鹿児島湾における地域特産水産資源の有効利用に関する研究 : タラバエビ科の1種Plesionika semilaevis資源の現状把握

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Studies on Effective Utilization of Local Fisheries Resources in Kagoshima Bay, Southern Japan: Preliminary Research on Present Status of the Pandalid Shrimp *Plesionika semilaevis* Stock

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Key words : effective utilization, local fisheries resource, by-catch, *Plesionika semilaevis*, Kagoshima Bay.

Abstract

In Kagoshima Bay, southern Japan, the pandalid shrimp *Plesionika semilaevis* (Decapoda, Caridea) is a principle by-catch of small-scale bottom seine fishery. Because the main target of the fishery is the deep-water mud shrimp *Solenocera melantho* (Decapoda, Penaeidea, Solenoceridae) and the market price of *P. semilaevis* is low, *P. semilaevis* is often discarded in the sea. Along with the integration of research methods from the fields of fisheries biology and marine social science, this research also aimed to provide the results to the local community in order to utilize *P. semilaevis* effectively as a local resource. The results of the present study confirmed that *P. semilaevis* can be caught throughout the year in a relatively stable manner, and this shrimp may have potential as sashimi or as other processed food products. However, the study clarified that there is a problem with the distribution channel and that the local consumers do not necessarily prefer aquatic products.

Despite being a semi-enclosed bay, Kagoshima Bay, southern Japan, has a water depth of more than 230 m and unique environmental features[1]. Urita[2] reported that the pandalid shrimp *Plesionika martia* (Decapoda, Caridea) is one of the dominant shrimp species in Kagoshima Bay. Later, Chace[3] designated the Indo-West Pacific population of *P. martia* as a distinct subspecies, *P. martia orientalis*, and restricted the original *P. martia* to the Atlantic Ocean. Chace[3] also reported two other sympatric species, a new species *P. parvimartia* and a resurrected species *P. semilaevis*. The morphological study by Ohtomi and Hayashi[4] indicated that the shrimp reported by Urita[2] as *P. martia* is most probably *P. semilaevis*.

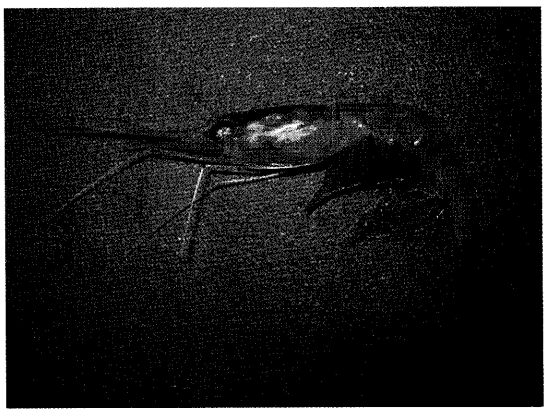

Fig. 1 *Plesionika semilaevis* (ovigerous female, 17.8 mm in carapace length) collected from Kagoshima Bay.

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Afterwards, Ohtomi[5] clarified some biological aspects, including reproduction and growth, of this shrimp.

In Kagoshima Bay, *P. semilaevis* (Fig. 1) is a principle by-catch of small-scale bottom seine fishery targeting deep-water mud shrimp *Solenocera melantho* (Decapoda, Penaeidea). Because the main target of the fishery is *S. melantho*[6-9] and the market price of *P. semilaevis* is lower, *P. semilaevis* is often discarded in the sea. *P. semilaevis* belongs to the same family as the pink shrimp *Pandalus borealis* and *P. eous* (Decapoda, Caridea, Pandalidae), and it has good palatability. Although *P. semilaevis* is consumed in some regions as sashimi or is deep-fried, it is not a well-known type of shrimp. Furthermore, because *P. semilaevis* is not a major species of shrimp for human consumption, there is no established distribution channel in the market, and *P. semilaevis* competes with imported small frozen headless shrimp.

