

Satoumi Conservation and Sustainability: An Empirical Exploration through a Face-to-face Interview Survey in a Local Fishery Community in Noto Peninsula

著者	Kohsaka Ryo, Kawabe Sakiko, Fujihira Yoshinori, Oyamada Kumi
journal or publication title	Journal of International Fisheries = 国際漁業研究
volume	14
page range	1-16
year	2015-01-01
URL	http://hdl.handle.net/2297/43123

Satoumi Conservation and Sustainability: An Empirical Exploration through a
Face-to-face Interview Survey in a Local Fishery Community in Noto Peninsula

Ryo KOHSAKA[†], Sakiko KAWABE, Yoshinori FUJIHIRA* and Kumi OYAMADA**

(Kanazawa University Graduate School of Human and Socio-Environmental
Studies/*Kanazawa University Graduate School of Natural Science and Technology,

Kanazawa, Japan/**JFE Steel Corporation Slag Division)

E-mail : [†]kohsaka@hotmail.com

[Abstract]

We explored the perceptions of local residents with respect to human intervention in marine environment, including the degrees of preferences with options for concrete conservation measures. A face-to-face interview survey was conducted with 15 local residents from Suzu City, located at the northern tip of the Noto Peninsula. The survey aimed to identify how local residents perceive the role of human intervention in preserving such an environment. We first examined the extent to which residents are ready to accept human intervention and then whether communities involved in fishery understand and appreciate terrestrial conservation activities, including those related to forests. The outcomes from our interviews suggested that local residents perceive a strong linkage between terrestrial and coastal environments. The residents, including those not directly involved in fishery, were sensitive to the theme of sustainability of their community, particularly in relation to rural fishery.

[keywords]

small scale fishery, biodiversity conservation, sustainable use, Suzu City

1. Introduction

In Japan, human life is supported by products and services from oceans. Humans enter these oceans to maintain the rich Satoumi environment (Berque and Matsuda 2013). The Japanese term Satoumi refers to a type of coastal area where human intervention (widely believed to be originally targeted at promoting economic diversification and productivity of species used as staple seafood) indirectly contributes to an increase in the global biological productivity of the coastal area and to enrich some aspects of its biodiversity (Japan Satoyama Satoumi Assessment 2010, Berkes 2012,

Maffi and Woodley 2012). Critically important here is that human intervention and influence are integral parts of the definition of Satoumi. However, to date, the interlinkage of human society and the role of community fishery related to Satoumi has not been fully explored (Henocque 2013).

With rapid economic development following World War II, Satoumi seascapes and their surrounding terrestrial environment have dramatically changed in Japan with its increasing number of harbors with concrete-covered breakwaters and human-made artifacts, such as tetrapods. These transformations have impacted biodiversity and ecosystem services. As a response, environmental strategies for restoring or conserving biodiversity have regularly been practiced in Satoumi through various methods, such as the installation of artifacts (e.g., blocks) in the seabed to regenerate ecosystems. Promotion of such activities requires evaluation in several phases and at various levels.

To promote consistency and success in the restoration and conservation of marine environment, the Japanese Ministry of Environment identifies four steps for marine conservation ⁽¹⁾:

- 1) Develop an interest in the sea.
- 2) Understand the importance of marine conservation.
- 3) Understand how to conserve the sea (understand the need for appropriate human intervention).
- 4) Participate in conservation activities.

Focusing on steps (1) to (3), our research aims to determine local understanding of “conservation of Satoumi” and steps taken so far for conservation. The basic phase will be to determine stakeholders’ awareness and perceptions of the importance of this activity. The study further aims to examine measures needed to promote conservation by surveying local residents’ awareness, as their awareness and understanding are critical for the sustainability of conservation and restoration activities.

2. Survey Method and Study Site

We conducted an interview survey with the local residents of Suzu City, which is located at the northernmost tip of Noto Peninsula. In order to safeguard and support the world’s agricultural and biodiversity heritage system of the peninsula, Noto’s Satoumi was registered and designated as a Globally Important Agricultural Heritage System (GIAHS)⁽²⁾ by the United Nations Food and Agricultural Organization (FAO). Iida Bay is located within Suzu City, and a branch of the Ishikawa fishery cooperative is

located in the region. The local residents benefit from fishery and tourism from the bay and the coastal area. The purpose of the interview survey was to identify local fishery and Satoumi conservation problems. The methodology of the questionnaire was conceptualized and modified from an existing work done on national parks by Shoji *et al.* (2005). The modification is as follows: the degree of preferences is scaled with two options. The degrees are simpler than the original methodology, as our aim was to interview local residents, including nonexperts, and to identify general trends.

Existing scientific assessments evaluate certain biological species as tools to mitigate excess nutrients in eutrophic coastal waters (Petersen *et al.* 2014) or apply ecosystem concepts to marine ecosystems (Shuntov and Temnykh 2013). In this study, we evaluate the perception of residents with regard to individual measures used to conserve or enrich productivity of the coastal environment. We initially examined the extent to which residents are prepared to accept human intervention and then whether communities involved in fishery understand and appreciate terrestrial conservation activities, including forests in river basin areas.

For this research, the interview survey was conducted with 15 respondents who reside or work in Suzu City, mainly in the Iida Bay area. The sample size is limited, and outcomes are not a statistical representation of the overall population of Suzu City (15,134 as of October 1, 2013).

Despite these limitations, views expressed here provide valuable insights from various backgrounds, including those of fishermen and nonfishermen (this will be explained later). Face-to-face in-depth interviews, each an average of 30 min, were conducted to capture the views of local residents. Interviewees were included on the basis of snowball sampling, mainly through the introduction of initial contact persons or through the introduction of researchers. Fifteen respondents were included because some of them were easily available, whereas others were more familiar with the marine environment. A researcher individually met them and had them complete the questionnaire-type interviews. The researcher visited respondents' homes or workplaces and conversed with them either individually or with their families.

The site of the interview survey was around the Iida Bay coastal area where the Takojima fishing port is located. The bay is particularly important to residents in terms of fishery. The Suzu branch of the Ishikawa fishery cooperative has the largest number of members of registered power-driven fishing boats⁽³⁾. Furthermore, the cooperative's location at the Iida port (i.e., the center of the fishery of Suzu City) makes it particularly relevant to the study because of its important role in the economy and employment in

the entire Noto Peninsula. However, the degree to which local residents appreciate the bay or ocean is not clear.

The Iida Bay coastal area forms the core, which houses the city's offices, shopping streets, and large grocery stores (Figure 1). In contrast, there are fishing villages with a small population surrounded by sea and mountains, such as the Takaya area. In both areas, the fishing industry has continued for many years, and many families there practice both farming and fishing. Moreover, both areas provide sightseeing opportunities. The Iida Bay coastal area offers several tourist spots, such as Mitsukejima (a desert island) and Michi-no-eki (a roadside rest area). In addition, there are facilities such as Suzunari (a restaurant), Suzu Beach Hotel, and Suzu Ware Museum. The Noroshi fishing port coastal village offers Misaki Nature Trail, which links Rokkouzaki Lighthouse and Kinoura Marine Park, and a driving tour popular as a viewing point. Therefore, many tourists from outside the city visit during the summer, although these numbers dwindle during winter. In addition, on the coastline facing the Sea of Japan, which includes places such as Noroshi fishing port, the raging sea during winter limits the number of possible fishing days.



Figure 1. Location of Iida town, Suzu City

2-1. Interviewee Profiles

Tables 1 to 5 provide a few demographic details about the 15 resident interviewees.

Table 1. Gender

Male	9
Female	6

Satoumi Conservation and Sustainability: An Empirical Exploration through a Face-to-face Interview Survey in a Local Fishery Community in Noto Peninsula

Table 2. Number of family members.

Alone	4
2 members	2
3 members	4
4 members	3
5 members	1
6 members	1

Table 3. Age (years)

20–29	2
30–39	6
40–49	0
50–59	4
60–69	2
70 or older	1

Table 4. Occupation

Company employee	3
Self-employed	4
Public servant	1
Part-time worker	2
Housewife	0
Student	0
Living on a pension	1
Others	4

Table 5. Annual income

Less than 2,000,000 yen	8
2,000,000–2,999,999 yen	2
3,000,000–3,999,999 yen	3
4,000,000–4,999,999 yen	1
5,000,000–5,999,999 yen	0
6,000,000 yen or more	1

With regard to occupation, no full-time housewives and students were included in the sample; however, interviewees' jobs were not limited to the fishing industry. Whereas five of the 15 interviewees were fishermen by occupation, others came from various backgrounds, ranging from a store manager, teacher, a traditional artisan of Suzu wares, to a businessman.

3. Results

3-1. Relationship Between the Interviewees and the Sea

We designed a questionnaire to examine interviewees' concerns with regard to local sea conditions and relevant ecosystem services. As a starting point, we asked about their conservation preferences. When asked about the natural sea environment, all 15 interviewees responded that they want the sea to be conserved. For a question asking how frequently they visit the sea, interviewees whose jobs were not marine- or fishery-related could not immediately respond, and four of them responded "neither," indicating their uncertainties. There is a possibility that their confusion was caused by ambiguity over the term "frequently." The results indicated that nine responded positively and two responded negatively to whether they frequently visit the ocean. For a question asking whether their jobs are marine- or fishery-related, six interviewees, including five fishermen, responded positively. One respondent was not a fisherman by occupation but was engaged in Satoumi conservation activities. For a question asking whether they like observing sea life, ten interviewees responded positively, three responded "neither," and two responded negatively. For a question asking whether they like seascapes or marine leisure activities, 13 responded positively and two responded that they like neither. Although not all of the interviewees were involved with marine activities on a daily basis, most of them enjoyed the marine and coastal environment.

