agricultural diversification is that income from non-fisheries is gradually increasing (Fig. 3). It has become possible to alleviate the instability of income from fishing boats by rock oyster farming and managing restaurants. Mr. A used to ship all of his catch to markets outside the island, but now it can be used at the restaurant he manages, and the unit shipping price has risen. In addition, seeing tourists at the restaurant happily eating the marine products that he caught helped improve his motivation for work.

However, labor intensity has increased. During the busy restaurant season, sleep time is decreasing because he helps in the restaurant in addition to fishery operation. Since Mr. A is in his mid-40s, increasing labor intensity may not be a problem. However, in the future, if he physically overextends himself, this may lead to an accident during fishery operation.

Attracting customers in winter is also an issue. Because the sea is rough and the cancellation rate of shipping routes is high, winter is a quiet season for tourism on Koshiki Island. Since most of the restaurant users are tourists from outside the island, it is necessary not only to try to attract customers through PR activities, but also to search for businesses that can earn money during this

period. However, although employment labor may be required to expand the scale of the business, it is not easy due to the significant shortage of human resources on Koshiki Island.

Figure-3 Changes in Sales Amount



Source: Kaiseimaru

3) Higasayama Fisheries' efforts for agricultural diversification

Mr. B, the representative of Higasayama Fisheries, is engaged in amberjack aquaculture and marine product processing, centering on Banded blue sprat gillnets. In 2018, a new processing plant was established by utilizing the “Agricultural Diversification Support Project” of Satsumasendai City. There are two vessels and four people working on the sea, including Mr. B, and seven people working on land (six of them are technical intern trainees).

(1) Overview of Banded blue sprat fishery and amberjack aquaculture

Mr. B runs a Banded blue sprat gillnet with his son, two employed workers, a total of two ships and four people. The Banded blue sprat gillnet is operated almost every year, except for closed days (Sundays and holidays) and the closed season during the spawning season in some sea areas. Mr. B aims to value the quality of the Banded blue sprat caught by (1) catching only large fish by using a gillnet with a large mesh; (2) catching the Banded blue sprat at midnight when the stomach is empty, which helps maintain freshness after catching; and (3) avoiding bending of the fish body by devising a storage method after catching. The annual production is about 30 tonnes, and depending on the price and demand, this goes to the market outside the island or to the Higasayama Fisheries processing plant.

In addition, Mr. B has been amberjack farming since 1996. By using juvenile collected around Koshiki Island, and using inferior-quality Banded blue sprat and processing residues as bait, he aims to make effective use of resources and reduce production costs. The annual production is about 1.6 tonnes, and the main shipping destinations are restaurants and mass retailers on the island.

(2) Processing business

Mr. B previously shipped the caught Banded blue sprat and farmed amberjack to markets outside the island. However, shipping to the outside of the island is expensive and disadvantageous to price competition with other production areas, so the processing business was started in the early 2000s. Banded blue sprat are not only caught using his own boat, but are also purchased from other fisherperson on Koshiki Island for processing. In 2018, he built a new processing plant, purchased processing-related equipment, and created pamphlets with the financial support of Satsumasendai City. He also focused on hygiene management and responded to HACCP (Hazard Analysis Critical Control Point). The main products are Banded blue sprat salt-dried, fried, individual quick frozen (IQF), and sashimi.

For example, Banded blue sprat sashimi is brought into the processing plant after the boat returns to port, sorted, washed with sterilized cold seawater, and processed mechanically or manually. After checking the quality, it is quickly frozen at minus 35°C and vacuum packed. After passing through a metal detector, it is packed in a box and shipped.

The main shipping destinations are major conveyor-belt sushi restaurants and Japanese gastropubs outside the island. In particular, IQF shipments to conveyor-belt sushi restaurants amount to 20 tonnes per year. At the sushi restaurants, it is cooked in tempura and offered for 110 yen for five fish. Because conveyor-belt sushi restaurants demand hygiene management higher than HACCP, Mr. B recommended improvement of the processing plant. This experience has further improved hygiene management at the processing plant and has reached a level where it can be dealt with by any trader.