Along with the integration of research methods from the fields of fisheries biology and marine social

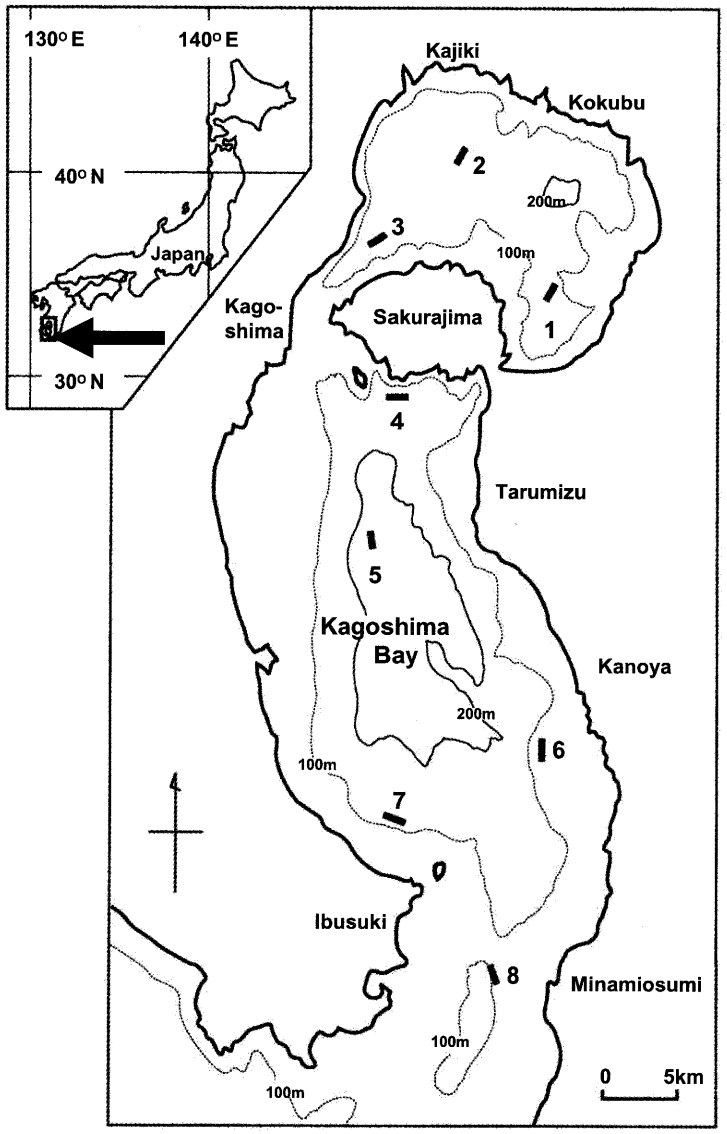

Fig. 2 Location of the 8 sampling stations for the experimental sampling survey in Kagoshima Bay.

science, the present study also aimed to provide the synthesized and organized results to the local community in order to utilize *P. semilaevis* effectively as a local resource. Furthermore, the successful example of effectively utilizing local resources was studied first-hand by visiting several locations of the established commercial fishing industry in Toyama Prefecture, central Japan, and by comparing Toyama Bay and Kagoshima Bay, the potential of *P. semilaevis* as an fisheries resource was investigated.

Materials and Methods

Fisheries biology

In order to ascertain the population size of *P. semilaevis*, an experimental sampling survey was conducted periodically at a total of eight stations in Kagoshima Bay: three stations in the inner part, four stations in the central part, and one station in the mouth of the bay (Fig. 2). Of the eight stations, four stations (Sts. 3, 4, 5 and 7) were within the main fishing ground for the small-scale bottom seine fishery, while the other four stations (Sts. 1, 2, 6 and 8) were outside the main fishing ground. The sampling survey was conducted with the Nansei-Maru (175 t), a training ship of the Faculty of Fisheries, Kagoshima University, during the daytime once or twice a month in principle, from April 2004 to March 2005. In the study, a simple experimental trawl net carrying canvas kites on the tip of the wings (total length, 23.5 m; mouth opening, 8.0 m; mesh size, 37.9 mm in net body and 20.2 mm in cod end)[10] was used. The length of the warp was adjusted according to water depth and was set to 4-5 times the water depth. After reeling out the warp, the net was towed for 10 minutes at a speed of 2.0 kt (approximately 3.7 km/h). All aquatic products that were caught using the net were sorted onboard and

Table 1 Number of individuals and weight (kg) of *Plesionika semilaevis* collected per tow at each station established in Kagoshima Bay in each month. NS; not sampled