On the basis of these results, it is estimated that local residents of the Iida Bay coastal area have relatively strong ties and interests in the marine and coastal environment.

3-2. Awareness and Perception of Conservation and Environmental Improvement

Interviewees were asked to respond to questions pertaining to how much human intervention they think is required to conserve fertile sea environments on a scale from 1 to 5. Respondents choosing option 1 think the area should be left in its natural state free from human intervention, whereas those choosing option 2 feel the same way but

less intensely. Respondents choosing option 5 think that artificial means should be used to conserve the area, whereas those choosing option 4 think the same but less intensely. Finally, those choosing option 3 think that the options of leaving the area in its natural state and using artificial means are equally important. Interviewees were asked to answer these questions by referring to cases of coastal fishing grounds (Figure 3), offshore fishing grounds (Figure 4), long-distance fishing grounds (Figure 5), and all three combined (Figure 2). Coastal fishing grounds refer to the sea area near shore where shellfishes and algae gathering and line-and-pole fishery, set net fishery, and small-scale trawl net fishery are conducted. Offshore fishing grounds refer to an offshore area where mid- to large-scale trawl net fishery and purse seine fishery are conducted and where squid, mackerel, and Pacific saury are mostly caught. Long-distance fishing grounds refer to the deep-sea area where fishing is conducted from a month to a year and where mostly tuna species are caught.

Although many interviewees responded that sea areas should remain as they are, those in the fishing sector thought that all fishing grounds should be maintained through artificial means to increase productivity (Figure 2). Respondents were relatively tolerant about using artificial means on coastal and offshore fishing grounds located nearer to inhabited areas (Figures 3 to 5).

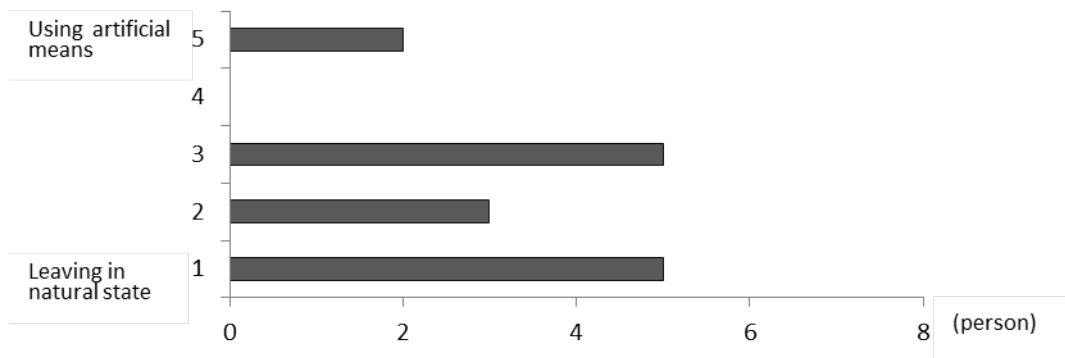


Figure 2. What type of conservation do you think is better for fishing grounds?

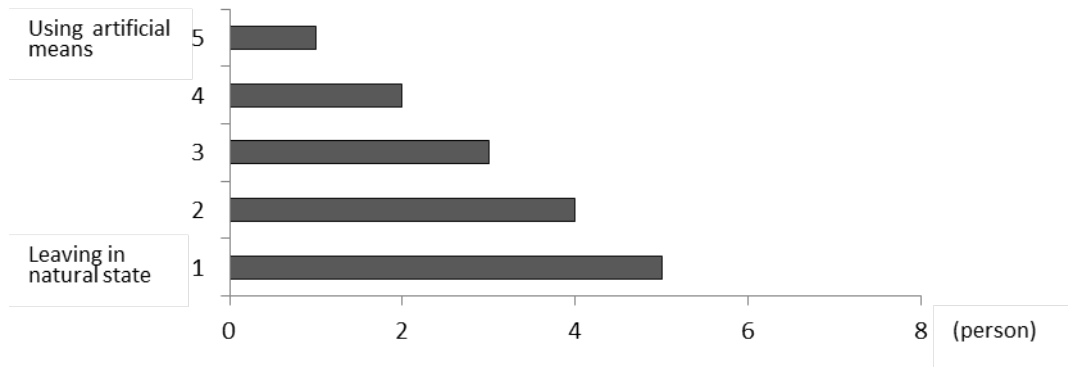


Figure 3. What type of conservation do you think is better in the case of fishing grounds in coastal areas?

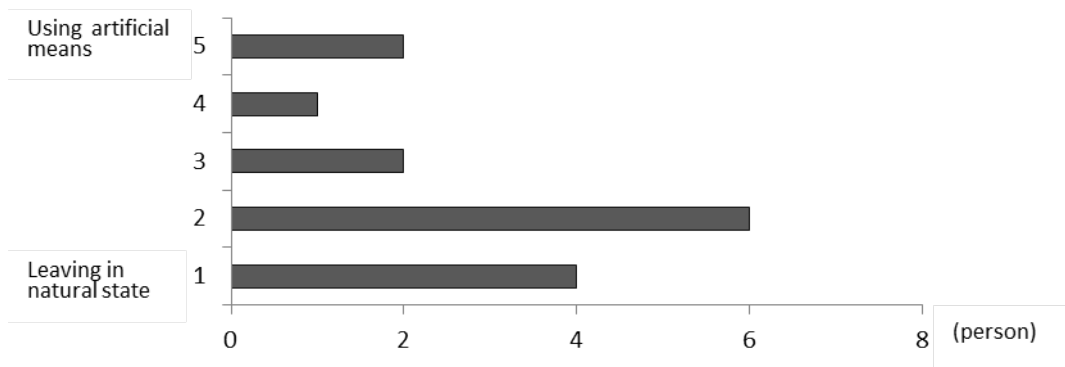


Figure 4. What type of conservation do you think is better in the case of fishing grounds in offshore areas?

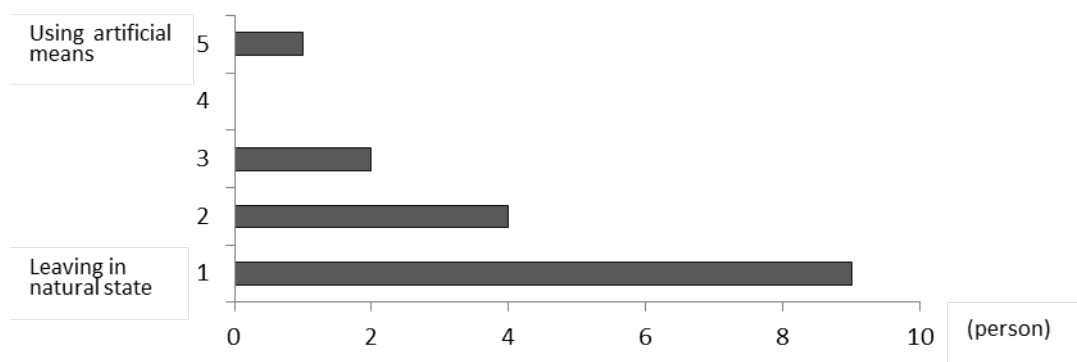


Figure 5. What type of conservation do you think is better in the case of long-distance fishing grounds?

Next, interviewees were asked to respond on a scale from 1 to 5 to questions pertaining to natural environments they think require the most human intervention

(Figures 6 to 8).

More than half of the interviewees thought it is more important to focus improvement on the coastal environment (Figure 6). In this case, interviewees felt that human intervention is mostly needed because shores are close to inhabited areas and garbage is found in shores and nearby coastal waters, according to their experience.

However, four interviewees responded that both the coastal environment and open sea are equally in need of improvement. This is because they think of the whole sea as one interrelated entity. As one interviewee said, “we understand the linkage between different zones and its importance as a total to fish catchments.”

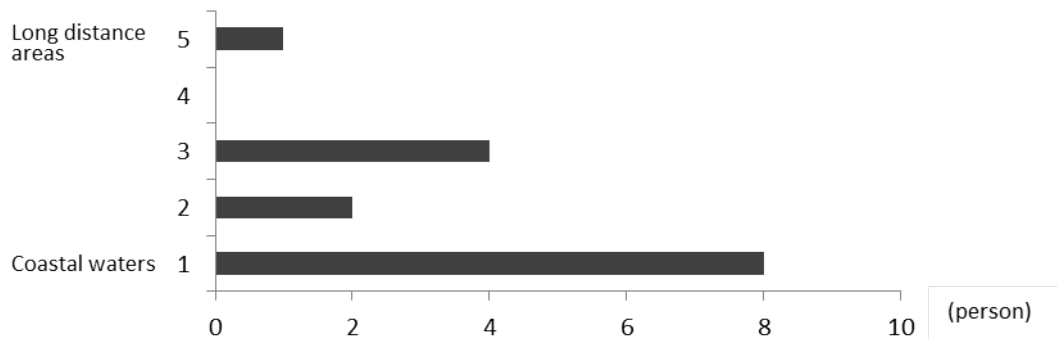


Figure 6. Is environmental improvement more important for coastal waters or for long-distance areas? Notes:

Respondents chose from five options graded as follows:

- (1) the coastal environments need to be improved the most ;
- (2) similar to option 1 but with less intensity;
- (3) improving coastal and open sea environments of equal importance;
- (4) similarly to option 5 but with less intensity;
- (5) improving the long-distance marine environment most important.