Higayama Fisheries also sells to general consumers via the Internet, and sales of processed products as a set are strong. In addition, they are focusing on developing sales channels, such as school meals, delivery to university cafeterias, and consideration of product development in collaboration with the Faculty of Fisheries, Kagoshima University.

(3) Achievements and issues of efforts

The first effect of agricultural diversification is the stabilization of management. When market conditions are good, the catch can be shipped to markets outside the island, and when it is cheap, it can be processed at their own processing plant, making it possible to avoid shipping at low prices.

Second, the creditworthiness of Higayama Fisheries has increased through transactions with major conveyor-belt sushi restaurants. The trading partner sushi restaurants are known to be strict about hygiene management standards, and Mr. B raised his knowledge and awareness of hygiene management in the process of closing the deal. It is thought that this experience will contribute to development of future school lunches and marketing to restaurants.

The third is to secure successors to the fishery. After seeing Mr. B's aggressive management response, his son decided to return to the island and started Banded blue sprat gillnet fishing with Mr. B. He became independent a few years ago and plans to build a new boat by the end of 2021.

Of course, there are still some challenges. First, there is a need to expand sales channels.

Higasayama Fisheries also purchases Banded blue sprat from other fisherperson on the island, and there is still plenty of production capacity. Although the sales channel to conveyor-belt sushi restaurants has been opened, it is necessary to secure more sales channels. However, Mr. B and his son, who are busy with daily fishing operations, cannot afford to be in charge of sales. Therefore, from 2020, Mr. B utilized the support project of the Kagoshima Chamber of Commerce and Industry, and started market development and product development with the support of a person familiar with marketing. However, the sales channels are not expanding, and the utilization rate of the processing plant is sluggish.

Second, the weaknesses of Banded blue sprat (i.e. fish species name) and Koshiki Island (i.e. region name) are also issues. Banded blue sprat is one of the representative fish of Kagoshima Prefecture, and Koshiki Island is well known as a region where fisheries are thriving. However, outside of Kyushu, the name recognition of Banded blue sprat drops significantly.

In some cases, although the product was evaluated favorably during negotiations, Banded blue sprat was rejected because of its poor name. Even if Banded blue sprat from Koshiki Island is emphasized, there is also Banded blue sprat of inferior quality from Koshiki Island in circulation. It is not easy for Higayama Fisheries alone to improve the image and name of Banded blue sprat from Koshiki Island and it is necessary for fisherperson to work together to improve quality, but such momentum is weak.

3. Effects and challenges of agricultural diversification efforts by fisherperson

The Ministry of Agriculture, Forestry and Fisheries has promoted agricultural diversification as one of the management promotion measures for the agriculture, forestry and fisheries industry. However, the annual sales amount of fishery production-related businesses is sluggish, and this paper analyzed two cases of Koshiki Island in order to determine the cause.

Kaiseimaru diversified its business by utilizing the subsidy project of Satsumasendai City. In addition to Banded blue sprat gillnets, rock oyster farming, Japanese oyster farming, restaurant management, and marine tourism business have improved income. However, it became clear that further scale expansion would not be easy due to increased labor intensity and labor shortage.

Higasayama Fisheries also established a new processing plant utilizing the subsidization from the project of Satsumasendai City. The level of hygiene management has risen dramatically, and it has become possible to do business with major conveyor-belt sushi restaurants. In addition, with the support of the Chamber of Commerce and Industry, Higayama Fisheries has started efforts to develop products and expand sales channels. However, there are challenges with the development of new sales channels and the name recognition of products, and the utilization rate of the processing plant remains low.

Thus, financial support from local government has certainly lowered the hurdles for fisherperson to undertake agricultural diversification efforts. However, it is not easy for a fishery management entity, which lacks management resources such as funds and labor, to expand the scope of management. The labor force of the family is insufficient to expand the scale of the business, and

an employed labor force is needed. However, in remote island areas where the population is declining and aging is notable, they must rely on external technical intern trainees.

Furthermore, it is difficult for fisherperson to perform the entire process from production to sale by themselves in terms of time and ability. They are professionals in fishery operation, but often lack experience and knowledge in sales and product development, so support from outside experts is required.

In order to link the efforts of agricultural diversification by fisherperson to the improvement of management, not only assistance to facilities but also support for product development, market development, and securing a labor force, are required.

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