Station	Mean Depth (m)	Month										
		Apr. 2004	June	Aug.	Sep.	Oct.	Nov.	Dec.	Jan. 2005	Feb.	Mar.	Average
		Number										
1	140.4	NS	0	NS	NS	NS	NS	NS	NS	0	NS	0
2	145.7	0	0	NS	NS	2	2	1	0	0	0	0.6
3	132.4	0	0	0	NS	0	1	NS	0	0	1	0.3
4	181.9	1660	956	368	NS	NS	NS	1390	NS	3732	NS	1621.2
5	230.1	1936	1684	1200	2755	1380	2768	194	705	7452	759	2083.3
6	81.3	13	0	0	NS	NS	NS	5	NS	0	NS	3.6
7	135.6	0	0	0	NS	3	0	4	0	0	0	0.8
8	99.5	NS	0	NS	NS	NS	NS	NS	NS	0	NS	0
		Weight										
1	140.4	NS	0	NS	NS	NS	NS	NS	NS	0	NS	0
2	145.7	0	0	NS	NS	5.9	4.0	0.1	0	0	0	1.2
3	132.4	0	0	0	NS	0	0.4	NS	0	0	3.5	0.5
4	181.9	3826.2	2892.6	1400.0	NS	NS	NS	1121.2	NS	4945.2	NS	2837.0
5	230.1	5360.0	4689.5	3400.0	8286.9	4028.6	5700.2	1399.7	1508.6	10306.8	1556.1	4623.6
6	81.3	34.5	0	0	NS	NS	NS	11.0	NS	0	NS	9.1
7	135.6	0	0	0	NS	8.4	0	37.8	0	0	0	5.1
8	99.5	NS	0	NS	NS	NS	NS	NS	NS	0	NS	0

were transported to the laboratory to be identified, counted and weighed.

Marine social science

The current state of the fishing and distribution of *P. semilaevis* and related problems were analyzed and reviewed.

Results and Discussion

Fisheries biology

The results of the sampling survey conducted in Kagoshima Bay showed that the density of *P. semilaevis* was the highest at the deepest part of the central area (Sts. 4 and 5) of the bay (Table 1). At the station with the highest distribution density (St. 5), *P. semilaevis* was caught throughout the year. At St. 5, the number of catch per tow ranged from approximately 200 to 7,500 with an average of 2,000, while the weight of catch per tow ranged from approximately 1.4 to 10.3 kg with an average of 4.6 kg.

The ratio of *P. semilaevis* among the aquatic species caught by the sampling survey was high, and consequently, *P. semilaevis* was shown to be one of the most dominant benthic species in the Kagoshima Bay. While slightly different fishing gear were used, commercial Danish seiners conduct up to five times of tow a day with each towing duration of 20 to 30 minutes in Kagoshima Bay. It can, therefore, be considered that *P. semilaevis* is a fisheries resource that should be available throughout the year at a stable quantity.

Marine social science

Bottom seine fishermen in Kagoshima Bay base their decisions on the current price difference between *S. melantho* and *P. semilaevis*. For these two species of shrimp, there are differences in the distribution, stock fluctuation and catching process. Under these conditions, the fishermen have been attempting take a stable catch of *S. melantho*, but the amount of by-catch *P. semilaevis* has been fluctuating widely affecting the population level. This may be one of the reasons why the local fishermen have not yet realized the added value of *P. semilaevis*.

The current situation of national distribution of aquatic products shows that, increasingly, more aquatic products are being imported, and domestic products are mainly coming from large-scale fishing grounds and aquaculture. While the market share for less than 20 species continues to increase, that for other species is decreasing. Also, the regional differences in the consumption of aquatic products are diminishing. Although the government has encouraged the idea of "local production and local consumption", effective utilization of local resources is often difficult, and at present, *P. semilaevis* is mainly used as a substitute for imported small frozen headless shrimp.

However, the Japanese glass shrimp *Pasiphaea japonica* (Decapoda, Pasiphaeidae) in Toyama Prefecture is a successful example. While *P. japonica* was once only consumed as a substitute for Sakura shrimp *Sergia lucens* (Decapoda, Sergestidae) that is commercially important and known from Suruga Bay, eastern Japan[11], it is now becoming an established value-added commodity in sashimi by removing the exoskeleton. The reasons that have allowed *P. japonica* to be established as a brand product include: mechanized shelling, the marking activities of local supermarkets, and tie-up campaigns with a major beer brewery. It is important to take into account a sentiment that consumers will pay slightly

more for superior local products.

Conclusions

The results of the present study confirmed that *P. semilaevis* can be caught throughout year in a relatively stable manner, and this shrimp may have potential as sashimi or as processed food products. However, the study clarified that there is a problem with the distribution channel and that the local consumers do not necessarily prefer aquatic products.

The final goals of the present study are to 1) estimate the available supply of *P. semilaevis* by assessing such data in fisheries biology as, life cycle, distribution and dynamics; 2) gather data related to processing and quality management by ascertaining the effects of handling during seining, distribution and processing on the quality of *P. semilaevis*; 3) survey the local fishermen about their knowledge of fishery economics, i.e., fishing strategies, marketing activities, and consumption behavior; and 4) share the results and findings with the local fishery cooperatives and distributors to invigorate the local economy.

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