For the question posed in Figure 7, more than half the interviewees responded that environmental improvement is needed in both forest and sea areas. This is because they were aware of the interrelationship between forests and sea areas. The term “sea areas” in the question here did not differentiate coastal, offshore, or long-distance but is used as one entity comparing to forests. The interviewees rather tend to think their surroundings are not isolated but are interconnected. However, more interviewees responded that forest environments needed improvement than sea areas. This is because they felt that mountain devastation has been advancing further than seas and were aware of the dangers this situation poses.

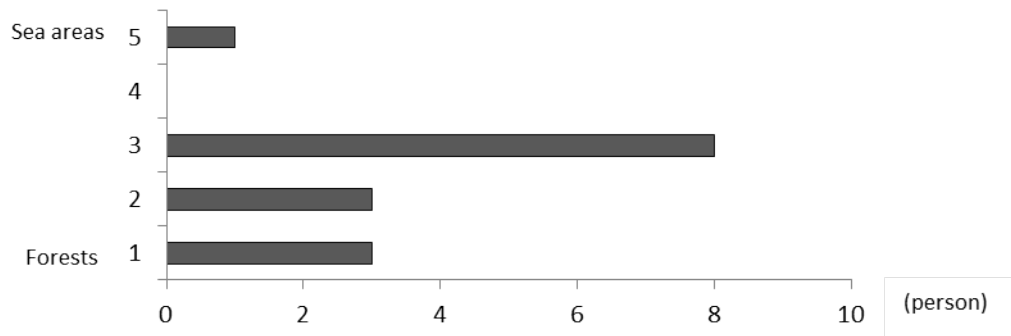


Figure 7. Is environmental improvement more important for forests or sea areas?

Notes:

Respondents chose from five options graded as follows:

- (1) Forest environments are most in need of improvement;
- (2) similar to option 1 but with less intensity;
- (3) improving forests and seas are equally important;
- (4) similar to option 5 but with less intensity. ;
- (5) sea areas are most in need of improvement.

For the question posed in Figure 8, more than half the interviewees responded that fishing ground environmental improvement is more important. Some said that fishing harbor environments have already been improved enough, and there was an opinion that fishing harbors have been overenhanced with buildings and concrete-covered grounds. Moreover, some argued that it is more important to let fishing grounds regenerate independently than to improve them through human intervention. The results suggest that respondents tend to believe that more the environments are improved through human intervention, the less natural and fertile they will be.

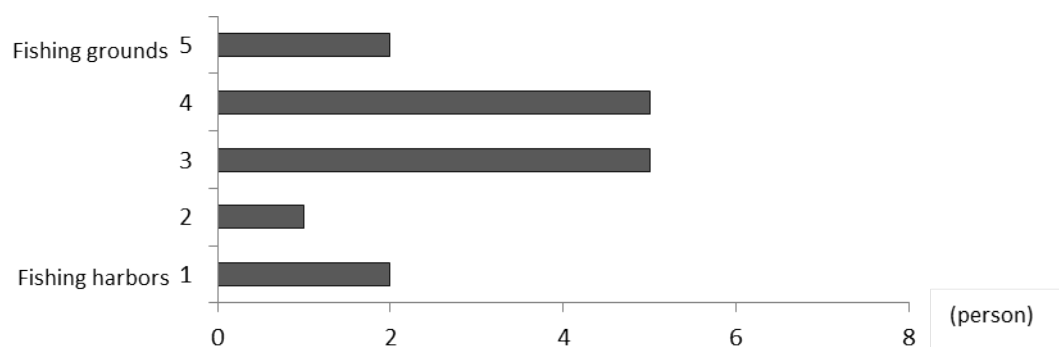


Figure 8. Is environmental improvement more important for fishing grounds or fishing harbors?Notes:

Respondents chose from five options graded as follows:

- (1) Fishing harbor environments are most in need of improvement;
- (2) similar to option 1 but less strongly;
- (3) improving both fishing harbor and fishing ground is equally important;
- (4) similar to option 5 but less strongly;
- (5) fishing ground environments are most in need of improvement.

3-3. Means to Improve Fishing Grounds and Promotion of Fishing Sector

We asked respondents to share their thoughts as to the most appropriate means to improve fishing grounds. Although many interviewees hesitated to respond because they felt that only a professional could answer the question, most responded that fishing grounds should be improved by installing natural sea walls (option 2 in Figure 9). Those in the fishing sector tended to agree with the installation of blocks in the seabed (option 3 in Figure 9).

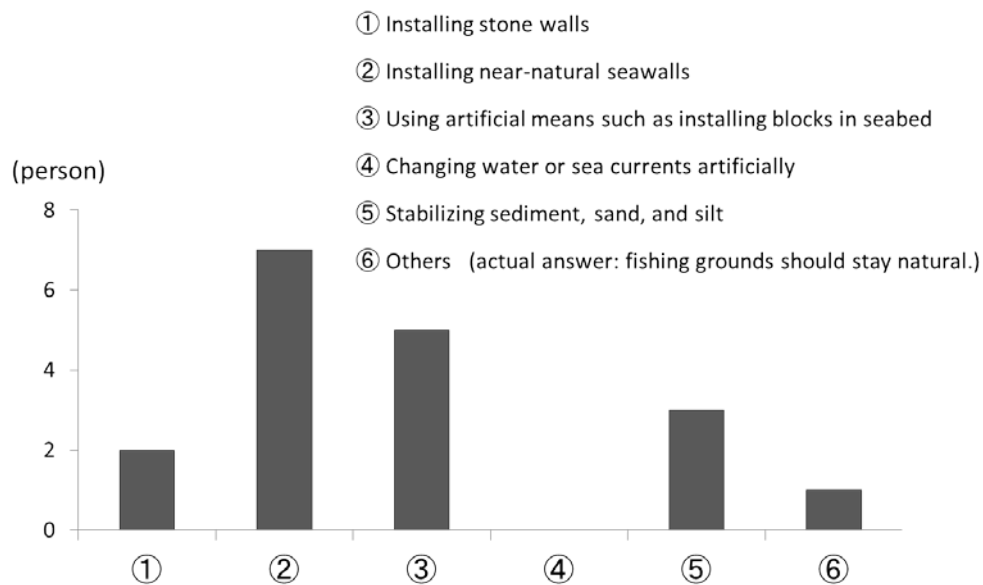


Figure 9. What means do you think should be used to improve fishing grounds? (Multiple answers allowed).

We then asked interviewees to suggest ways of promoting the local fishing sector; they responded that fostering personnel to become leaders in the fishing industry was

most needed (option 6 in Figure 10). Many responded that the maintenance of forests was needed; they considered it important to maintain economic development by increasing the productivity of seas.

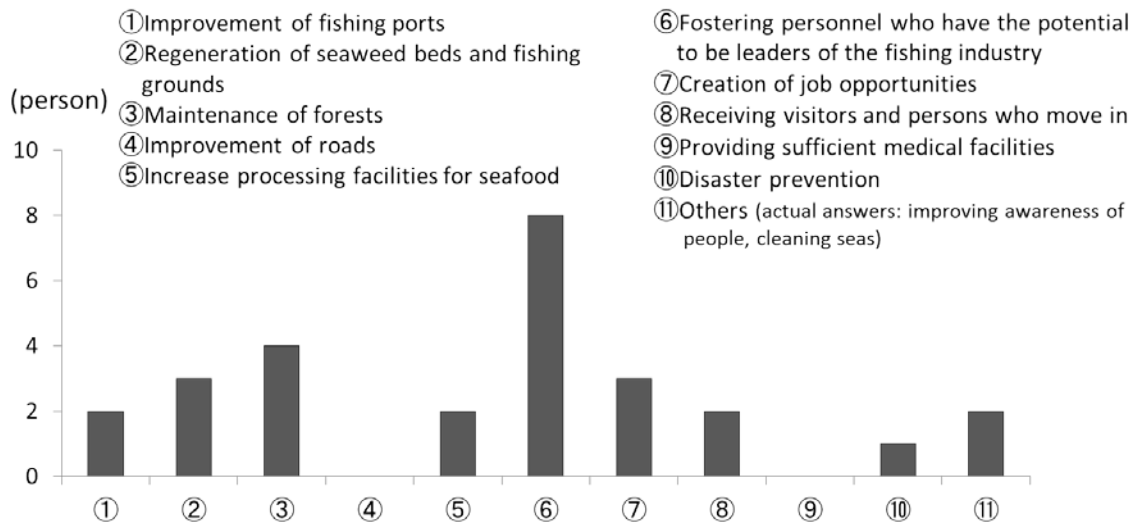


Figure 10. What should be prioritized to promote the local fishing industry?

4. Other Issues Raised During Interviews

During the interview, the survey revealed challenges for the fishing industry. Here we present the repeated common points that were expressed in the unstructured interview sessions, after the formal interview session ended.

4-1. A Decrease in Marine Products Consequent to Excessive Fishing

Instead of citing sea pollution due to domestic sewage or industrial effluent to explain the reduction in marine catch, interviewees argued that the more serious issue was that of overfishing, although rising seawater temperatures were changing the types and amounts of products that could be caught in a given sea area. It was also noted that with net fishing, it is difficult to avoid nonmarketable catches, such as juvenile fish. Fishermen also tend to catch more sea products than they need, in an attempt to buffer unstable market prices. An implication of this finding would be the need to assure that fishermen understand regulations governing illegal fishing and ecosystem consequences of catching some of the nonmarketable fish and to then introduce targeted education programs or grants to aid in adapting their fishing equipments accordingly.

4-2. The Low Price of Fish

Many interviewees complained about the low and unstable prices of fish offered at the market. Moreover, some noted the problem that adding value to sea products was difficult to implement because all catches are shipped to the fishery cooperative. In contrast, some were of the opinion that the market price of fish decreased as a consequence of fewer people eating fish.

4-3. Obstacles to Newcomers

A young fisherman claimed that restrictions on new entrants into the fishery, such as barriers to acquiring fishing rights, made entry into the fishing sector difficult for both youth and formal organizations, including private entities.

4-4. Succession

Although many residents mentioned the critical problems of the lack of young leaders, aging population, and depopulation of workers in the fishing sector, some interviewees were also of the opinion that no solution is possible because of the unprofitability of fishing. Although companies using net fishing and line fishing can earn a relatively high income, many newcomers and those fishing under private management cannot do so because they cannot fish as much. Entering the fishing industry as a side business is also difficult because fishing permits are needed to fish turban shells or abalones and fishing is permitted only in limited sea areas.

4-5. Maintenance of Forests

We found that many people felt a sense of crisis regarding the lack of maintaining forests in mountainous areas. One interviewee stated that he felt that more water flowed down the mountains than before, particularly during a rainstorm, and he was concerned that muddy water flowing into estuaries would impact the coastal seaweed. Similarly, another interviewee was concerned about landslides for security reasons.

4-6. Declining Interest in Seas

A decrease in fishery population and number of people visiting the seashore was noted. One reason for the increasing accumulation of litter at coastal areas seems to be the decreasing cultural and provisional value of the coast as a children's play area or place to collect resources. As such, fewer people visit the coast; thus, opportunities for people to clean the shoreline have also decreased. In many areas, residents were

gathering once a year to clean the shores, but such actions were ineffective because they occurred too infrequently.

Table 6 compares issues raised by fishermen and nonfishermen, showing that the latter group generally tended to view the state of fishery similarly to the fishermen, rather than viewing the situation from a consumer’s perspective. For example, nonfishermen are also concerned about the low market price of fish because the current recession within the fishery sector can potentially affect the economy of the whole city. As for succession in the fishery, nonfishermen were even more concerned than fishermen themselves. A possible reason for this difference could be that fishermen better understand that fishery is not profitable; thus, is unpopular for the younger generation.

Table 6. Classification of respondents who raised the issues

	Fisherman	Non-fisherman
A decrease in marine products consequent to excessive fishing	○	○
The low price of fish	○	○
Obstacles to newcomers	○	×
Succession	×	○
Maintenance of forests	○	○
Declining interest in the seas	×	○

Notes:

Table 6 shows which fisherman or non-fisherman raised the each issue. For example, some fishermen but no non-fisherman raised “obstacles to newcomers” as an issue; this is showed at the row of “Obstacles to newcomers”: ○ at the column of “Fisherman,” and × at the column of “Non-fisherman.”

5. Conclusion

We raised two questions in the Introduction: one on perception of human intervention and other on community fishery. As for the first point, we examined the perceptions of residents with regard to their acceptance of human intervention on the coast for an objective of Satoumi or marine conservation. There was strong preference among the residents for natural-state or close-to-nature measures for all sea areas, coastal, offshore, and long distance. Natural materials were preferred over artificial measures.

Satoumi Conservation and Sustainability: An Empirical Exploration through a Face-to-face Interview Survey in a Local Fishery Community in Noto Peninsula

A balance between “hard” intervention and more natural restoration is a central issue highlighted in the existing literature (Breque 2013, Henocque 2013). The present study provides initial empirical data attesting to the divided views of residents on this topic. Although both views were expressed (i.e., preserving nature in its pristine state vs. the necessity to intervene, including the use of artificial blocks), most local residents were critical of any human intervention in natural elements in coastal areas of the seascape, particularly when it involved installation of artifacts.

According to residents, the worst problem faced in protecting the abundant sea environment is the reduction in marine products due to excessive fishing, rather than sea pollution or loss of seaweed beds (which directly relates to environmental conditions).

The actual Satoumi is a landscape where human intervention is a prerequisite, given the hybrid human–nature system that has developed over centuries. To endorse such recognitions, some residents also felt it necessary to use artificial means to improve coasts and coastal waters to ensure the safety of inhabited areas, for example by keeping coastal areas clean by picking up litter.

Careful further research will be necessary to determine what type of intervention is preferred at what point by local communities for Satoumi conservation.

Our second question was related to the social aspects of communities involved in fishery. It was clear that for most residents, broader issues involved sustainability of the community, particularly related to the rural fishery. Most residents mentioned fishery management itself, such as the lack of young leaders in the fishery industry, excessive fishing, and changing relationship between human beings and seas.

According to survey responses, local residents, including those not working in the fishery sector, understand and appreciate terrestrial conservation activities, including those related to forests. We confirm that local residents understand the linkage between forests and oceans and indicated a willingness to conserve forests.

As a general fishery issue in Suzu City, the most frequently mentioned aspect was the lack of young leaders to perpetuate the fishery industry. The consequent dearth of newcomers was thought to be due to unstable fish prices and strict regulations. Moreover, a systemic problem of fishery is the difficulty in implementation of contrivance, such as adding value to sea products, as all catches are shipped to the fishery cooperative.

In this research, we obtained various opinions from rural residents regarding the conservation and restoration of the Satoumi landscape in relation to the local economy

and ecosystems, including fishery activities. These opinions were sorted as basic data. Further investigation is needed to determine what intervention should be developed and what companies or other organizations can do to promote the rural fishing industry. Awareness-raising activities to clarify the catchment and ecosystem functions can be helpful in the future. Residents recognize the importance of conserving terrestrial areas along with the fishery area. However, they do not fully understand conservation and restoration actions and methods, particularly when this implies the need for human intervention. A future task is to identify a set of relevant educational instruments, financial incentives, or legal measures needed to stimulate local residents to engage in effective conservation and restoration actions that are compatible with their everyday lives' constraints in their Satoumi landscapes.

Notes

- (1) Ministry of Environment (2008). Sato-Umi Net, MoE Tokyo, 2008, http://www.env.go.jp/water/heisa/satoumi/en/index_e.html (accessed 2014/6/2).
- (2) Globally Important Agricultural Heritage Systems (GIAHS) are defined by the Food and Agriculture Organization (FAO) as “remarkable land use systems and landscapes which are rich in globally significant biological diversity evolving from the co-adaptation of a community with its environment and its needs and aspirations for sustainable development” (<http://www.fao.org/giahs/giahs/en/>)
- (3) Source of the information is a booklet of fishery cooperative and fishery of Ishikawa reported by J.F. Ishikawa in 2013.

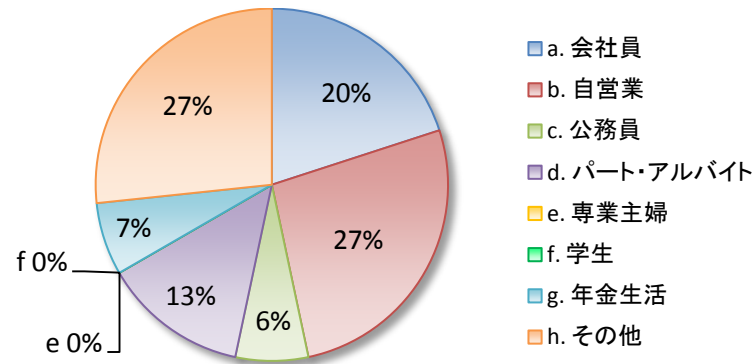
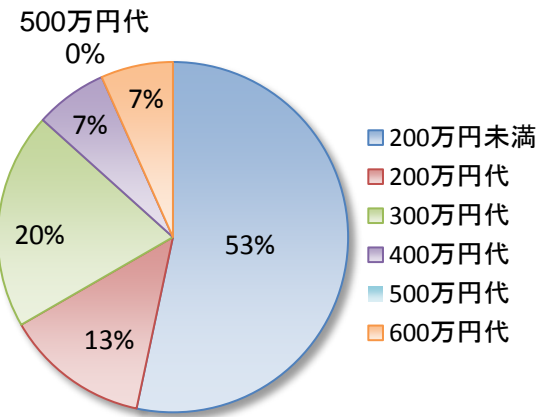
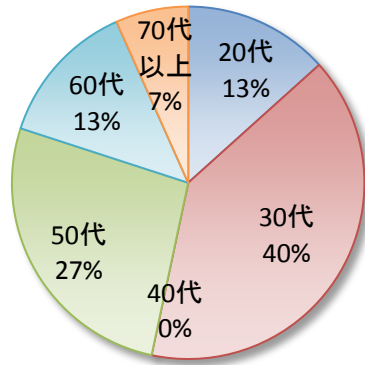
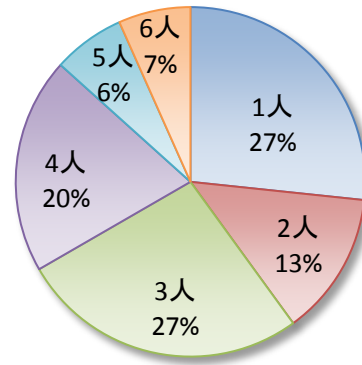
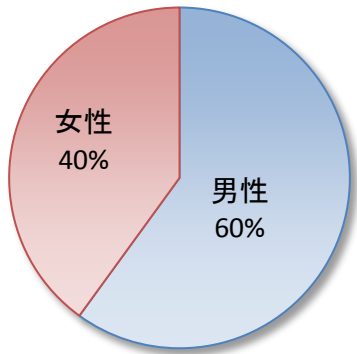
Reference

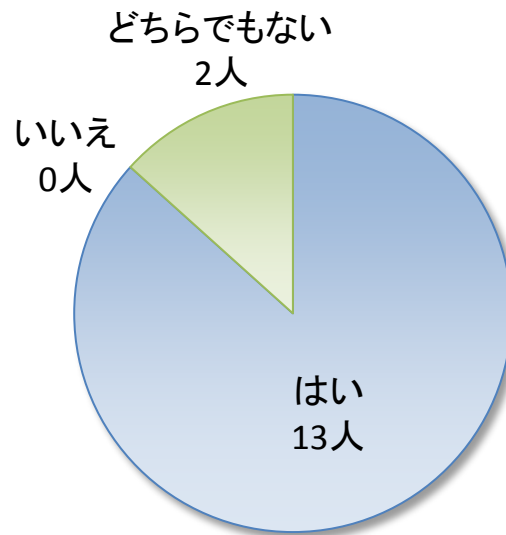
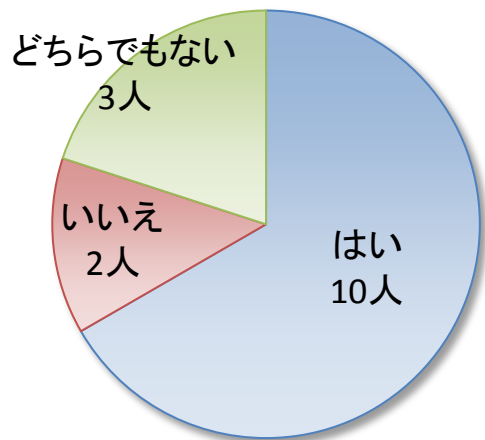
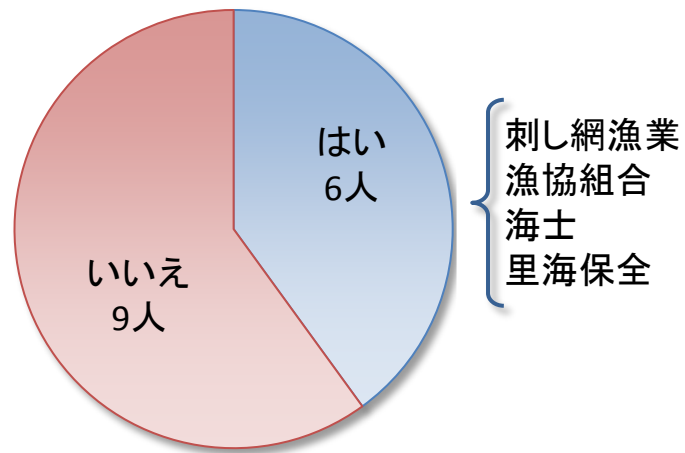
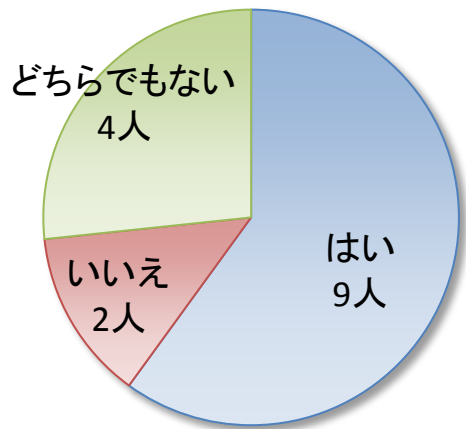
- [1] Berque J. and Matsuda O. (2013) “Coastal biodiversity management in Japanese satoumi,” *Marine Policy*, 39, 191-200.
- [2] Berkes, F. (2012) *Sacred ecology: traditional ecological knowledge and resource management*, Taylor & Francis, London.
- [3] Henocque Y. (2013) “Enhancing social capital for sustainable coastal development: Is satoumi the answer?,” *Estuarine Coastal and Shelf Science*, 116, 66-73.
- [4] Japan Satoyama Satoumi Assessment (2010) *Satoyama-Satoumi Ecosystems and Human Well-being: Socio-Ecological Production Landscapes of Japan (Summary for Decision Makers)*, United Nations University, Tokyo, Japan.
- [5] JF Ishikawa (2013) *Guide to Fishery in Ishikawa*, JF Ishikawa, Kanazawa (in Japanese).

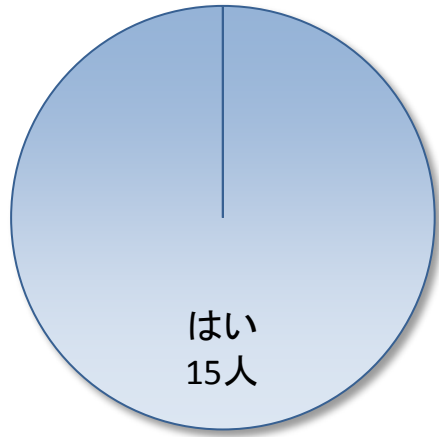
Satoumi Conservation and Sustainability: An Empirical Exploration through a Face-to-face Interview Survey in a Local Fishery Community in Noto Peninsula

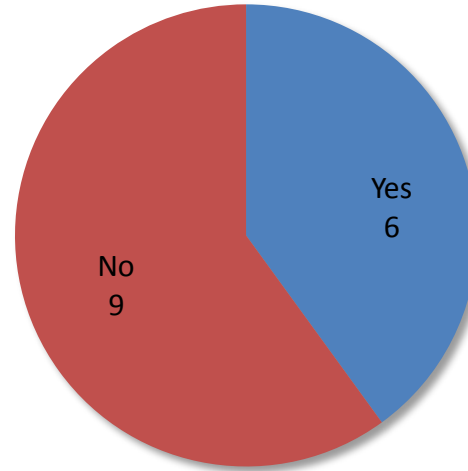
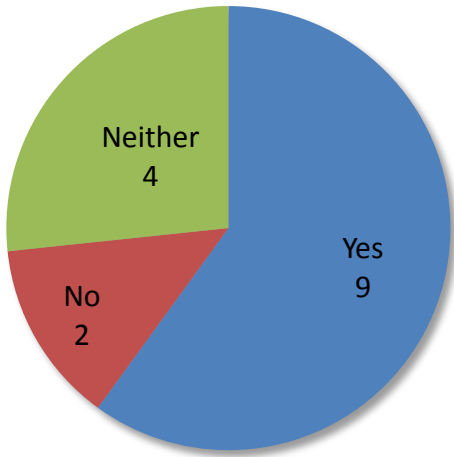
- [6] Maffi, L. and Woodley, E. (2012) *Biocultural diversity conservation: a global sourcebook*. Routledge, London.
- [7] Petersen J.K., Hasler B., Timmermann K., Nielsen P., Tørring D.B., Larsen M.M. and Holmer M. (2014) "Mussels as a tool for mitigation of nutrients in the marine environment," *Marine Pollution Bulletin*, 82, 137-143.
- [8] Shoji Y., Kuriyama, K., Mitani, Y. (2005) Empirical analysis of Taisetsu-zan National Park In Kuriyama & Shoji (eds) *Economic Evaluation of Environment and Tourism*:179-230, Keiso Shobo, Tokyo (in Jpanaese).
- [9] Shuntov, V.P. and Temnykh O.S. (2013) "Illusions and Realities of the Ecosystem Approach to the Study and Management of Marine and Oceanic Biological Resource," *Russian Journal of Marine Biology*, 39, 455-473.

[Acknowledgements] The authors would like to thank the residents for their collaboration with the surveys. We would also like to thank the sponsor who enabled this research. This study was also conducted as a part of the research project, supported by the Japan Society for the Promotion of Science (Grants-in-Aid for Scientific Research 26360062 Project Leader Kohsaka, R, FY2014-FY2016). A part of this project was also conducted as a part of the research project, "Trade off Analysis and Local Governance Model of Satoyama Ecosystem Services" (ES-Tradeoff, FY2013-FY2015; 1-1303), which is supported by the Ministry of the Environment (MoE), Japan through its Environment Research and Technology Development Fund.

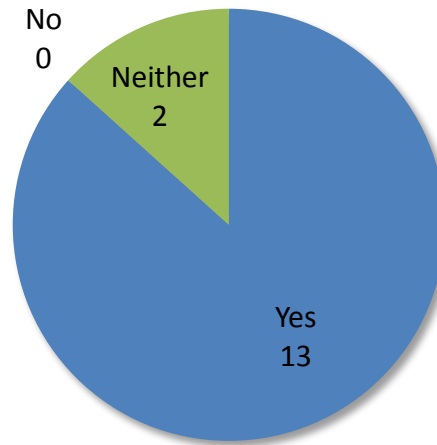
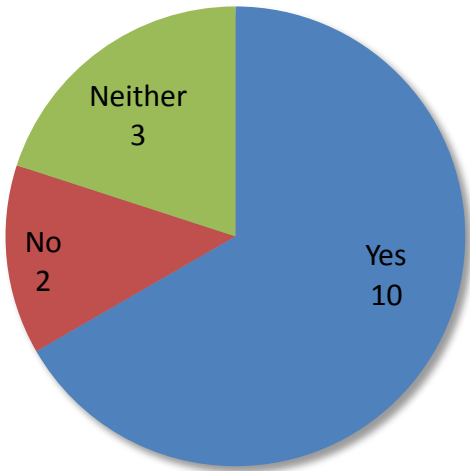


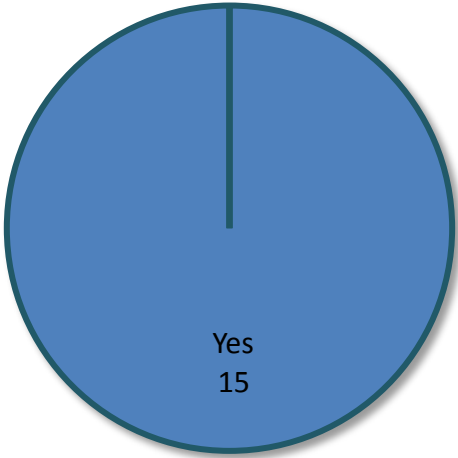


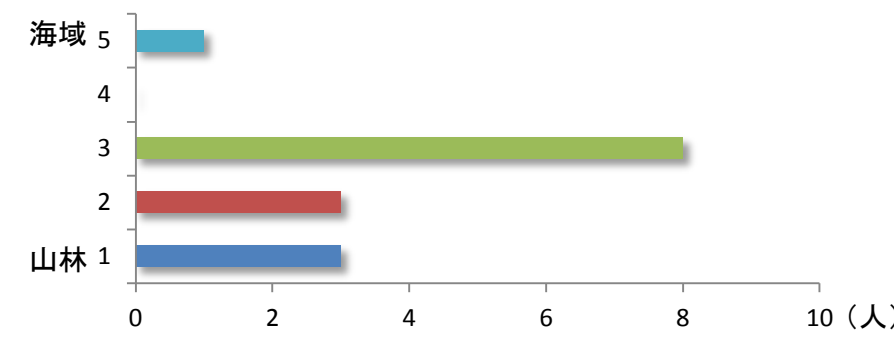
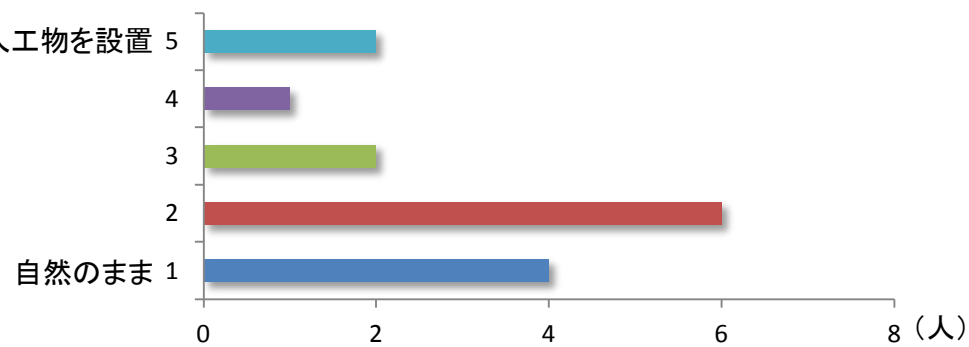
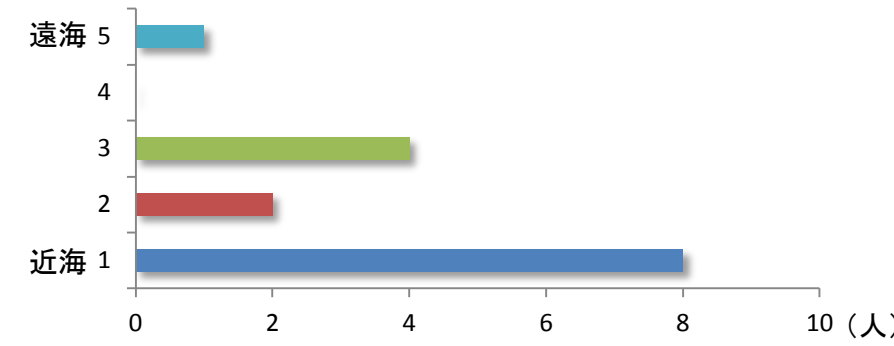
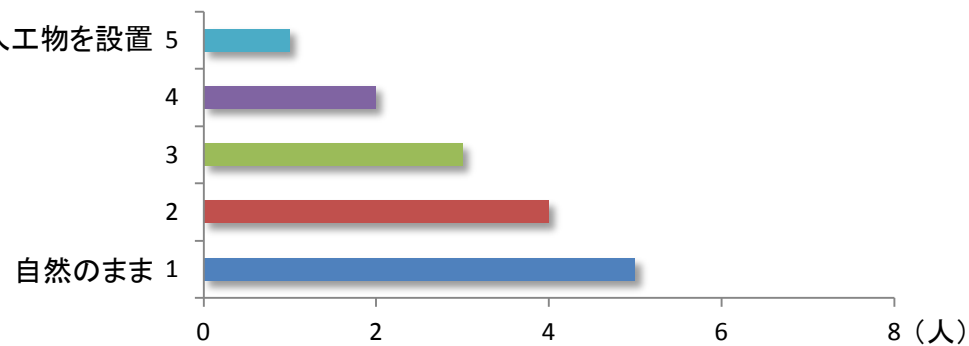
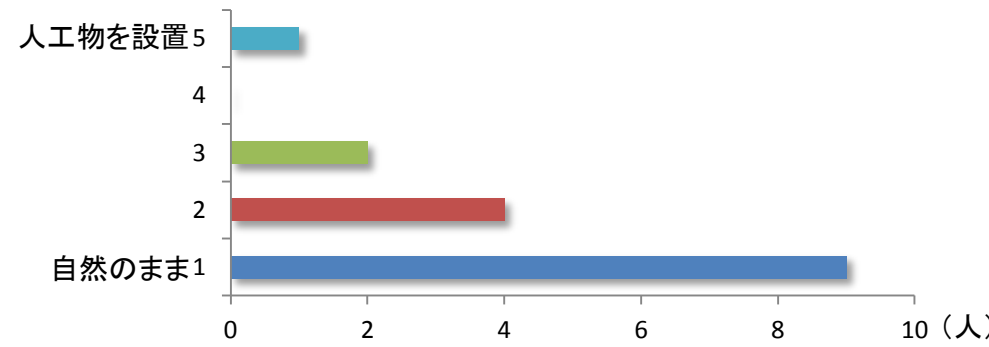
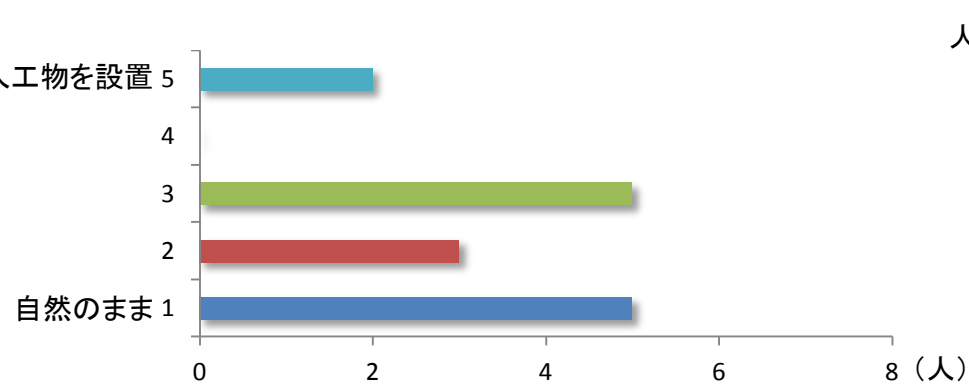


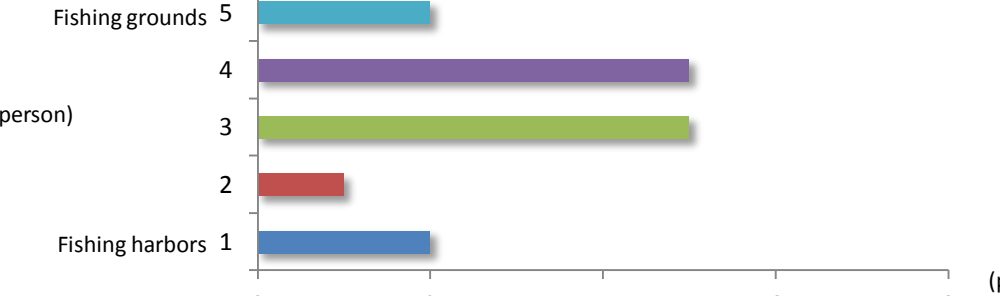
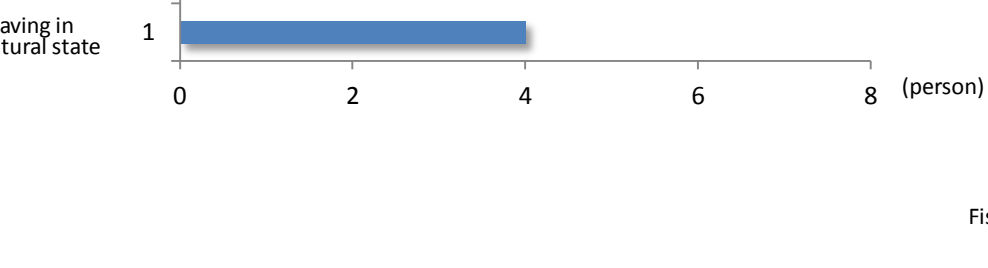
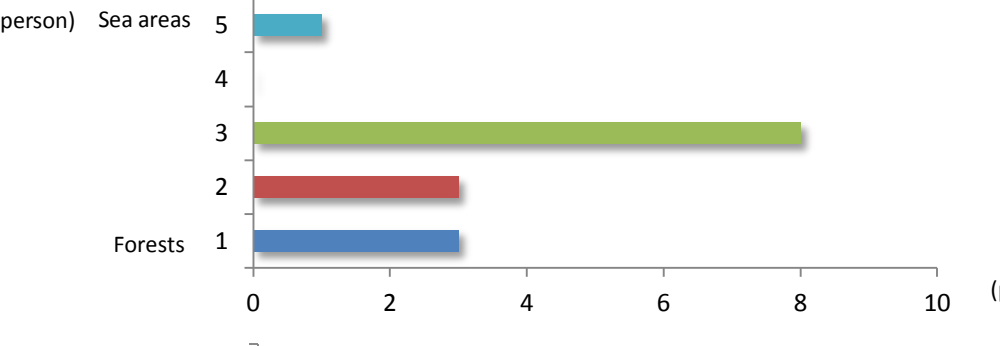
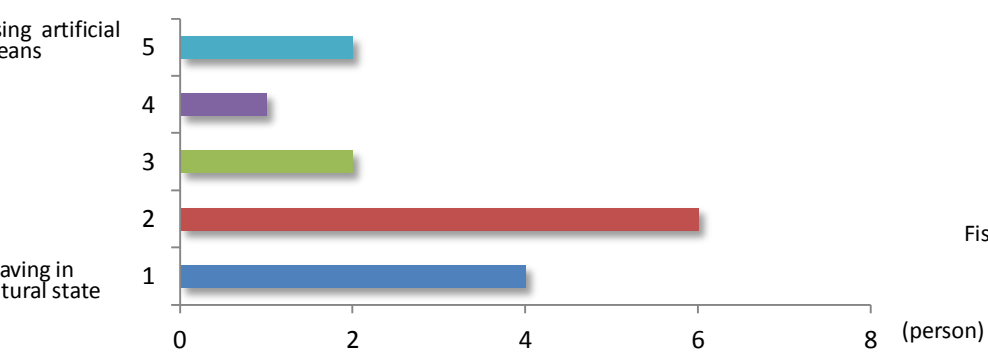
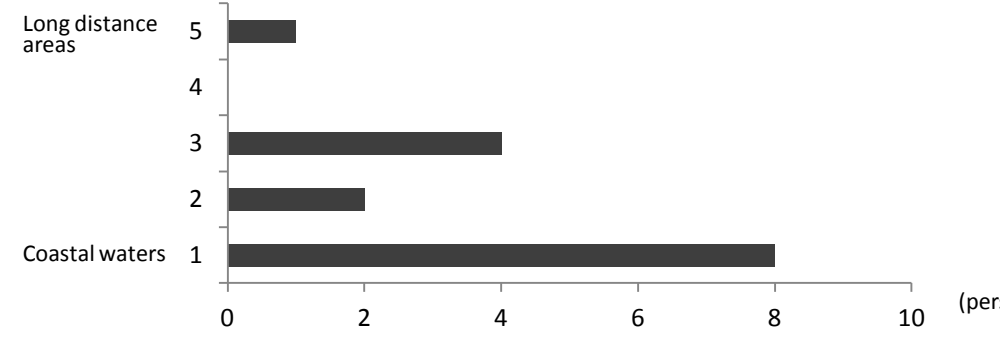
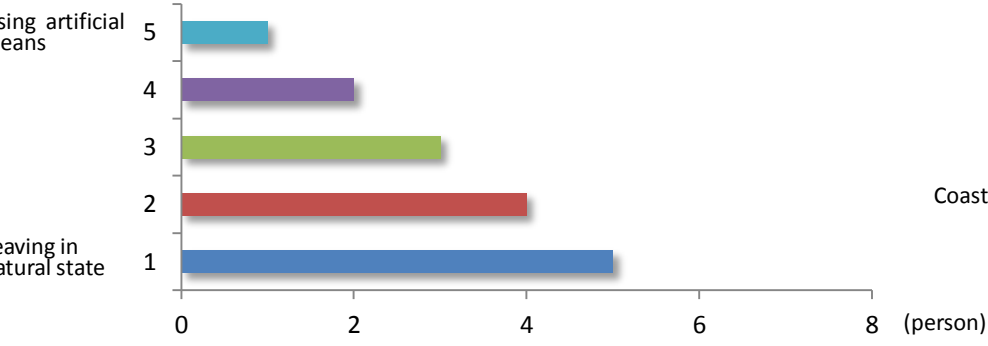
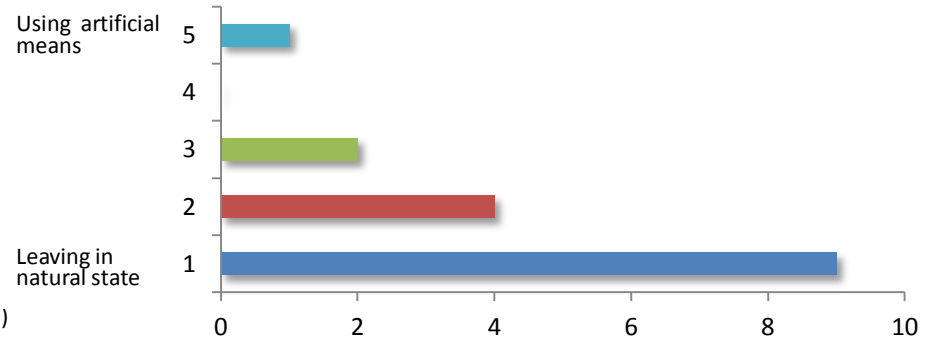
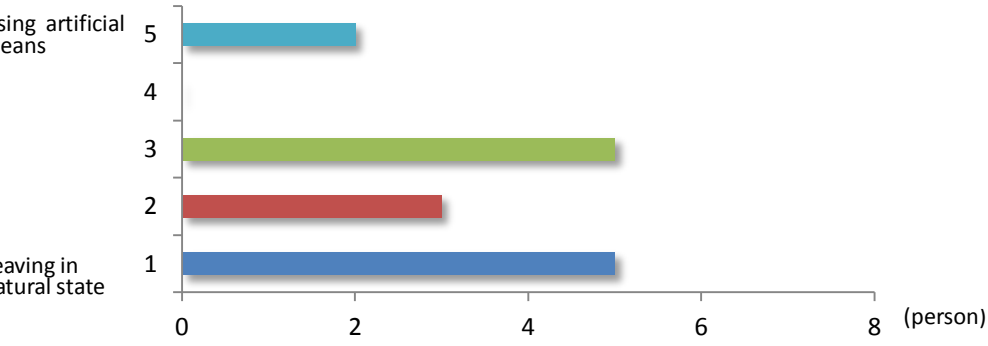


- Gill net fishery
- Fisherman's union
- Ama, diver who collects shells
- Conservation of Satoumi

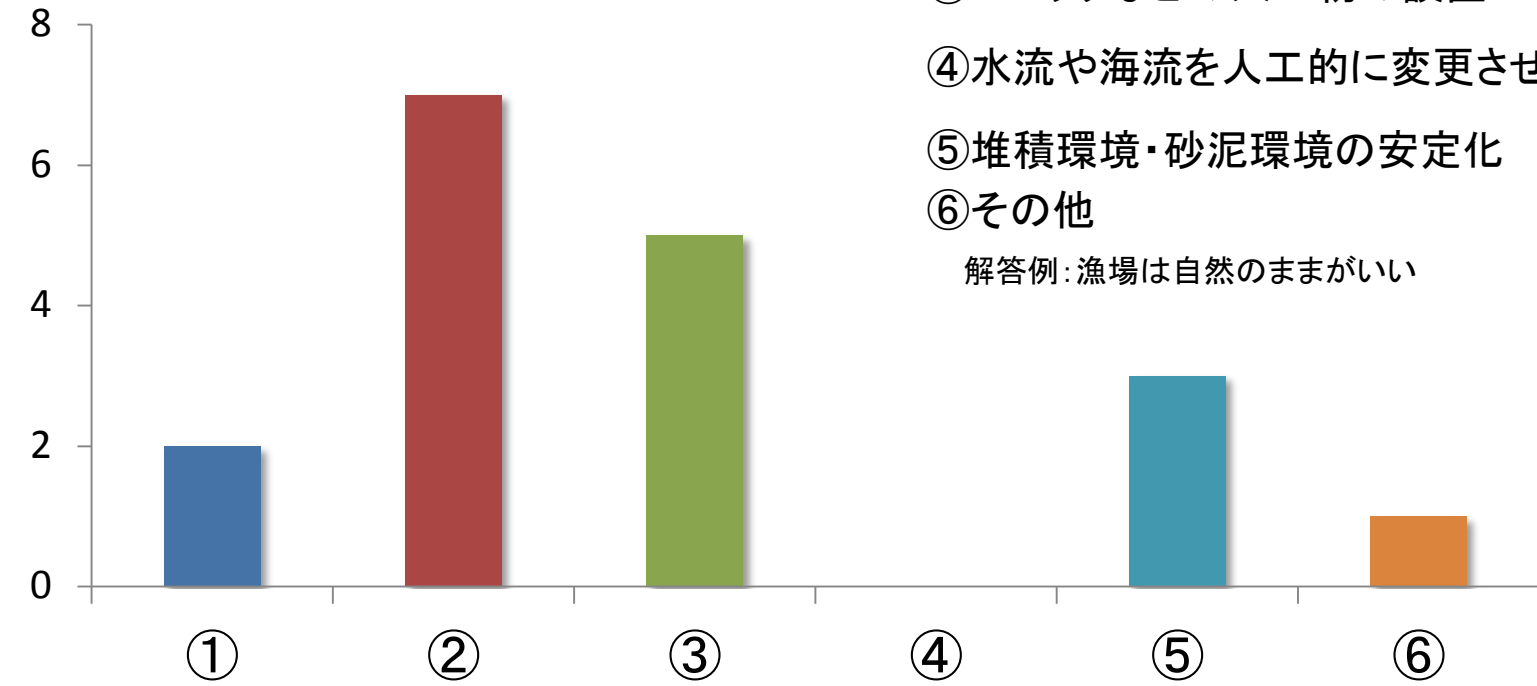








(人)



①石垣の設置

②自然に近い護岸の設置

③ブロックなどの人工物の設置

④水流や海流を人工的に変更させる

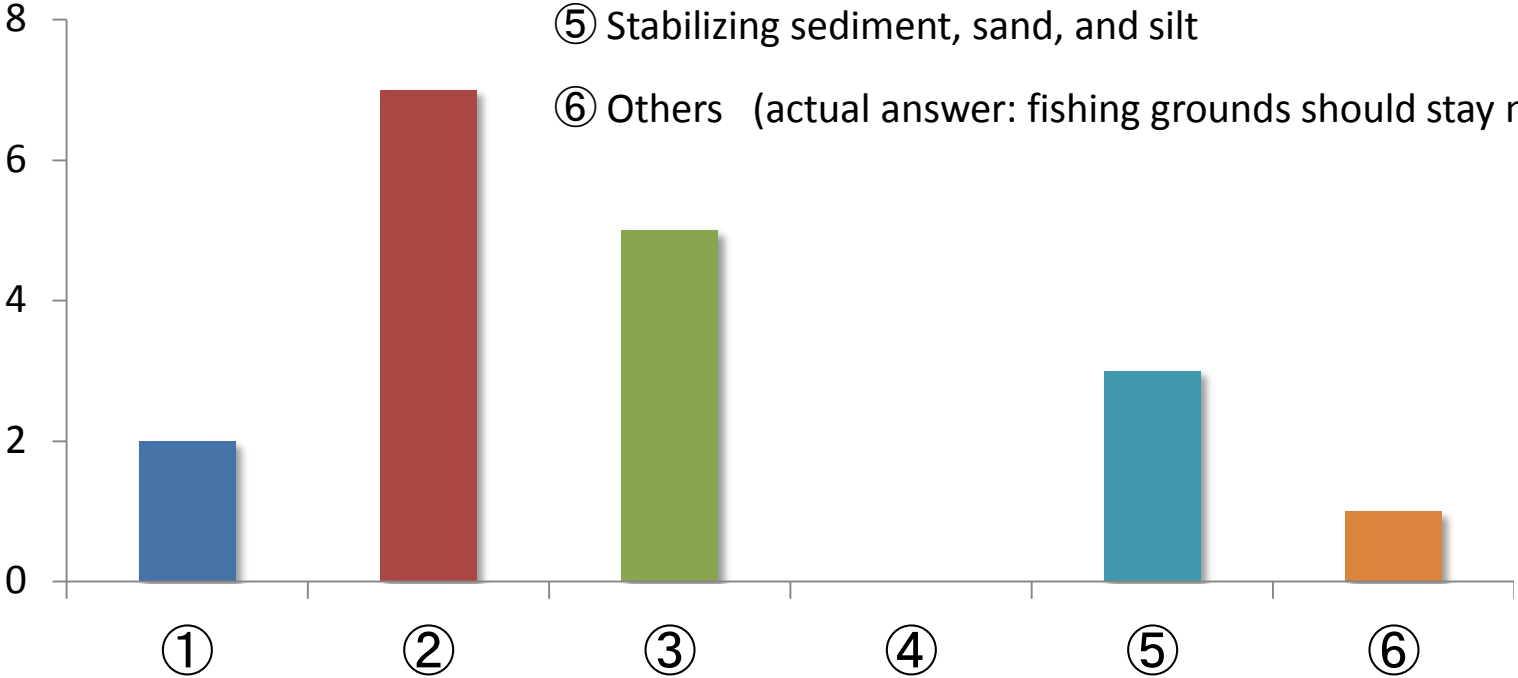
⑤堆積環境・砂泥環境の安定化

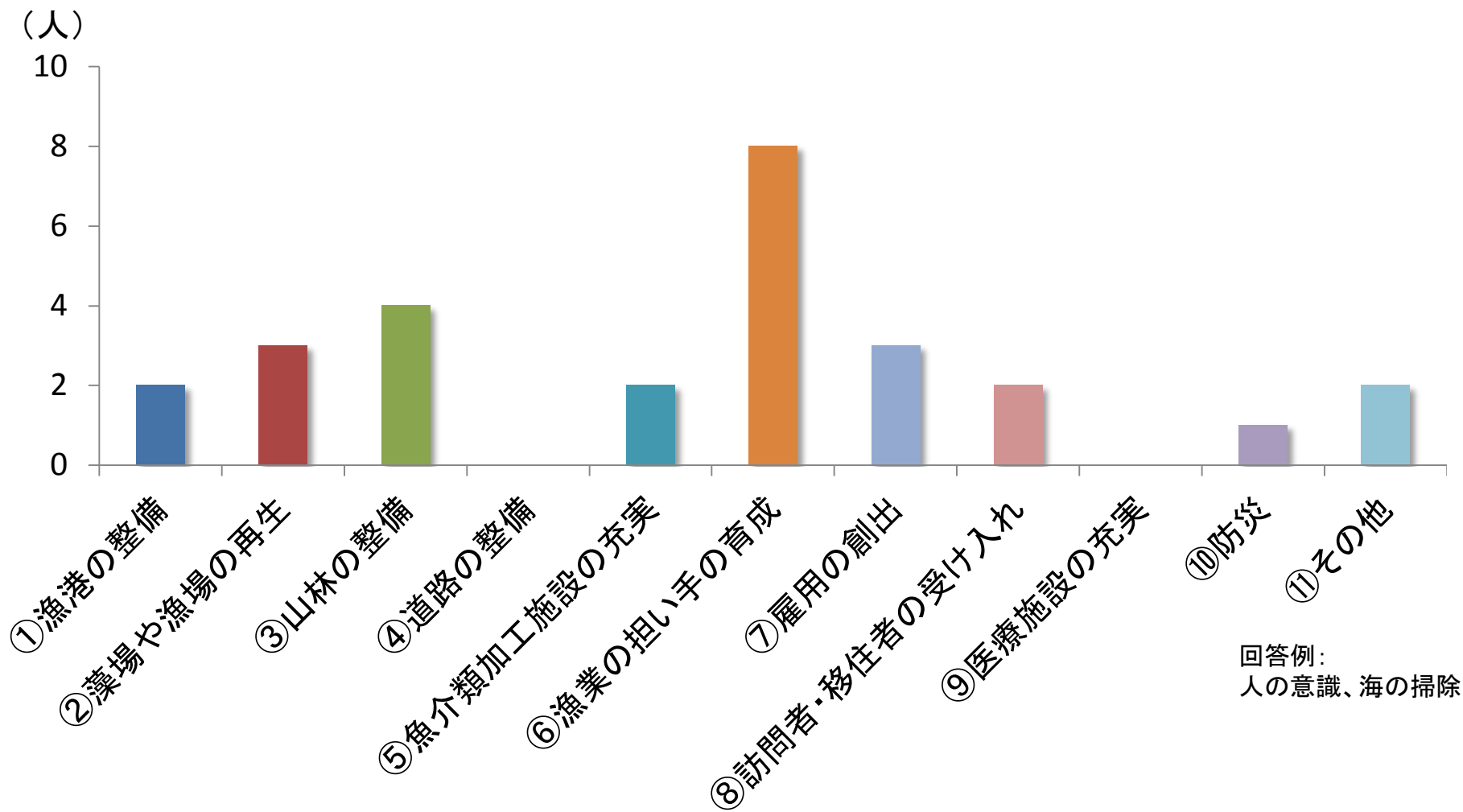
⑥その他

解答例: 漁場は自然のままがいい

- ① Installing stone walls
- ② Installing natural stone barriers
- ③ Using artificial means such as installing blocks in seabed
- ④ Changing water or sea currents artificially
- ⑤ Stabilizing sediment, sand, and silt
- ⑥ Others (actual answer: fishing grounds should stay natural.)

(person)





回答例：
人の意識、海の掃除

